Filed 4/9/2025 3:32 PM
Karen L. Wilson
District Clerk
Van Zandt County, Texas

CAUSE NO 25-00067

Stormy Canady

VAN ZANDT COUNTY, TEXAS, Plaintiff,	*	IN THE 294TH
V.	*	
TAALERI ENERGIA NORTH AMERICA, LLC, BT AMADOR STORAGE, LLC AMADOR BESS HOLDINGS, INC RENEWABLE ENERGY SYSTEMS AMERICAS, INC. BELLTOWN TEXAS POWER 2, LLC, Defendants.	*	JUDICIAL DISTRICT COURT VAN ZANDT COUNTY, TEXAS

VAN ZANDT COUNTY'S ORIGINAL PETITION AND APPLICATION FOR TEMPORARY RESTRINING ORDER AND TEMPORARY AND PERMANENT INJUNCTION

Plaintiff, Van Zandt County, Texas (the County), files this Original Petition and Application for Temporary Restraining Order and Temporary and Permanent Injunction in this enforcement action complaining that Defendants Taaleri Energia North America, (Taaleri), BT Amador Storage, LLC, (BT Amador), Amador BESS Holdings, Inc., (Amador BESS), Renewable Energy Systems Americas, Inc., (RES) and Belltown Texas Power 2, LLC, (Belltown) are developing property in Van Zandt County, Texas, for the installation of a Battery Energy Storage System without complying with the National Fire Protection Association Standard 1, National Fire Protection Association Standard 101 and National Fire Protection Association Standard 855 (2020). Van Zandt County seeks injunctive relief.

I. DISCOVERY AND RELIEF REQUESTED

Pursuant to Texas Rules of Civil Procedure section, 190.1, Van Zandt County will conduct discovery under a Level 2 Discovery Control Plan in accordance with Tex.R.Civ.Pro. 190.3.

This case is not subject to the restrictions of expedited proceedings under Rule 169 because Van Zandt County seeks non-monetary injunctive relief.

II. AUTHORITY TO SUE

Van Zandt County, Texas, brings this cause of action for injunctive relief and civil penalties pursuant to the authority granted under Texas Local Government Code sections 233.066, 233.067, 240.901.

III. PLAINTIFF

Van Zandt County, Texas, is a political subdivision of the State of Texas. Van Zandt County has a population of less than 250,000 people.

IV. DEFENDANTS

Taaleri Energia North America, LLC, is a Delaware corporation doing business in Texas. Taaleri is affiliated with Taaleri, PLLC, a Finnish Corporation. According to their website Taaleri "is a Nordic investment and asset manager that focuses on businesses with industrial-scale opportunities within bioindustry and renewable energy." Taaleri may be served through its Registered Agent CT Corporation System, 1999 Bryan St. Ste 900, Dallas, Texas 75201.

BT Amador Storage, LLC, is a Texas Corporation and may be served through its Registered Agent CT Corporation System, 1999 Bryan St. Ste 900, Dallas, Texas 75201.

Amador BESS Holdings, inc. is a Delaware Corporation and is the sole member and managing member of BT Amador. Amador Bess does not have a Texas registered agent. Therefore service may be made through the Texas Secretary of State's Office to its Delaware registered agent, The Corporation Trust Co, Corporation Trust Center, 1209 Orange St., Wilmington, Delaware, 19801.

Renewable Energy Systems Americas, Inc., is a Delaware Corporation with its principal office in Denver, Colorado. RES is the contractor for the Amador BESS project. RES does not have a Texas registered agent. Therefore service may be made through the Texas Secretary of

State's Office to the Colorado registered agent at CT Corporation System 1601 19th St. Ste 400, Denver, Colorado 80202.

Belltown Texas Power 2, LLC, is a Texas Corporation and may be served at Corporation Service Company 211 E. 7th St. Ste 620, Austin, Texas, 78401.

V. JURISDICTION AND VENUE

This Court has jurisdiction over this case and venue is proper in Van Zandt County because Van Zandt County is the county in which the real property at issue is located and the acts or omissions giving rise to these claims occurred in Van Zandt County. Tex.Civ.Prac &Rem. Code sections 15.002(a)(1) and 15.011.

VI. APPLICABLE LAW

Texas Local Government Code

Because Van Zandt County has a population of less than 250,000 people it may not adopt a fire code. Local Gov't Code section 233.061. Rather the County and the County Fire Marshal may utilize any nationally recognized code or standard adopted by the State. Local Gov't Code section 352.016(b). The State of Texas has adopted the National Fire Protection Association Standards 2021. The Van Zandt County Fire Marshal enforces that Code.

In unincorporated areas of a County, the relevant fire code applies to all commercial establishments. Local Gov't Code 233.062. All commercial establishments are required to submit a plan and get a permit prior to construction. Local Gov't Code 233.063.

Additionally, the Fire Marshal may inspect any real property for fire or life safety hazards including the storage of hazardous substances. Local Gov't Code section 352.016(a)(5). Lithium-ion batteries are a hazardous substance. When a county fire marshal finds a fire or life safety hazard on a premise he may issue orders to the entities in control of the premises. Local Gov't Code section 352.016(b).

"The appropriate attorney representing the county in the district court may seek injunctive relief to prevent the violation or threatened violation of the fire code." Local Gov't Code section 233.066 (emphasis added).

2. Texas Civil Practice and Remedies Code.

Van Zandt County is not required to pay a filing fee or other security for costs and is not required to pay a bond prior to the Court granting an injunction. Tex.Civ.Prac. & Rem. Code section 6.001.

3. National Fire Protection Association Standards.

NFPA 1, NFPA 101, NFPA 855, and all standards referenced therein, taken together address life safety issues in the context of Battery Energy Storage Systems. NFPA 855 1.3 brings lithium-ion BESS under the auspices of the NFPA.

NFPA 855 contains the following requirements for BESS that are relevant to this cause.

a. **4.1.2.1.1** The plans and specifications associated with an ESS and its intended installation, replacement or renewal, commissioning, and use shall be submitted to the AHJ for approval and include the following:

-Location and layout diagram of the room or area in which the ESS is to be installed

-Details on hourly fire-resistant-rated assemblies provided or relied upon in relation to the ESS

-The quantities and types of ESS units

-Manufacturer's specifications, ratings, and listings of ESS

-Description of energy storage management systems and their operation

-Location and content of required signage

-Details on fire suppression, smoke or fire detection, gas detection, thermal management, ventilation, exhaust, and deflagration venting systems, if provided

-Support arrangement associated with the installation, including any required seismic support.

b. 4.1.2.1.3 The following test data, evaluation information, and calculations shall be provided in addition to the plans and specifications in **4.1.2.1.1** where required elsewhere in this standard:

-Large-scale fire test data in accordance with **4.1.5**

-Hazard mitigation analysis in accordance with **4.1.4**

-Calculations or modeling data to determine compliance with NFPA 68 and NFPA 69 in accordance with Section **4.12**

-Other test data, evaluation information, or calculations as required elsewhere in this standard.

c. 4.1.2.4 Commissioning Plan. A commissioning plan meeting the provisions of Chapter **6** shall be provided to the building owner or their authorized agent and the AHJ.

d. 6.1.5 The commissioning plan shall include, but not be limited to, the following information:

-An overview of the commissioning process developed specifically for the ESS to be installed and narrative description of the activities to be conducted

-Roles and responsibilities for all those involved in the design, commissioning construction, installation, or operation of the system(s)

-Means and methods whereby the commissioning plan will be made available during the implementation of the ESS project(s)

-Plans and specifications necessary to understand the installation and operation of the ESS and all associated operational controls and safety systems

-A detailed description of each activity to be conducted during the commissioning process, who will perform each activity, and at what point in time the activity is to be conducted

-Procedures to be used in documenting the proper operation of the ESS and all associated operational controls and safety systems

-Testing for any required fire detection or suppression and thermal management, ventilation, or exhaust systems associated with the installation and verification of proper operation of the safety controls

-Guidelines and format for a commissioning checklist and relevant operational testing forms and necessary commissioning logs and progress reports

-Means and methods whereby facility operating and maintenance staff will be trained on the system

-Identification of personnel who are qualified to service and maintain the system and respond to incidents involving each system

-A decommissioning plan meeting the provisions of Section **8.1** that covers the removal of the system from service and from the facility in which it is located and information on disposal of materials associated with each ESS.

e. 4.1.3 Emergency Planning and Training.

4.1.3.1* General.

Emergency planning and training shall be provided by the owner of the ESS or their authorized representative so that ESS facility operations and maintenance personnel and emergency responders can effectively address foreseeable hazards associated with the on-site systems.

4.1.3.2 Facility Staff Planning and Training.

An emergency operations plan and associated training shall be established, maintained, and conducted by ESS facility operations and maintenance personnel.

4.1.3.2.1.4 The emergency operations plan shall include the following:

-Procedures for safe shutdown, de-energizing, or isolation of equipment and systems under emergency conditions to reduce the risk of fire, electric shock, and personal injuries, and for safe start-up following cessation of emergency conditions

-Procedures for inspection and testing of associated alarms, interlocks, and controls

-Procedures to be followed in response to notifications from the energy storage management system (ESMS), when provided, that could signify potentially dangerous conditions, including shutting down equipment, summoning service and repair personnel, and providing agreed upon notification to fire department personnel for off-normal potentially hazardous conditions

-Emergency procedures to be followed in case of fire, explosion, release of liquids or vapors, damage to critical moving parts, or other potentially dangerous conditions

-Response considerations similar to a safety data sheet (SDS) that will address response safety concerns and extinguishment when an SDS is not required

-Procedures for dealing with ESS equipment damaged in a fire or other emergency event, including contact information for personnel qualified to safely remove damaged ESS equipment from the facility

-Other procedures as determined necessary by the AHJ to provide for the safety of occupants and emergency responders

-Procedures and schedules for conducting drills of these procedures.

f. 4.1.4.1. Hazard Mitigation Analysis

A hazard mitigation analysis shall be provided to the AHJ for review and approval when any of the following conditions are present: (1) When technologies not specifically addressed in Table 1.3 are provided. (2) More than one ESS technology is provided in a room or indoor area where adverse interaction between the technologies is possible. (3) When allowed as a basis for increasing maximum stored energy as specified in 4.8.1 and 4.8.2.

g. 4.1.5 Large-Scale Fire Test.

4.1.5.1* Where required elsewhere in this standard, large-scale fire testing in accordance with **4.1.5** shall be conducted on a representative ESS in accordance with UL 9540A or equivalent test standard.

4.1.5.2 The testing shall be conducted or witnessed and reported by an approved testing laboratory and show that a fire involving one ESS unit will not propagate to an adjacent unit.

4.1.5.3 Where installed within buildings, the fire during the test shall be contained within the room or enclosed area for a duration equal to the fire resistance rating of the room separation specified in **4.3.6**.

4.1.5.4* The test report shall be provided to the AHJ for review and approval.

h. 4.4.3.1 Classification.

Outdoor ESS installations shall be classified as follows:

(1) Remote locations. Remote outdoor locations include ESS located more than 100 ft (30.5 m) from buildings, lot lines that can be built upon, public ways, stored combustible materials, hazardous materials, high-piled stock, and other exposure hazards not associated with electrical grid infrastructure.

(2) Locations near exposures. Locations near exposures include all outdoor ESS locations that do not comply with remote outdoor location requirements.

i. 4.8 Maximum Stored Energy

This provision contains a table with the maximum allowable storage permitted in given locations. Subsection 2 states, "Outdoor ESS installations in locations near exposures as described in 4.4.3.1(2) shall not exceed the maximum stored energy values in Table 4.8 except as permitted by 4.8.3." The maximum stored energy value in Table 4.8 for lithium-ion batteries is 600 kWh.

j. 4.8.2

Where approved by the AHJ, outdoor ESS installations, ESS installations in open parking garages and on rooftops of buildings, and mobile ESS equipment that exceed the amounts in **Table 4.8** shall be permitted based on a hazardous mitigation analysis in accordance with **4.1.4** and large-scale fire testing in accordance with **4.1.5**.

VII. BACKGROUND AND INVESTIGATION

This suit concerns a 46.374 acre tract of real property located at 32021 FM 47, Mabank, Van Zandt County, Texas. The property was owned in 2022 by Maria Amador.[1] The property was

[1] The property has since been transferred by gift deed, subject to the lease, to Jose Amador.

leased on September 23, 2022, by Belltown Texas Power 2, LLC., a developer of utility scale renewable energy and storage systems. (Exhibit A). That lease was subsequently assigned to BT Amador Storage, LLC, for installation of a Lithium-ion Battery Energy Storage Facility. The lease is for a minimum term of thirty years.

The property is adjacent to six acres of property owned by Rayburn Electric Cooperative. Rayburn is in the process of replacing its electricity service substation on the property. When completed, the BESS facility on the property will be owned by Taaleri as part of its Taaleri Solar Wind III investment fund. RES is the firm constructing the facility on behalf of Taaleri. Exhibit B, attached, shows the location of the properties.

In its simplest terms, a battery energy storage facility buys excess electric energy from an electric service provider at a time of low demand. Because demand at that point in time is low, the value or price of the electricity is also low. The BESS stores that electricity in batteries, in this case lithium-ion batteries until the demand on the electric service provider is high. At that point the BESS discharges the batteries, releasing the electricity back to the service provider. Because that release is at a time of peak demand, the price charged to the electric service provider is high. The profit comes from the difference between the low demand purchase price and the high demand sales price.

Van Zandt County officials became aware of the plan for a BESS facility on the property when Belltown sent an email to the County Judge inquiring about County zoning or building regulations in February, 2023. The Judge rightfully responded that he was aware of no zoning or building regulations unique to the county, as counties in Texas do not have the authority to impose zoning restrictions. The Judge was not asked about and did not address State requirements or fire code requirements.

On December 20, 2024, Van Zandt County sent a letter to the BESS project developers requesting that they provide documentation required by NFPA 855 concerning the project. (Exh C). Ville Rimali, Investment Director, Energy Storage for Taaleri Energia replied to the request sending a portion of the requested documentation. (Exh D).

On of the documents submitted by Taaleri was a Fire Protection Design Basis Report submitted by general contractor RES and prepared by fire protection experts ORR Protection. (Exh D app 1). That report acknowledges that the NFPA is the regulatory law applicable to this project and lists many of the requirements of 855. (Exh D app 1 sect 5).

In the submitted documentation, the project was described as a battery energy storage facility that will be enclosed by a fence and will include a fenced high voltage electrical substation. The storage units are Fluence Gridstack Pro units using lithium-ion batteries, specifically lithium iron phosphate chemistry batteries. There will be forty-five Fluence brand units to start with, and additional units to be added during expansion of storage capacity. Each unit measures 28 feet long by 8 ft wide by 9.5 feet tall. (Exh D app 2) The site has an energy storage capacity of approximately 100 mega watts and energy capacity of 200 megawatt hours. (Exh D app 1).

This capacity of 200 megawatt hours is greater than the 600 kilowatt hours allowed for in the Maximum Stored Energy chart located in NFPA 855 4.8. Taaleri has maintained in the documents provided that the limitations of 4.8 do not apply to this facility because it is classified under 4.4.3.1 as a remote location. (Exh D). The County strongly disagrees with this classification. RES goes so far as to say that County officials have expressed agreement with this classification. (Exh D app 1, sec. 3). That statement is just not true.

In order to be classified as remote, this project would have to be more than 100 feet from "lot lines that can be built upon, public ways, stored combustible materials, hazardous materials, high-piled stock, and other exposure hazards not associated with electrical grid infrastructure." The leased property also contains a fifty foot easement to Explorer Pipeline for an active refined petroleum products pipeline that runs from the gulf coast to the southern tip of Lake Michigan. (Exh E)

Because this facility is not classified as remote, the December 30 letter from the County to Taaleri requested submission of a hazardous mitigation plan and a large scale fire test in accordance with NFPA 855 4.1.4.1 and 4.1.5. Neither of these have been received and approved by the County. While Taaleri did submit a hazardous mitigation plan, it was a generic document not tailored to the hazards or conditions of this proposed facility. (Exh D app 1). The Fire Marshal as representative of the Authority Having Jurisdiction did not approve the Hazardous Mitigation Plan.

In accordance with NFPA 4.1.2.1.3 the December 20 letter requested that Taaleri submit test results for the individual cells (batteries), the modules, and the containers. The tests to be performed are UL 9540A standards regarding thermal runaway and flammable gas in accordance with UL9540A. The responsive documents included a Cell Test Report from UL (Changzhou) Quality Technical Service Co., LTD. The report indicated that the cell did not meet the UL standards and therefore **failed** the test. (Exh D app 3a p.3 and p12).

The responsive documents also included a module testing report. Again this report is from UL (Changzou) Quality Technical Service Co., LTD. The testing report indicates that the performance criteris of UL 9540A was **not** met. While the module passed the thermal runaway test, it failed the flammable gas test. (Exh 3b p.3 and p.12).

Taaleri failed to provide container testing results. The letter submitted "the Fluence Gridstack Pro 5000 system, incorporating these battery cells, underwent full-scale testing in January 2025 per UL 9540A standards. The corresponding test report is currently being prepared and will be provided to AHJ prior to the delivery of equipment to the project site." The letter further stated that independent third-party fire safety report is attached. Notably, however, that report concludes in the statement of compliance "based on this preliminary review, the GSP5000 *can comply* with the 2023 Edition of NFPA 855. However, this evaluation is considered preliminary given the UL listings, UL 9540A tests, and other engineering reports . . . are currently in progress. Once these are completed, a full compliance review of all aspects of NFPA 855 can be performed for the GSP5000 and a final statement of compliance can be provided." (Exh D app 2). Even their own expert cannot fully evaluate the safety of the containers until the testing report is received.

The County letter dated December 30 requested that Taaleri provide the emergency operations plan required by 4.1.3.2.1. The documents submitted did not include any such plan. In fact the submittal letter (Exh D) does not even purport to have an emergency operations plan attached.

According to the NFPA 4.13.1 a non-mechanical ESS, such as a BESS, must have an adequate water supply for fire suppression. The County December 20 letter requested that Taaleri identify the water source. They did not. Rather the Taaleri response states, "A conference call was held with the Van Zandt County Fire Department on September 4, 2024, with participation from Van Zandt County Fire Department, Taaleri (Project Owner), Bureau Veritas (Owner's Engineer), RES (EPC Contractor), ORR Protection (Fire Protection Contractor), Fluence (Equipment Supplier.) During this discussion, the Deputy Fire Marshal, as the AHJ, approved the omission of an onsite water supply per NFPA 855 section 9.5.2.5, given that water is not used for lithium batter fires." This is not accurate.

First, the NFPA allows for a waiver of the adequate water supply requirement only if the site is on a remote location. As stated above, this site is not. Second, Deputy Fire Marshal Ashley Bowen attended this virtual meeting. In her affidavit attached she did not have the authority to waive this requirement and at no time did she waive this requirement. (Exh G). Water is in fact used to control lithium-ion battery fires as it is used to cool neighboring containers to avoid spread. It is also obviously used to control vegetation fires and protect neighboring residential structures.

Due to the failure of Taaleri to supply the documentation requested, the Van Zandt County Fire Marshal issued an order pursuant to Local Government Code 352.016 requiring Taaleri to produce certain documents. (Exh F). The order contained a deadline of April 7, 2025. The company responded, submitted the fire marshal's application and paying the applicable fee. However, they did not supply all the documents requested and some of those supplied were insufficient. The response is included at Exh G.

Appendix two to Exhibit G is an undated, unsigned report containing testing data from container tests. It is clearly labeled as UL 9540A checklist. It is not results from testing done by an Underwriters Laboratory certified lab. It is the preliminary work for such testing. Additionally, the report indicates that flammable gas testing was not performed because this is to be an outdoor installation. They list no authority for the proposition that an outdoor installation is not required to have flammable gas testing.

The order requested that Taaleri submit a survey showing the distance between the petroleum product pipeline and this battery installation. They did not. They submitted an illegible drawing that completely fails to identify the location of the pipeline. (Exh G. app 3). It is vitally important that the pipeline be identified for safety purposes. It seems odd that Taaleri wouldn't want to provide something as easy as a survey unless there is a reason they do not want the location of the pipeline in relation to the BESS facility known.

The documents produced also included a preliminary Hazard Mitigation Plan. (Exh. G app. 4). This plan was prepared by Hiller, a fire protection engineering firm. The plan acknowledges that it is preliminary and points out its own deficiencies, promising to supplement them.

Taaleri's response to the request for an emergency response plan shows a total lack of regard for accuracy in providing the requested information. In their plan (Exh G app. 5) they list the fire department having jurisdiction over this area near the intersection of FM 47 and FM 1651 as the Canton Fire Department. Clearly, that is wrong. The plan lists the law enforcement authority as the Canton Police Department. Clearly, that is wrong. The plan lists the local emergency planning commission of the City of Houston Office of Emergency Management. Wrong. And finally the State Emergency Response Commission as the governor. Again, wrong. This plan full of errors can not be approved by the fire marshal. It is a requirement of NFPA 855 that an emergency response plan be submitted *and approved* by the fire marshal.

Finally, the Taaleri response included the requested information about water supply. (Exh G app. 6). This included both calculations and supply. While the amounts were calculated correctly and if that amount of water is supplied it will meet the requirements, the source is not an acceptable source because it is not permanent and fire department accessible. In the even of a fire, water is of no use if fire personnel cannot access it with fire apparatus.

Notably, in the Taaleri letter of April 7, 2025, paragraph three states, "the installation of the Battery Energy Storage System, which falls under the scope of NFPA 855 and related documentation, is scheduled to commence only at the end of April 2025." The end of April 2025, is a mere twenty-one days away.

VIII. VIOLATIONS

The Defendants as developers of this project have continuously and continually violated the provisions of the National Fire Protection Act Standards. Starting with the most basic of the requirements in NFPA 855 4.1.2.1 and 4.1.2.3 that construction documents and component testing results must be submitted to the AHJ. First there was no submission, then after a letter from the County, a partial submission with untruths; then after a Fire Marshal Order another incomplete and inaccurate submission. They have demonstrated that they do not respect the authority of Van Zandt County Officials and will not comply until forced to comply.

Thus this action for injunctive relief has become necessary.

IX. INJUNCTIVE RELIEF

The appropriate attorney representing the county in the district court may seek injunctive relief to prevent the violation or threatened violation of the fire code. The defendants in this action have violated the fire code as set forth above, they continue to violate the fire code, and they have threatened further violations. Representatives of Taaleri have publicly noted that they anticipate batteries arriving to the Amador BESS site in Van Zandt County in April or May of 2025. That is the hazard this action seeks to enjoin. Lithium-ion batteries are a class 9 hazardous material. Bringing 47 containers full of lithium-ion batteries that have failed UL testing in containers that have not been tested is an imminently hazardous situation. No other adequate relief is available.

Violations of the NFPA are criminal in nature. They are prosecuted as class B misdemeanors. Each day of violation and each type of violation is a separate offense. However, prosecuting violations after the fact does not mitigate the hazard. The only available remedy to protect the citizens of Van Zandt County is to grant this Temporary Restraining Order for a period of fourteen days until a full hearing on the merits may be had.

X. PRAYER

Van Zandt County, Texas, asks this Court for a temporary restraining order and upon final judgment a permanent injunction against Defendants as follows:

1. That a temporary restraining order issue.
2. That Defendants be cited to appear and answer herein.
3. That upon notice and hearing, a temporary injunction be granted against Defendant as requested above.
4. That upon final trial of this cause, a permanent injunction be granted against Defendants as requested above.
5. That upon final trial of this cause, this Court grant that all costs be assessed against Defendants.
6. This Court grant such other and further relief to which Van Zandt County may be justly entitled.

Respectfully Submitted

Tonda Curry
Criminal District Attorney
Van Zandt County, Texas
400 S. Buffalo St
Canton, Tx 75103
903 567 4104
903 567 6258
tcurry@vanzandtcounty.org
Texas Bar No. 05275400

CAUSE NO ____________________

VAN ZANDT COUNTY, TEXAS, Plaintiff,	*	IN THE 294TH
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	*	
V.	*	
	*	
TAALERI ENERGIA NORTH AMERICA, LLC, BT AMADOR STORAGE, LLC AMADOR BESS HOLDINGS, INC RENEWABLE ENERGY SYSTEMS AMERICAS, INC. BELLTOWN TEXAS POWER 2, LLC, Defendants.	*	JUDICIAL DISTRICT COURT
	*	
	*	
	*	
	*	
	*	VAN ZANDT COUNTY, TEXAS

VERIFICATION

Before me, the undersigned authority, on this day personally appeared Kevin D. Palmer, a person whose identity is known to me. After I administered an oath to him, upon his oath he said:

"My name is Kevin D. Palmer. I am over the age of 21 years and of sound mind, capable of making this Affidavit, and personally familiar with the facts herein.

I am employed as the Van Zandt County Fire Marshal. I have been employed as a fire fighter or fire protection authority for over twenty years. I have a bachelor's degree in Occupational Health and Safety.

I have read the foregoing Van Zandt County's Original Petition and Application for Temporary Restraining Order and Temporary and Permanent Injunction, in Van Zandt County v. Taaleri Energia Northa America, LLC, et al, and I am familiar with the facts alleged. The allegations in Section VII Background and Investigation are true and correct to the best of my knowledge and belief. "

[signature]
Kevin D. Palmer

Subscribed and Sworn to before me on April 8, 2025, to certify which I affix my hand and seal.

[signature]
Notary Public, State of Texas

PAMELA PEARMAN
Notary Public
STATE OF TEXAS
ID# 11262402
My Comm. Exp. Dec. 14, 2026

VAN ZANDT COUNTY, TEXAS, Plaintiff,	*	IN THE 294TH
	*	
	*	
V.	*	
	*	
TAALERI ENERGIA NORTH AMERICA, LLC,	*	JUDICIAL DISTRICT COURT
BT AMADOR STORAGE, LLC	*	
AMADOR BESS HOLDINGS, INC	*	
RENEWABLE ENERGY SYSTEMS AMERICAS, INC.	*	
	*	
BELLTOWN TEXAS POWER 2, LLC, Defendants.	*	VAN ZANDT COUNTY, TEXAS

AFFIDAVIT

Before me, the undersigned authority, on this day personally appeared Kevin D. Palmer, a person whose identity is known to me. After I administered an oath to him, upon his oath he said:

"My name is Kevin D. Palmer. I am over the age of 21 years and of sound mind, capable of making this Affidavit, and personally familiar with the facts herein.

I am employed as the Van Zandt County Fire Marshal. I have been employed as a fire fighter or fire protection authority for more than twenty years. I have a bachelor's degree in Occupational Health and Safety

Since being appointed as Van Zandt County Fire Marshal, I have become familiar with the battery energy storage system (BESS) proposed by Taaleri and other corporations located near FM 47 and FM 1651 in Van Zandt County Precinct 2. I have reviewed the letter sent on December 20, 2024 by Van Zandt County District Attorney Tonda Curry to Taaleri requesting that they supply the documents required by NFPA 855.

Taaleri timely responded to the letter and included seven attachments. Those attachments are included with Van Zandt County's Petition and Application for Temporary Restraining Order as Exhibit D. With regard to those documents, several items were missing and several items were insufficient and therefore not approved.

Because of those deficiencies, I issued a fire marshal order requiring additional documentation listed as Exhibit F. The deadline for this submission was April 7, 2025. On that date, Taaleri presented me with some additional documents, but not everything required by NFPA 855. Specifically missing were UL 9540 PASSING test results for battery cells and modules and any results of container testing performed by a UL certified laboratory. Taaleri submitted the documentation regarding required water. While the water amount calculations were correct, I did not approve the water source.

The submitted documents also include an emergency response plan. I cannot approve this plan however for several reasons, including that it identifies the wrong departments as emergency responders, and fails to include law enforcement and ems in several scenarios.

Lithium Ion Batteries are a class 9 hazardous material. They also are a fire hazard according to the NFPA definition of fire hazard. Bringing lithium ion batteries and modules that have failed UL testing inside containers that have not been tested onto property in a residential area of Van Zandt County is a fire hazard. That hazard is exacerbated by the lack of water supply in the area. Whitton fire department services this area of the county. Even with mutual aid from other departments, there are not enough tankers in the county to adequately address this type of fire.

In the documents Taaleri indicated that it plans to move in batteries and containers at the end of April. If allowed to do so this would create an unreasonable risk to the citizens of the county.

Kevin D. Palmer

Subscribed and Sworn to before me on April 8, 2025, to certify which I affix my hand and seal.

PAMELA PEARMAN
Notary Public
STATE OF TEXAS
ID# 11262402
My Comm. Exp. Dec. 14, 2026

Notary Public, State of Texas

EXHIBIT A

Stormy Canady

Document No. 2022-013545

MEMORANDUM OF LEASE AND EASEMENT

Parties: AMADOR MARIA

to

BELLTOWN POWER TEXAS LAND 2 LLC

FILED AND RECORDED
OFFICIAL PUBLIC RECORDS

On: 12/08/2022 at 11:04 AM

Document Number: 2022-013545
Receipt No.: 2022151354
Amount: $ 54.00

By: eseale
Susan Strickland, County Clerk
Van Zandt County, Texas

9 Pages

DO NOT REMOVE THIS PAGE – IT IS A PART OF THIS INSTRUMENT

STATE OF TEXAS
COUNTY OF VAN ZANDT

I hereby certify that this instrument was filed on the date and time stamped hereon by me and was duly recorded under the Document Number stamped hereon of the Official Public Records of Van Zandt County.

Susan Strickland, County Clerk

Record and Return To:

BELLTOWN POWER TEXAS LAND 2 LLC
13612 MIDWAY ROAD SUITE 200

DALLAS, TX 75244

DOCUMENT PREPARED BY AND
AFTER RECORDING, PLEASE RETURN TO:

Belltown Power Texas Land 2, LLC
c/o Lloyd Pope
13612 Midway Road, Suite 200
Farmers Branch, TX 75244

MEMORANDUM OF LEASE and EASEMENT

This MEMORANDUM OF LEASE and EASEMENT (the "Memorandum") is made and entered into as of September 23, 2022, by and by and between Maria Amador ("Landlord"), and Belltown Power Texas Land 2, LLC, a Delaware limited liability company ("Tenant").

PRELIMINARY STATEMENT

WHEREAS, pursuant to that certain Ground Lease Agreement (the "Lease") dated September 23rd, 2022 (the "Effective Date") by and between Landlord and Tenant, Tenant leases from Landlord the approximately 46.37 acres of land located in Van Zandt County, Texas more particularly described and depicted in Exhibit A attached hereto and made a part hereof, together with all easements and similar appurtenances thereto (collectively, the "Land"). The Land, together with all easements and appurtenances thereto are hereinafter collectively referred to as the "Premises". In the event any portion of the Land is released to Landlord or otherwise excluded from this Lease, the original unreduced size of the Land referenced herein as the "**Landlord's Property**". Any part of Landlord's Property that is outside of, but adjacent to, the Premises is known as "**Landlord's Adjacent Property**".

WHEREAS, the parties hereto desire to enter into this Memorandum so that third parties shall have notice of the existence of the Lease and of the rights and obligations of Landlord and Tenant under the Lease.

AGREEMENT

NOW, THEREFORE, the parties hereto do hereby certify and agree as follows:

1. Landlord leases, lets, and demises to Tenant, and Tenant leases from Landlord, for the Term (as defined below), the Premises in accordance with the terms and provisions of the Lease.

2. Landlord grants an exclusive easement to use the Premises to construct, operate and maintain an electrical power system for the collection, storage, transmission, and distribution of electric power, including, but not limited, to installation and use of batteries, capacitors, transformers, structures, buildings, crane pads, staging area, electrical wires, substations, switching facilities, a solar photovoltaic electric generating facility or facilities and related Utilities, improvements, equipment, facilities, appurtenances and other improvements both to the extent they exist on the Effective Date and as they are developed, constructed, owned, operated and maintained on the Premises, including but not limited to, all structures, machinery, equipment, meters, fixtures, interconnections, ancillary equipment and materials, power transmission lines, poles, anchors, support structures, underground and overhead power and communication cables, substations, distribution, collection and interconnection facilities and associated equipment and appurtenances, electricity storage facilities, capacitors, batteries, and roads for access and for installation and maintenance and any buildings and fences as Tenant in its sole discretion deems to be necessary or appropriate to further the other uses provided herein and all additions, expansions and modifications thereto as may be located on the Premises (the "**Energy Storage Facility**").

3. Landlord grants to Tenant:

(i) The right to utilize, on a nonexclusive basis, any access, utility, water, communication, sewer, septic, transmission or other easements, rights of way or licenses already held by or benefitting Landlord over, under or across or benefitting the Premises or Landlord's Property, which Tenant determines could be used for the benefit of Tenant's operations at the Premises, as permitted by the instruments evidencing such rights and other applicable laws;

(ii) A nonexclusive easement for access over Landlord's Adjacent Property to the Premises, to and from the Premises from a public road, including for vehicular and pedestrian ingress, egress and access to and from the Energy Storage Facility, whether by means of roads and lanes previously existing or otherwise by such roads and lanes as Tenant may construct from time to time, and for the installation, construction, use and maintenance of underground and aboveground telephone, communication, and power lines and electric utilities in connection with the Tenant's use of the Premises as it relates to the construction, operation and maintenance of the Energy Storage Facility on the Premises;

(iii) A nonexclusive easement on, over, across, under and through Landlord's Property to install water lines and facilities as may be necessary or beneficial to deliver water to the Premises in connection with the development, construction, use, operation and maintenance of the Energy Storage Facility; and

(iv) A nonexclusive easement over, under and across Landlord's Property for audio, visual, view, light, flicker, noise, vibration and any other effects attributable to the use of the land for the Energy Storage Facility.

4. Landlord grants to Tenant the right to utilize, on a nonexclusive basis, any access, utility, water, communication, sewer, septic, transmission or other easements, rights of way or licenses already held by or benefitting Landlord over, under or across or benefitting the Premises, which Tenant determines could be used for the benefit of Tenant' s operations at the Premises, as permitted by the instruments evidencing such rights and other applicable laws.

5. The Lease provides for a Development Term, a Construction Term, an Operating Term, and Renewal Terms. The Development Term commences on the Effective Date and terminates on the earlier of the Commencement of Construction Date or the date that is one (1) year following the Effective Date (which date may be extended by Tenant by up to three (3) one (1) year periods). The Construction Term begins on the expiration of the Development Term or the Commencement of Construction Date, whichever is earlier, and terminates on the earlier of the Commercial Operations Date or the date that is twenty-four (24) months after the commencement of the Construction Term. The Operating Term begins on the expiration of the Construction Term and terminates three hundred sixty (360) full calendar months thereafter. Tenant shall have the right to extend the Operating Term for up to two (2) additional successive terms of five (5) years each.

6. For any mineral rights it may hold, for the duration of the Lease and except as otherwise provided in the Lease, Landlord hereby expressly releases and waives, on behalf of itself and its successors and assigns (and agrees that all future owners and lessees of any rights, titles or interests in or to the mineral rights owned by Landlord, shall be subject to and burdened by the following waiver of rights and automatically be deemed to include a contractual waiver by the lessee or grantee, as applicable), all rights of ingress and egress to enter upon (i) the surface of the Land, (ii) the area located between the surface and 500 feet beneath the surface of the Land, and (iii) the surface of the Landlord's Adjacent Property that is within 200 feet of the property line of the Land for purposes of exploring for, developing, drilling, producing, transporting, or any other purposes incident to the development or production of the oil, gas or other minerals. In the event that Tenant is unable to secure within six (6) months after the Effective Date a Surface Waiver from any and all mineral rights owners, lessees, and other parties holding an interest in the mineral rights, or if necessary to obtain such Surface Waiver, then Tenant may, at its option, but shall not be obligated to, designate on the Premises drill sites within which Landlord or any other mineral rights owner or lessee shall have the exclusive right to explore for, drill, develop, produce, and transport minerals underlying the Premises.

7. In the event that Tenant fails to timely cure a default under the Lease, Landlord shall provide the Finance Parties with written notice that Tenant has failed to cure the default and an opportunity for the Finance

Parties to cure such default. Such Finance Party shall have the absolute right to substitute itself for Tenant and perform the duties of Tenant under the Lease for purposes of curing such defaults as provided in the Lease.

8. Subject to the terms and conditions of the Lease, Landlord waives any lien, security interest, or claim of any nature that Landlord now has or may hereafter have by statute, rule, regulation, common law, agreement or otherwise, in and to Tenant's Property and other of Tenant's property that is or may be from time to time hereafter located at the Premises and/or Landlord's Adjacent Property, if any, and to which Tenant at any time has granted or will grant a security interest to Finance Party (all such property and the records relating thereto shall be hereafter called the "Collateral") to the lien of Finance Party. Landlord recognizes and acknowledges that any claim or claims ("Claims") that Finance Party has or may have against such Collateral by virtue of any lien or security interest are superior to any lien, security interest, or claim of any nature that Landlord now has or may hereafter have to such Collateral by statute, rule, regulation, common law, agreement or otherwise. The waiver provided for herein shall be effective until the discharge of the Claims. Landlord further agrees to notify any purchaser of the Land and/or Landlord's Adjacent Property and any subsequent mortgagee or other encumbrance holder of the existence of the foregoing waiver of Landlord's lien rights, which shall be binding upon the executors, administrators, successors and transferees of Landlord, and shall inure to the benefit of the successors and assigns of Finance Party.

9. A Leasehold Mortgagee shall have the right, subject to the terms and conditions of the Lease: (a) to assign its security interest; (b) to enforce its lien and acquire title to the Leasehold Estate by any lawful means; (c) to take possession of and operate the Tenant's Property, the Leasehold Estate or any portion thereof and to perform all obligations to be performed by Tenant under the Lease, or to cause a receiver to be appointed to do so; and (d) to acquire the Leasehold Estate by foreclosure or by an assignment in lieu of foreclosure and thereafter to assign or transfer the Leasehold Estate to a third party. Landlord's consent shall not be required for the acquisition of the encumbered Leasehold Estate or subleasehold estate by a third party who acquires the same by or subsequent to foreclosure or assignment in lieu of foreclosure.

10. Neither the bankruptcy nor the insolvency of Tenant shall be grounds for terminating the Lease as long as the rent and all other obligations of Tenant under the Lease are paid or performed by or on behalf of Tenant or the Leasehold Mortgagee in accordance with the terms of the Lease.

11. If the Lease terminates because of Tenant's default or if the Leasehold Estate is foreclosed, Landlord shall, upon receiving a written request from any Leasehold Mortgagee within ninety (90) days after such event, enter into a new lease agreement for the Premises, on substantially the same terms and conditions of the Lease.

12. The Lease provides that the provisions of the Lease are binding upon and inure to the benefit of Landlord and Tenant and each of their respective representatives, successors and assigns, subject to certain limitations.

13. All of the terms, conditions and agreements contained within the Lease are fully incorporated herein by reference as if fully set forth herein. This Memorandum is not intended to change the terms of the Lease and, in the event of a conflict between the terms and conditions of this Memorandum and the Lease, the terms and conditions of the Lease shall control. All capitalized terms not defined herein shall have the meaning set forth in the Lease.

14. This Memorandum shall be governed by the laws of the State of Texas.

15. Tenant may substitute Exhibit A attached hereto and/or unilaterally amend this Memorandum to include a more accurate description of the Land or to narrow the scope of the Land in accordance with Section 3(d) of the Lease.

16. The parties agree that in the event this Memorandum or any supplemental memorandums conflict with the Lease that the terms and conditions of the Lease will control.

17. The parties agree that this Memorandum may be executed in multiple counterparts which, when signed by all parties, shall constitute a binding agreement.

18. The Landlord represents and warrants that she owns the interest in the Land as her sole and separate property, and not as community property, and that no other person or entity is required to execute the Lease and this Memorandum, to be enforceable according to their terms.

[Signature Page to Follow]

IN WITNESS WHEREOF, the parties have caused this Memorandum to be duly executed under seal and delivered as of the date first written above.

LANDLORD: MARIA AMADOR

maria amador

Maria Amador

TENANT: BELLTOWN POWER TEXAS LAND 2, LLC

By: ____________________

Name: Lloyd Pope

Title: President

STATE OF TEXAS §
COUNTY OF Dallas §
§

This instrument was ACKNOWLEDGED before me on the 23rd day of September, 2022, by Lloyd Pope, as President, Belltown Power Texas Land 2, LLC, a Delaware limited liability company.

[SEAL]

My Commission Expires:
1/21/2023

Jacquelyn Breeze Parker
Notary Public - State of Texas
Jacquelyn Breeze Parker
Printed Name of Notary Public

JACQUELYN BREEZE PARKER
Notary ID # 125948037
My Commission Expires
January 21, 2023

STATE OF TEXAS §
COUNTY OF Dallas §
§

This instrument was ACKNOWLEDGED before me on the 23rd day of September, 2022, by Maria Amador.

[SEAL]

My Commission Expires:
1/21/2023

Jacquelyn Breeze Parker
Notary Public - State of Texas
Jacquelyn Breeze Parker
Printed Name of Notary Public

Id #125948037

JACQUELYN BREEZE PARKER
Notary ID # 125948037
My Commission Expires
January 21, 2023

EXHIBIT A TO MEMORANDUM OF LEASE and EASEMENT

The Land

The Land is identified as the approximately 46.37 acre site described below (Reference Tax Parcel Nos. 108316, 108315, 107150, and 107149):

(Reference Tax Parcel Nos. 108315 and 108316):

All that certain lot, tract or parcel of land situated in the Wm. Warenshold Survey Abstract 942, Van Zandt County, Texas, and being part of a called 139.8 acre tract descried as Tract Two by deed recorded in Volume 1551, Page 627 of the Deed Records of Van Zandt County, Texas. Said tract or parcel of land being more fully described by metes and bounds as follows.

BEGINNING at the northwest corner of this tract located S23° 20′ 29″ E 218.94 feet and S89° 20′ 00″ E 1429.31 feet from the northwest corner of the above mentioned 139.8 acre tract;

THENCE S23° 19′ 50″ E 1032.62 feet to a set ½″ iron rod for an angle corner of this tract;

THENCE S89° 20′ 00″ E 675.62 feet to a set ½″ iron rod for the northeast corner of this tract;

THENCE S00° 38′ 38″ W 1023.51 feet to a found ½″ iron rod for the southeast corner of this tract;

THENCE N89° 15′ 19″ W 305.63 feet to a found ½″ iron rod for and angle corner of this tract;

THENCE N89° 54′ 21″ W 400.35 feet to a found ½″ iron rod for the southwest corner of this tract;

THENCE N04° 43′ 55″ W 61.33 feet to a set ½″ iron rod for an angle corner of this tract;

THENCE N10° 42′ 51″ W 1947.69 feet to the place of beginning and containing 21.37 acres of land.

(Reference Tax Parcel Nos. 107149 and 107150):

NEIGHBORS TRACT
25.00 ACRES

WM. WARENSHOLD SURVEY
ABSTRACT 942

VAN ZANDT COUNTY

All that certain lot, tract, or parcel of land situated in the Wm. Warenshold Survey Abstract 942, Van Zandt County, Texas, and being part of a called 139.8 acre tract described as Tract Two by deed recorded in Volume 1551, Page 627 of the Deed Records of Van Zandt County, Texas. Said tract or parcel of land being more fully described by metes and bounds as follows.

BEGINNING at the northwest corner of this tract and the northwest corner of the above mentioned 139.8 acre tract at or near the centerline of F.M. Highway 47, said point being on the north line of the Wm. Warenshold Survey A-942 and the south line of a J.A. Stark Survey A-797; Witness: S89°20'00"E 43.4 feet, a found 1/2" iron rod.

THENCE with said common survey line and the north line of a 50 ffot easement S89°20'00"E 1891.47 feet to a found 1/2" iron rod for the most northerly northeast corner of this tract;

THENCE S00°38'56"W 360.05 feet to a found 1/2" iron rod for an ell corner of this tract;

THENCE S89°19'33"E 722.00 feet to the most easterly northeast corner of this tract; Witness: S89°19'33"E 3.9 feet, a found 1/2" iron rod.

THENCE S00°38'38"W 783.22 feet to a set 1/2" iron rod for the southeast corner of this tract;

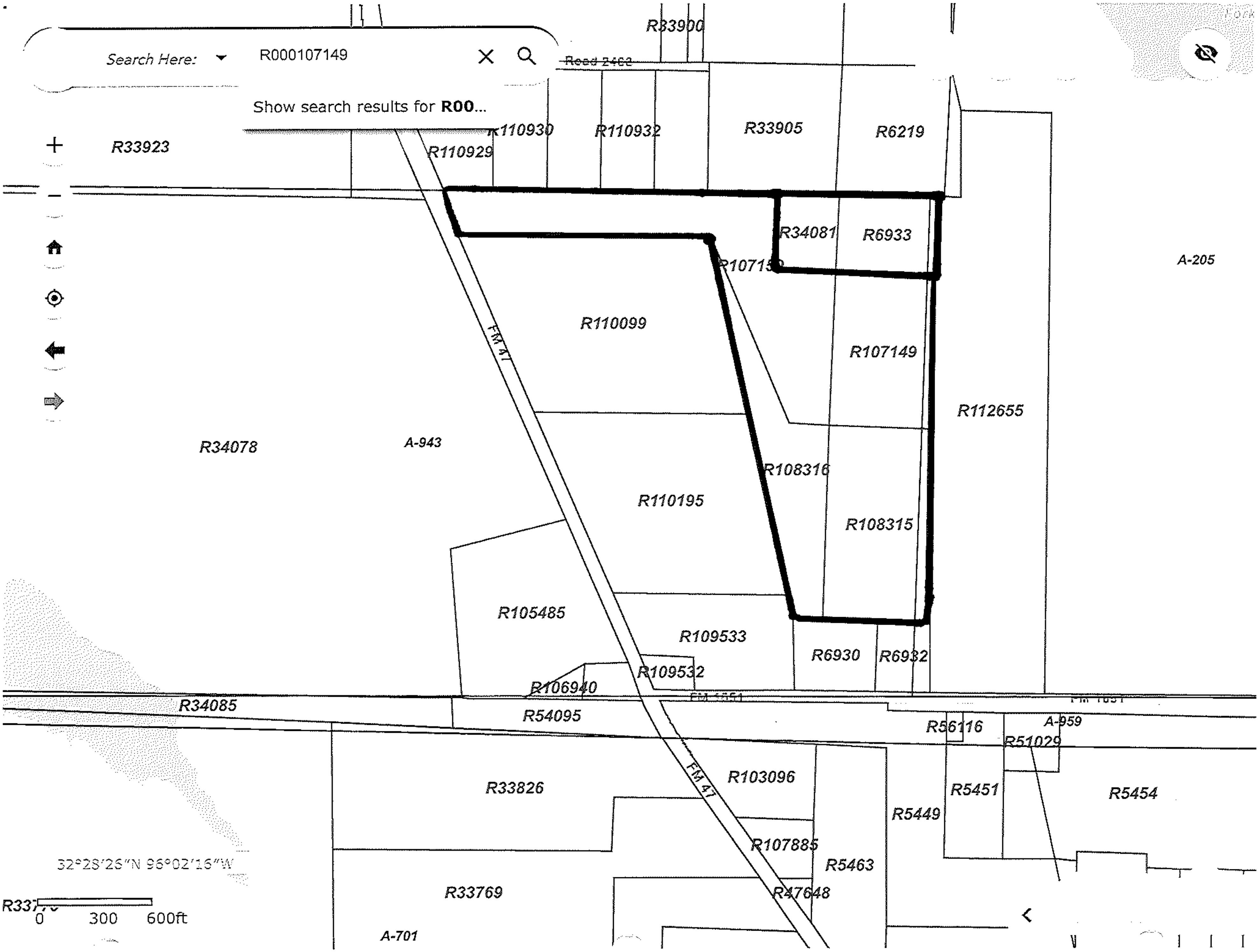
THENCE N89°20'00"W 675.62 feet to a set 1/2" iron rod for the most southerly southwest corner of this tract;

THENCE N23°19'50"W 1032.62 feet to a set 1/2" iron rod for an angle corner of this tract;

THENCE N89°20'00"W 1429.31 feet to the most westerly southwest corner of this tract located at or near said centerline of F.M. Highway 47; Witness: S89°20'00"E 44.7 feet, a set 1/2" iron rod.

THENCE with said centerline N23°20'29"W 218.94 feet to the place of beginning and containing 25.00 acres of land.

EXHIBIT
B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FM 47
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Stormy Canady

EXHIBIT C

TONDA CURRY
Criminal District Attorney
Van Zandt County

400 S. Buffalo, Canton TX 75103
Tel (903) 567-4104
Fax (903) 567-6258
tcurry@vanzandtcounty.org

December 20, 2024
Taaleri Energia
Kasarmikatu 21 B
00130 Helsinki

Re: Request for information – Amador Battery Energy Storage System (BESS)

Your company has initiated construction on the above-referenced BESS located roughly at the intersection of State Highway 47 and Farm-to-Market 1651 in rural Van Zandt County. As legal counsel for Van Zandt County, I am sending this letter to obtain information for the protection of the public health, safety, and welfare of Van Zandt County residents.

This request is in accord with the National Fire Protection Association (hereinafter "NFPA") Section 855 4.2.2.2. The request is from the Authority Having Jurisdiction (hereinafter "AHJ") and that Authority shall be defined as the Van Zandt County Fire Marshal and the Van Zandt County Commissioner's Court. The section numbers below are references to the NFPA 855.

Please note that the AHJ has not authorized the use of ESS dedicated-use buildings without the protection of automatic fire control and suppression systems. To that end, please provide the Fire and Explosion Testing in compliance with 9.1.5.1 and 9.1.5.2 (Test Reports) if you should desire to seek authority to eliminate the fire control and suppression systems. If you have not provided the information required, the AHJ shall be inspecting the dedicated-use buildings for the required protection of automatic fire control and suppression and the constituent systems. According to NFPA 855, it is in the sole discretion of the AHJ to allow the BESS to become operational without the required automatic fire control and suppression systems.

If this site is installing nonmechanical ESS there must be a permanent source of water for fire protection. Please indicate your permanent source of water, at volumes which meet the NFPA 1142 requirements, for the project.

Please provide your complete commissioning plan in accord with 6.1.3.2 which describes the means and methods necessary to document and verify that the system and its associated controls and safety systems, as required by this standard, are in proper working condition. The minimum information required for this request is:

- (1) An overview of the commissioning process developed specifically for the ESS to be installed and narrative description of the activities to be conducted
- (2) Roles and responsibilities for all those involved in the design, commissioning, construction, installation, or operation of the system(s)

- (3) Means and methods whereby the commissioning plan will be made available during the implementation of the ESS project(s)
- (4) Plans and specifications necessary to understand the operation of the ESS and all associated operational controls and safety systems
- (5) A detailed description of each activity to be conducted during the commissioning process, who will perform each activity, and at what point in time the activity is to be conducted
- (6) Procedures to be used in documenting the proper operation of the ESS and all associated operational controls and safety systems
- (7) Testing for any required fire detection or suppression and thermal management, ventilation, or exhaust systems associated with the installation and verification of proper operation of the safety controls
- (8) The following documentation:
    - (a) Commissioning checklist
    - (b) Relevant operational testing forms
    - (c) Necessary commissioning logs
    - (d) Progress reports
- (9) Means and methods whereby facility operation and maintenance staff will be trained on the system
- (10) Identification of personnel who are qualified to service and maintain the system and respond to incidents involving each system
- (11) A decommissioning plan meeting the provisions of Section **8.1** that covers the removal of the system from service and from the facility in which it is located and information on disposal of materials associated with each ESS

The commissioning report shall document the commissioning process and the results in accordance with **6.1.5.2.1**, **6.1.5.2.2**, and **6.1.5.2.3**. For your reference, these have been outlined as follows:

6.1.5.2.1

A commissioning report shall summarize the commissioning process and verify the proper operation of the system and associated operational controls and safety systems.

6.1.5.2.2

The report shall include the final commissioning plan, the results of the commissioning process, and a copy of the plans and specifications associated with the as-built system design and installation.

6.1.5.2.3

The report shall include any issues identified during commissioning and the measures taken to resolve them.

Your installation is placing the ESS batteries in a container outdoors and the installation must comply with one of the following:

- (1) The container shall be provided with explosion control complying with **9.6.5.6.3**.
- (2) Combination of the container and cabinets shall be tested together to show compliance with **9.6.5.6.1.1**.

Please provide the compliance with 9.6.5.6.1.1 in your response to this request.

Please provide a copy of the approved emergency operations plan for AHJ. Van Zandt County requires the items outlined in this letter to be provided and the AHJ must complete the review and approval prior to the BESS becoming operational.

Please respond to this inquiry within 20 business days.. Your response should be directed to my office and attention.

If you have any questions, please do not hesitate to contact me.

Sincerely,

Tonda Curry
Van Zandt County
District Attorney

EXHIBIT
D

TAALERI
Energia

Confidential – For Authority Having Jurisdiction use only.
Unauthorized disclosure is prohibited.

Ville Rimali
Investment Director, Energy Storage
Taaleri Energia
Kasarmikatu 21 B
00130 Helsinki, Finland
ville.rimali@taaleri.com
+358 41 435 6268

February 3, 2025

Tonda Curry
Criminal District Attorney
Van Zandt County
400 S. Buffalo,
Canton TX 75103
tcurry@vanzandtcounty.org
(903) 567-4104

Subject: Response to Request for Information - Amador Battery Energy Storage System (BESS)

We sincerely appreciate your inquiry concerning compliance with the National Fire Protection Association ("NFPA") 855 standards and the documentation required by the Authority Having Jurisdiction ("AHJ"). Please find below the response outlining the compliance measures of Project Amador and in detail (Appendix 1)

Project Amador is categorized as an "Outdoor Installation" under NFPA 855 section 9.3.2 and as "Energy Storage System Cabinet" under NFPA section 3.3.9.2., rather than an "ESS Dedicated-Use Building" as defined in section 9.3.1.1. The proposed non-walk-in, nonoccupiable ESS enclosures comply with the dimensional requirements set forth in NFPA 855 section 9.5.2.4.1. Additionally, Project Amador is installed in a Remote Location per NFPA 855 section 9.3.2 (1) and 9.5.2.5.

Pursuant to NFPA 855 section 9.6.5.6.3, all nonoccupiable enclosures are equipped with NFPA 69 and NFPA 68 explosion prevention and control systems, which has been tested (see Appendix 2). The project utilizes CATL 306Ah battery cells, which have successfully passed cell and module level UL 9540A testing (Appendices 3a and 3b). Furthermore, the Fluence Gridstack Pro 5000 system, incorporating these battery cells, underwent full-scale fire testing in January 2025 per UL 9540A standards. The corresponding test report is currently being prepared and will be provided to AHJ prior to the delivery of equipment to the project site. Preliminary NFPA 855 compliance review by independent third-party fire safety expert in Appendix 2. Fluence Gridstack Pro safety architecture is explained in detail in Appendix 4.

In compliance with NFPA 855 section 9.6.1, each ESS enclosure is fitted with NFPA 72 and 855-compliant multi-detectors for heat (95°C), smoke, and off-gas detection. This system reports to a UL-listed fire alarm control panel, which is redundantly backed up by a master fire alarm control panel with an auto-dialer (details in Appendix 5).

As clarification as per NFPA 855 section 4.9.4, an adequate water supply shall be calculated according NFPA 1142, where no permanent water supply exists for firefighting purposes. However, A conference call was held with the Van Zandt County Fire Department on September 4, 2024, with participation from Van Zandt County Fire Department, Taaleri (Project Owner), Bureau Veritas (Owner's Engineer), RES (EPC Contractor), ORR Protection (Fire Protection Contractor), Fluence (Equipment supplier). During this discussion, the Deputy Fire Marshal, as the AHJ, approved the omission of an onsite water supply per NFPA 855 section 9.5.2.5, given that water is not used for lithium battery fires. For other fire scenarios, the Fire Department confirmed their ability to provide necessary water resources.

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Unauthorized disclosure is prohibited.

Even with successful full-scale fire testing without a fire suppression system, Project Amador will install an aerosol fire suppression system in the auxiliary compartments of battery energy storage enclosures. In addition, we will engage with the AHJ in a later phase to evaluate the fire suppression system and AHJ's potential approval for its disablement per NFPA 855 section 9.5.2.5.

Project Amador's main contractors are RES and Fluence Energy. RES is responsible for civil works, equipment installation, and project substation construction and commissioning, while Fluence Energy is the equipment supplier and oversees the commissioning of energy storage equipment and fire detection/suppression systems. RES's project manager is William Hammond and commissioning manager is Bradley Collier, while Fluence Energy's project manager is Julio Lima and commissioning manager William Ward. The draft commissioning plans per NFPA 6.1.3.2 for RES and Fluence Energy are provided in Appendices 6a and 6b, respectively. The project commissioning is scheduled for Q3–Q4 2025. As is customary, the final commissioning plans will be available only a few weeks prior to commencement, once the project design has been finalized and all equipment orders have been confirmed. Therefore, the final commissioning plan will be provided to AHJ closer to the commissioning start date. The commissioning report, as required by NFPA 855 sections 6.1.5.2.1, 6.1.5.2.2, and 6.1.5.2.3, will be submitted upon completion. Additionally, the Emergency Operations Plan, in accordance with NFPA 855 section 4.3.2.1.4, will be provided to AHJ before the ESS system is energized for commissioning.

Under the land lease agreement, Project Amador is obligated to restore the land within 180 days following the termination of the lease, including the removal of all tenant property. Decommissioning guide is outlined in Appendix 7, and per NFPA 855 sections 8.1 and 8.1.3, a written decommissioning plan will be submitted to AHJ before decommissioning begins.

Should you require any additional information or clarification, please do not hesitate to contact us.

Sincerely,

DocuSigned by:
Ville Rimali
30FC3AF8DD26466...

Ville Rimali
Investment Director, Energy Storage
Taaleri Energia

Appendices:

- Appendix 1: Project Amador - Fire Protection Design Basis Report
- Appendix 2: Grid Stack Pro 5000 NFPA 855 Compliance Statement Draft
- Appendix 3a: UL 9540A Cell-Level Test Report
- Appendix 3b: UL 9540A Module-Level Test Report
- Appendix 4: Safety Architecture of Fluence Gridstack Pro system
- Appendix 5: Fire Alarm System for Battery Energy Storage System
- Appendix 6a: RES Draft Commissioning Plan
- Appendix 6b: Fluence Energy Draft Commissioning Plan
- Appendix 7: Decommissioning Guide

APPENDIX 1

Fire Protection Design Basis Report

Revision 6

January 29, 2025

By

ORR® Protection

Mission Critical Fire Protection Experts®

ORR® Protection
Mission Critical Fire Protection Experts®

Date	Revision	Reason for Issue	Developed By	Checked By	Approved by
09/11/2024	REV1	Comments from RES	LK	LK	LK
09/25/2024	REV2	Comments from RES	LK	LK	LK
10/01/2024	REV3	Comments from RES's Customer	LK	LK	LK
11/02/2024	REV4	Comments from RES's Customer	DD	RR	LK
12/05/2024	REV5	Comments from RES's Customer	LK	LK	LK
1/295/2025	REV6	Added suppression	LK	LK	LK

REVISION CONTROL SHEET

REVISION	SECTION	CHANGE NOTED
REV1	3,4,5,6,7,8 AND10	LK
REV2	3,4,5,6,7,8 AND 10	LK
REV3	3,4,5 AND 7	DD
REV4	3, 4, 5, 6, 7 AND 8	LK
REV5	3 AND 4	LK
REV6	Added new Section	LK

ORR® Protection
Mission Critical Fire Protection Experts®

Design Basis Report

Site Name: Amador

Site Location: 32072 FM 47, Mabank, Texas 75147 (32.476810, -96.030491)

Fire Protection Engineer: Lee Kaiser, PE

Stakeholders: Taaleri Energia, RES, Van Zandt County Fire Marshall's Office, Local Government

1 Table of Contents

Contents

2 About this Report

This design basis report is written following guidance of NFPA 850-2020 Recommended Practice for Fire Protection for Electric Generating Plants and High Voltage Direct Current Converter Stations, section 4.4 and Appendix E of the same document. It is modified to address a battery energy storage system (BESS) site.

3 Description of Project

A battery energy storage system (BESS) site is planned for Van Zandt County, TX. The site is situated in a rural area and qualifies as a Remote Outdoor Installation under NFPA 855 Section 9.3.2. This classification is based on the absence of nearby exposures and the isolated nature of the location. Additionally, consultations with local regulators and input from stakeholders have affirmed that the installation is remote, with no direct impact on occupied structures or critical public infrastructure.

The site will be enclosed by a fence and will include a fenced high voltage electrical substation. There will be two 12-foot-wide drive-thru gates in the fence line and one 4-foot-wide Pedestrian gate into the substation accessible from inside the BESS fence.

The site has an energy storage capacity of approximately 100 megawatts (MW) and energy capacity of 200 megawatt-hours (MWh).

The storage units are Fluence Gridstack Pro units using lithium-ion batteries – the batteries are lithium iron phosphate chemistry. There will be 45 Fluence units at Beginning of Life (BOL) with additional units to be added during augmentation (expansion of storage capacity).

The site will have a 20-foot-wide gravel access road around the site for access to the batteries, the substation, and for fire department access. There is approximately 10 feet 6 inches of clearance to the site fence from the nearest container. There will be no landscaping inside the fence.

Each unit will sit on a steel helical pile system and be welded to it. The units will be locked from unauthorized access.

The project is proposed to begin construction on in the fourth quarter of 2024 and begin commercial operations in the fourth quarter of 2025.

4 Hazards of the Installation

The BESS containers are generally subject to fires as follows:

1. An electrical fire resulting in a piece of electrical equipment or at an electrical connection
2. A battery failure leading to cascading thermal runaway of multiple batteries in the container
3. Deflagration (slow explosion) occurs in the container because of the buildup and ignition of flammable gases released during failure of battery cells
4. The site is also subject to external fire hazards, such as wildfires or grass fires. To mitigate these risks, combustible vegetation will be removed and maintained within a 10-foot

perimeter around the container per NFPA 855 Section 9.5.2.2. The gravel access road will serve as a firebreak, further limiting the potential spread of external fires.

The analysis of the fire protection requirements for a BESS site is meant to keep people safe and lead to a successful resolution of the incident and return to service of the BESS site.

The design of the Fluence Gridstack Pro BESS containers mitigates these hazards through fire testing following the UL9540A test standard and integrated deflagration vent panels. More information can be found by referring to the Fluence Gridstack Pro Global Specs.

5 Required Codes and Standards

At the site location in the unincorporated county there are no adopted building code or fire codes to follow. The design basis assumes following these standards for fire protection: *NFPA 1-2021 Fire Code, NFPA 68 Standard on Explosion Protection by Deflagration Venting , NFPA 70-2023 National Electric Code, NFPA 72-2022 National Fire Alarm and Signaling Code for the site fire alarm system, NFPA 855-2023 Standard for the Installation of Stationary Energy Storage Systems and UL 9540A Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems.*

Requirements of NFPA 855:

- 4.2 Construction Documents – Will be provided per this section
- 4.3 Emergency Planning and Training – Will be provided per this section
- 4.4 Hazard Mitigation Analysis (HMA) – Will be provided per this section
- 4.6 Equipment – Listed BESS equipment will be used per this section
- 4.7 Installation – The BESS equipment will be installed per this section
- 4.8 Smoke and Fire Detection – A fire detection system will be installed per this section and the BESS manufacturers requirements
- 4.9 Fire Control and Suppression – Fire suppression systems will not be installed because of the outdoor, remote location of the BESS system following the exception of 9.5.2.5
- 9.3 Location Classification – Outdoor Installation per 9.3.2 not near exposures
- 9.4.1 Maximum Stored Energy – No restrictions on this location classification
- 9.4.2 Size and Separation – Outdoor installations are not subject to any requirements
- 9.5.2.1 HMA – A hazard mitigation analysis is required
- 9.5.2.2 Vegetation Control – Combustible vegetation control is required within 10 feet of each side of any BESS container.
- 9.5.2.3 Walk-in Units – These units are non-walk-in and are only accessible from doors on the outside
- 9.5.2.4 Maximum Size – All BESS containers are within the maximum physical size requirements
- 9.5.2.5 Remote Locations – The BESS site is a remote location and does not require fire suppression systems or a water supply at the site

- NOTE: A meeting was held on 9/4/24 with Ashley Brown, Deputy Fire Marshal of Van Zandt County. Also at the meeting were representatives of Taaleri Energia, RES, Bureau Veritas, and ORR Protection. In the meeting it was verbally agreed that a fire water source would not be provided for the site.

- 9.5.2.6.1 Clearance to Exposures – The site layout of the BESS installation meets the minimum 10 feet separation requirements in this section
- 9.5.2.6.1.7 Means for Egress Separation – The site layout of the BESS installation meets the requirements in this section

6 Fire Protection Philosophy

If a battery container were to catch fire the site's fire protection goal is to limit the loss to a single container (Fluence unit). It is recognized that fixed firefighting systems or manual firefighting from the fire department will not work or cannot safely be accomplished. Therefore, losing one container is acceptable. It is anticipated that full scale fire testing of this model of Fluence container will show that fire does not extend to more than one unit when installed according to their guidance.

The fire department responding to the site is not expected to apply water or other agent to the unit on fire.

An Emergency Operations Plan will be established for the site as required in NFPA 855. The local fire department is expected to follow the BESS site Emergency Operations Plan established for the site. During an emergency, the fire department should use the information available from the displays in the master fire panel and monitor the fire from a safe distance. Refer to the Fire Alarm System section of this report for more information.

The BESS system will be remotely monitored by the energy storage management system and personnel from the site operator and/or the battery system OEM will respond to the site to partner with the fire department for a safe resolution to the conditions found on the site.

7 List of Assumptions

The following are our assumptions forming the basis of this report:

- Assume that all equipment and systems will be operated in strict accordance with the manufacturer's guidelines and recommendations to ensure safety and operational integrity.
- Assume the AHJ approves the list of required codes.
- Assume the AHJ will approve the location of the site master fire panel.
- Assume the local fire department will approve the Emergency Operations Plan submitted (later in the project).
- Assume the local fire department will follow the Emergency Operations Plan, and it will include limited manual firefighting for the BESS system.

- Assume there is no landscaping or vegetation inside fence and the site is maintained over its life to have no vegetation.
- The BESS containers are installed with the manufacturer's recommended clearances to other containers and to other combustibles.
- By the time of installation, UL 9540A full scale fire testing will be completed by Fluence on this model of container, and it will show no fire growth to involve adjacent containers.

8 Fire Alarm System

As required by NFPA 855 the site shall have a site-wide fire alarm installed following NFPA 72. The system shall send signals off-site to reach trained responders as required by NFPA 72 and NFPA 855. The system will have a master fire alarm control panel (FACP) installed near the site entrance.

Each container is provided with a multi-criteria fire detector detecting smoke and carbon monoxide. These detectors will be integrated into the site's fire alarm system. There will be FACPs located to connect to the detectors and the FACPs will be networked to the master FACP.

The containers are not occupiable and do not require interior fire alarm system evacuation notification for life safety purposes. There will be exterior horn/strobe devices provided for each row of containers (Fluence calls these a Node) to help locate the row having a problem. Multiple rows will have a FACP for the grouping of rows (Fluence calls these a Core) and there will be an exterior horn/strobe device on the cabinet containing the FACP along with a smoke detector inside that cabinet.

When the fire alarm system senses an alarm condition the fire alarm system is interfaced with the container's battery management system to electrically isolate the containers.

9 Deflagration Control

The Fluence containers come with manufacturer-provided deflagration panels on the roof of the units meeting the requirements of NFPA 68.

10 Fire Suppression

The Fluence containers will be provided with a fire suppression system which is not required by code. An aerosol fire suppression unit will be installed in each container's mechanical compartment by the unit manufacturer, Fluence. The aerosol generator will protect the container's secondary systems from fire. The unit is a Stat-X 250T thermally activated unit and will be installed in accordance with NFPA 2010, *Standard for Fixed Aerosol Fire-Extinguishing Systems*.

11 Fire Department Access

The site is accessible through normal roads in the county. The fire department is expected to follow the site Emergency Operations Plan. The EOP will detail these steps for the fire department:

- The fire department will stop at the entrance gate and not enter the fence.
- Wait for a representative of the BESS operating company and/or the battery system OEM to meet the fire department at the site.
- Enter the fence when decided jointly it is safe to do so according to the plan.

The site will have a gravel access road inside the fence suitable for heavy truck traffic.

APPENDIX 2

Stormy Canady

January 31, 2025

Fluence Energy, Inc.
4601 Fairfax Drive, Suite 600
Arlington, VA 22203

RE: Grid Stack Pro 5000
NFPA 855 Compliance Statement Draft Rev0

Fire & Risk Alliance, LLC (FRA) performed an evaluation of the Fluence Grid Stack Pro 5000 (GSP5000) Battery Energy Storage System (BESS). As part of this evaluation, FRA performed a preliminary review of the GSP5000 for compliance with the 2023 Edition of NFPA 855, *Standard for the Installation of Stationary Energy Storage Systems* (NFPA 855). Note, this review is based upon the design schematics and equipment datasheets for a typical GSP5000 installation at the product level.[1]

Reference Materials

To perform this scope of work, FRA reviewed the following documents and standards:

- NFPA 855, *Standard for the Installation of Stationary Energy Storage Systems* – 2023 Edition.
- Grid Stack Pro 5000, CATL 306 Ah – 2 Hour Battery Enclosure Design Drawings Rev 1.0, dated December 27, 2024.

GSP 5000 Design Summary

The GSP5000 is a fully integrated lithium-ion BESS consisting of battery modules, control systems, a battery management system, a thermal management system, a gas/fire detection system, and an explosion control system all pre-assembled within a single, non-occupiable cabinet. It is meant for outdoor installations, mounted to the ground, for commercial, industrial, and utility applications. The GSP5000 will be factory listed to UL 9540, Energy Storage Systems and Equipment – 2023 3rd Edition (UL 9540) and will be tested to UL 9540A, Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems – 2019 4th Edition (UL 9540A). These listings and fire tests are currently in progress and the certifications and test reports will be shared once available.

[1] This review was not performed based upon as built or complete for construction drawings for a specific site or jurisdiction.

The GSP5000 container is a non-walk-in type lithium-ion BESS with all equipment accessible from the exterior. Meaning, it cannot be entered or occupied, as shown in Figure 1.

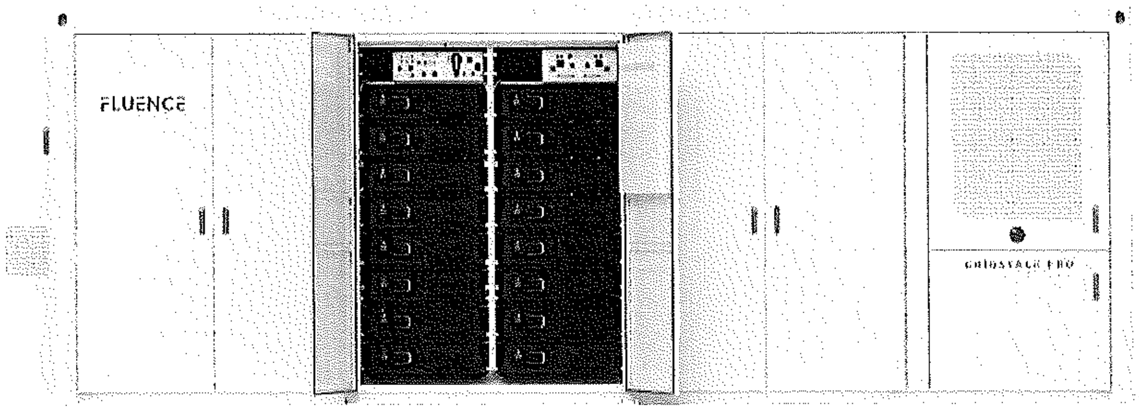

Figure 1. GSP5000 Container Layout

The exterior container is a rigid steel enclosure with an IP 55 rating designed to house the battery racks, associated controllers, and appurtenances and to protect them from water and particulate ingress. It is approximately 22 ft (6.8 m) long by 8 ft (2.4 m) wide and 9.5 ft (2.9 m) tall and once populated with battery modules, can weigh up to 93,000 pounds. The GSP5000 has three battery compartments and a compartment housing the thermal management system and communication systems, as shown in Figure 2.

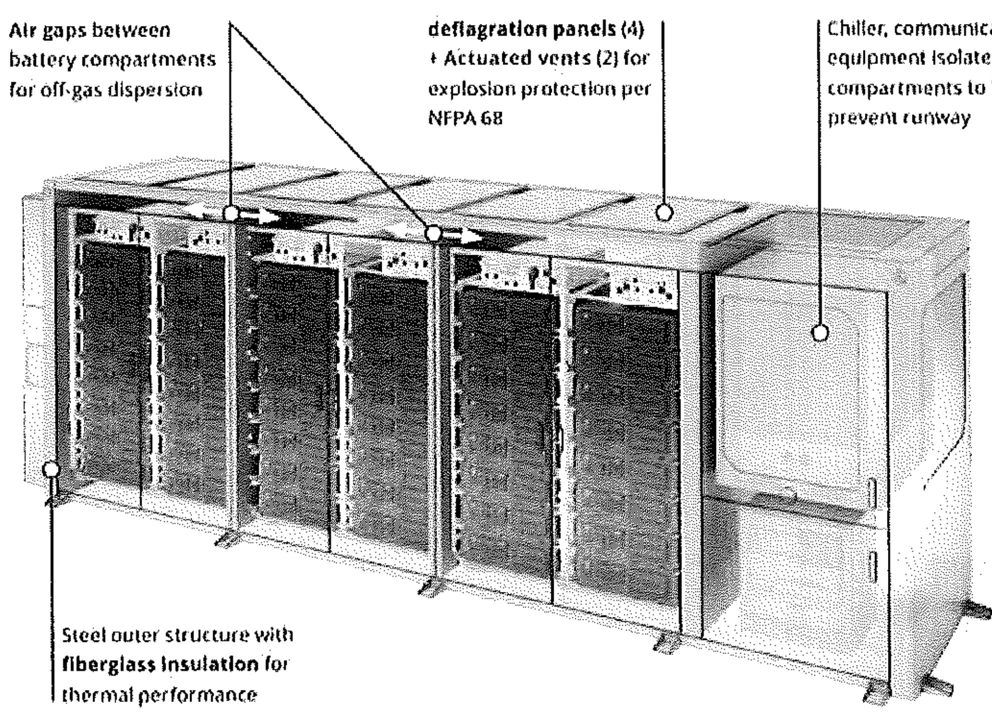

Figure 2. GSP5000 Safety Features

The GSP5000 utilizes a lithium iron phosphate (LFP) battery chemistry with a prismatic geometry and has an energy capacity up to 5,644 kilowatt hours. Each battery compartment houses two racks of eight battery modules. In total, it holds 48 battery modules. The thermal management system is located in its own separate compartment to isolate it from the battery modules. It includes a chiller and a Heating, Ventilation, and Air Conditioning (HVAC) system. The HVAC system maintains the internal temperature and humidity of the GSP5000 container, and the chiller circulates a mixture of ethylene glycol and water to the battery racks. Chilled coolant is supplied to each module to cool them during operation. Upon cooling the modules, the heated coolant returns to the chiller unit from the top of each rack in a closed loop. The TMS works autonomously to maintain an optimum battery operating temperature, thus minimizing the lifetime degradation of the battery system.

The GSP5000 has a layered Battery Management System (BMS) that monitors the health of the batteries and provides thermal runaway risk protection by disconnecting the batteries in case of fault conditions. For fire safety features, the GSP5000 container is equipped with four passive deflagration panels, two actuated deflagration panels, a combustible gas concentration reduction system (CCRS), automatic gas detection, and an automatic fire detection and notification system. The design intent for these fire protection systems is for them to meet NFPA 68, *Standard on Explosion Prevention by Deflagration Venting* – 2023 Edition (NFPA 68), NFPA 69, *Standard on Explosion Prevention Systems* – 2024 Edition (NFPA 69) and NFPA 72, *National Fire Alarm and Signaling Code* – 2022 Edition (NFPA 72), as required by NFPA 855. A full compliance review of all these fire protection systems is currently in progress.

Statement of Compliance

The GSP5000 design appears to include all the battery safety systems, safety features, and fire protection systems required by NFPA 855 for an outdoor BESS. This includes but is not limited to enclosure construction and size, a thermal management system, a battery management system, a smoke and fire detection system, thermal runaway protection, and explosion control. Therefore, based on this preliminary review, the GSP5000 *can comply* with the 2023 Edition of NFPA 855. However, this evaluation is considered preliminary given the UL listings, UL 9540A tests, and other engineering reports (such as an NFPA 68/69 analysis and NFPA 72 drawings) are currently in progress. Once these are completed, a full compliance review of all aspects of NFPA 855 can be performed for the GSP5000 and a final statement of compliance can be provided.

Sincerely,

Andrew F. Blum

Andrew Blum, PE
Director of Energy Storage Systems
Principal Fire Protection Engineer
Fire & Risk Alliance, LLC.
ablum@fireriskalliance.com

APPENDIX 3A

CELL TEST REPORT
UL 9540A
Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems (AACD)

Project Number.............................:	**4790838636.3**
Date of issue ....:	**2023.08.24 Amendment No.1: 2023.12.22**
Total number of pages..................:	**51**
UL Report Office ....:	**UL(Changzhou) Quality Technical Service Co., LTD**
Applicant's name...........................:	**Contemporary Amperex Technology Co., Limited**
Address ....:	No 2 Xingang Road Zhangwan Town Jiaocheng District NingdeFujian 352100 China
Test specification:	4th Edition, Section 7, November 12, 2019
Standard ....:	UL 9540A, Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems
Test procedure ....:	7.1, 7.2, 7.3.1, 7.4, 7.6.1, 7.7
Non-standard test method ....:	N/A

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General disclaimer:

The test results presented in this report relate only to the sample tested in the test configuration noted on the list of the attachments.

UL LLC did not select the sample(s), determine whether the sample(s) was representative of production samples, witness the production of the test sample(s), nor were we provided with information relative to the formulation or identification of component materials used in the test sample(s).

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Cell level information	
Model No ....:	CBDD0
Ratings (Vdc, Ah) ....:	3.2V, 306Ah
Chemistry of test item..................:	Lithium Iron Phosphate
Original Equipment Manufacturer (OEM):	Contemporary Amperex Technology Co., Limited
Branding Manufacturer (if not OEM):	N/A
Was the cell certified? ....:	Yes
Standard test item certified to ....:	UL 1973
Organization that certified test item ....:	MH62898
Average cell surface temperature at gas venting, °C:	154
Average surface temperature at thermal runaway, °C:	241
Gas Volume-:	204L
Lower flammability limit (LFL), % volume in air at the ambient temperature	8.595
Lower flammability limit (LFL), % volume in air at the venting temperature	7.24
Burning velocity (S_u) cm/s:	54.20
Maximum pressure (P_{max}) psig:	102.74

Cell Gas composition

Gas		Measured %
Carbon Monoxide	CO	14.596
Carbon Dioxide	CO_2	26.925
Hydrogen	H_2	43.066
Methane	CH_4	7.051
Acetylene	C_2H_2	0.119
Ethylene	C_2H_4	3.289
Ethane	C_2H_6	1.060
Propylene	C_3H_6	0.686
Propane	C_3H_8	0.260
-	C4 (Total)	0.865
-	C5 (Total)	0.399
-	C6 (Total)	0.148
1-Heptene	C7H14	0.025
Styrene	C8H8	0.013
Benzene	C_6H_6	0.082
Toluene	C_7H_8	0.012
Dimethyl Carbonate	$C_3H_6O_3$	1.304
Ethyl Methyl Carbonate	$C_4H_8O_3$	0.101
Total	-	100

Cell failure test method performed (summary of method and test clause): ☒ External heating using thin film with 4°C to 7°C thermal ramp. ☐ Nail Penetration ☐ Overcharge ☐ External short circuit (*X* Ω *external resistance*) ☐ Flow Battery with 2 active electrolyte methods ☐ Flow Battery with 1 active electrolyte methods ☐ Others		
Description of method used to fail cells if other than external thin film heater with thermal ramp, :N/A		
Summary of testing:		
Performance Criteria in accordance with Clause 7.7 and Figure 1.1: [ ] Thermal runaway was not induced in the cell; and [ ] The cell vent gas did not present a flammability hazard when mixed with any volume of air, as determined in accordance with ASTM E918 at both ambient and vent temperatures.		
Necessity for a module level test		
[X] The performance criteria of the cell level test as indicated in 7.7 of UL 9540A 4th edition has not been met, therefore a module level testing in accordance with UL 9540A will need to be conducted on a complete module employing this cell. **[ ]** The performance criteria of the module level tests as indicated in 7.7 of UL 9540A 4th edition has been met, therefore a module level testing in accordance with UL 9540A need not be conducted.		
Testing Laboratory information		
Testing Laboratory and testing location(s):		
Testing Laboratory:	UL(Changzhou) Quality Technical Service Co., LTD	
Testing location/ address .... :	21 Longmen Rd, National High-Tech Industrial Development District, Wujin, Changzhou, Jiangsu, China	
Tested by (name, signature)........................ :	Huang Fei /Vic Zhang	
Witnessed by (for 3rd Party Lab Test Location) (name, signature) .... :	N/A	N/A
Project Handler (name, signature).............. :	Arui Zhou	Arui Zhou
Reviewer (name, signature) ....:	Benjamin Liu	Benjamin Liu
Amendment 1 Project Handler (name, signature) .... :	Arui Zhou	Arui Zhou
Amendment 1 Reviewer (name, signature) ....:	Benjamin Liu	Benjamin Liu

Gas Analysis Testing Laboratory :	
Testing location/ address .... :	UL SOLUTIONS 333 Pfingsten Rd. Northbrook, Il 60062 USA
Project Handler (name, signature).............. :	Ian A. Erickson
Reviewer (name, signature) ....:	Sean. Mitchell

List of Attachments (including a total number of pages in each attachment):

Attachment A: Cell Conditioning (Charge/discharge) Profiles - (*Pages **18** through **20***)

Attachment B: Cell Instrumentation Photos - (*Pages **21** through **21***)

Attachment C: Cell Temperature Profiles during testing - (*Pages **22** through **24***)

Attachment D: Cell Testing Photos - (*Pages **25** through **34***)

Attachment E: Cell vent gas test chamber photo and profile of chamber gas analysis (O_2 and Pressure) – (*Pages **35** through **35***)

Attachment F: Cell Gas Analysis Report - (*Pages **36** through **36***)

Attachment G-1~G4 for Amendment 1 report

Attachment G-1: Cell Conditioning (Charge/discharge) Profiles - (*Pages **39** through **40***)

Attachment G-2: Cell Instrumentation Photos - (*Pages **41** through **41***)

Attachment G-3: Cell Temperature Profiles during testing - (*Pages **42** through **43***)

Attachment G-4: Cell Testing Photos - (*Pages **44** through **51***)

Photo of cell/Stack	

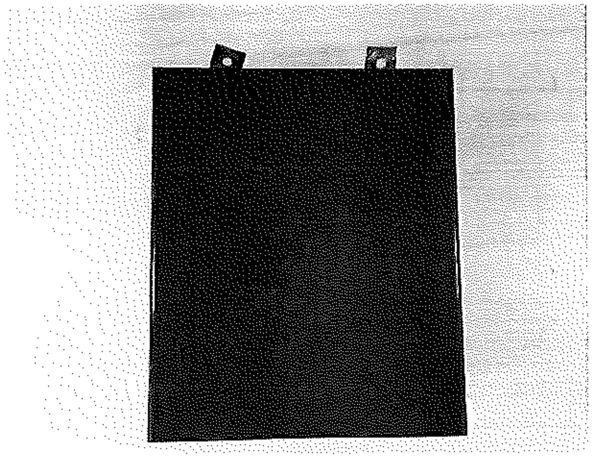
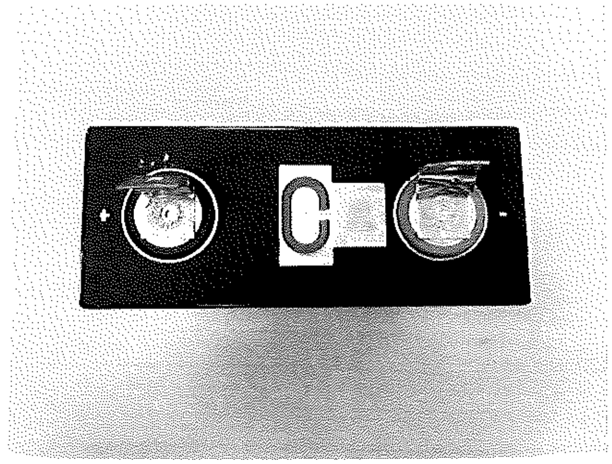

	

Figure 0-1	Figure 0-2
Test Item Charge/Discharge Specifications:	
• **Charge current, A:**	153
• **Charge Power, w**	489.6
• **Standard full charge voltage, Vdc:**	3.65
• **Charge temperature range, °C:**	0~60
• **End of charge voltage, V:**	3.65
• **Discharge current, A:**	153
• **Discharge Power, w**	489.6
• **End of discharge voltage, Vdc:**	2.5
• **Discharge temperature range, °C:**	-20~60

Test item particulars:	
Possible test case verdicts:	
- test case does not apply to the test object...........:	N/A
- test object does meet the requirement ....:	P (Pass)
- test object does not meet the requirement...........:	F (Fail)
- test object was completed per the requirement...:	C(Complete)
- test object was completed with modification......:	M(Modification)
Testing..:	CBDD0
Date of receipt of test item ....:	2023-04-28, 2023-10-10
Date (s) of performance of tests ....:	2023-05-10~2023-05-13, 2023-10-30~2023-11-08

General remarks:

"(See Enclosure #)" refers to additional information appended to the report.
"(See appended table)" refers to a table appended to the report.

Throughout this report a point is used as the decimal separator.

Manufacturer's Declaration of samples submitted for test:	
The applicant for this report includes samples from more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided ....:	☒ **Yes** ☐ **Not applicable**
Name and address of factory (ies) ....:	Factory_1: Guangdong Ruiqing Contemporary Amperex Technology Limited Factory_1 address: No.1 Shidai Street,High-tech Industrial Development Zone, Zhaoqing City, Guangdong Province Factory_2: Jiangxi Yichun Contemporary Amperex Technology Limited Factory_2 address: No. 1, Chunfeng Road, Yichun Economic and Technological Development Zone, Jiangxi Province Factory_3: Fuding Contemporary Amperex Technology Limited Factory_3 address: No. 1, Shidai Road, Xueqiao village, Qianqi Town, Fuding City, Ningde City, Fujian Province

General product information and other remarks:

The tested cell is a Lithium-ion battery cell, Model CBDD0. Each cell has a capacity of 306 Ah and nominal voltage 3.2 Vdc.

The weight of cell is 5500g±300g.

The test samples were produced in Factory 1.

The test samples are figure 0-1 and figure 0-2.

The customer has changed the design of the top cover of the cell, figures 0-1 and 0-2 are the original design of the cell, 0-3 and 0-4 are the new designs.

Amendment 1 report:

The overall dimensions of cell were corrected from 71.6±0.8mm(Width) by 174.7±0.8mm(Length) by 207.3±0.8mm(Height) to the 71.55±0.8mm (depth) by 174.3±0.8 mm(width) by 207.3±0.8 mm(height).

The customer has changed the design of the top cover of the cell, figures 0-1 and 0-2 are the original design of the cell, 0-3 and 0-4 are the new designs.

Attachment G-1~G-4 is the supplementary test after the design change of the cell.

According to customer analysis, the above differences do not affect the test results.

UL 9540A, Edition 4,			
Clause	Requirement + Test	Result - Remark	Verdict

5.0	CONSTRUCTION		Verdict
5.1. 5.4	**Cell/Stack Construction**		—
5.1.1, 5.4.1	Generic Chemistry:	Lithium iron phosphate	—
	Electrolyte Chemistry:	LiPF6 with additives	—
	Flow Battery Electrolyte No. 1 Chemistry:	Not flow battery	—
	Max volume of system electrolyte No. 1, L:	Not flow battery	—
	Flow Battery Electrolyte No. 2 Chemistry:	Not flow battery	—
	Max volume of system electrolyte No. 2, L:	Not flow battery	—
	Separator Melt Temperature, °C:	Not used during test	—
	Format: Cylindrical /Prismatic /Pouch Flow Battery Stack	Prismatic	—
	Overall Dimensions, mm	174.3±0.8mm (Length) by 71.55±0.8mm (width) by 207.3±0.8mm (height)	—
	Cell Weight, g	5500±300	—
5.1.2	Cell Certification:	Yes	—
	Standard Used for Cell Certification:	UL 1973	—
	Organization that Certified Cell:	MH62898	—
5.1.1, 5.4.1	Cell/Stack Ratings: • Nominal Voltage, Vdc •Nominal Capacity, Ah	3.2 306	— —
5.4.1	Flow Battery: No. of Cells per Stack:	Not flow battery	—
	Flow battery system manufacturer:	Not flow battery	—
	Flow battery system model:	Not flow battery	—
	Flow battery system ratings, Vdc, Ah:	Not flow battery	—
5.4.2	Flow battery system certified to UL 1973:	Not flow battery	—
	Organization that certified flow battery system:	Not flow battery	—
6.0	**PERFORMANCE**		**Verdict**
6.1	**General**		C
7.2	**Samples**		C

UL 9540A, Edition 4,			
Clause	Requirement + Test	Result - Remark	Verdict

7.2.1	Samples conditioned through charge discharge cycling a minimum of 2 cycles.	See Attachment A and Attachment G1 for profiles	C
7.2.2	100% SOC and stabilize from 1h to 8 h before testing	See Table 1 and Table G0-1 for specifications See also Table 2 and Table G0-2	
7.2.3	Pouch Cells constrained per end use during testing.		N/A
7.3	**Determination of thermal runaway methodology**		C
7.3.1	**General**		C
7.3.1.1	Ambient indoor laboratory conditions: 25 ±5°C (77 ±9°F) ≤50 ±25% RH at the initiation of the test.	See Attachment C and Attachment G3 See Table 3 and Table G0-3	C
7.3.1.2	Heat the cell to thermal runaway by externally applied flexible film heaters	See Attachment B and Attachment G2	C
	Heater Dimension	Two heaters 152.4mm by 203.2 mm in size for each sample. Each side of the cells was instrumented with the heater	
	A surface heating rate of 4° C (7.2° F) to 7° C (12.6° F) per minute was applied to the cell.	See Attachment C, D, G1, G4 See Table 4 and Table G0-4	C
	Maximum surface end point temperature, °C	Not used, the cells are heated until the thermal runaway achieved According to the Certification Requirement Decision: Test Method for Evaluating Thermal Runaway Fire Propagation in Battery. Holding temperature was not utilized during the test and the cell was continuously heated until thermal runaway occurred	

UL 9540A, Edition 4,			
Clause	Requirement + Test	Result - Remark	Verdict

	The following method(s) was employed to cause thermal runaway: ☐ Mechanical (e.g. nail penetration); ☐ Electrical stress in the form of overcharging, ☐ Electrical stress in the form of over discharging ☐ Electrical stress in the form of external short-circuiting ☐ Use of alternate heating sources (e.g. oven). ☐ Other (explain)	Only external heating in the form of using flexible thin film heaters to cause thermal runaway	N/A
7.3.1.3	Detail of test method when using another cell abuse method to initiate thermal runaway	See Attachment E	N/A
7.3.1.4	Monobloc batteries such as a lead acid battery		N/A
7.3.1.5	Estimated surface temperature at which internal short circuiting within the cell will occur that could lead to a thermal runaway condition.	Not used, the cells are heated until the thermal runaway achieved According to the Certification Requirement Decision: Test Method for Evaluating Thermal Runaway Fire Propagation in Battery. Holding temperature was not utilized during the test and the cell was continuously heated until thermal runaway occurred	N/A
7.3.1.6	The cell was heated until thermal runaway has occurred.	Refer to Attachment C and Attachment G3	C
	Another external heating method was used to cause cell thermal runaway		N/A
7.3.1.7	The cell's exterior surface temperature was measured	See Attachment B and Attachment G2	C
7.3.1.8	The temperature at which the cell case vents due to internal pressure rise was documented.	See Table 4 and Table G0-4See Attachment C, D, G3, G4	C
7.3.1.9	The temperature at the onset of thermal runaway was documented.	See Table 4 and Table G0-4See Attachment C, D , G3,G4	C
	If cell venting occurs first, the cell was heated continuously until thermal runaway occurs.	See Attachment C and Attachment G3	C
7.3.1.10	When using methods other than the heater method, the stresses were applied to the cell until thermal runaway occurs.		N/A

UL 9540A, Edition 4,			
Clause	Requirement + Test	Result - Remark	Verdict

7.3.1.11	3 additional samples were tested using the same method and exhibited thermal runaway	See Table 3, 4,5, G0-3, G0-4 and G0-5 See Attachment C, D, G3, G4	C
7.4	**Cell vent gas composition test**		C
7.4.1	Cell vent gas was generated and captured by forcing a cell into thermal runaway with the methodology developed in 7.3, inside a pressure vessel	Size of pressure vessel used: 100L Refer to Attachment E	C
	The test was initiated with an initial condition of atmospheric pressure and less than 1% oxygen by volume.	Refer to Attachment E Atmospheric pressure (psig):0.13 Oxygen concentration measured (% volume):0.06 Inert gas used: Nitrogen	C
7.4.2	Cell vent gas composition was determined using Gas Chromatography (GC)	Refer to Table 8 Refer to Attachment F	C
	Hydrogen gas was measured	Refer to Table 8	C
	The initial atmospheric conditions prior to testing were noted.	Refer to Table 3 Refer to attachment C and F	C
7.4.3	The lower flammability limit of the cell vent gas was determined on samples of the synthetically replicated gas mixture in accordance with ASTM E918, testing at both ambient and cell vent temperatures.	Refer to Table 9,10 and Table G0-6 (Lower Flammability limit at Vent Temperature)	C
7.4.4	The gas burning velocity of the synthetically replicated cell vent gas was determined in accordance with the Method of Test for Burning Velocity Measurement of Flammable Gases Annex in ISO 817.	Refer to Table 9 and 10	C
7.4.5	P_{max} of the synthetically replicated cell vent gas was determined in accordance with EN 15967.	Refer to Table 9 and 10	C
7.6	**Cell Level Test Report Information**		C

UL 9540A, Edition 4,			
Clause	Requirement + Test	Result - Remark	Verdict

7.6.1	Minimum information provided in the report for items a) through m)		C
7.6.2	Minimum information of items a) through k) was provided in the report for flow battery		N/A
7.7	**Performance – cell level test**		C
7.7.1	a) Thermal runaway cannot be induced in the cell; and	Thermal runaway can be induced in the cell with external heater during the test	F
	b) The cell vent gas does not present a flammability hazard when mixed with any volume of air, at both ambient and vent temperatures.	As a result of gas analysis, the gas generated from the cell were identified flammable	F

Note: Table G0-1~G0-5 and Attachment G-1~G4 for amendment 1, Table 1~5 and Attachment A~F for original report.

UL 9540A, Edition 4,			
Clause	Requirement + Test	Result - Remark	Verdict

Table 1 – Specified conditioning parameters			
Charging:		Discharging	
Power (CP), W	489.6	Power (CP), W	489.6
Standard full charge voltage, Vdc	3.65	Voltage at start of discharge, Vdc	3.65
End of charge voltage, Vdc	3.65	End of discharge voltage, Vdc	2.5
Charging Test Ambient, °C	0~60	Discharging Test Ambient, °C	-20~60
Refer to Attachment A for charge/discharge profiles for each cell.			

Table 2 – Charge completion and cell test initiation times		
Cell Test Number	**Charge Completion Date and Time**	**Cell test Date and Time**
1	2023-05-10 08:24	2023-05-10 11:14
2	2023-05-10 08:26	2023-05-10 15:28
3	2023-05-11 10:18	2023-05-11 15:26
4	2023-05-12 11:41	2023-05-12 14:59
5	2023-05-13 11:11	2023-05-13 17:49

Table 3 - Test Initiation Details					
	Cell Test 1	**Cell Test 2**	**Cell Test 3**	**Cell Test 4**	**Cell Test 5**
Test Date	2023-05-10	2023-05-10	2023-05-11	2023-05-12	2023-05-13
Test Start Time	11:14	15:28	15:26	14:59	17:49
Initial Lab Temperature	21.6°C	21.6°C	21.6°C	21.6°C	23.6°C
Initial Relative Humidity	68.5%RH	68.5%RH	68.5%RH	68.5%RH	68.1%RH

Table 4 - Thermal Runaway Results					
	Cell Test 1	**Cell Test 2**	**Cell Test 3**	**Cell Test 4**	**Cell Test 5**
OCV at start of test, Vdc	3.384	3.374	3.405	3.400	3.379
Average Heating Rate, °C/min	4.5	4.5	4.5	4.5	4.5
Venting Time after the test start (hh:mm:ss)	0:34:55	0:36:44	0:35:46	0:36:00	0:36:24
Venting Temperature, °C	153	153	159	152	166
Thermal Runaway Time after the test start (hh:mm:ss)	0:55:32	0:57:42	0:56:49	0:56:41	0:56:10
Thermal Runaway Temperature, °C	240	243	244	238	247
Refer to Attachment C for surface temperature profiles during testing					

UL 9540A, Edition 4,			
Clause	Requirement + Test	Result - Remark	Verdict

Table 5 – Average Vent and Thermal Runaway Temperatures	
Average of Cell Vent Temperatures, °C	154
Average of Cell Thermal Runaway Temperatures, °C	241
#Averages of cell tests other than the gas analysis test	

Table 6 – Parameters Flow Battery
N/A

Table 7 – Results of Flammability Testing of Flow Battery Electrolyte
N/A

Table 8 – Results of Gas Analysis (Excluding O_2 and N_2)			
Gas		Measured %	Component LFL[1]
Carbon Monoxide	CO	14.596	10.9
Carbon Dioxide	CO_2	26.925	N/A
Hydrogen	H_2	43.066	4.0
Methane	CH_4	7.051	4.4
Acetylene	C_2H_2	0.119	2.3
Ethylene	C_2H_4	3.289	2.4
Ethane	C_2H_6	1.060	2.4
Propylene	C_3H_6	0.686	1.8
Propane	C_3H_8	0.260	1.7
-	C4 (Total)	0.865	N/A
-	C5 (Total)	0.399	N/A
-	C6 (Total)	0.148	N/A
1-Heptene	C7H14	0.025	N/A
Styrene	C8H8	0.013	1.1
Benzene	C_6H_6	0.082	1.2
Toluene	C_7H_8	0.012	1.0
Dimethyl Carbonate	$C_3H_6O_3$	1.304	N/A
Ethyl Methyl Carbonate	$C_4H_8O_3$	0.101	N/A
Total	-	100	-

[1] Extracted LFL values from ISO 10156-2017

Table 9 – Gas composition excluding the constituents with boiling points higher than 60°C[2]			
Gas		**Measured %**	**Component LFL**
Carbon Monoxide	CO	14.846	10.9
Carbon Dioxide	CO2	27.386	N/A
Hydrogen	H2	43.804	4.0
Methane	CH4	7.172	4.4
Acetylene	C2H2	0.121	2.3
Ethylene	C2H4	3.345	2.4
Ethane	C2H6	1.078	2.4
Propylene	C3H6	0.697	1.8
Propane	C3H8	0.264	1.7
Propadiene	C3H4	0.000	1.9
-	C4 (Total)	0.880	N/A
-	C5 (Total)	0.405	N/A
Total	-	100	-

[2] The constituents with a higher boiling point were excluded for the flammability characteristic analysis as these components will turn into a liquid state at room temperature and will not release from the gas bottle as a homogenous mixture.

UL 9540A, Edition 4,			
Clause	Requirement + Test	Result - Remark	Verdict

Table 10 – Properties of Vent Gas Analysis	
Lower Flammability limit at Ambient Temperature, 25°C (% vol in air)	8.595
Lower Flammability limit at Vent Temperature, [154 °C] (% vol in air)	7.24
Burning Velocity Measurement, S_u cm/sec	54.20
Maximum Pressure P_{max}, psig	102.74

UL 9540A, Edition 4,			
Clause	Requirement + Test	Result - Remark	Verdict

	TABLE: Critical components information				
Object / part No.	**Manufacturer/ trademark**	**Type / model**	**Technical data**	**Standard**	**Mark(s) of conformity**
Cell Model	Contemporary Amperex Technology Co.,Limited	CBDD0	Nominal voltage：3.2V Rated capacity：306Ah	UL 1973	MH62898
Separator	Contemporary Amperex Technology Co.,Limited	SBM	Material: PE Size: LxWxT;(27937-33532mm) * (176-214mm) * (0.008-0.018mm) Separator melting temperature: 140±5°C	—	—
Electrolyte	Contemporary Amperex Technology Co.,Limited	ESN	Composition: LiPF6, DMC, EMC, EC, PC, DEC;	—	—
Case	Contemporary Amperex Technology Co.,Limited	PPA	Material: Al 3003 Minimum thickness: 0.6-0.7mm	—	—
Insulators/ location in cell	Contemporary Amperex Technology Co.,Limited	PTA PAP	Up-Plate Material: PP Down-Plate Material: PP	—	—
Vent	Contemporary Amperex Technology Co.,Limited	PTA	Length: (25.3-30.3)mm, Width: (13.7-16.7)mm Material: MFX2 Valve opening pressure:(0.4-1.2)MPa	—	—

Attachment A: Cell Conditioning (Charge/discharge) Profiles - (*Pages **18** through **20***)

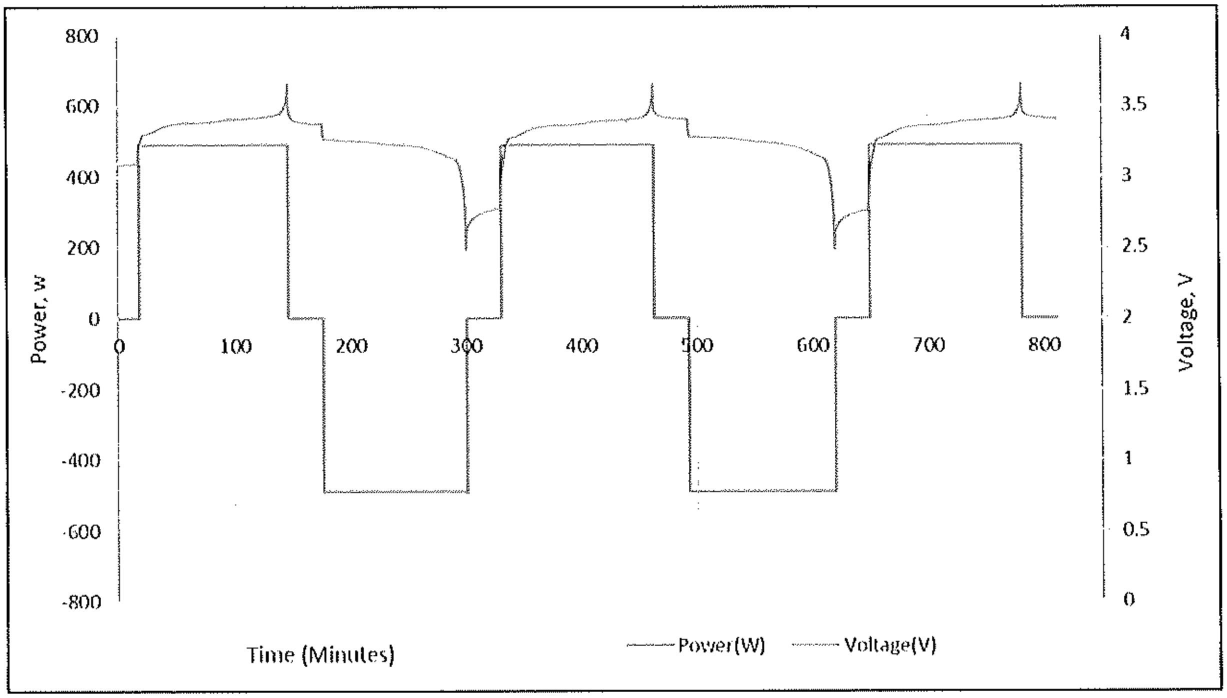


Figure 1: Cell 1 Conditioning (Charge/discharge) Profiles

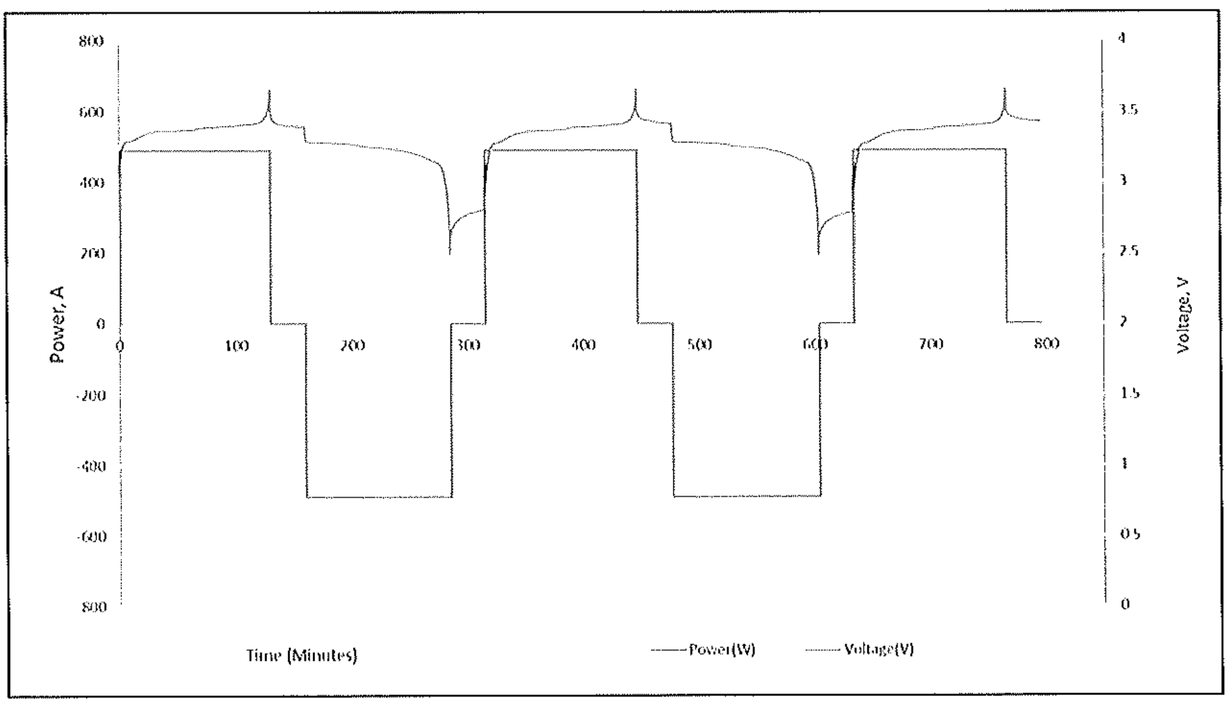


Figure 2: Cell 2 Conditioning (Charge/discharge) Profiles

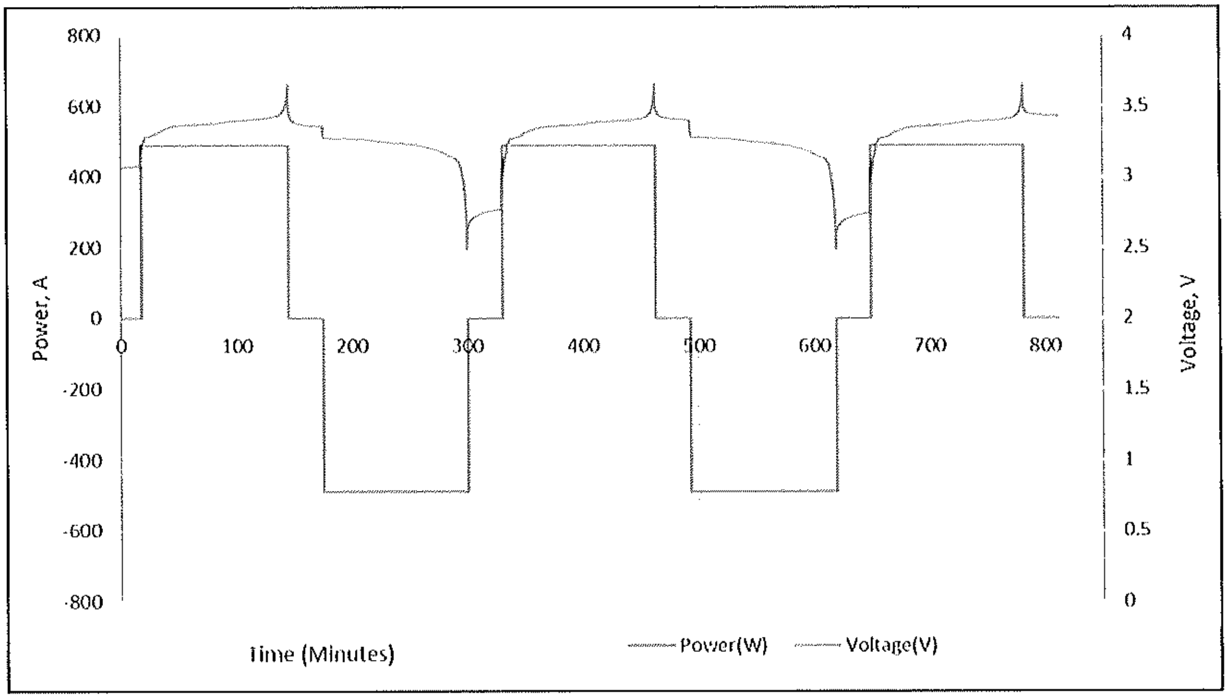


Figure 3: Cell 3 Conditioning (Charge/discharge) Profiles

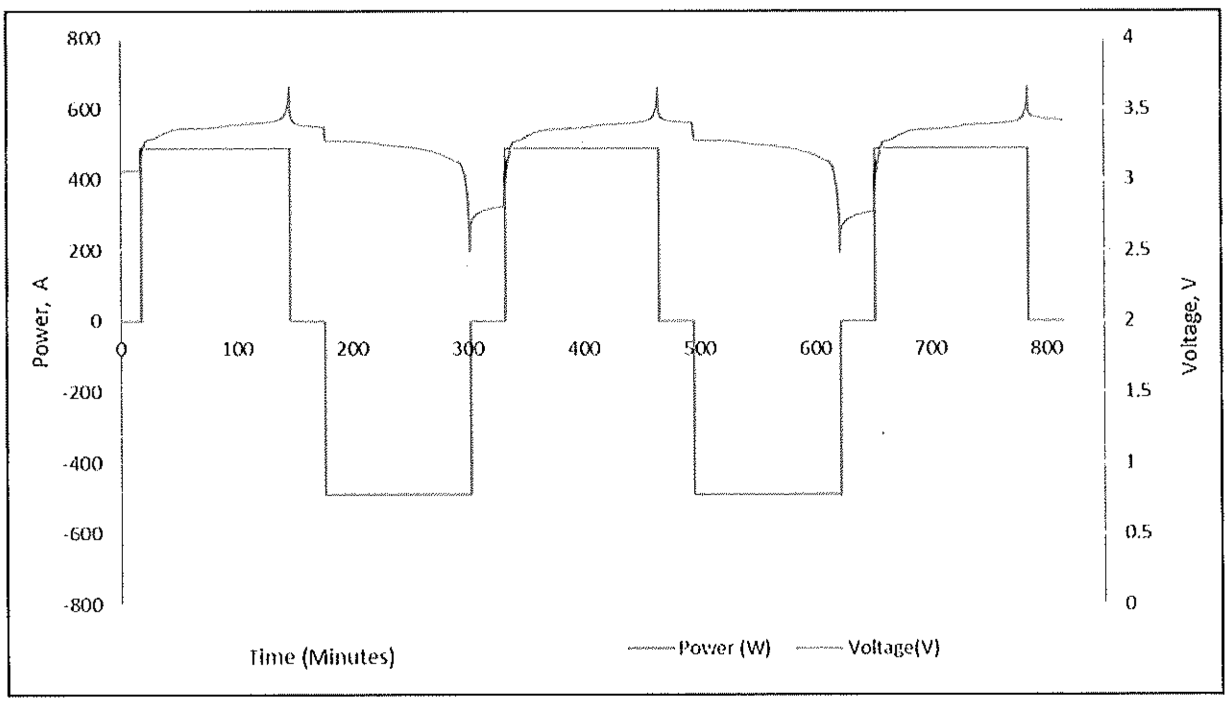


Figure 4: Cell 4 Conditioning (Charge/discharge) Profiles

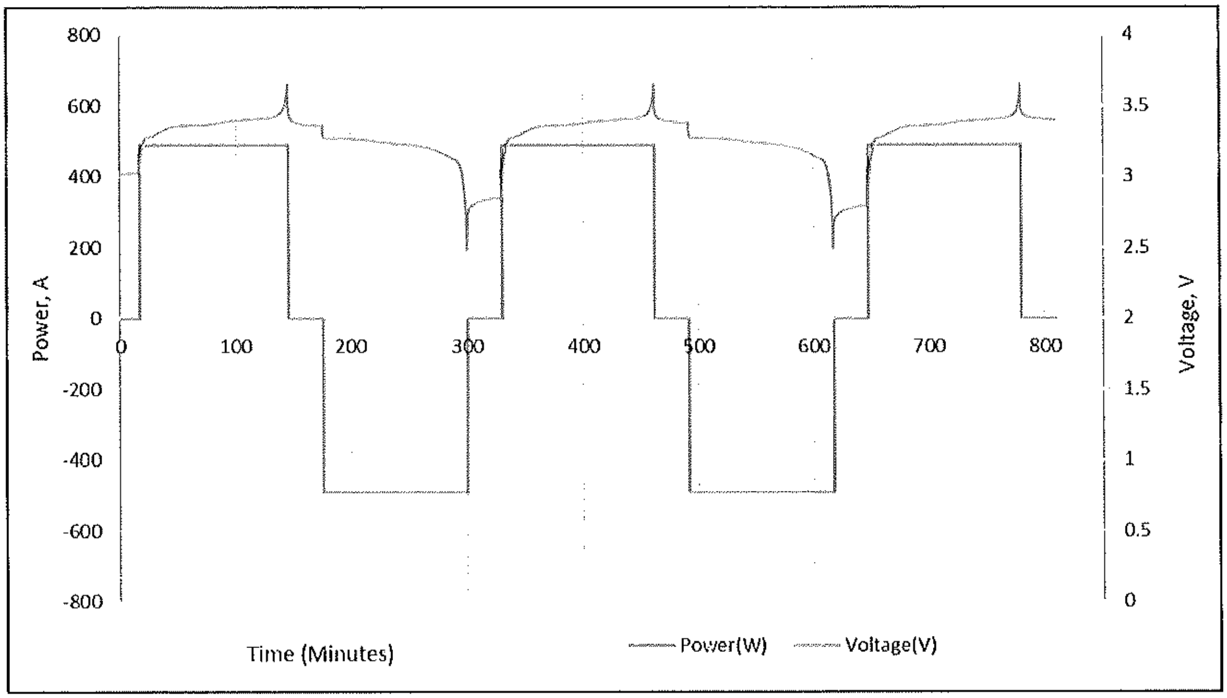


Figure 5: Cell 5 Conditioning (Charge/discharge) Profiles

Attachment B: Cell Instrumentation Photos - (*Pages **21** through **21***)

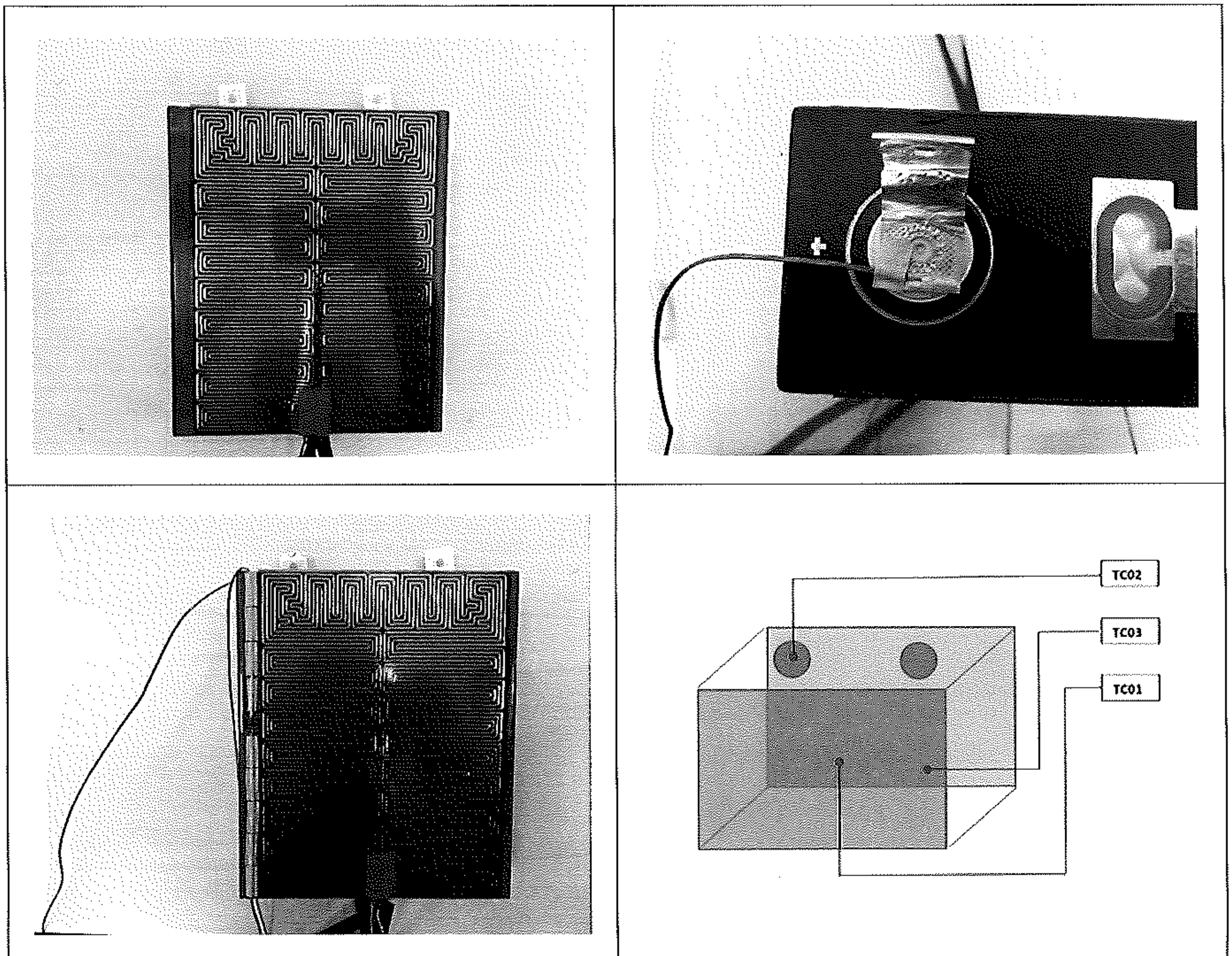


Figure 6: Sample Instrumentation Prior to Test

Note: heaters were placed on two sides of the cell after thermocouples were instrumented.

Note: TC01 between cell body and heater; TC02 on the cell positive; TC03 on the cell body not covered by heater; TC04 Ambient temperature; V1 cell voltage.

Attachment C: Cell Temperature Profiles during testing - (*Pages **22** through **24***)

Note: TC01 between cell body and heater; TC02 on the cell positive; TC03 on the cell body not covered by heater; TC04 Ambient temperature; V1 cell voltage.
TC01 was used to control the temperature at 4 to 7°C/min and TC03 temperatures were reported herein for the surface temperature at the onset of vent and thermal runaway.

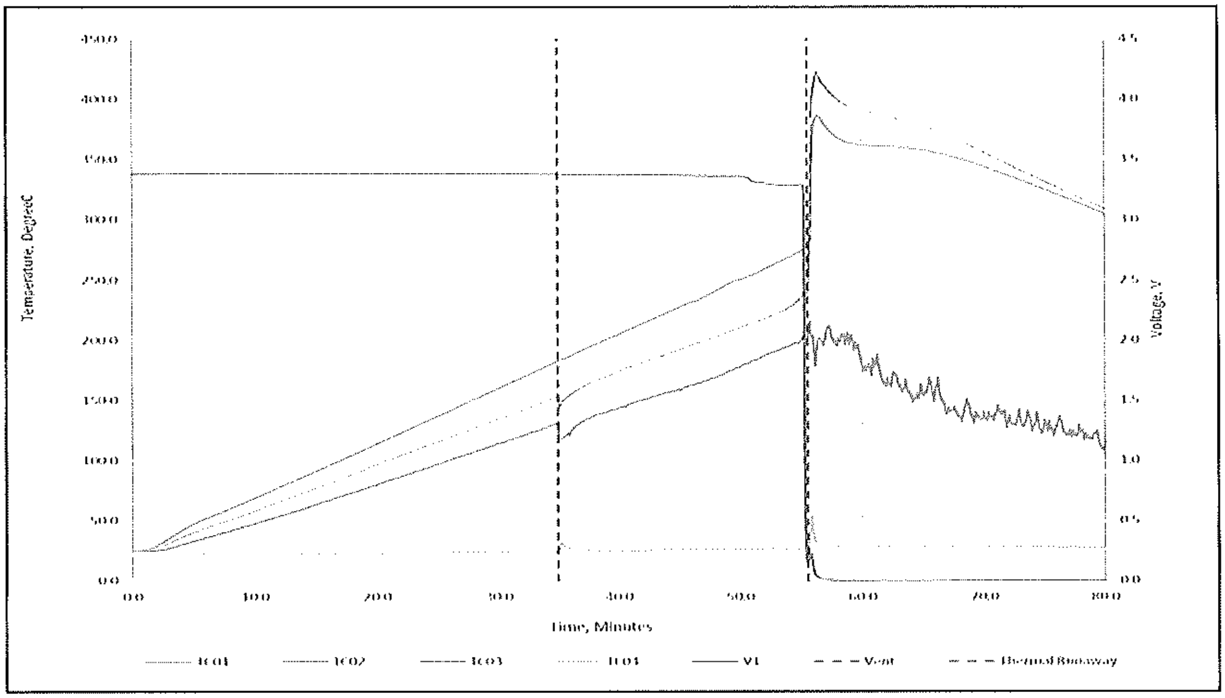


Figure 7: Cell 1 – External Heating 4.5°C per minute

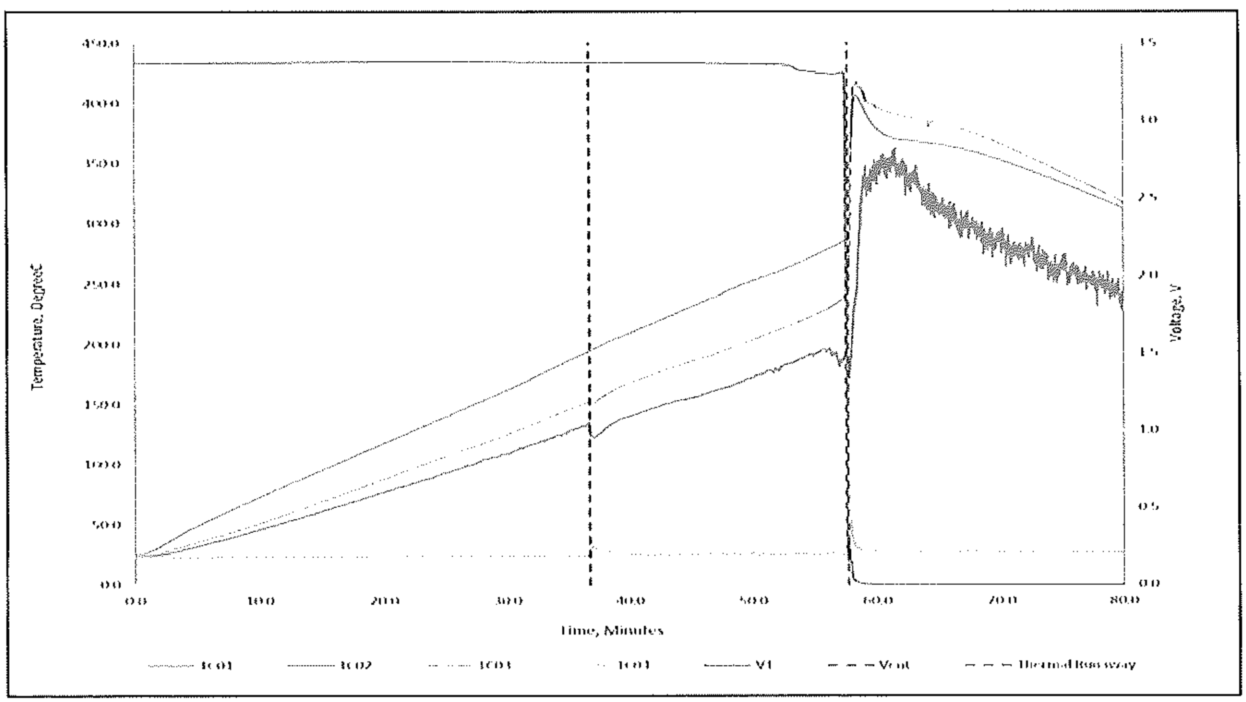


Figure 8: Cell 2 – External Heating 4.5°C per minute

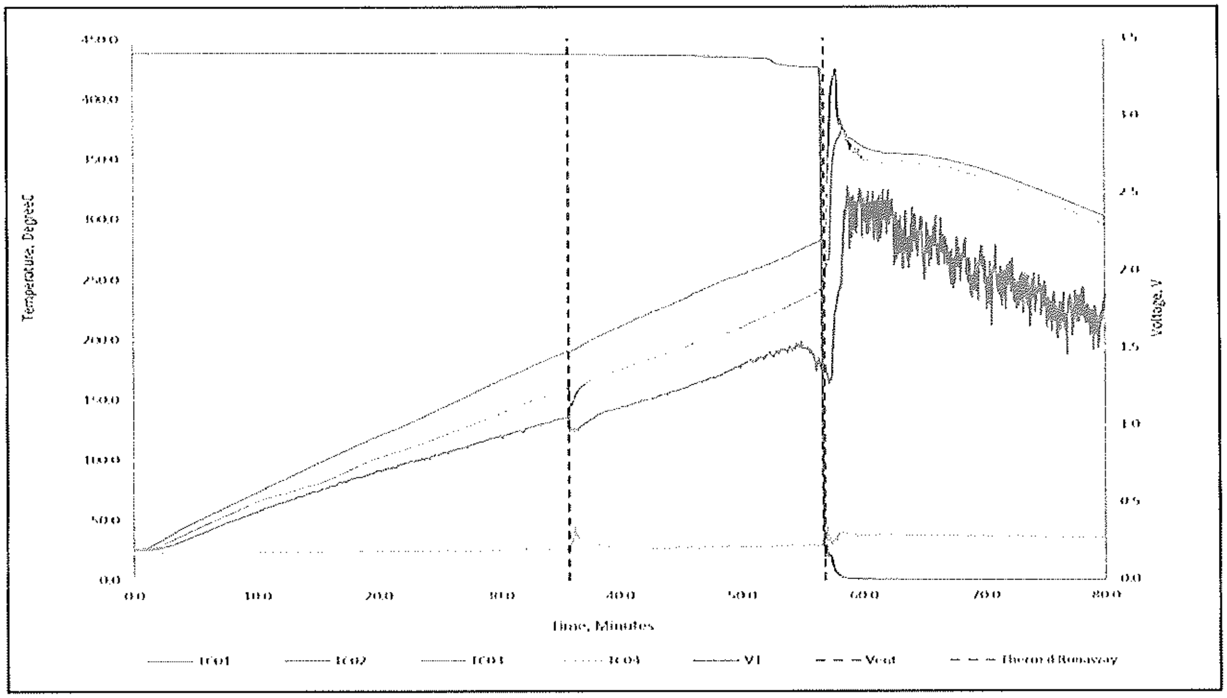


Figure 9: Cell 3 – External Heating 4.5°C per minute

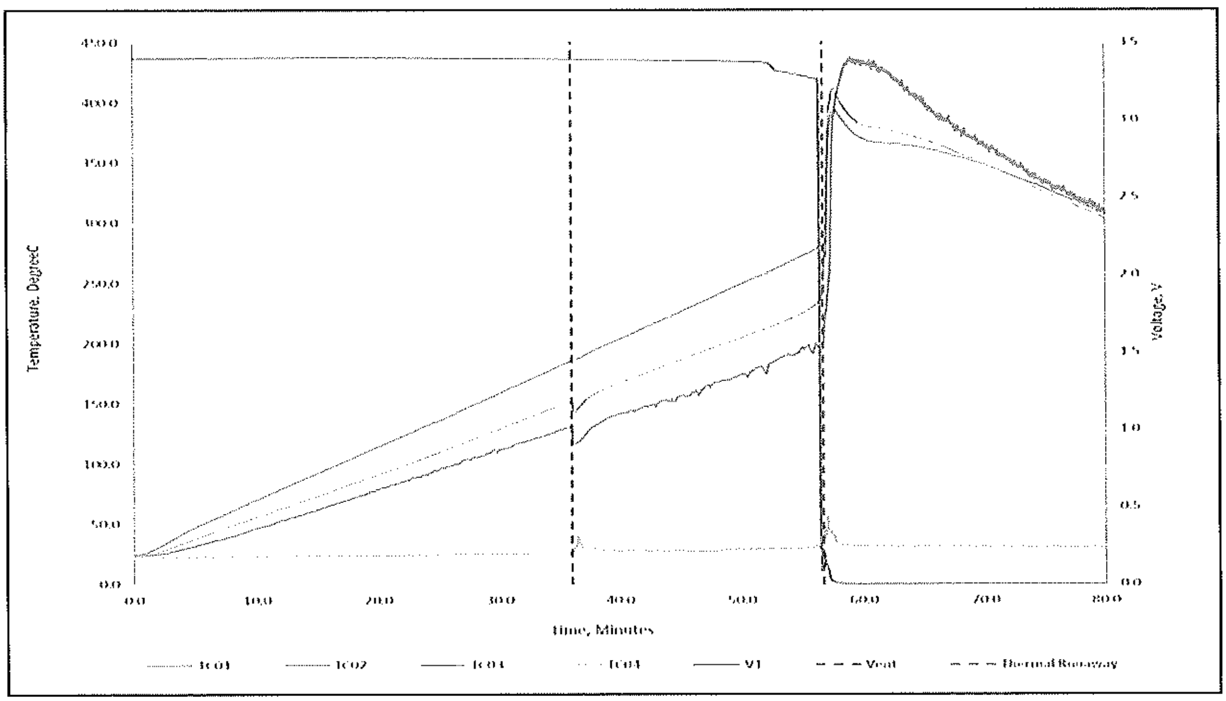


Figure 10: Cell 4 – External Heating 4.5°C per minute

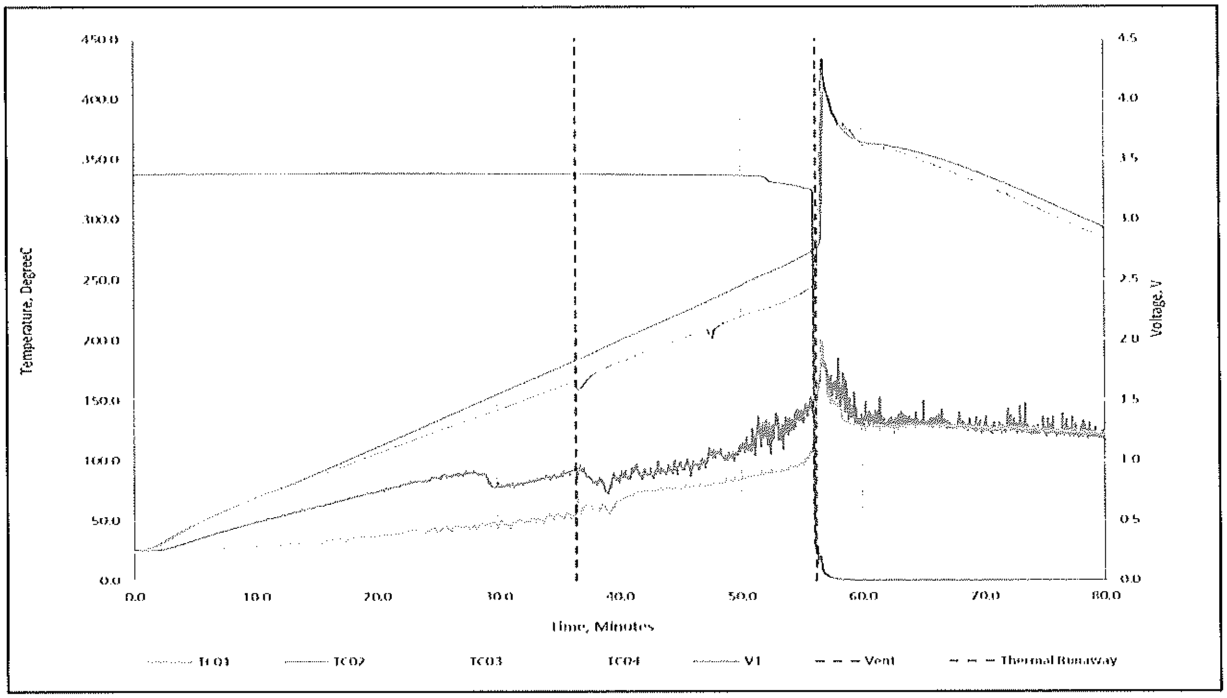


Figure 11: Cell 5 – External Heating 4.5°C per minute

Attachment D: Cell Testing Photos - (*Pages **25** through **34***)

Cell Sample 1 – below figure shows highlights of cell testing. Cell venting and thermal runaway were observed, however no evidence of fire. Figure on next page shows photos of cell after testing.

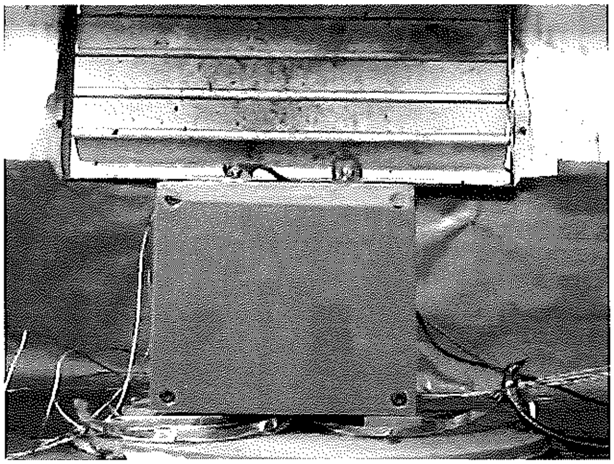
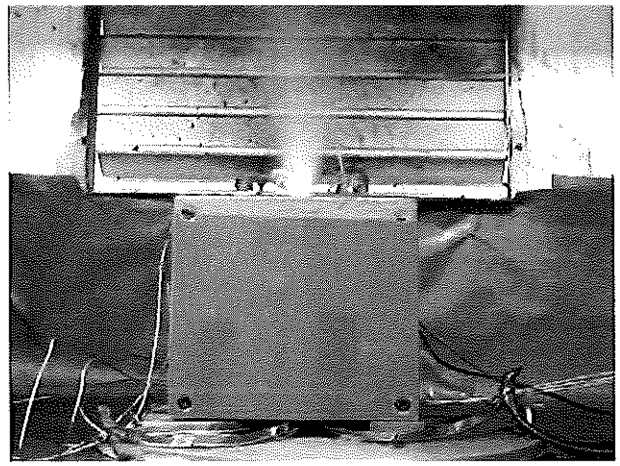
	
(a) Test Start [00:00]	(b) Cell Venting [34:55]
	
(c) Thermal runaway behavior [55:32]	

Figure 12: Highlights of Cell 1 Testing

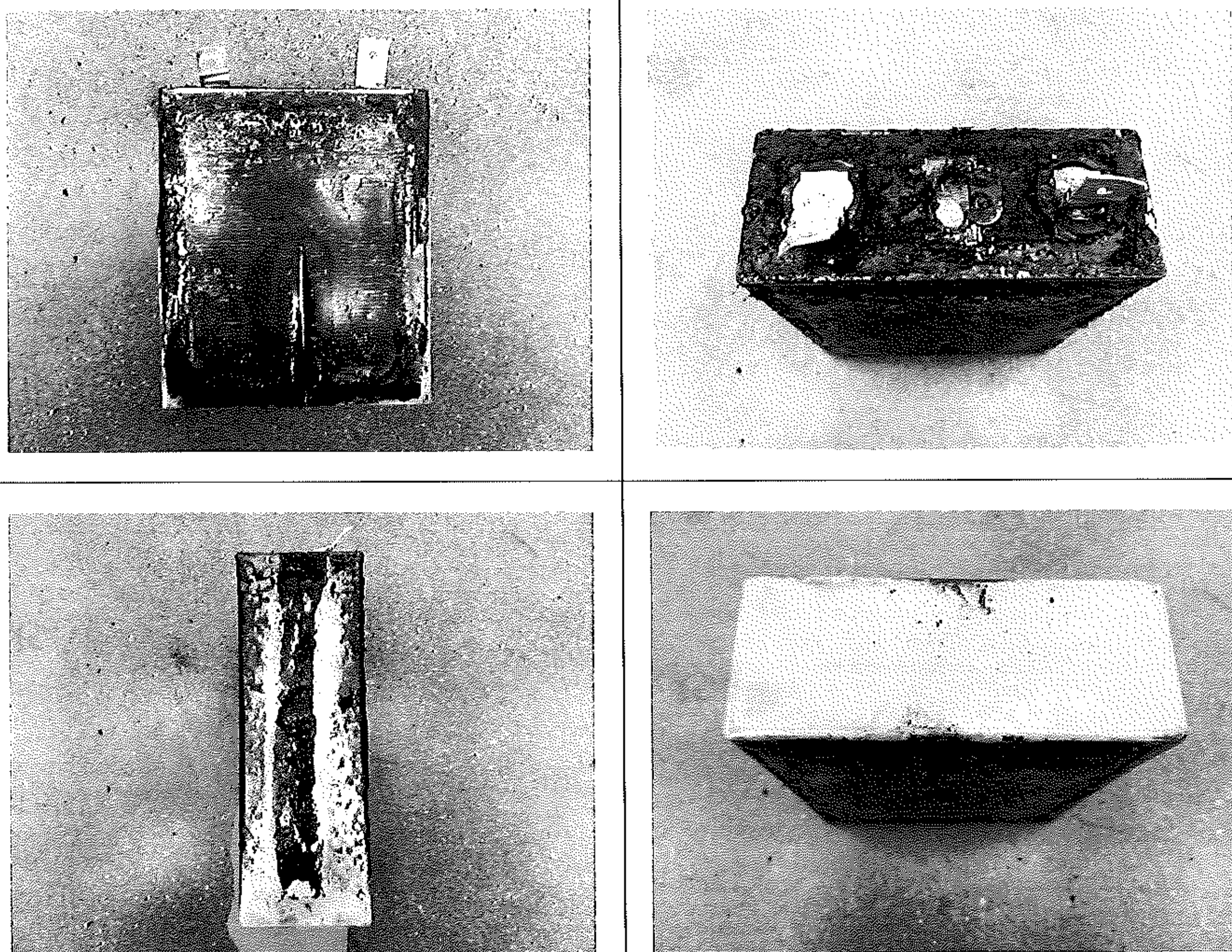
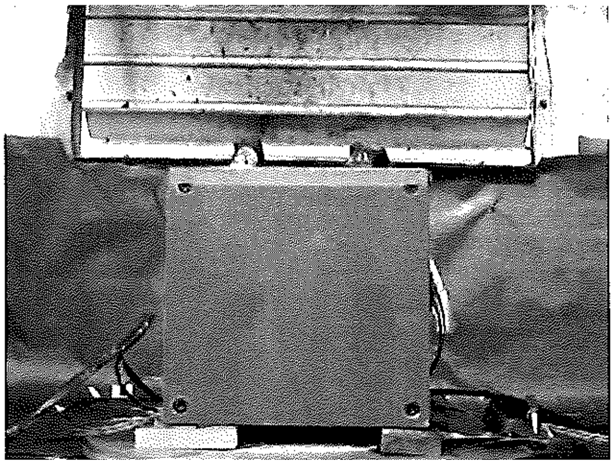
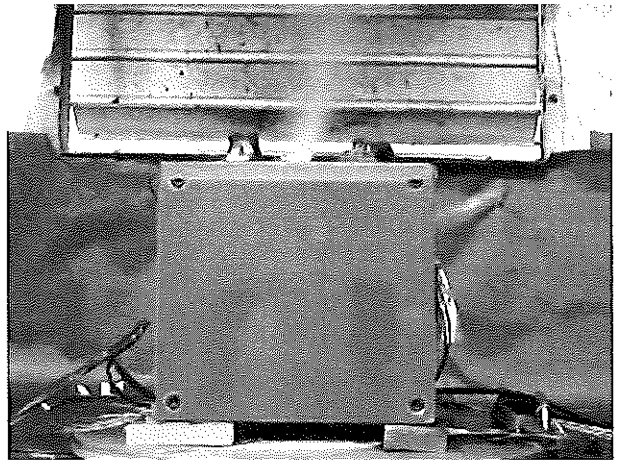
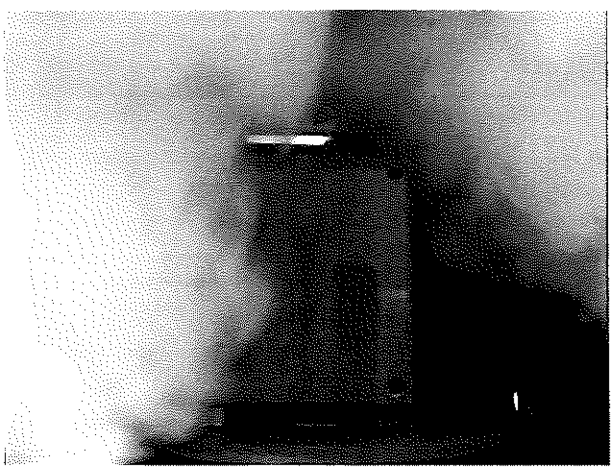


Figure 13: Sample 1 Post Test Photos

Cell Sample 2 – below figure shows highlights of cell testing. Cell venting and thermal runaway were observed, however no evidence of fire. Figure on next page shows photos of cell after testing.

	
(a) Test Start [00:00]	(b) Cell Venting [36:44]
	
(c) Thermal runaway behavior [57:42]	
Figure 14: Highlights of Cell 2 Testing	

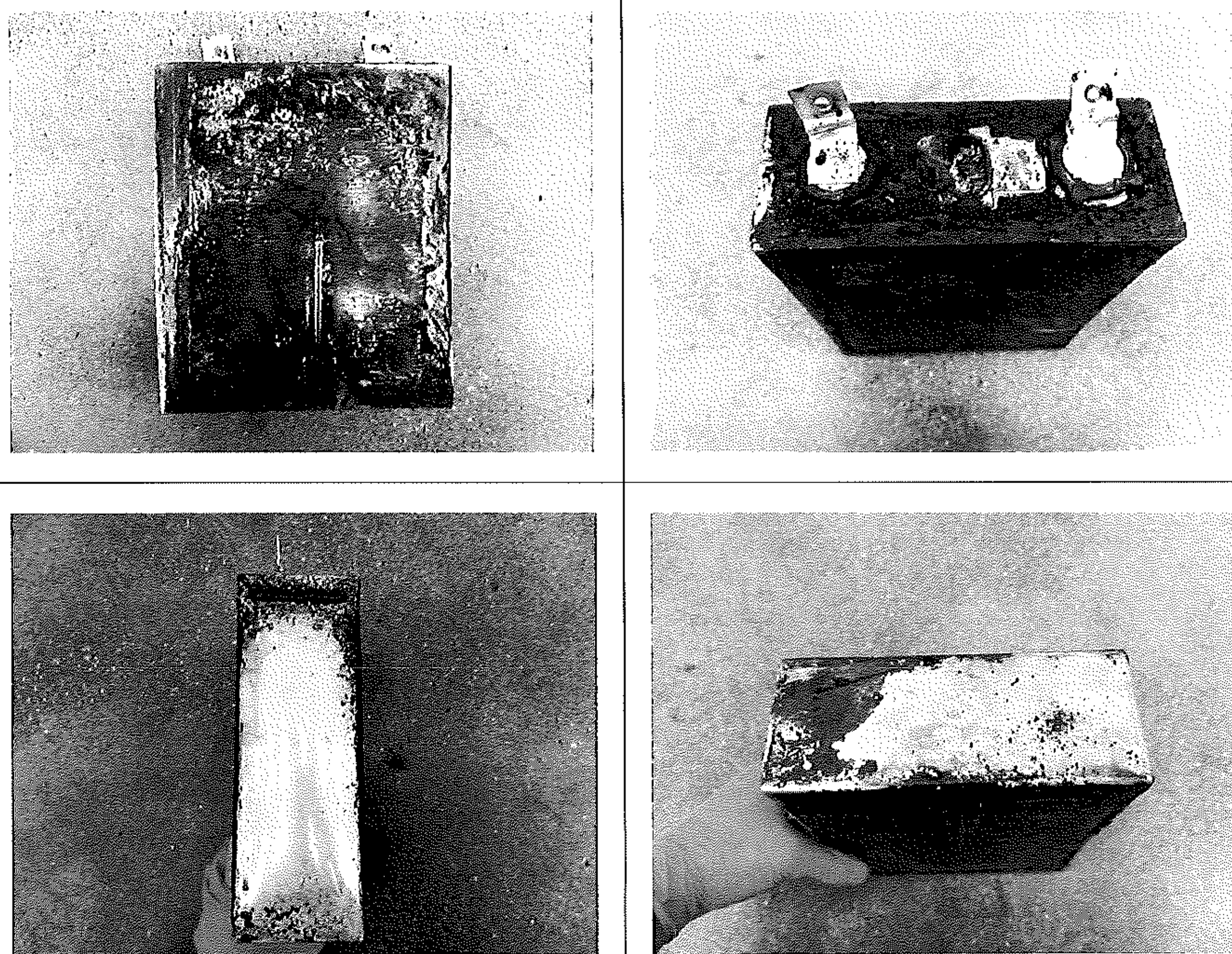
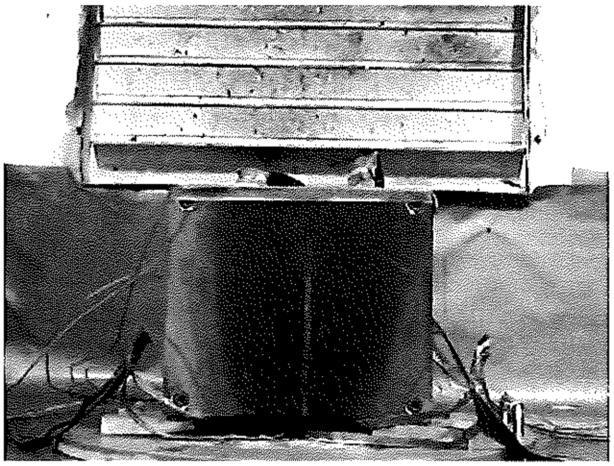
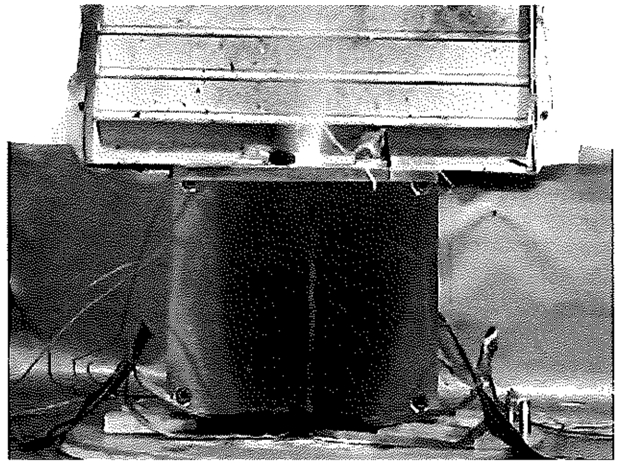


Figure 15: Sample 2 Post Test Photos

Cell Sample 3 – below figure shows highlights of cell testing. Cell venting and thermal runaway were observed, however no evidence of fire. Figure on next page shows photos of cell after testing.



(a) Test Start
[00:00]



(b) Cell Venting
[35:46]

(c) Thermal runaway behavior
[56:49]

Figure 16: Highlights of Cell 3 Testing

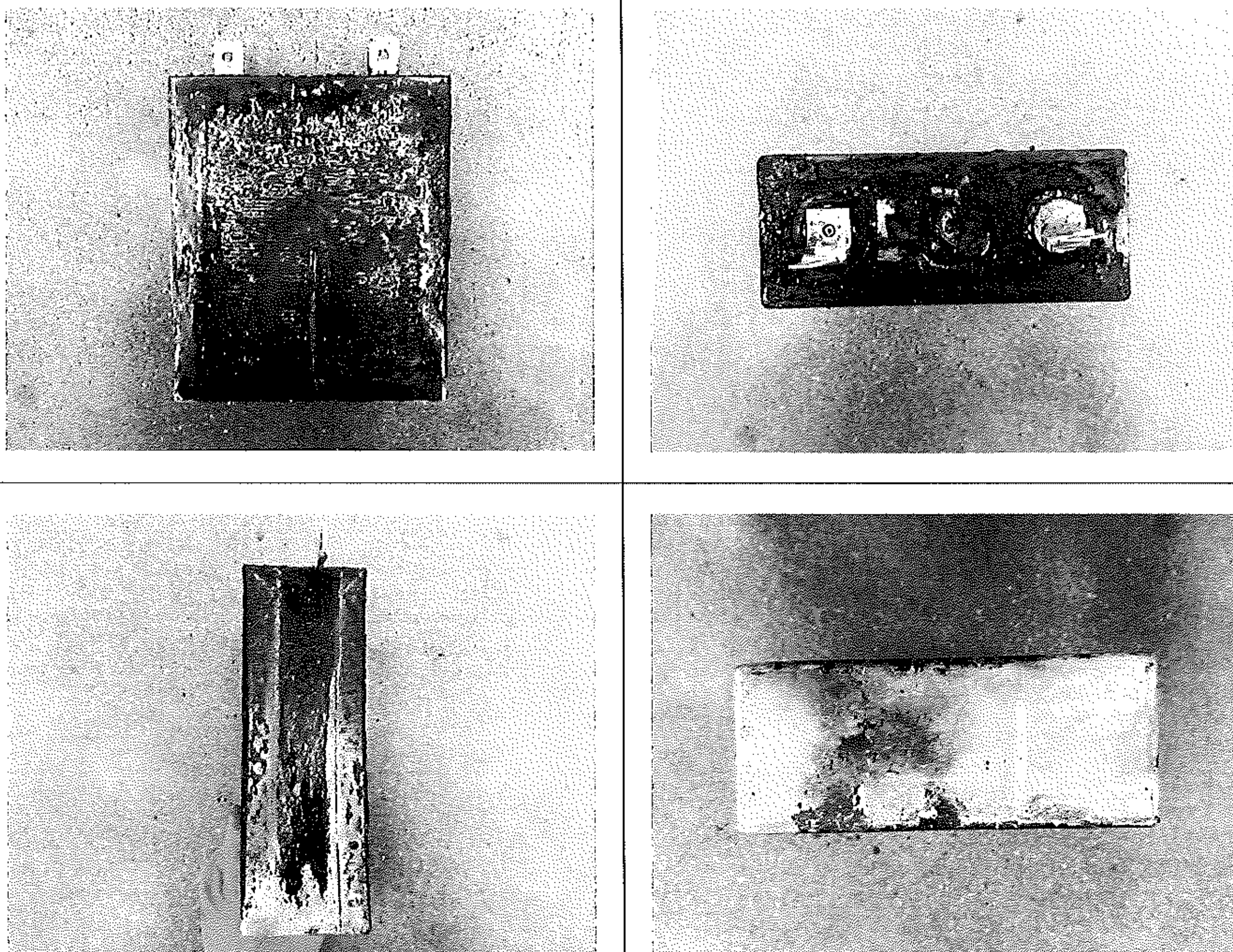
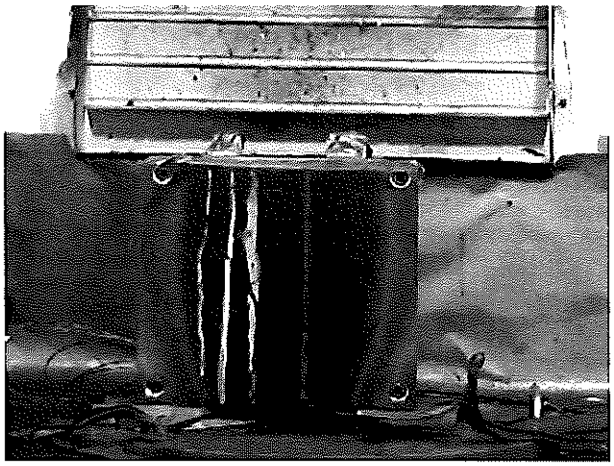
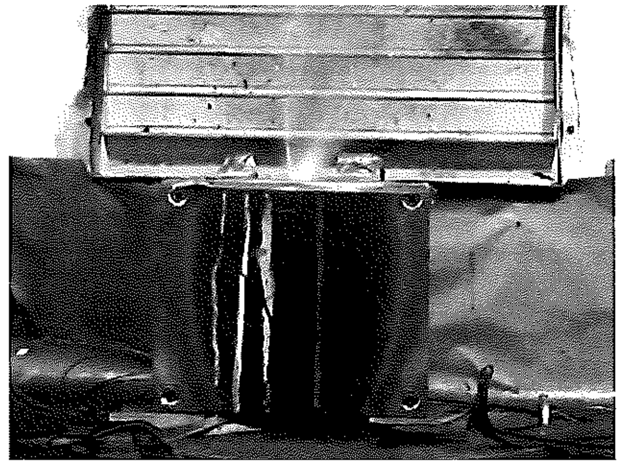


Figure 17: Sample 3 Post Test Photos

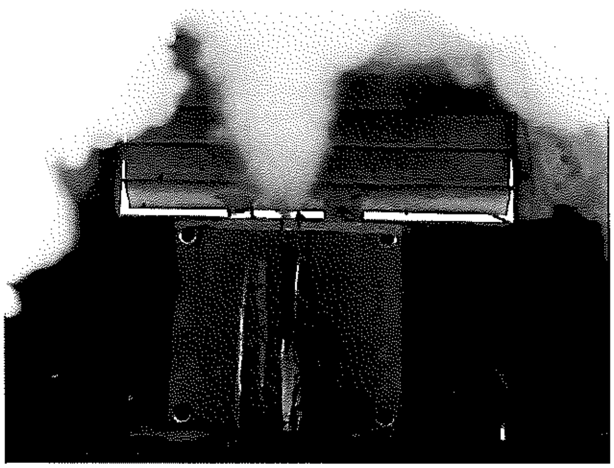
Cell Sample 4 – below figure shows highlights of cell testing. Cell venting and thermal runaway were observed, however no evidence of fire. Figure on next page shows photos of cell after testing.



(a) Test Start
[00:00]



(b) Cell Venting
[36:00]



(c) Thermal runaway behavior
[56:41]

Figure 18: Highlights of Cell 4 Testing

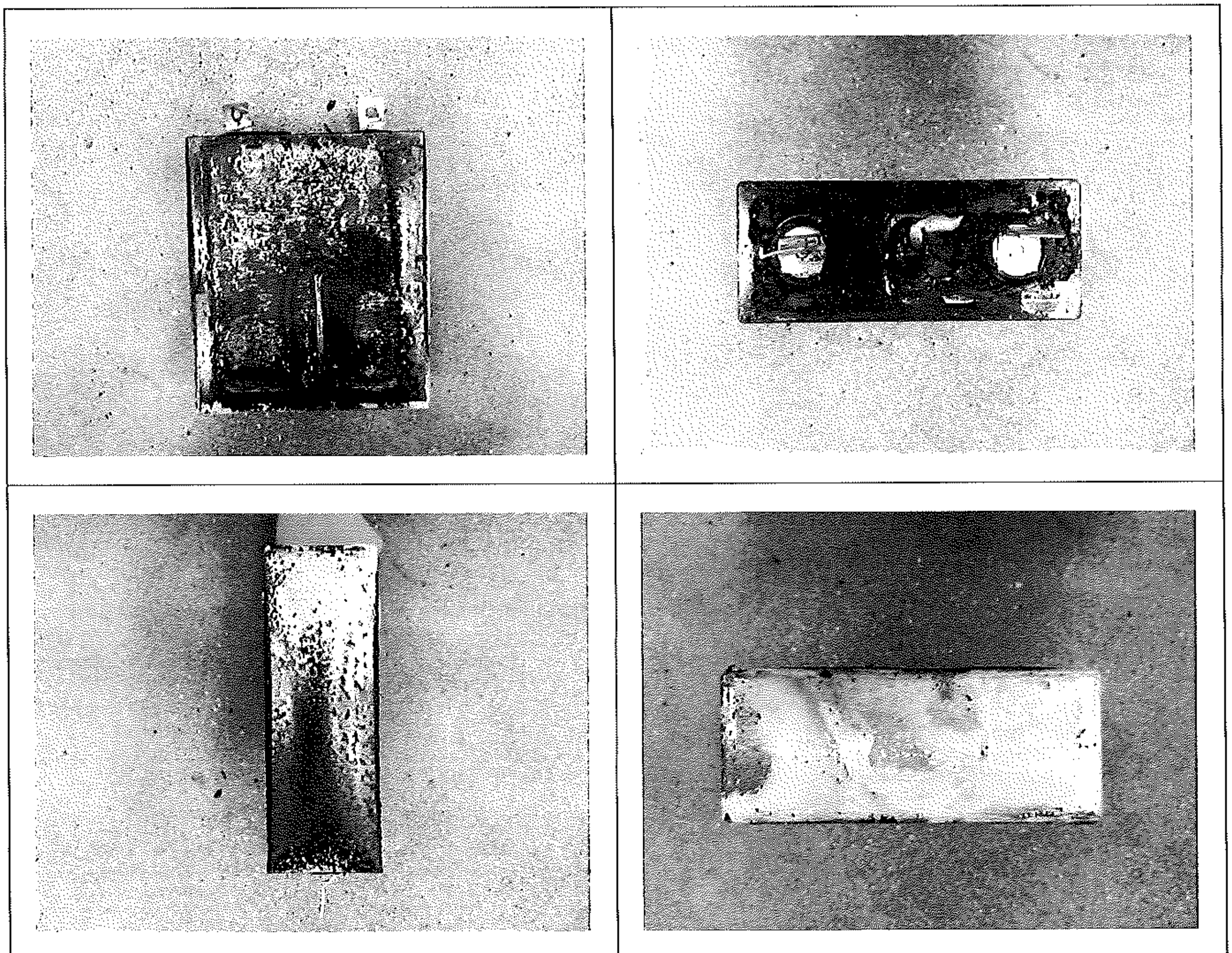
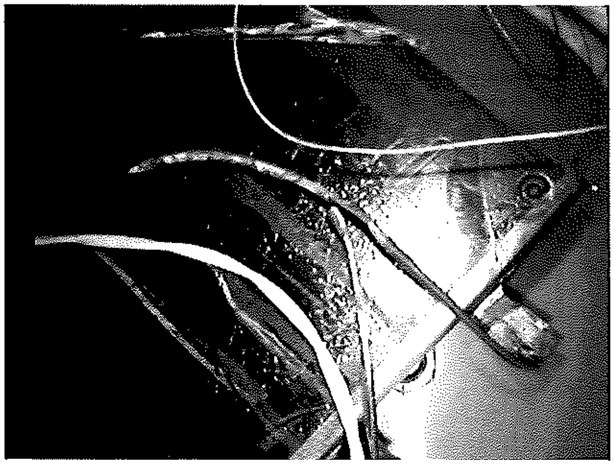
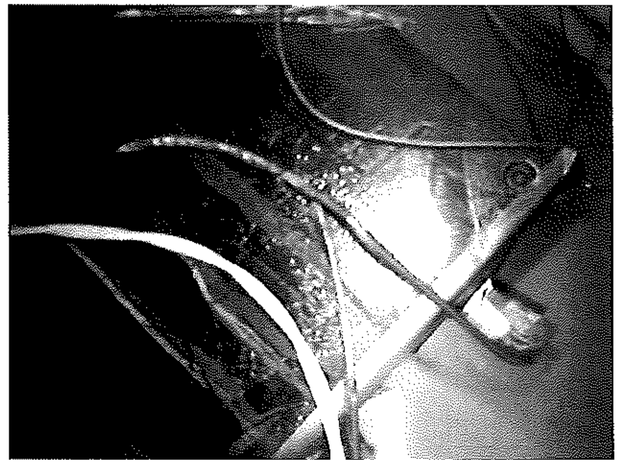
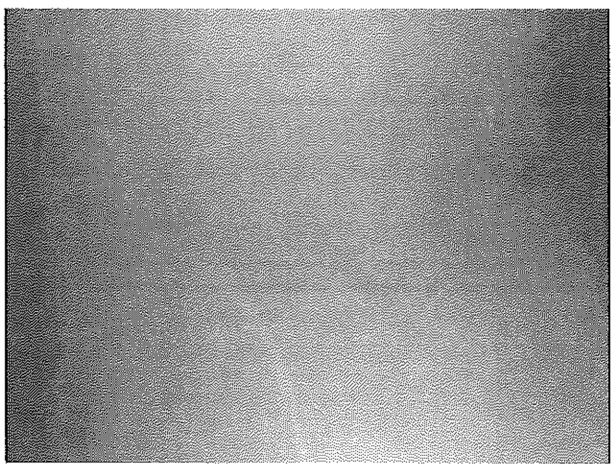


Figure 19 Sample 4 Post Test Photos

Cell Sample 5 – below figure shows highlights of cell testing. Cell venting and thermal runaway were observed, however no evidence of fire. Figure on next page shows photos of cell after testing.

	
(a) Test Start [00:00]	(b) Cell Venting [36:24]
	
(c) Thermal runaway behavior [56:10]	
Figure 20: Highlights of Cell 5 Testing	

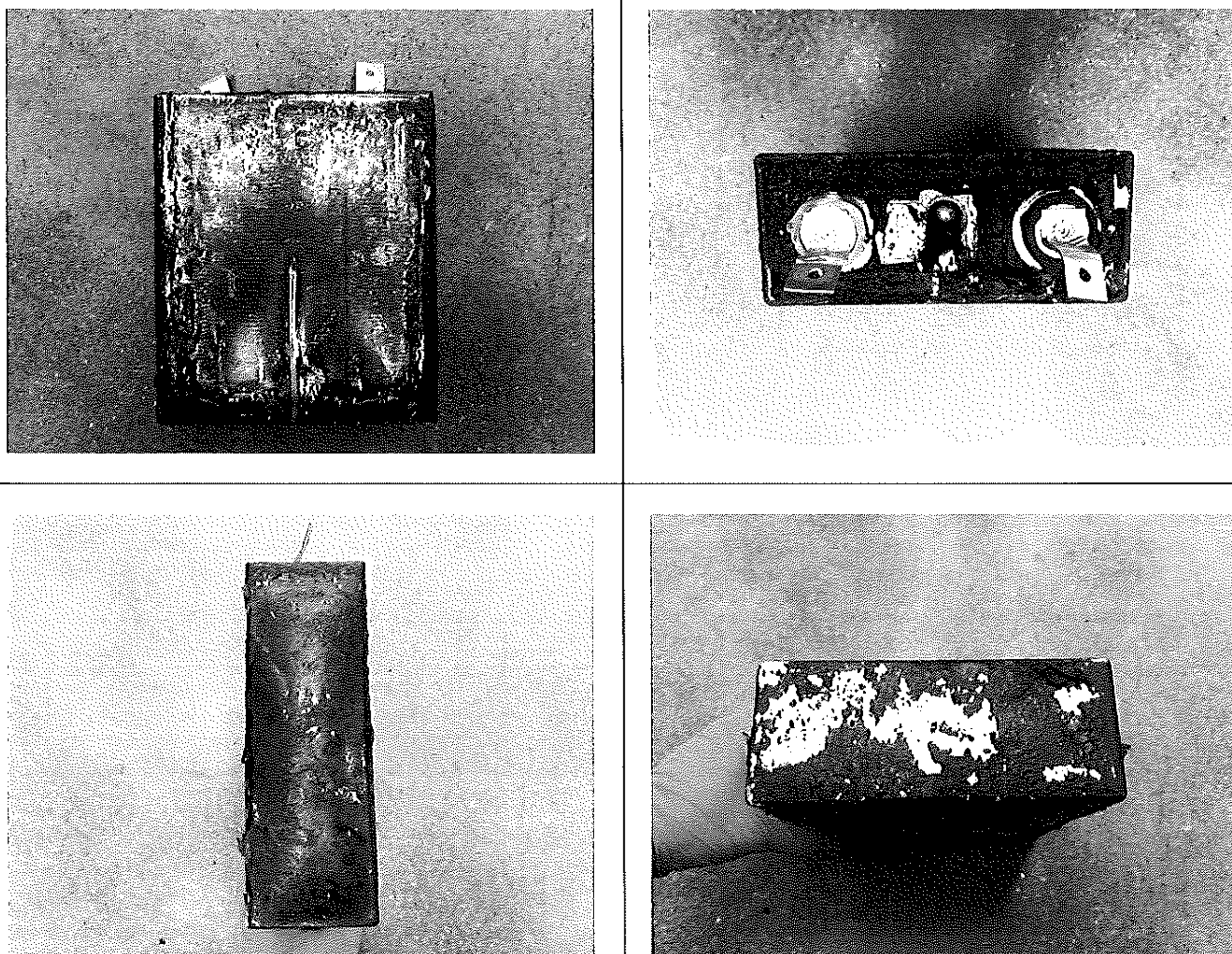


Figure 21: Sample 5 Post Test Photos

Attachment E: Cell vent gas test chamber photo and profile of chamber gas analysis (O2 and Pressure) - (Pages ***35*** through ***35***)

The gas composition test was conducted with the battery inserted into the battery gas composition test chamber and the chamber was sealed. The battery gas composition test chamber is a 100 L pressure vessel and is shown in figure below.

Prior to initiating thermal runaway, the chamber's atmosphere was purged until a condition of less than 1% oxygen by volume (actual 0.06%, with initial pressure 0.13psig).

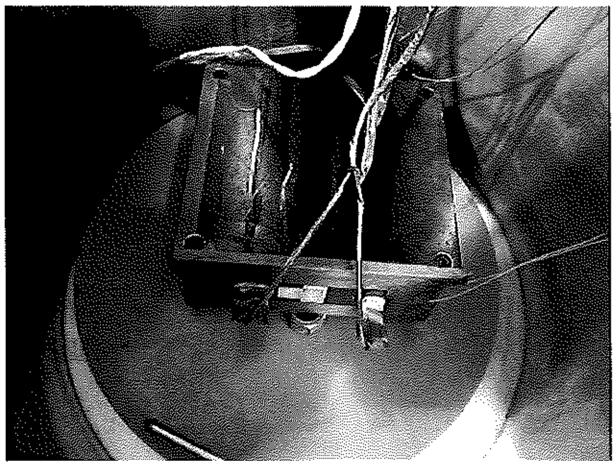


Figure 22: Sample 5 instrumented and inside gas test chamber

$\phi_{O2,\ chamber}$=	0.06	%		Pinitial,chamber=	0.13	psig

Figure 23: Profile of gas test chamber (O2 and Pressure)

Attachment F: Cell Gas Analysis Report - (Pages *36* through *36*)

Table Re-normalized Gas Quantification, excluding N_2 and O_2, and unknown compounds.

Item	Measure	Chemical formula	Conc.(%)
1	Carbon Monoxide	CO	14.596
2	Carbon Dioxide	CO_2	26.925
3	Hydrogen	H_2	43.066
4	Methane	CH_4	7.051
5	Ethylene	C_2H_4	3.289
6	Acetylene	C_2H_2	0.119
7	Ethane	C_2H_6	1.060
8	Propane	$CH_3CH_2CH_3$	0.260
9	Propylene	C_3H_6	0.686
10	Propadiene (Allene)	C_3H_4	0.000
11	Isobutane	$CH_3CH(CH_3)CH_3$	0.006
12	Butane	C_4H_{10}	0.121
13	Isobutylene	C_4H_8	0.322
14	1-Butene	C_4H_8	0.161
15	trans-2-Butene	C_4H_8	0.101
16	cis-2-Butene	C_4H_8	0.154
17	Pentane	C_5H_{12}	0.227
18	trans-2-Pentene	C_5H_{10}	0.067
19	cis-2-Pentene	C_5H_{10}	0.068
20	1,4-Pentadiene	C_5H_8	0.036
21	Hexane	C_6H_{14}	0.022
22	1-Hexene	C_6H_{12}	0.125
23	Benzene	C_6H_6	0.082
24	1-Heptene	C_7H_{14}	0.025
25	Toluene	C_7H_8	0.012
26	Styrene	C_8H_8	0.013
27	Dimethyl Carbonate	$C_3H_6O_3$	1.304
28	Ethyl Methyl Carbonate	$C_4H_8O_3$	0.101
29	Diethyl Carbonate	$C_5H_{10}O_3$	0.000
	Total	Measurement result	100.000

Amendment 1 report:

Photo of cell/Stack:

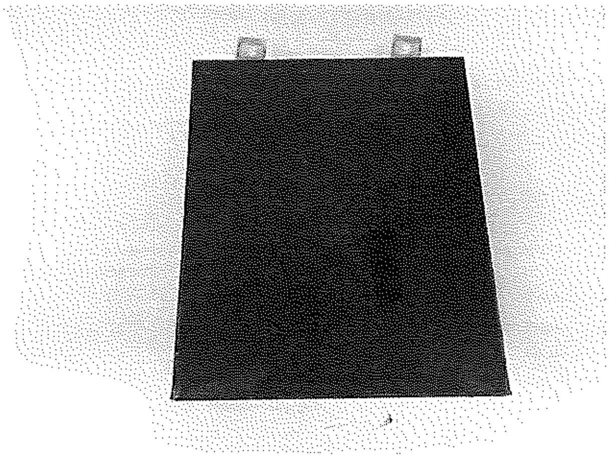


Figure 0-3

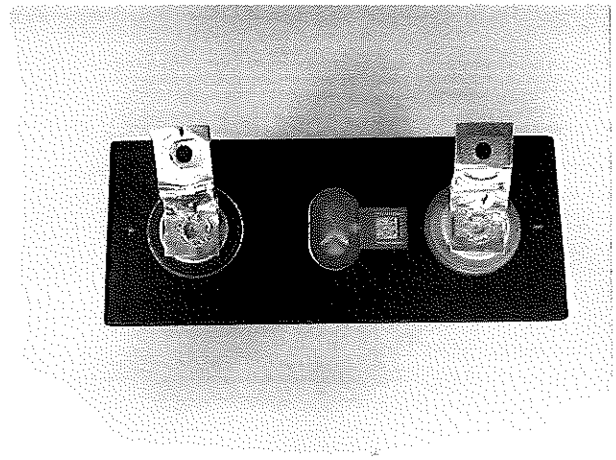


Figure 0-4

Test Item Charge/Discharge Specifications:	
• **Charge Power, W**	489.6
• **Standard full charge voltage, Vdc:**	3.65
• **Charge temperature range, °C:**	0~60
• **End of charge voltage, V:**	3.65
• **Discharge Power, W**	489.6
• **End of discharge voltage, Vdc:**	2.5
• **Discharge temperature range, °C:**	-20~60

Table G0-1 – Specified conditioning parameters			
Charging:		Discharging	
Power (CP), W	489.6	Power (CP), W	489.6
Standard full charge voltage, Vdc	3.65	Voltage at start of discharge, Vdc	3.65
End of charge voltage, Vdc	3.65	End of discharge voltage, Vdc	2.5
Charging Test Ambient, °C	0~60	Discharging Test Ambient, °C	-20~60
Refer to Attachment A-1 for charge/discharge profiles for each cell.			

Table G0-2 – Charge completion and cell test initiation times		
Cell Test Number	**Charge Completion Date and Time**	**Cell test Date and Time**
6	2023-10-30 07:40	2023-10-30 11:01
7	2023-10-31 08:38	2023-10-31 10:50
8	2023-11-08 08:56	2023-11-08 10:49
9	2023-11-08 09:01	2023-11-08 15:36

Table G0-3 - Test Initiation Details				
	Cell Test 6	**Cell Test 7**	**Cell Test 8**	**Cell Test 9**
Test Date	2023-10-30	2023-10-31	2023-11-08	2023-11-08
Test Start Time	11:01	10:50	10:49	15:36
Initial Lab Temperature	25.4°C	24.8°C	25.2°C	24.9°C
Initial Relative Humidity	56.8%RH	69.4%RH	48.6%RH	50.1%RH

Table G0-5 - Thermal Runaway Results				
	Cell Test 6	**Cell Test 7**	**Cell Test 8**	**Cell Test 9**
OCV at start of test, Vdc	3.350	3.349	3.346	3.347
Average Heating Rate, °C/min	4.5	4.5	4.5	4.5
Venting Time after the test start (hh:mm:ss)	0:36:47	0:37:36	0:38:45	0:36:55
Venting Temperature, °C	166	170	167	171
Thermal Runaway Time after the test start (hh:mm:ss)	0:54:59	0:55:11	0:55:46	0:54:11
Thermal Runaway Temperature, °C	237	239	234	229

Table G0-5 – Average Vent and Thermal Runaway Temperatures	
Average of Cell Vent Temperatures, °C	169
Average of Cell Thermal Runaway Temperatures, °C	235
#Averages of cell tests other than the gas analysis test	

Table G0-6 – Properties of Vent Gas Analysis	
Lower Flammability limit at Vent Temperature, [169 °C] (% vol in air)	6.945

Attachment G-1: Cell Conditioning (Charge/discharge) Profiles - (*Pages**39** through **40***)

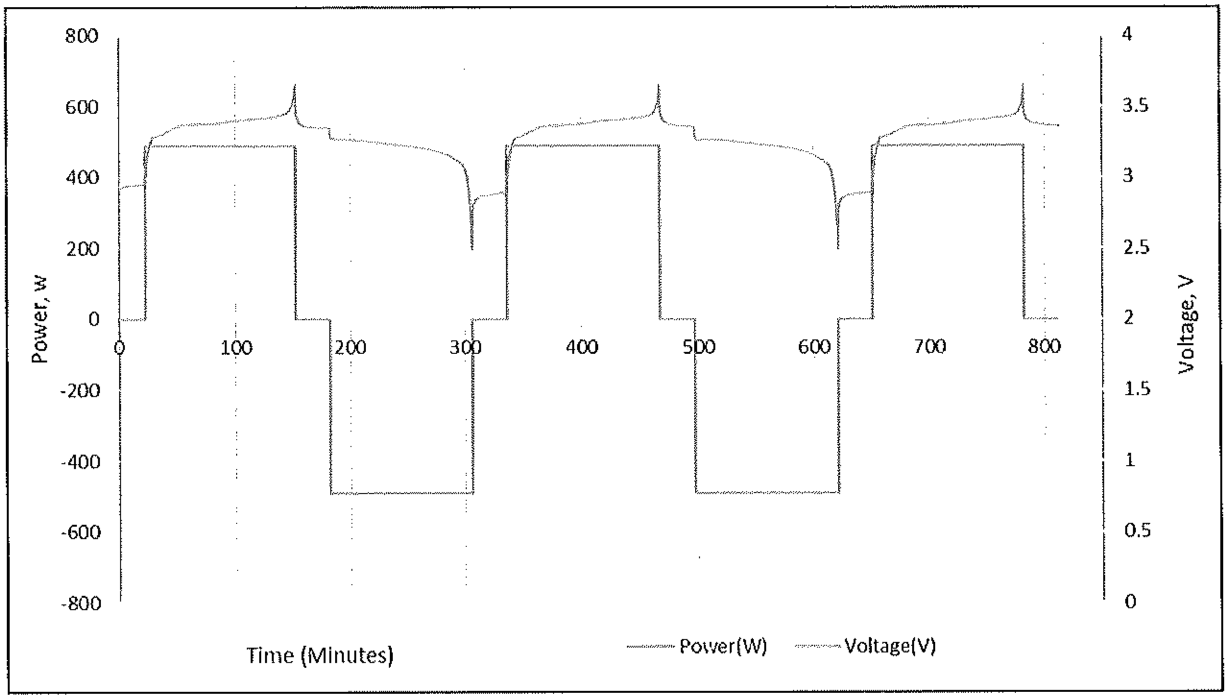


Figure 24: Cell 6 Conditioning (Charge/discharge) Profiles

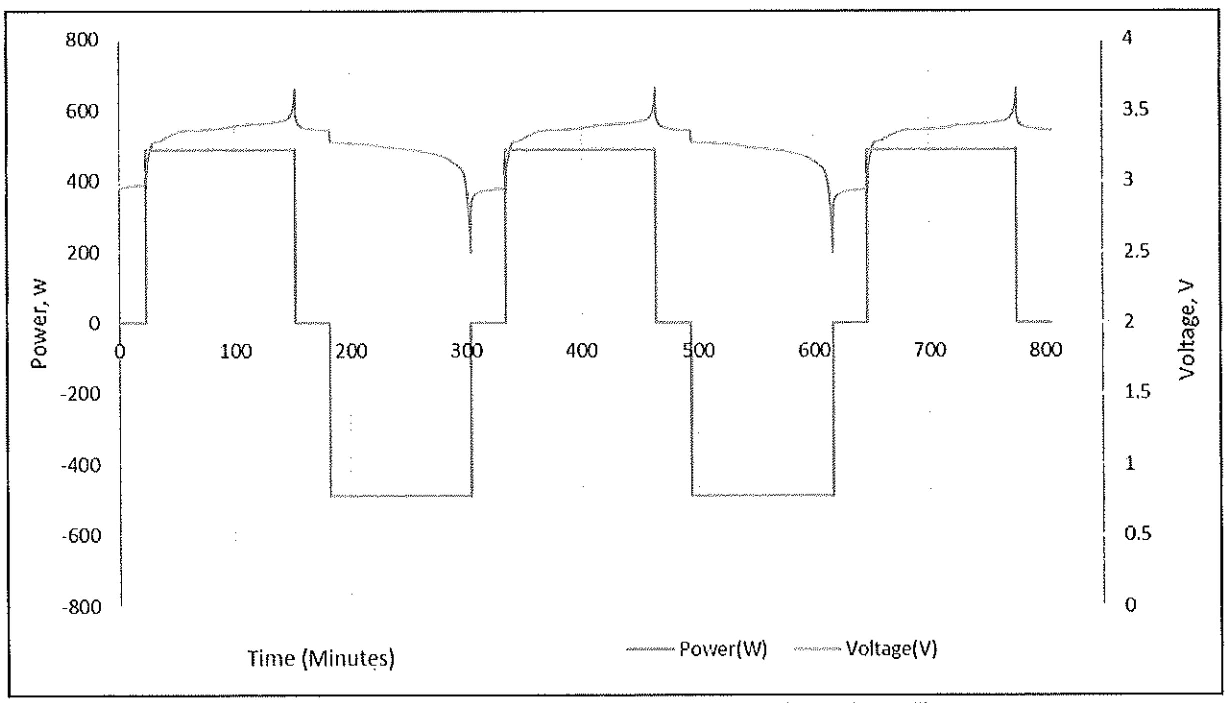


Figure 25: Cell 7 Conditioning (Charge/discharge) Profiles

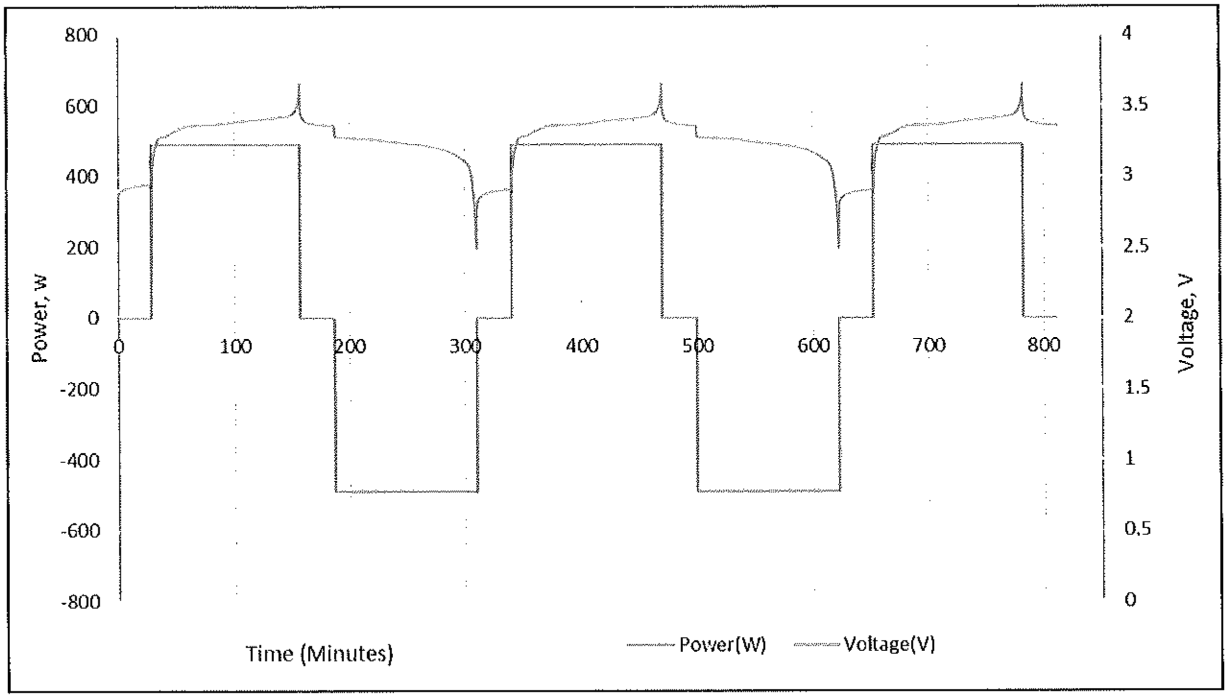


Figure 26: Cell 8 Conditioning (Charge/discharge) Profiles

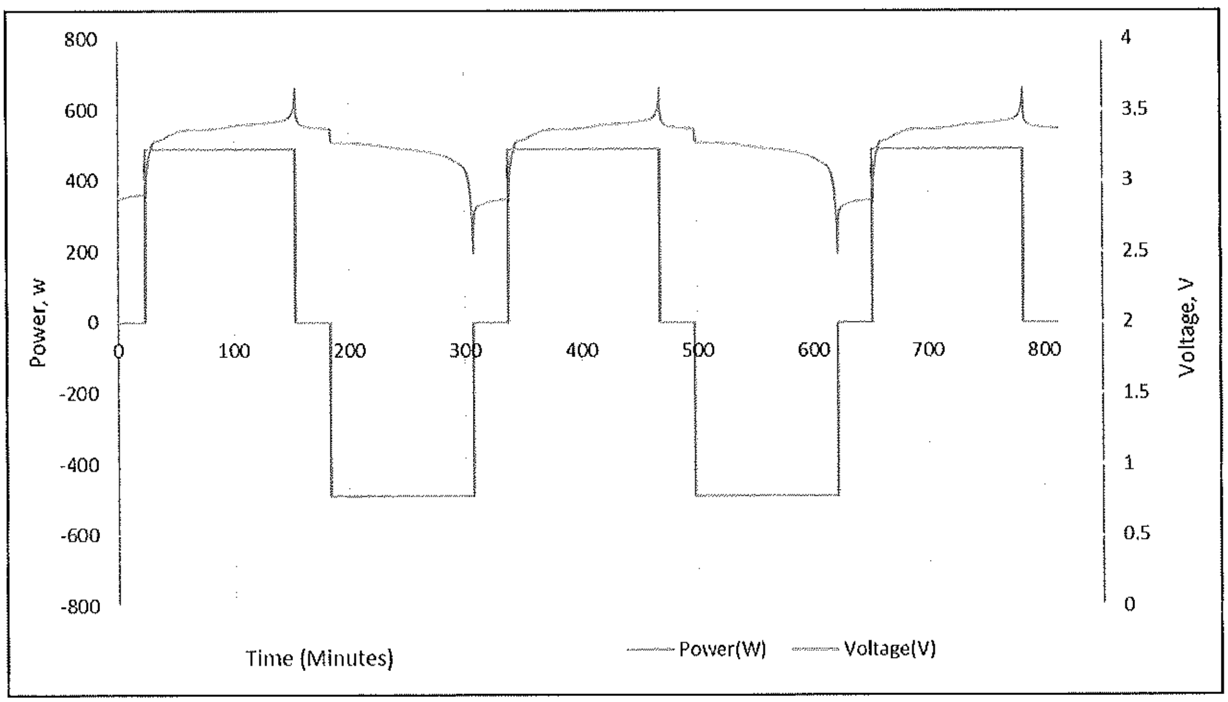


Figure 27: Cell 9 Conditioning (Charge/discharge) Profiles

Attachment G-2: Cell Instrumentation Photos - (*Pages **41** through **41***)

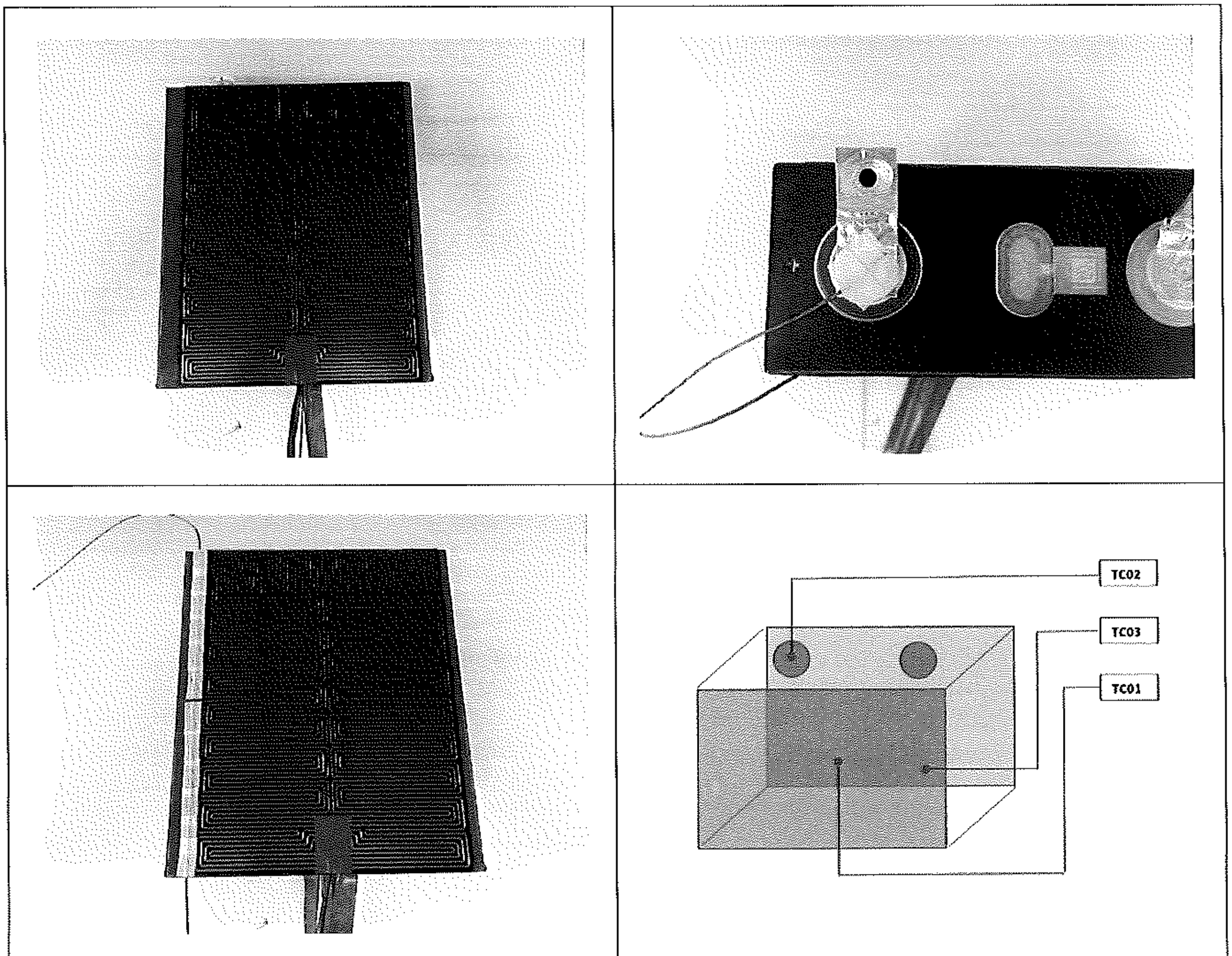


Figure 28: Sample Instrumentation Prior to Test

Note: heaters were placed on two sides of the cell after thermocouples were instrumented.

Note: TC01 between cell body and heater; TC02 on the cell positive; TC03 on the cell body not covered by heater; TC04 Ambient temperature; V1 cell voltage.

Attachment G-3: Cell Temperature Profiles during testing - (*Pages **42** through **43***)

Note: TC01 between cell body and heater; TC02 on the cell positive; TC03 on the cell body not covered by heater; TC04 Ambient temperature; V1 cell voltage.
TC01 was used to control the temperature at 4 to 7°C/min and TC03 temperatures were reported herein for the surface temperature at the onset of vent and thermal runaway.

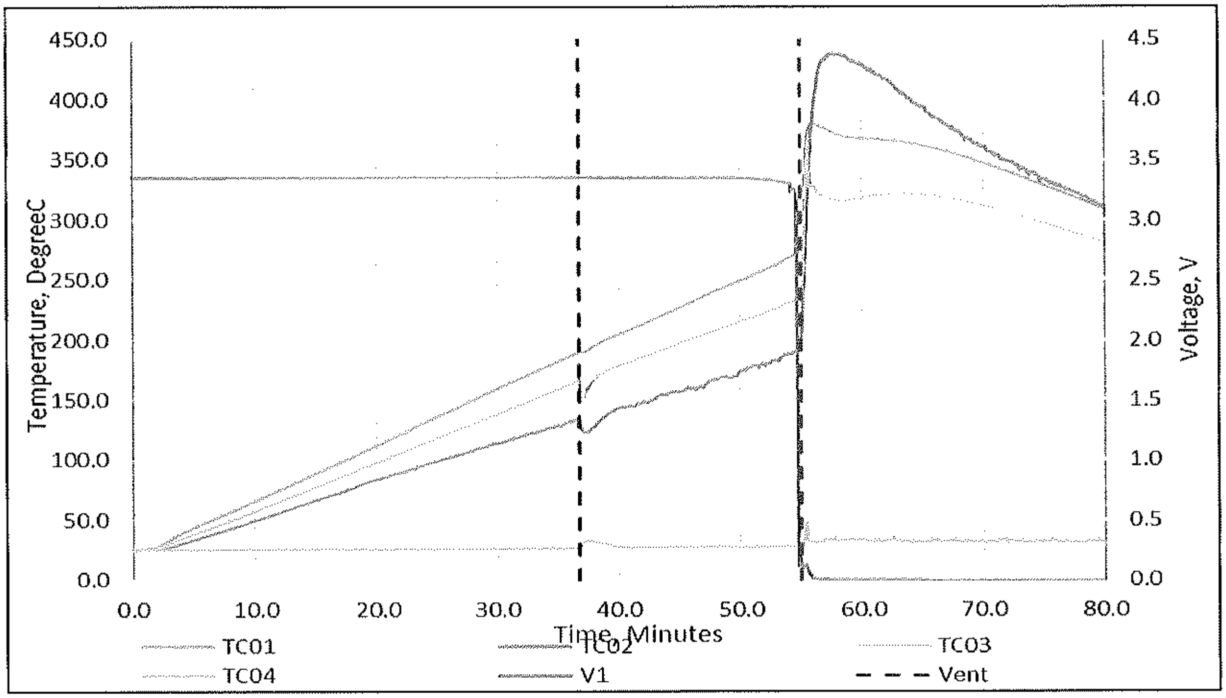


Figure 29: Cell 6 – External Heating 4.5°C per minute

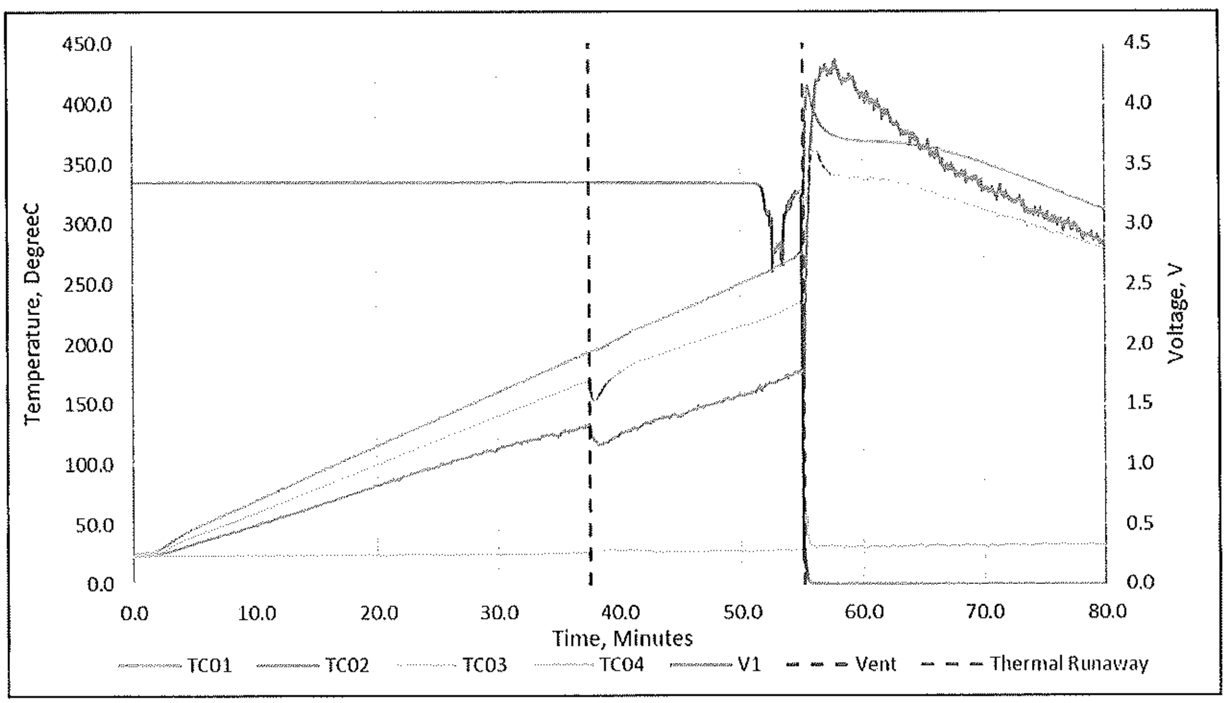


Figure 30: Cell 7- External Heating 4.5°C per minute

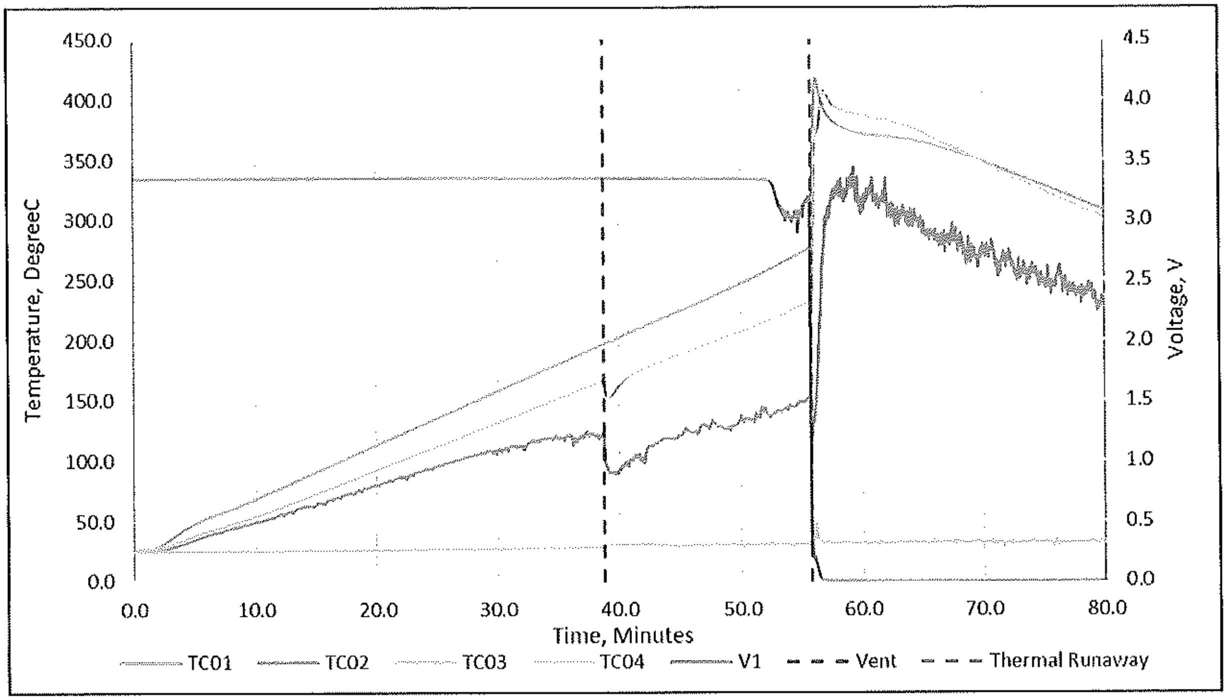


Figure 31: Cell 8 – External Heating 4.5°C per minute

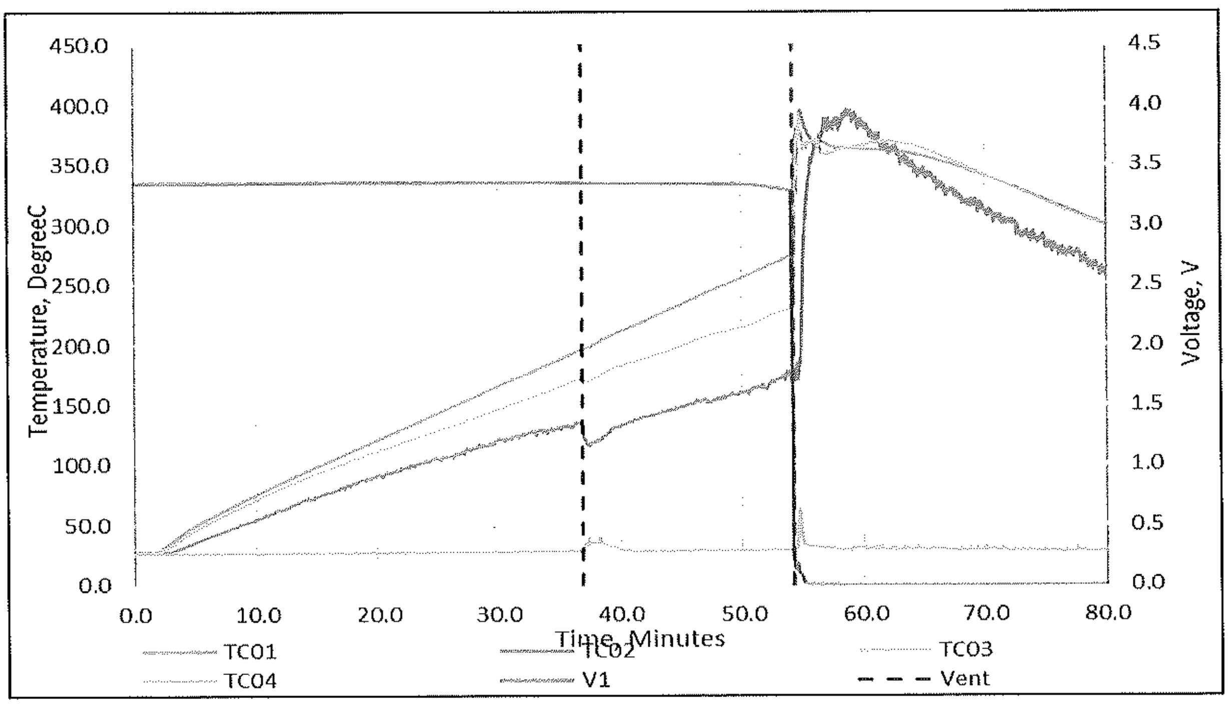
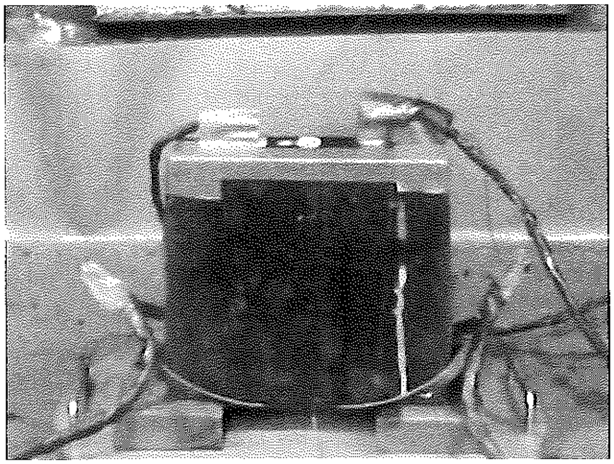


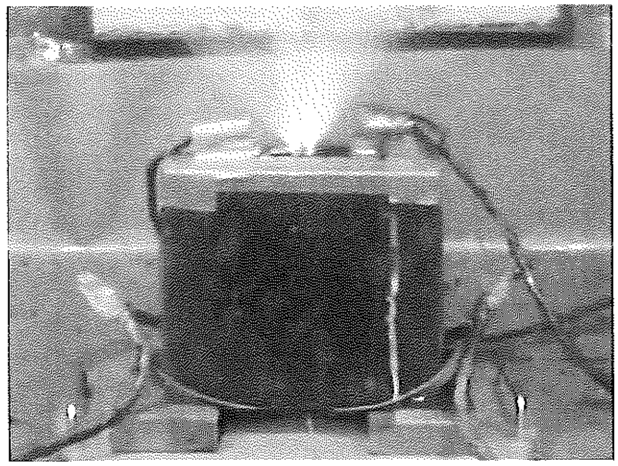
Figure 32: Cell 9 – External Heating 4.5°C per minute

Attachment G-4 Cell Testing Photos - (*Pages **44** through **51***)

Cell Sample 6 – below figure shows highlights of cell testing. Cell venting and thermal runaway were observed, however no evidence of fire. Figure on next page shows photos of cell after testing.



(a) Test Start
[00:00]



(b) Cell Venting
[36:47]

(c) Thermal runaway behavior
[54:59]

Figure 33: Highlights of Cell 6 Testing

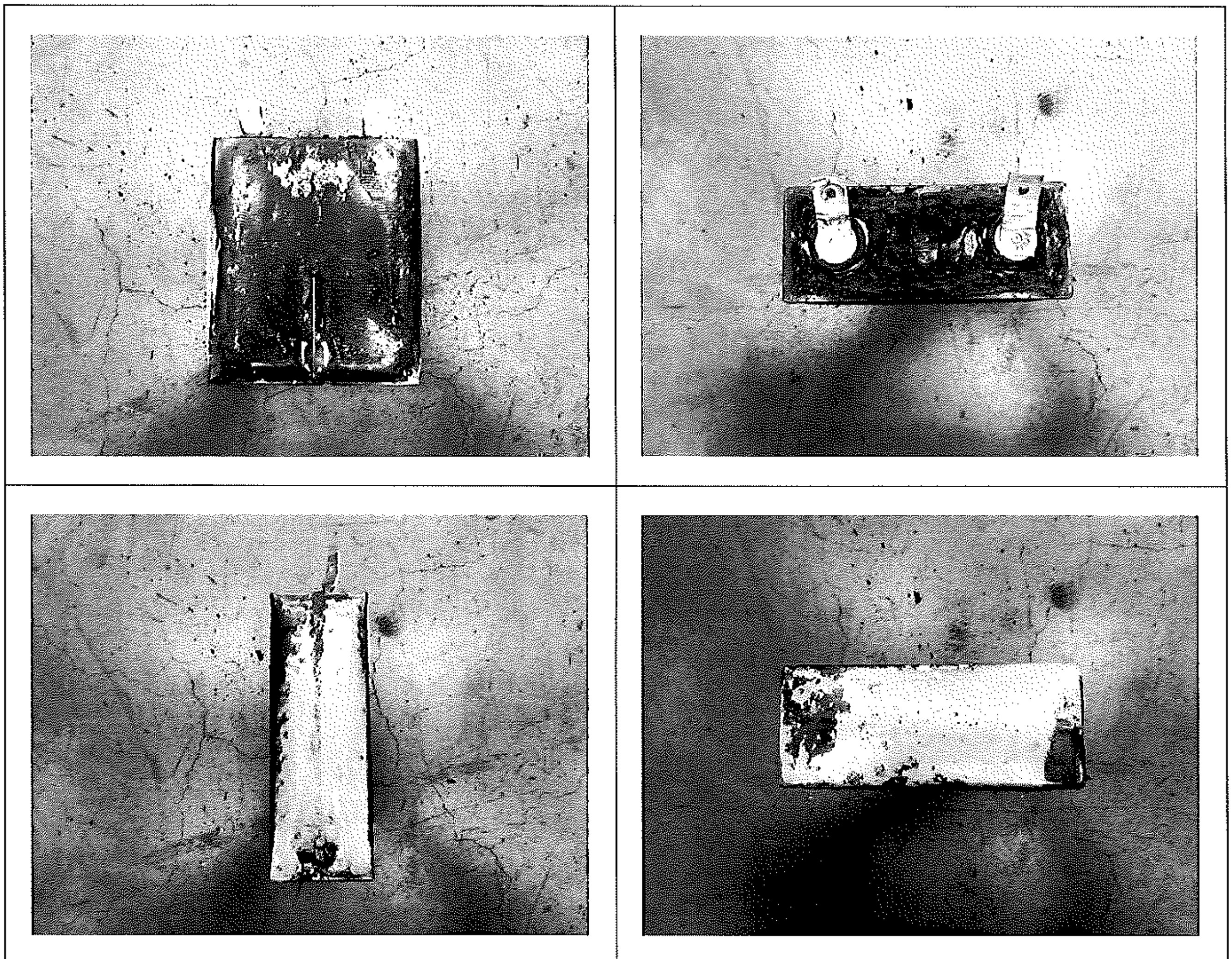
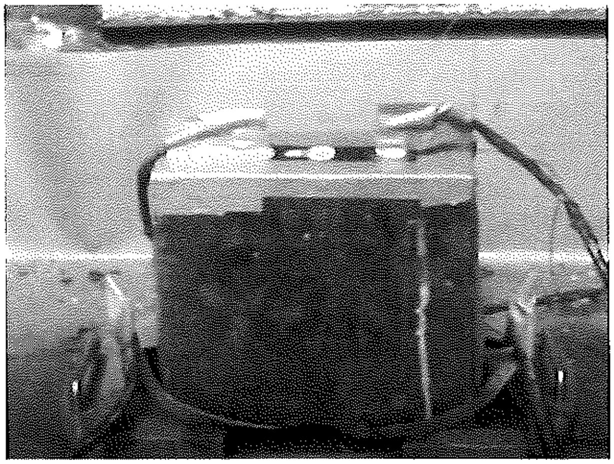
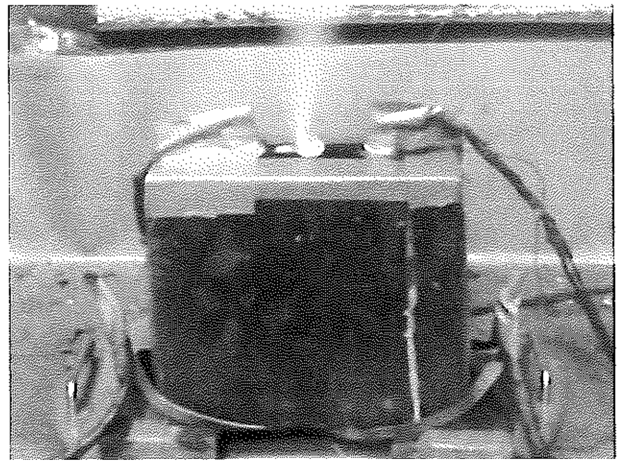


Figure 34: Sample Post Test Photos

Cell Sample 7 – below figure shows highlights of cell testing. Cell venting and thermal runaway were observed, however no evidence of fire. Figure on next page shows photos of cell after testing.



(a) Test Start
[00:00]



(b) Cell Venting
[37:36]

(c) Thermal runaway behavior
[55:11]

Figure 35: Highlights of Cell 6 Testing

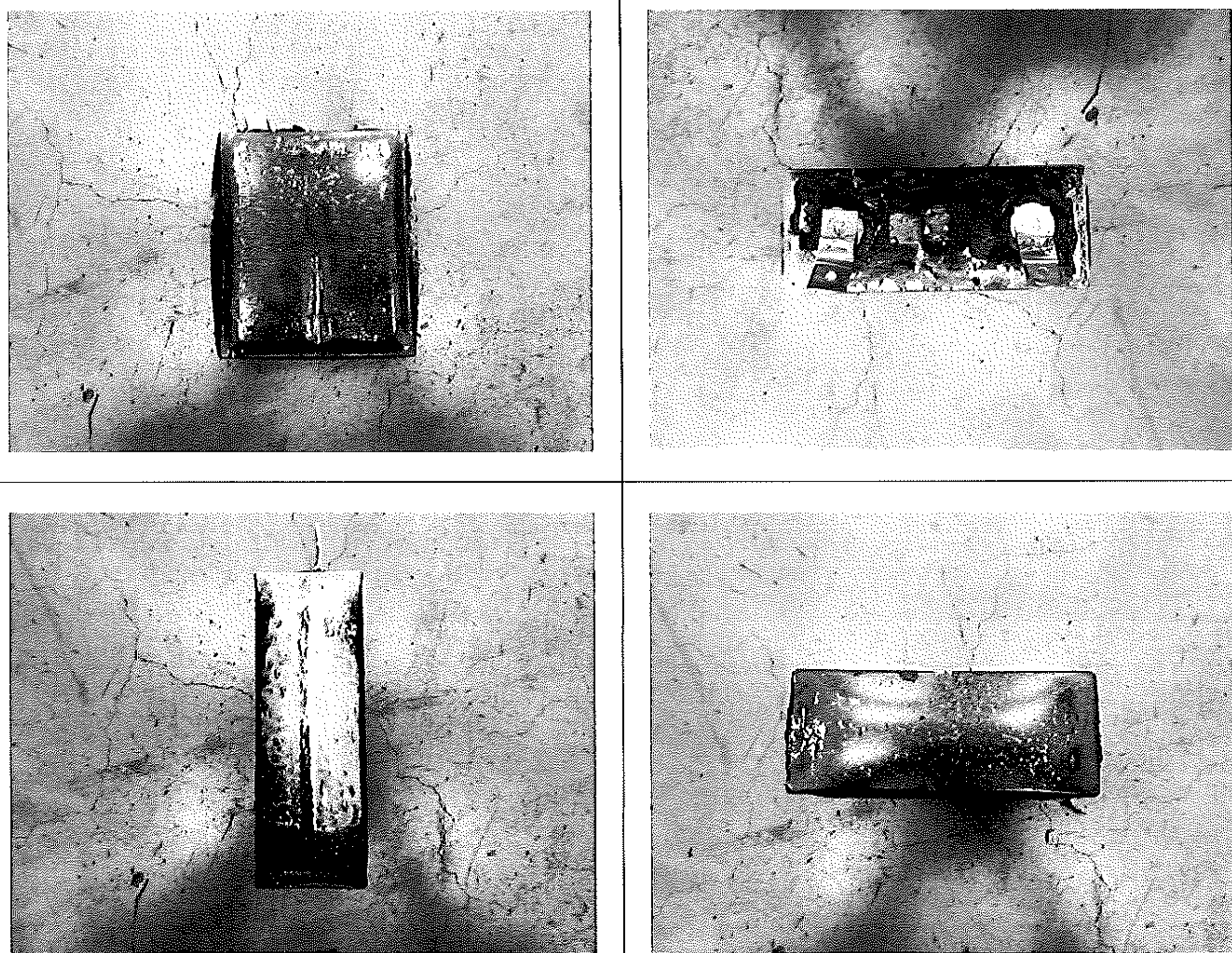


Figure 36: Sample Post Test Photos

Cell Sample 8 – below figure shows highlights of cell testing. Cell venting and thermal runaway were observed, however no evidence of fire. Figure on next page shows photos of cell after testing.

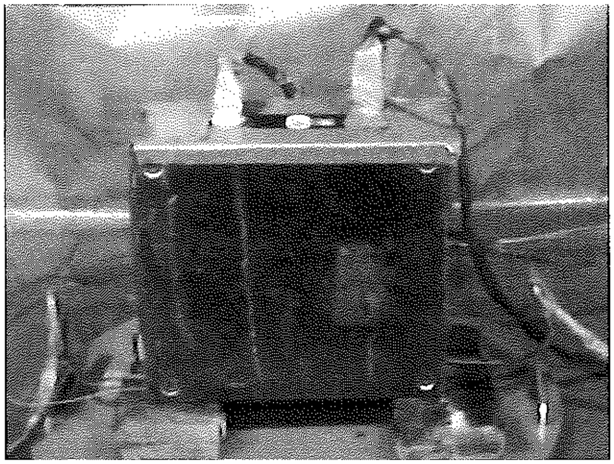
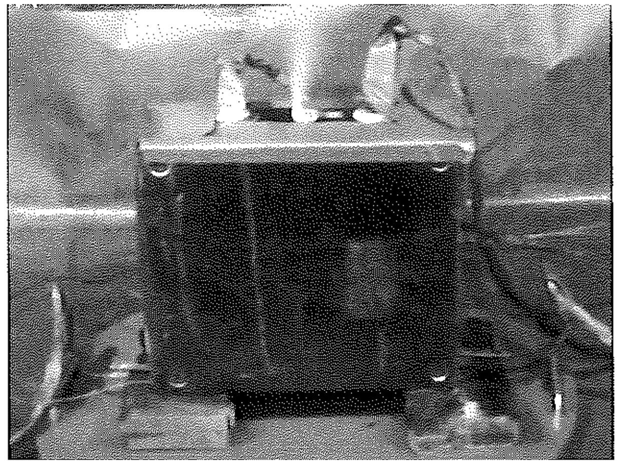
	
(a) Test Start [00:00]	(b) Cell Venting [38:45]
	
(c) Thermal runaway behavior [55:46]	

Figure 37: Highlights of Cell 6 Testing

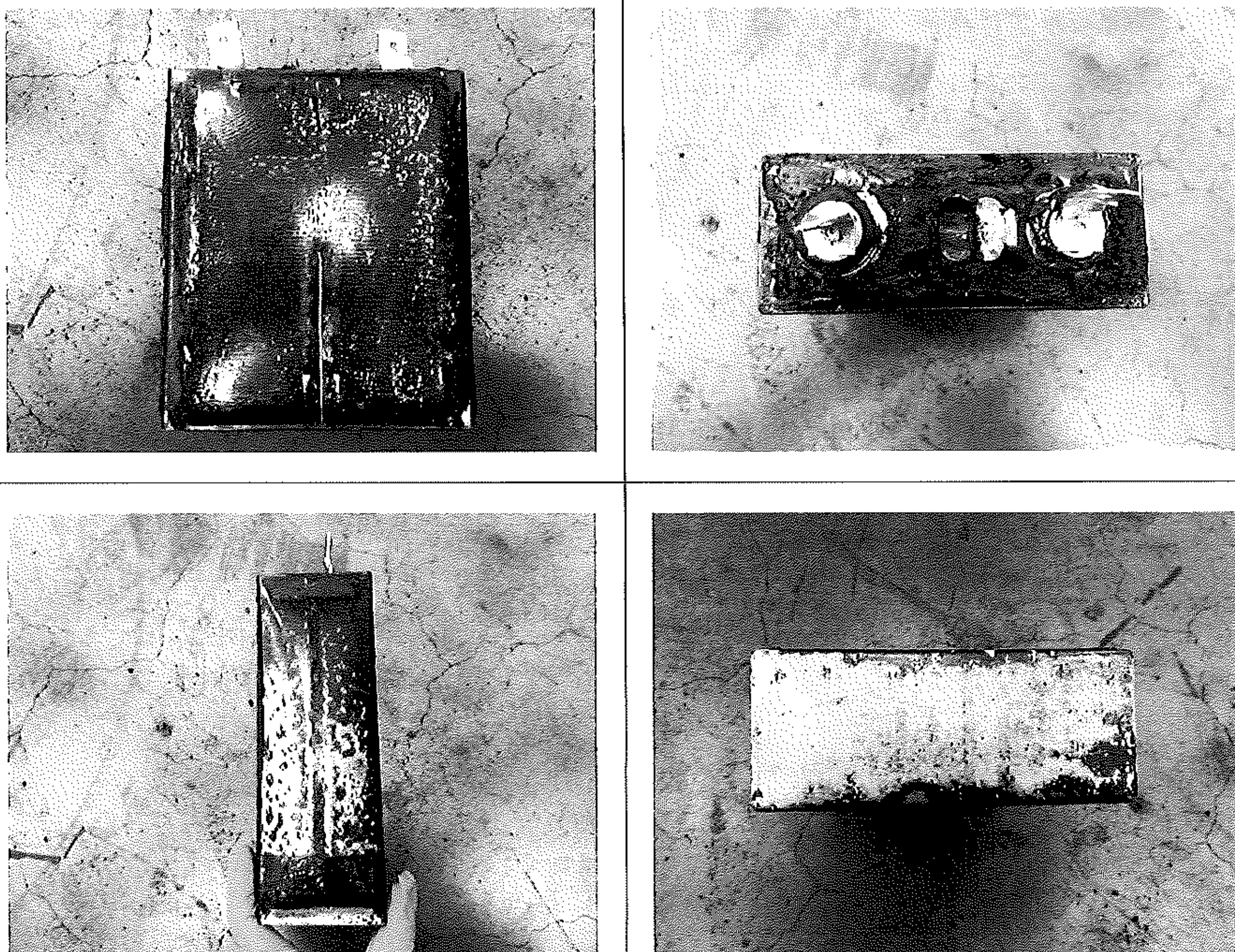
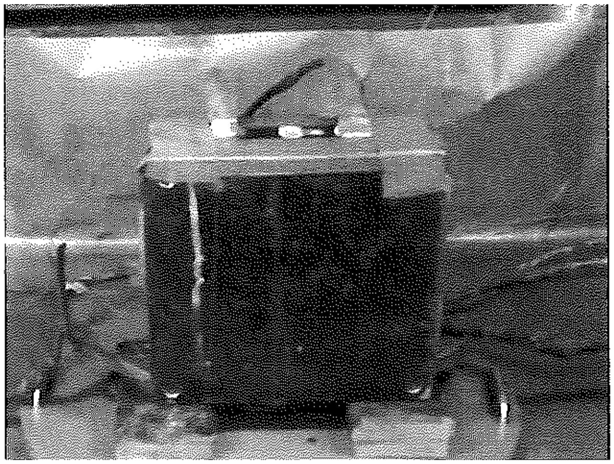
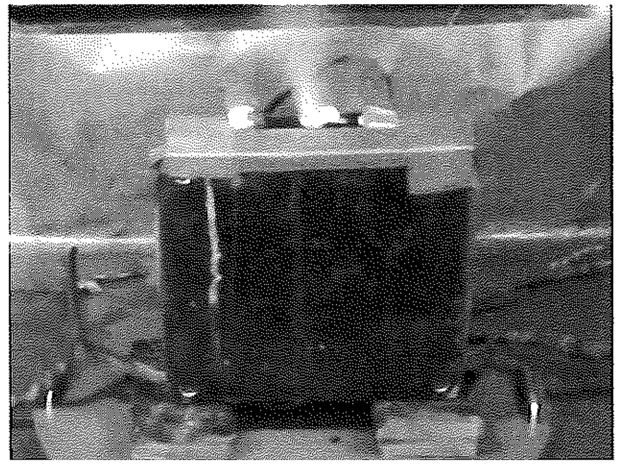


Figure 38: Sample Post Test Photos

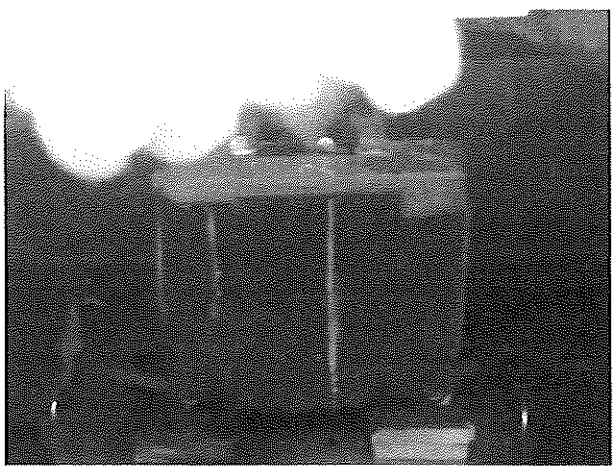
Cell Sample 9 – below figure shows highlights of cell testing. Cell venting and thermal runaway were observed, however no evidence of fire. Figure on next page shows photos of cell after testing.



(a) Test Start
[00:00]



(b) Cell Venting
[36:55]



(c) Thermal runaway behavior
[54:11]

Figure 39: Highlights of Cell 6 Testing

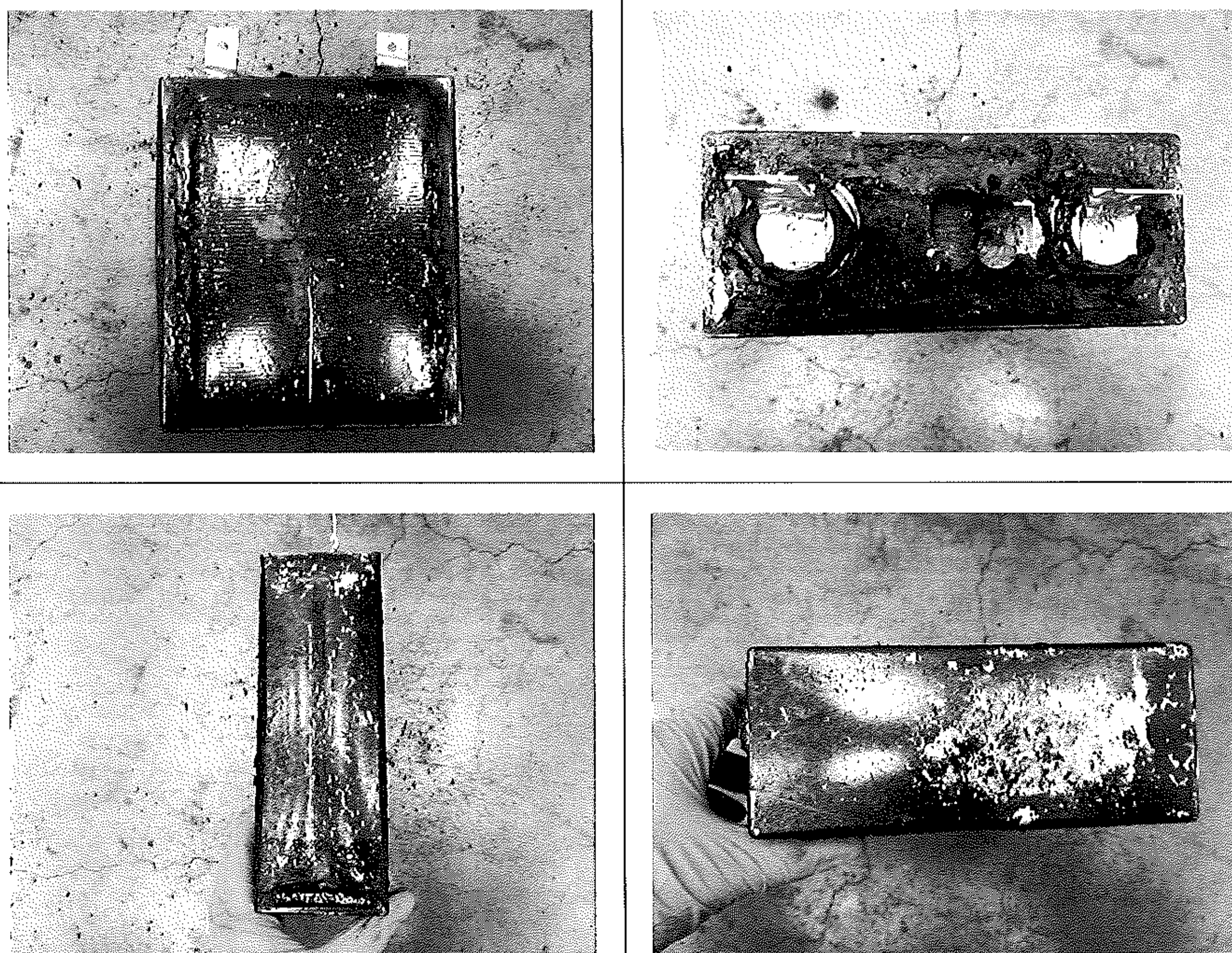


Figure 40: Sample Post Test Photos

Stormy Canady

APPENDIX
3B

MODULE TEST REPORT
UL 9540A
Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems (AACD)

Project Number.	**4790931782**
Date of issue	**2023-09-13**
Total number of pages	**27**
UL Report Office	**UL(Changzhou) Quality Technical Service Co., LTD**
Applicant's name	**Contemporary Amperex Technology Co., Limited**
Address	**Contemporary Amperex Technology Co., Limited** **No.2 Xin'gang Road, Zhangwan Town, Jiaocheng District, Ningde, Fujian, China**
Test specification:	4th Edition, Section 8, November 12, 2019
Standard	UL 9540A, Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems
Test procedure	8.1 – 8.4
Non-standard test method	N/A

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General disclaimer:

The test results presented in this report relate only to the sample tested in the test configuration noted on the list of the attachments.

UL LLC did not select the sample(s), determine whether the sample(s) was representative of production samples, witness the production of the test sample(s), nor were we provided with information relative to the formulation or identification of component materials used in the test sample(s).

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Cell level information	
Cells in Module:	
•Manufacturer Name	**Contemporary Amperex Technology Co., Limited**
•Part Number	**CBDD0**
•Chemistry	**Lithium Iron Phosphate**
•Format	**Prismatic**
Ratings (Vdc, Ah) :	**3.2V, 306Ah**
Was the cell certified? :	**Yes**
Standard the cell was certified to:	**UL 1973**
Organization that certified the cell:	**MH62898**
Average cell surface temperature at gas venting, °C:	**154**
Average cell surface temperature at thermal runaway, °C:	**241**
Gas Volume:	**204L**
Lower flammability limit (LFL), % volume in air at the ambient temperature:	**8.595**
Lower flammability limit (LFL), % volume in air at the venting temperature:	**7.24**
Burning velocity (S_u) cm/s:	**54.20**
Maximum pressure (P_{max}) psig:	**102.74**

Cell Gas Composition:

Gas		Measured %
Carbon Monoxide	CO	14.596
Carbon Dioxide	CO_2	26.925
Hydrogen	H_2	43.066
Methane	CH_4	7.051
Acetylene	C_2H_2	0.119
Ethylene	C_2H_4	3.289
Ethane	C_2H_6	1.060
Propylene	C_3H_6	0.686
Propane	C_3H_8	0.260
-	C4 (Total)	0.865
-	C5 (Total)	0.399
-	C6 (Total)	0.148
1-Heptene	C7H14	0.025
Styrene	C8H8	0.013
Benzene	C_6H_6	0.082
Toluene	C_7H_8	0.012
Dimethyl Carbonate	$C_3H_6O_3$	1.304
Ethyl Methyl Carbonate	$C_4H_8O_3$	0.101
Total	-	**100**

Module level Information	
Model No:	M02306P05L01
Ratings (Vdc, Ah) :	166.4V, 612Ah
Module cell configuration (xS/yP) ......:	52S2P
Module dimensions (W x D x H (mm)) :	830mm*2235mm * 250mm
Module weight (kgs) :	653±5kg
Module enclosure material:	Bottom enclosure -Material: Al6063.T6 -Thickness: ≥2mm -Size: L*W*H(mm) (2235±3.5)*(830±3)*(31±3) Top Plastic enclosure: -Material: PP -Thickness: ≥2.5mm -Size: L*W*H（mm）2203.1*830*218.5 -Fire rating: V-0 -Maximum ambient temperature: 90±2°C
Was the module certified? :	N/A
Standard the module was certified to:	N/A
Organization that certified test item:	N/A
Cell failure test method performed for the module level (summary of method and test clause): ☒ External heating using thin film with 4°C to 7°C thermal ramp. ☐ Nail Penetration ☐ Overcharge ☐ External short circuit (*X Ω external resistance*) ☐ Others	
Description of method used to fail cells if other than external thin film heater with thermal ramp, :N/A	
Description of components employed within the module that serve to supress propagation (fire protection features). **N/A**	
Number of initiating cells failed to achieve propagation.	1
Thermal Runaway Propagation:	Initiating cell went into thermal runaway and propagated to three adjacent cells.
Maximum Smoke Release Rate (m^2/s)	0.52
Total Smoke Released: (m^2)	1.41
Total smoke released duration	0:47:08 to 2:00:00

Peak Chemical Heat Release Rate: (kW):	No flaming occurred
External Flaming:	No external flaming occurred
Location(s) of Flame Venting:	No flaming occurred
Flying Debris:	No flying debris occurred
Re-ignitions:	No further re-ignitions were observed during post test observation

Summary of Module level test Gas Analysis Data:

Gas Analysis:

☒ **Flame ionization detection**

☐ **Fourier-Transform infrared Spectrometer**

☒ **Hydrogen Sensor (palladium-nickel, thin-film solid state sensor)**

☒ **White light source with photo detector (smoke release rate)**

- **Gas Composition & Volume for Each Compound (Pre-flaming and After flame):**

Gas Compound	Gas Type	Pre-Flaming (L)	Flaming (L)	Minimum detectable flow rate (LPM)
Total Hydrocarbons (Propane Equivalent)	Hydrocarbons	260.29	No flaming	0.50
Carbon Dioxide	Carbon Containing	217.03	No flaming	1.82
Carbon Monoxide	Carbon Containing	77.57	No flaming	0.61
Hydrogen	Hydrogen	263.37	No flaming	14.29

Summary of Module testing:

Performance Criteria in accordance with Clause 8.4 and Figure 1.1:

[X] The effects of thermal runaway was contained by the module design;

[ ] Cell vent gas (based upon the cell level test) was non-flammable

Necessity of a unit level test

[X] The performance criteria of the module level test as indicated in 8.4 and as shown in Figure 1.1 of UL 9540A 4th edition has not been met, therefore unit level testing in accordance with UL 9540A will need to be conducted on a complete unit employing this module.

[ ] The performance criteria of the module level test as indicated in 8.4 and as shown in Figure 1.1 of UL 9540A 4th edition has been met, therefore unit level testing in accordance with UL 9540A need not be conducted.

Testing Laboratory information

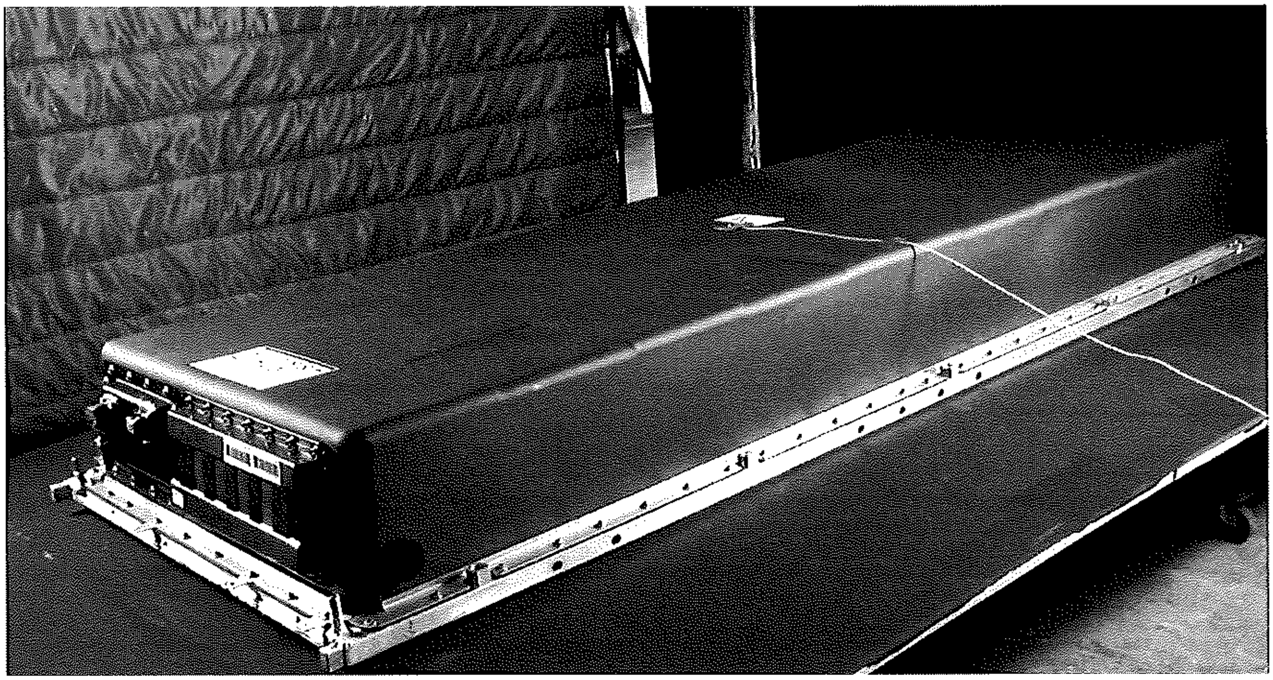
Testing Laboratory and testing location(s):

Testing Laboratory:	Beijing Building Materials Testing Academy
Testing location/ address ....:	Block 1, B15 Yaxin Road, Doudian Town, Fangshan district, Beijing 102402, CN PSN: 3369533

Tested by (name, signature) ....:	Zhang Qi, Huang Fei	
Witnessed by (for 3rd Party Lab Test Location) (name, signature) ....:	N/A	N/A
Project Handler (name, signature)..............:	Arui Zhou	Arui Zhou
Reviewer (name, signature) ....:	Benjamin Liu	Benjamin Liu

List of Attachments (including a total number of pages in each attachment):
Attachment A: Module Conditioning (Charge/discharge) Profiles - (*Pages **19** through **19***)
Attachment B: Module Construction Photos - (Pages ***20*** through ***20***)
Attachment C: Module Instrumentation Photos - (*Pages **21** through **21***)
Attachment D: Module and Initiating Cell(s) Temperature Profiles During Testing - (*Pages **22** through **22***)
Attachment E: Module Testing Photos - (*Pages **23** through **24***)
Attachment F: Module Gas Flow Rate and Heat Release Profiles - (*Pages **25** through **27***)

Photo(s) of module:



Test Item Charge/Discharge Specifications:	M02306P05L01
• Charge Power, kW:	50.91, then 5.091
• Standard Full charge Voltage, Vdc:	Any cell reaches of 3.65V or total voltage reach 189.8V
• Charge temperature range, °C:	0~60
• End of charge voltage, Vdc:	Any cell reaches of 3.65V or total voltage reach 189.8V
• Discharge Power, kW:	50.91
• End of discharge voltage, Vdc:	Any cell reaches of 2.5V or total voltage reach 130V
• Discharge temperature range, °C:	-20~60
• Storage temperature, °C:	-30~60

UL 9540A, Edition 4,			
Clause	Requirement + Test	Result - Remark	Verdict

Test item particulars.. :	
Possible test case verdicts:	
- test case does not apply to the test object..........:	N/A
- test object does meet the requirement.................:	P (Pass)
- test object does not meet the requirement..........:	F (Fail)
- test object was completed per the requirement...:	C(Complete)
- test object was completed with modification......:	M(Modification)
Testing..:	
Date of receipt of test item ....:	2023.08.15
Date (s) of performance of tests ....:	2023.08.18

General remarks:

"(See Enclosure #)" refers to additional information appended to the report.
"(See appended table)" refers to a table appended to the report.

Throughout this report a point is used as the decimal separator.

Manufacturer's Declaration of samples submitted for test:

The applicant for this report includes samples from more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided..........................:	☒ **Yes** ☐ **Not applicable**

Name and address of factory (ies) ....:	Factory1: Contemporary Amperex Technology Co., Limited Factory address1: No.2 Xin'gang Road, Zhangwan Town, Jiaocheng District, Ningde, Fujian, China Factory 2: Guangdong Ruiqing Contemporary Amperex Technology Limited Factory address 2: No.1 Contemporary Avenue, Sihui City, Zhaoqing City, Guangdong Province, People's Republic of China Factory 3: Yichun Contemporary Amperex Technology Limited Factory address 3: No.1 chunfeng Road ,Economic and Technological Development Zone ,Yichun City, Jiangxi Province, People's Republic of China Factory 4: Jiaocheng Contemporary Amperex Technology Limited Factory address 4: No. 1, outer ring road, Feiluan Town, Jiaocheng District, Ningde City, Fujian Province China

General product information and other remarks:

Battery Module Model M02306P05L01 employs cell Models CBDD0 manufactured by Contemporary Amperex Technology Co., Limited, rated 166.4V, 612Ah.

UL 9540A, Edition 4,			
Clause	Requirement + Test	Result - Remark	Verdict

5.0	**CONSTRUCTION**		**Verdict**
5.2	**Module Construction**		—
5.2.1, 5.2.3	Construction information	See Test Item Description at the beginning of this report	—
	General layout of module contents	See Attachment B	—
5.2.2	Module certified to UL 1973	**No**	
	Organization that certified module:	**N/A**	—
6.0	**PERFORMANCE**		**Verdict**
6.1	**General**		
8.1	**Samples**		
8.1.1	Samples conditioned through charge discharge cycling a minimum of 2 cycles.	See Attachment A for profiles See Table 1 for specifications See also Table 2 The module voltage was checked before the test, and the voltage did not drop further compared to 1h to 8h after cycles, which was judged acceptable.	M
8.1.2	100% SOC and stabilize from 1h to 8 h before testing		
8.1.3	Electronic controls such as BMS not relied upon during testing.		C
8.2	**Test Method**		-
8.2.1	Ambient indoor laboratory conditions: 25 ±5°C (77 ±9°F) ≤50 ±25% RH at the initiation of the test.	See Table 3 The ambient humidity at the beginning of the test was 79%. The engineering judgment is that it is acceptable.	M
8.2.2	Test conducted under a smoke collection hood appropriately sized for the module	See Attachment C for figures showing location within the module of the cell(s) forced into thermal runaway	C
8.2.3	The weight of the module was recorded before and after testing, (kg)	See Table 11	C
8,2,4	A sufficient number of cells were forced into thermal runaway to create a condition of cell to cell propagation within the module.	See Attachment C See Tables 4 and 5 One cell was forced into thermal runaway selected by client.	C
	The location of the cell(s) forced into thermal runaway were selected to present the greatest thermal exposure to adjacent cells	See Attachment C for figures showing location within the module of the cell(s) forced into thermal runaway	C

UL 9540A, Edition 4,			
Clause	Requirement + Test	Result - Remark	Verdict
8.2.5	The method used to initiating thermal runaway in the cell(s) were in accordance with 7.2	See Summary of Cell Testing at the beginning of this report.	C
8.2.6	The occurrence of thermal runaway was verified	See Test Results from Cell Level Test from the beginning of this report. See Attachments D	C
8.2.7	The module was placed on top of a non-combustible horizontal surface with the module orientation representative of its intended final installation.	See Attachment E	C
8.2.8	The chemical heat release rate of the module was measured with oxygen consumption calorimetry	See Table 10 See Attachment F	C
8.2.9	The chemical heat relate rate was measured for the duration of the test	See Attachment E	C
8.2.10	The chemical heat release rate was measured using the following equipment: • Paramagnetic oxygen analyser • Non-dispersive infrared carbon dioxide and carbon monoxide analyser • Velocity probe • Type K thermocouple	See Table 10 See Attachment F	C
	The instrumentation was located in the exhaust duct of the heat release rate calorimeter at a location that minimizes the influences of bends or exhaust devices.	See Attachment F	C
8.2.11	The chemical heat release rate at each of the flows was calculated in accordance with 8.2.11.	See Attachment F	C
8.2.12	The hydrocarbon content of the vent gas was measured using flame ionization detection.	See Attachment F	C
	Hydrogen gas shall be measured with a palladium-nickel thin-film solid state sensor.	See Table 9	C
8.2.13	The hydrocarbon content of the vent gas may also be measured using a Fourier-Transform Infrared Spectrometer with a minimum resolution of 1 cm-1 and a path length of at least 2 m (6.6 ft), or equivalent gas analyzer.	FTIR analysis was not used in accordance with the Certification Requirement Decision: Corrections to gas measurement methods to make FTIR as an option for measuring hydrocarbon contents of gas emissions and to include Hydrogen measurements during the Unit Level Test. FTIR was considered redundant to the other gas measurement methods used.	C

Clause	Requirement + Test	Result - Remark	Verdict
	Vent gas velocity and temperature measurements respectively were obtained in the exhaust duct of the heat release rate calorimeter using equipment specified in 8.2.10.		C
8.2.14	The light transmission in the exhaust duct of the heat release rate calorimeter was measured using a white light source and photo detector for the duration of the test.		C
8.2.15	Smoke release rate was calculated as outlined in 8.2.15	See Table 10 See Attachment F	C
8.3	**Module level test report**		
	a. Module manufacturer and model number; b. Number of cells in module; c. Module configuration;	See Test Item Description in beginning of this report.	C
	d. Module construction features;	See Attachment C See Critical Components Table	C
	e. Module voltage corresponding to the tested SOC;	See Table 3	C
	f. Thermal runaway initiation method used;	See Attachment C	C
	g. Heat release rate versus time data;	See Table 10 See Attachment F	C
	h. Flammable gas generation and composition data;	See Attachment F See Tables 8 and 9	C
	i. Peak smoke release rate and total smoke release data.	See Table 10	C
	j. Observation(s) of flying debris or explosive discharge of gases;	See Table 12	C
	k. Observation(s) of sparks, electrical arcs, or other electrical events;	See Table 12	C
	l. Identification/location of cells(s) that exhibited thermal runaway within the module;	See Tables 4 and 5	C
	m. Locations and visual estimations of flame extension and duration from the module;	See Attachments E and F See Table 7	C
	n. Module weight loss;	See Table 11	C
	o. Video of the test.		C
8.4	**Performance – Module level**		
8.4.1	The following performance conditions are met during the module level test: a) Thermal runaway is contained by module design;	Thermal runaway was contained by module design.	P

UL 9540A, Edition 4,			
Clause	Requirement + Test	Result - Remark	Verdict
	b) Cell vent gas is nonflammable as determined by the cell level test	Cell gas report show the cell gases are flammable. See Cell Gas Composition Table.	F

Table 1 – Specified conditioning parameters			
Charging:		**Discharging:**	
Power (CP), kW	50.91,then 5.091	Power (CP), kW	50.91
Standard full Charge Voltage, Vdc	Any cell reaches of 3.65V or total voltage reach 189.8V	End of discharge voltage, Vdc	Any cell reaches of 2.5V or total voltage reach 130V
Cutoff Voltage, Vdc	Any cell reaches of 3.65V or total voltage reach 189.8V	Cutoff Voltage, Vdc	Any cell reaches of 2.5V or total voltage reach 130V
Charging Test Ambient, °C	0~60	Discharging Test Ambient, °C	-20~60
Refer to Attachment A for charge/discharge profiles for the module.			

Table 2 – Charge completion and module test initiation times	
Charge Completion Date and Time	**Module Test Date and Time**
2023-8-14 19:01 PM	2023-8-18 09:33 AM

Table 3 - Test Initiation Details	
	Module No.:
Test Date	2023-08-18
Test Start Time	09:33 AM
Initial Lab Temperature	28.0°C
Initial Relative Humidity	79%
Module OCV at Start of Test, Vdc	173.2V

Table 4 – Approximate time of thermal runaway propagation through module	
Time to thermal runaway	**Location**
0:48:53	Cell 20-2
0:50:41	Cell 20-1
0:54:54	Cell 21-1
1:07:12	Cell 21-2

Table 5 – Test overview timeline		
Time (HH:MM:SS)	**Event**	**Description**
00:00:00	Test Start	The test was started and the heater was turned on to heat the initiating cell (Cell 20-2) at a ratio of 4 ~ 7 °C/min.
00:47:08	Venting of initiating Cell	Initiating cell (Cell 20-2) vented at around 173.5 °C measured through TC 2-1 by an indication of sudden dip in cell's temperature curve. See Figure (b)
00:48:53	Thermal runaway of initiating cell	Initiating cell (Cell 20-2) was at around 183.2 °C measured through T2-1. The temperature of cell 20-2 began to increase inan uncontrollable manner, With the release of smoke. See Figure (c)
00:50:41	Thermal runaway of initiating cell	Thermal runaway propagated to nearby cell (cell 20-1). More gas released and accompanied by electrolyte and molten material outflow. See Figure (e)

00:54:54	Thermal runaway of initiating cell	Thermal runaway propagated to nearby cell (cell 21-1). More gas released. See Figure (f)
01:07:12	Thermal runaway of initiating cell	Thermal runaway propagated to nearby cell (cell 21-2). More gas released. See Figure (g)
02:00:00	Test Termination	Data acquisition was stopped. The module was left in the test overnight and with video monitored.

UL 9540A, Edition 4,			
Clause	Requirement + Test	Result - Remark	Verdict

Table 6 – Gases measured and measurement methods used in unit level testing			
Measurement Method	**Gases Measured**	**Chemical Formula**	**Gas Type**
Flame Ionization Detection (FID)	Total Hydrocarbons	-	Hydrocarbons
Solid-state Hydrogen Sensor	Hydrogen	H_2	--
Non-dispersive infrared spectroscopy (NDIR)	Carbon Dioxide	CO_2	Carbon Containing
	Carbon Monoxide	CO	Carbon Containing
# - This table was modified to reflect the gases measured during testing.			

Table 7 - Gas generation periods	
Time	**Condition**
0:47:08 to 02:00:00	No flaming
External Flaming of Gas	
Condition	**Duration (hh:mm:ss)**
External Flaming of Vent Gases:	N/A

Table 8– Summary of battery gas volumes for deflagration hazard calculations				
Gas Component	Gas Type	During Pre-flaming (L)	During Flaming (L)	Minimum detectable flow rate (LPM)
See Table 9				

Table 9– Summary of battery gas volumes for deflagration hazard calculations				
Gas Component	Gas Type	During Pre-flaming (L)	During Flaming (L)	Minimum detectable flow rate (LPM)
Total Hydrocarbons (Propane Equivalent)	Hydrocarbons	260.29	No flaming	0.50
Carbon Dioxide	Carbon Containing	217.03	No flaming	1.82
Carbon Monoxide	Carbon Containing	77.57	No flaming	0.61
Hydrogen	Hydrogen	263.37	No flaming	14.29

Table 10 – Smoke and heat release rate			
Heat Release Rate (HRR)		**Smoke Release Rate (SRR)**	
Peak Chemical HRR (kW)	0(No flaming)	Maximum SRR (m^2/s)	0.52
		Total Smoke Released (m^2)	1.41

UL 9540A, Edition 4,			
Clause	Requirement + Test	Result - Remark	Verdict

Table 11 – Module Weight During Test, kg	
Before Test:	655.5kg
After Test:	653.5kg
Weight Loss:	2kg

Table 12 – Other Observations during module test		
	Observed, Yes/No	Location
Flying debris	No	N/A
Explosive discharge of gas	No	N/A
Sparks or electrical arcs	No	N/A

UL 9540A, Edition 4,			
Clause	Requirement + Test	Result - Remark	Verdict

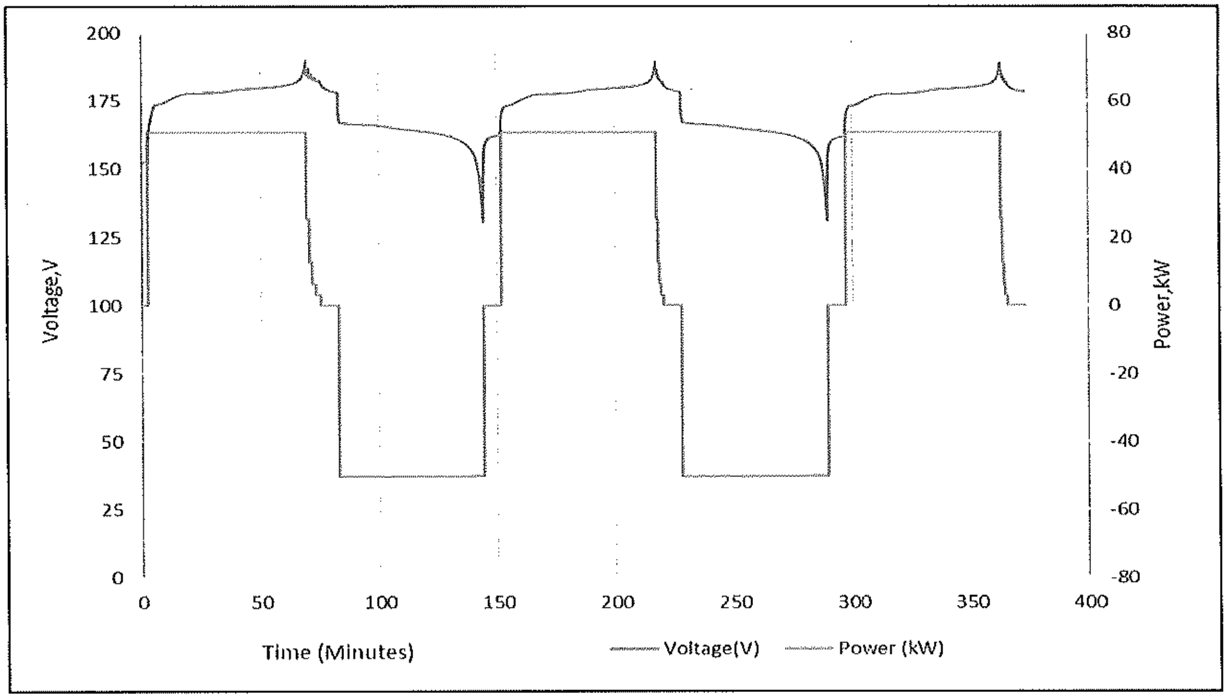
TABLE: Critical components information					
Object / Part No.	**Manufacturer/ trademark/ Supplier Code**	**Type / model**	**Technical data**	**Standard**	**Mark(s) of conformity**
Cells	CATL	CBDD0	Nominal voltage：3.2Vdc Rated capacity：306Ah	UL 1973 IEC 62619：2022	UL MH62898 JPTUV-146897
Metal enclosure	CATL	-	Material: Al6063.T6 Thickness: ≥2mm Size: L*W*H(mm) (2235±3.5)*(830±3)*(31±3)	–	–
Plastic enclosure	0000013277	NHPP-FR NHPP-FR-2	Fire rating：V-0 Material: PP RTI: 65°C	UL746	UL E171666
Connector	0000007975	REA4	Voltage：1500VDC Current：350A for TUV, 300A for UL Fire rating：V-0	UL4818 EN 61984	UL E526230 J 50586193
Connecting wire for HV	0000009966	3932	Voltage: 2000V Current-carrying capability: 75°C 350A Maximum ambient temperature:-40°C~+125°C	UL 758 EN 50525 IEC 60227 IEC 60228:2004	E214184 M.2021.206.C63716
Wire for LV	0000009966	3666	Voltage: 600V Wire diameter: (0.5~4mm2) Maximum ambient temperature: -40°C~+105°C	UL 758 EN 50525 IEC 60227 IEC 60228:2004	E214184 0B160705.DNTDS30
Plastic material (Harness isolation plate)	0000015262	PP C6540R-G20HF	Fire rating: V-0 Maximum ambient temperature: 90±2°C	UL94	SHMR220800424401
Plastic material (Output pole base)	0000007541	46GF30	Fire rating: V-0 Maximum ambient temperature: 180°C	UL94	UL E225348
Plastic material (Buffer pad)	0000007929	MPP	Fire rating: V-0 Maximum ambient temperature: 100°C	UL94	UL E509966

Plastic material (PC Insulating sheet)	0000007929	U42B-1(PC)	Fire rating: VTM-0 Maximum ambient temperature: -40°C ~+85°C	UL94	A2230075498101C
Plastic material (Fuse base)	0000027338	PBT-GF30	Fire rating: V-0 Maximum ambient temperature: 120±2°C	UL94	UL E225348
Plastic material (Wire harness bracket)	0000027338	PBT-GF30	Fire rating: V-0 Maximum ambient temperature: 120±2°C	UL94	UL E225348
Plastic material (Injection-molded slide rail)	0000027338	POM	Fire rating: HB Maximum ambient temperature: 90±2°C	UL94	UL E171666
Plastic material (Fuse Protective Cover)	0000027338	P2G(X)	Fire rating: V-0 Maximum ambient temperature: 120±2°C	UL94	E204321
Plastic material (Gasket)	0000011532	SecA	Fire rating: ≥V-0 Maximum ambient temperature: -50~200°C	UL94	UL E529227
Mica paper	0000014138	--	Fire rating: V-0 Maximum ambient temperature: 1000±200°C	GB/T 2408-2008 UL94	MS220712040C-04 E302583

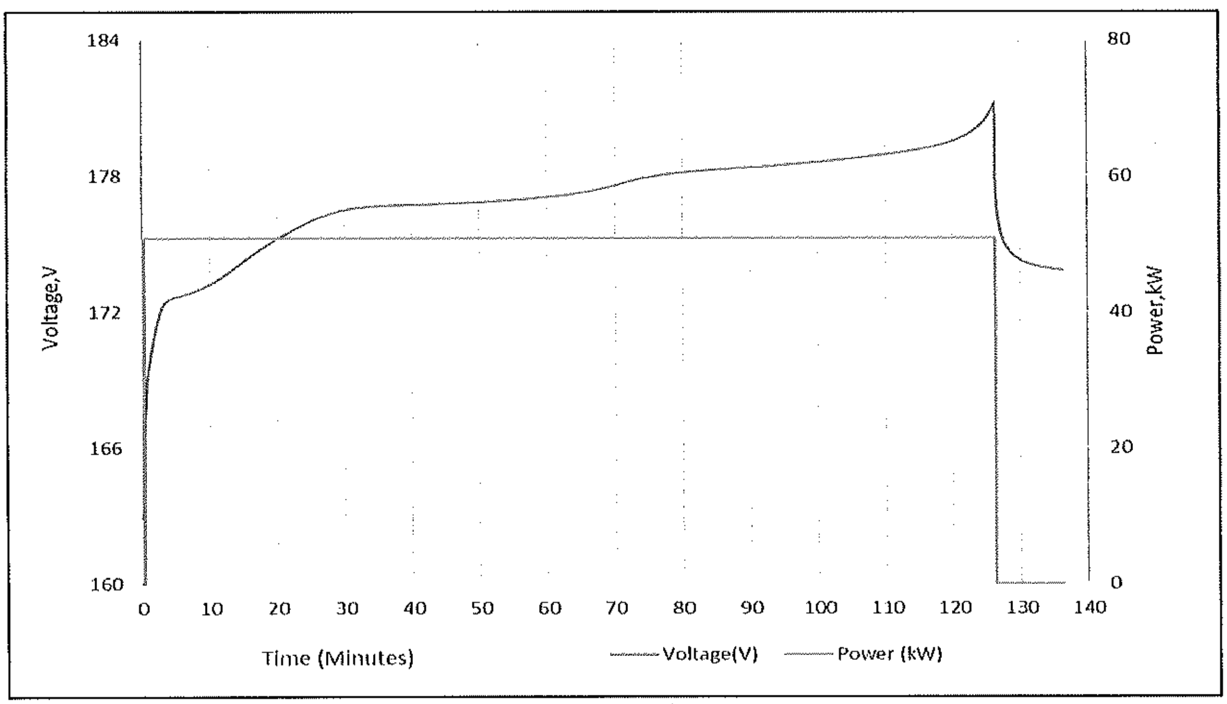
Attachment A: Module Conditioning (Charge/discharge) Profiles - (*Pages **19** through **19***)

Ntoe: 1. BMS power reduction charging strategy is as follows: initially charge at 1P until the battery voltage is 3.65 V, then reduce the charging power to 0.5 P, while the battery voltage is 3.65 V, reduce the charging power to 0.25 P, then charge at 0.125 P and 0.05 P to 3.65 V in turn, and then stand for 10min, and discharge at 1P power until the voltage is 2.5 V, and the discharge ends.

2. Charge to 100% SOC: Charge at constant power 50.91kW until any cell voltage reaches 3.65V then derate until charge with 0.05P till 189.8V or any cell voltage reaches 3.65V



Chargre/Discharge Cycle



Charge to 100% SOC

Attachment B: Module Construction Photos - (Pages ***20*** through ***20***)

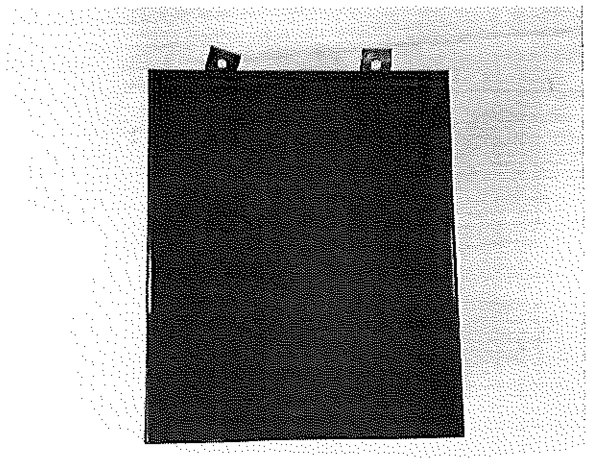


Figure 1: Photo of cell – large side

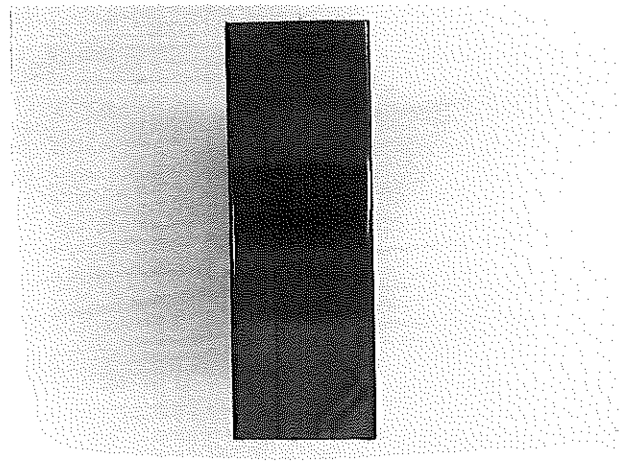


Figure 2: Photo of cell with Heaters

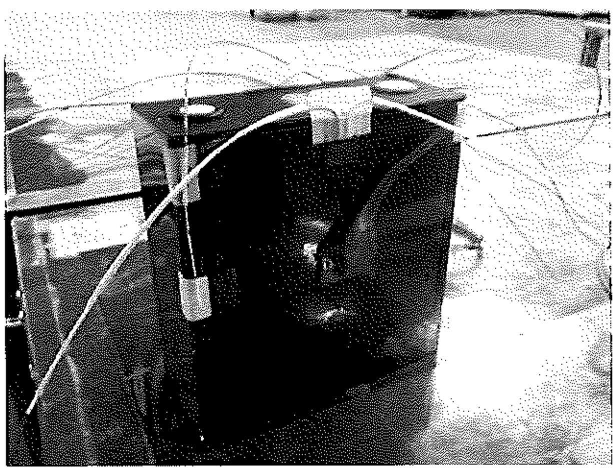


Figure 3: Cell with heater. two pieces of 203.0 mmby 152.4 mm for each sample.

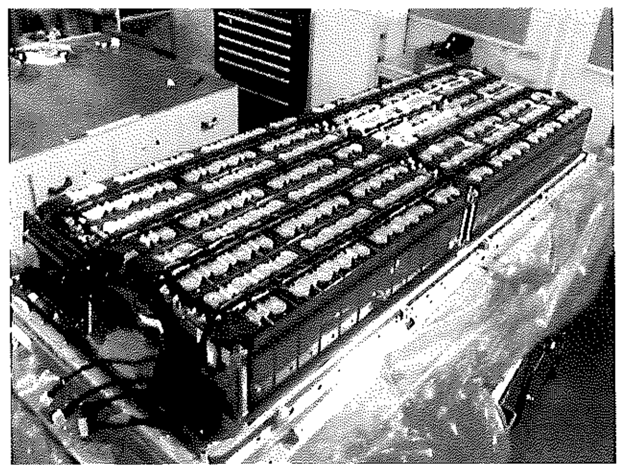


Figure 4: Photo of module

Figure 5: Mica sheet in the module

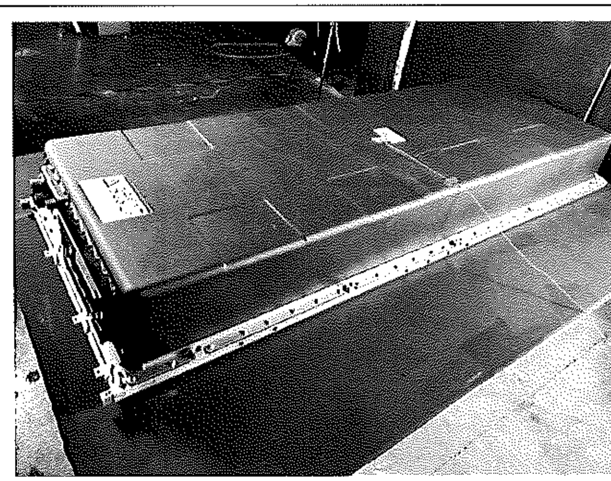


Figure 6: Photo of module

Attachment C: Module Instrumentation Photos - (*Pages **21** through **21***)

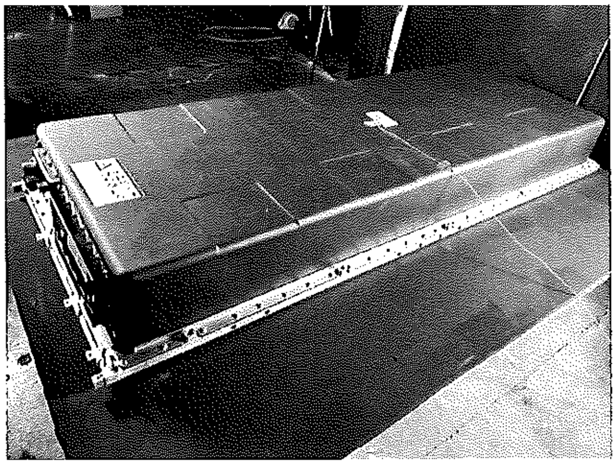
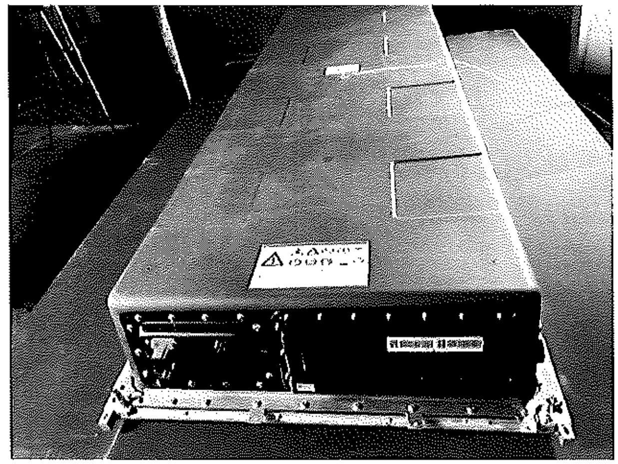
	

Figure 7: Module on the test platform-side view	Figure 8: Module on the test platform-front view

Note: The thermocouple T1-1 was used to control the supply power to the heater to keep the heating rate at 4 ~ 7 °C/min. T2-1 and T2-3 were used to represent the temperature of initiating cell.
T1-1, on the wide side surface center of cell 20-2, between the cell and heater.
T1-2 on the other wide side surface center of cell 20-2, between the cell and heater.
T2-1, T2-2, on each wide side surface center of cell 20-2, not covered by heater.
V1, V3, V4, V5, V6, V6, V7, V8, V9 was the voltage of cell 19-2, 20-1, 21-1, 22-1, 7-2, 33-2, M6, M7, M8 separately.
T3 to T8 and Ta to Tc were attached on the wide side surface center of cells shown in below illustration.

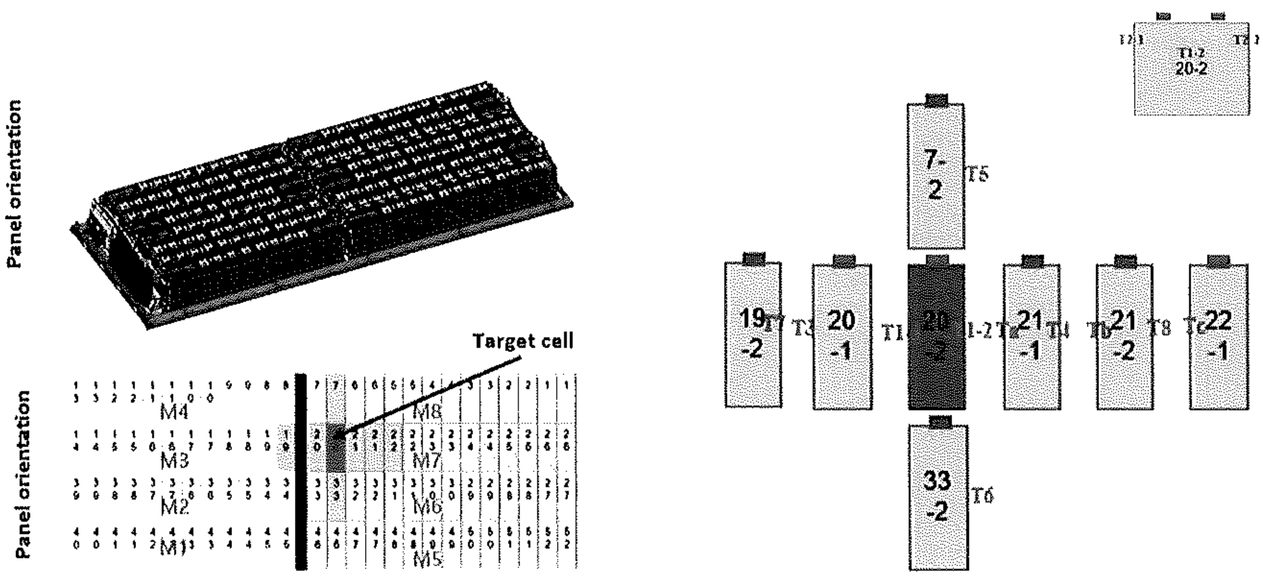


Figure 9: Locations of TCs

Attachment D: Module and Initiating Cell(s) Temperature Profiles During Testing - (*Pages **22** through **22***)

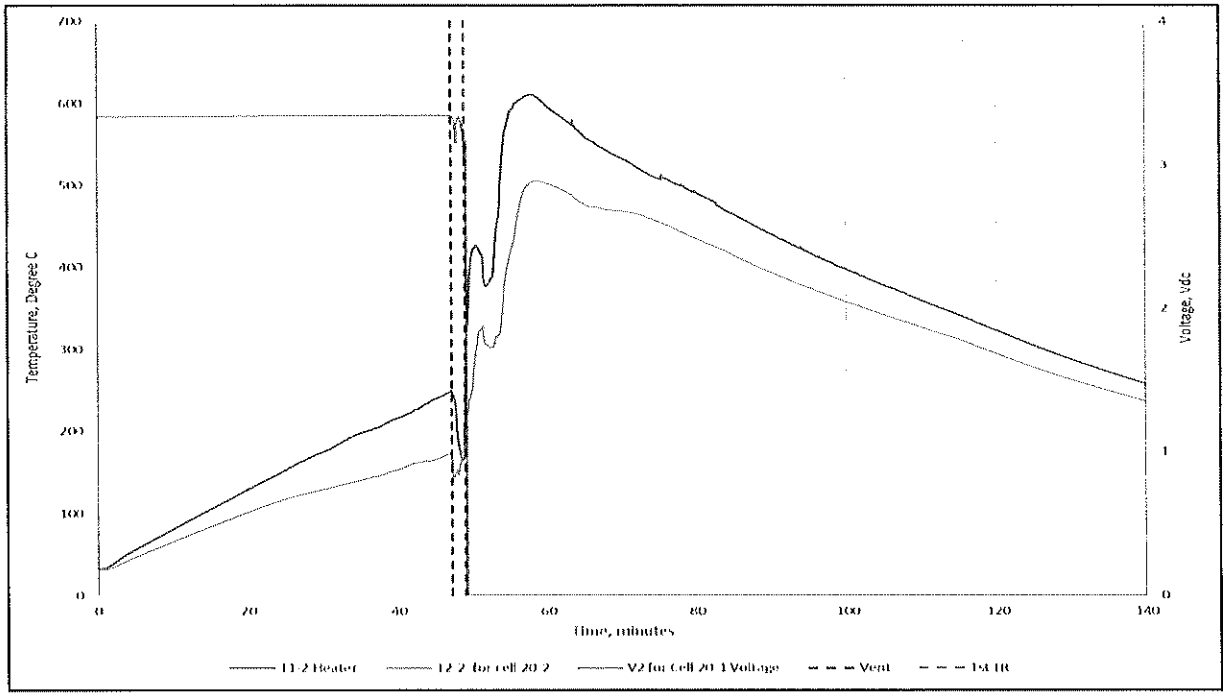


Figure 10: Initiating cell Temperature and voltage Profiles During Testing

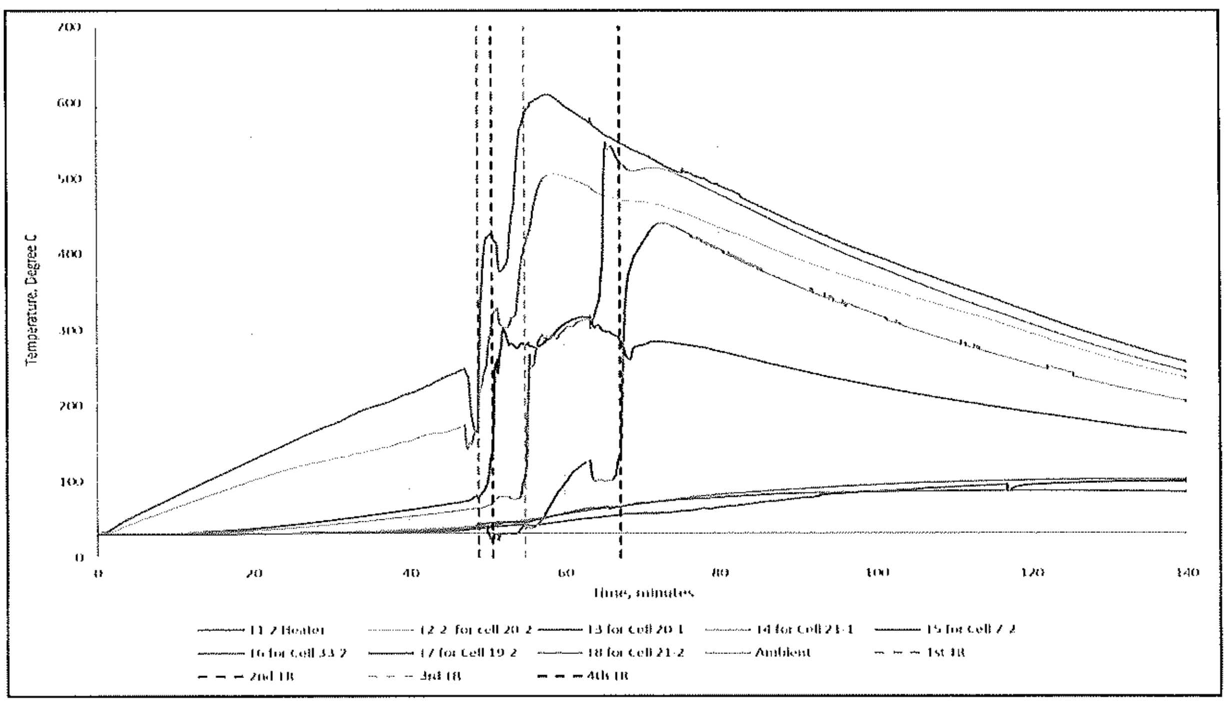
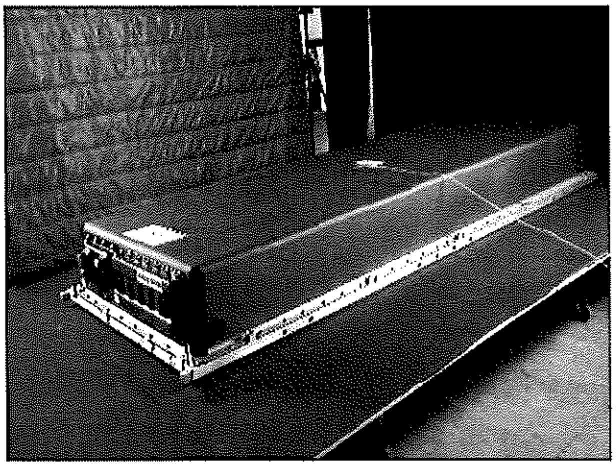
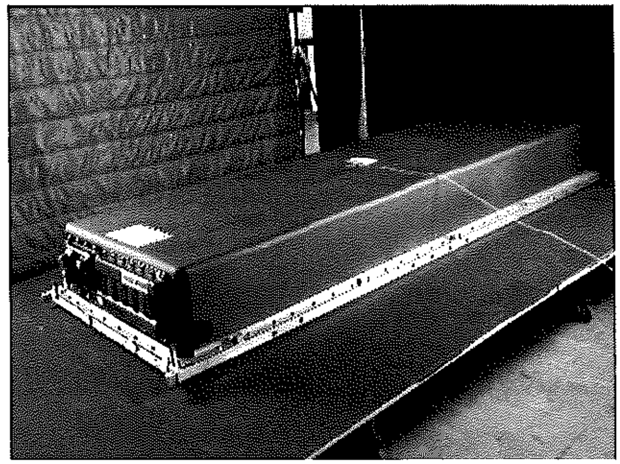
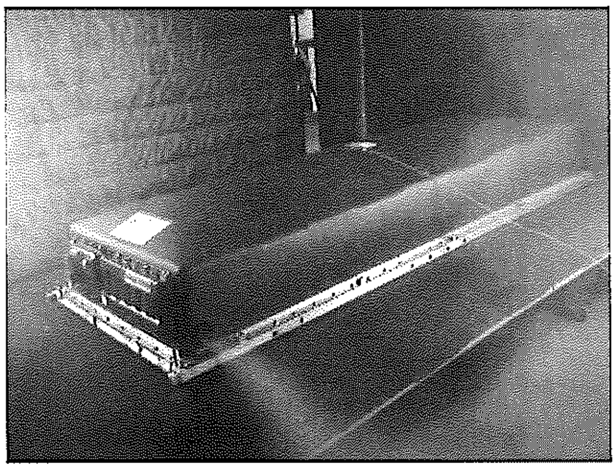
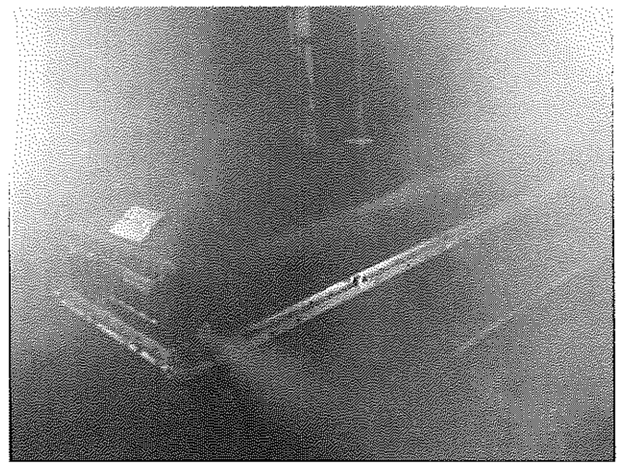
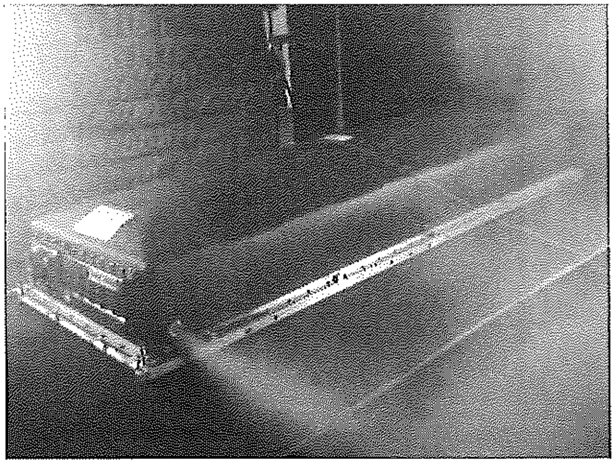
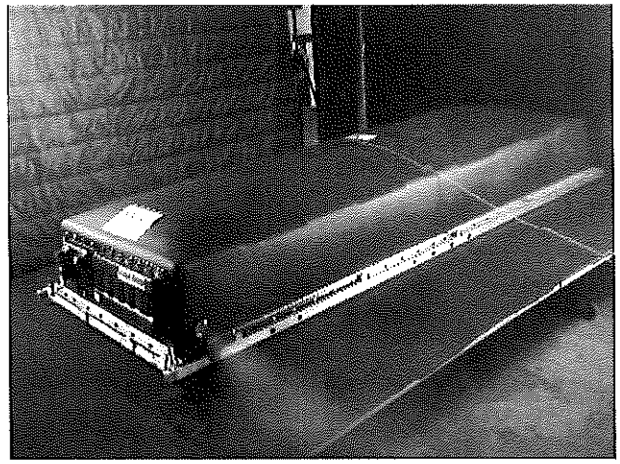
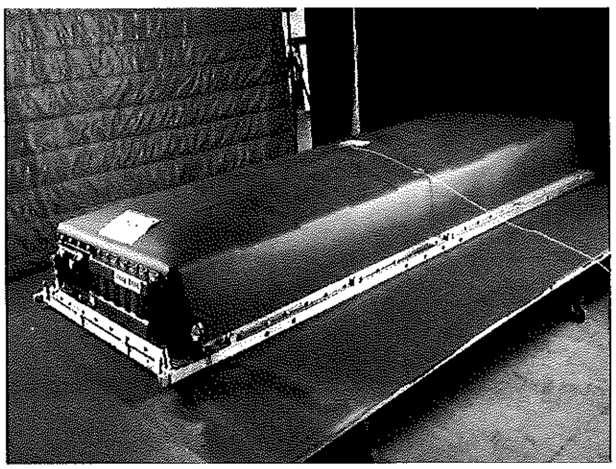


Figure 11: Temperature Profiles Describing Cell to Cell Propagation

Attachment E: Module Testing Photos - (*Pages **23** through **24***)

	
(a) Test Start [00:00:00]	(b) Initiating cell Venting [00:47:08]
	
(c) Smoke released from enclosure [00:48:53]	(d) Thermal runaway of initiating cell [00:50:41]

 (e) Thermal runaway of adjacent cell 21-1 [00:54:54]	 (f) Thermal runaway of adjacent cell 21-2 [01:07:12]
 (g) Test Termination [02:00:00]	

Attachment F: Module Gas Flow Rate and Heat Release Profiles - (*Pages **25** through **27***)

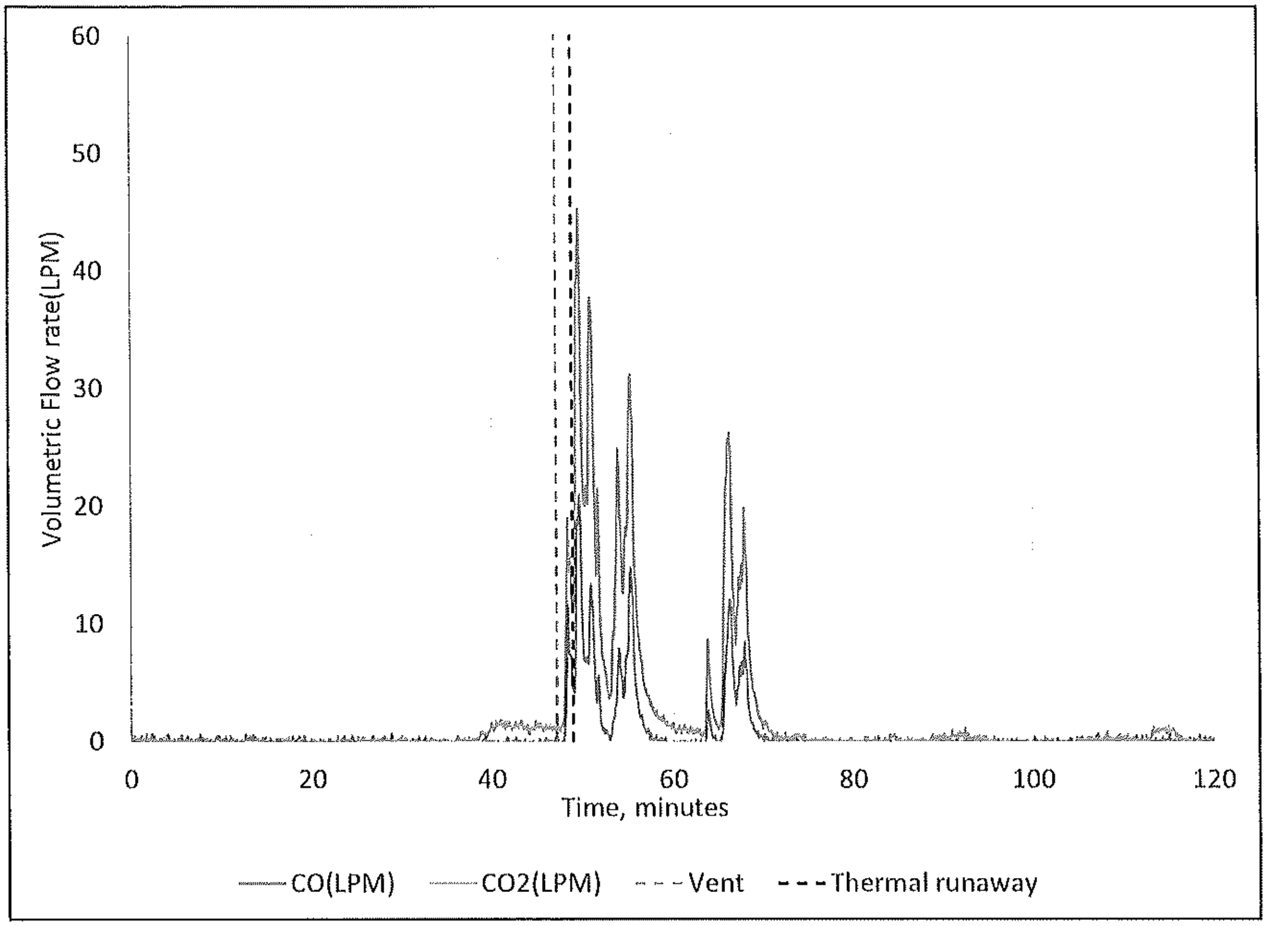


Figure 12: CO, CO2 Volumetric flow rates

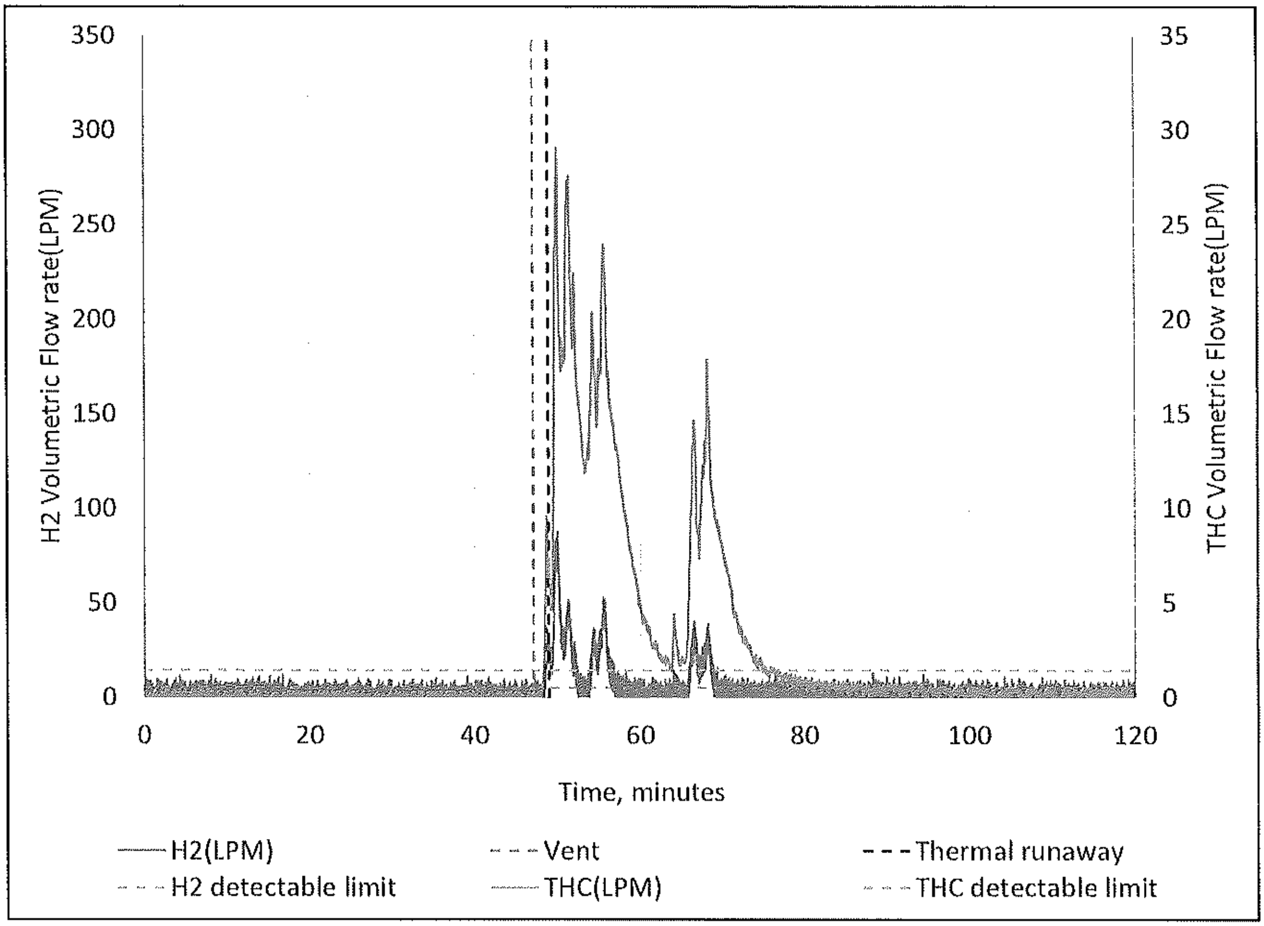


Figure 13: THC, H2 Volumetric flow rates

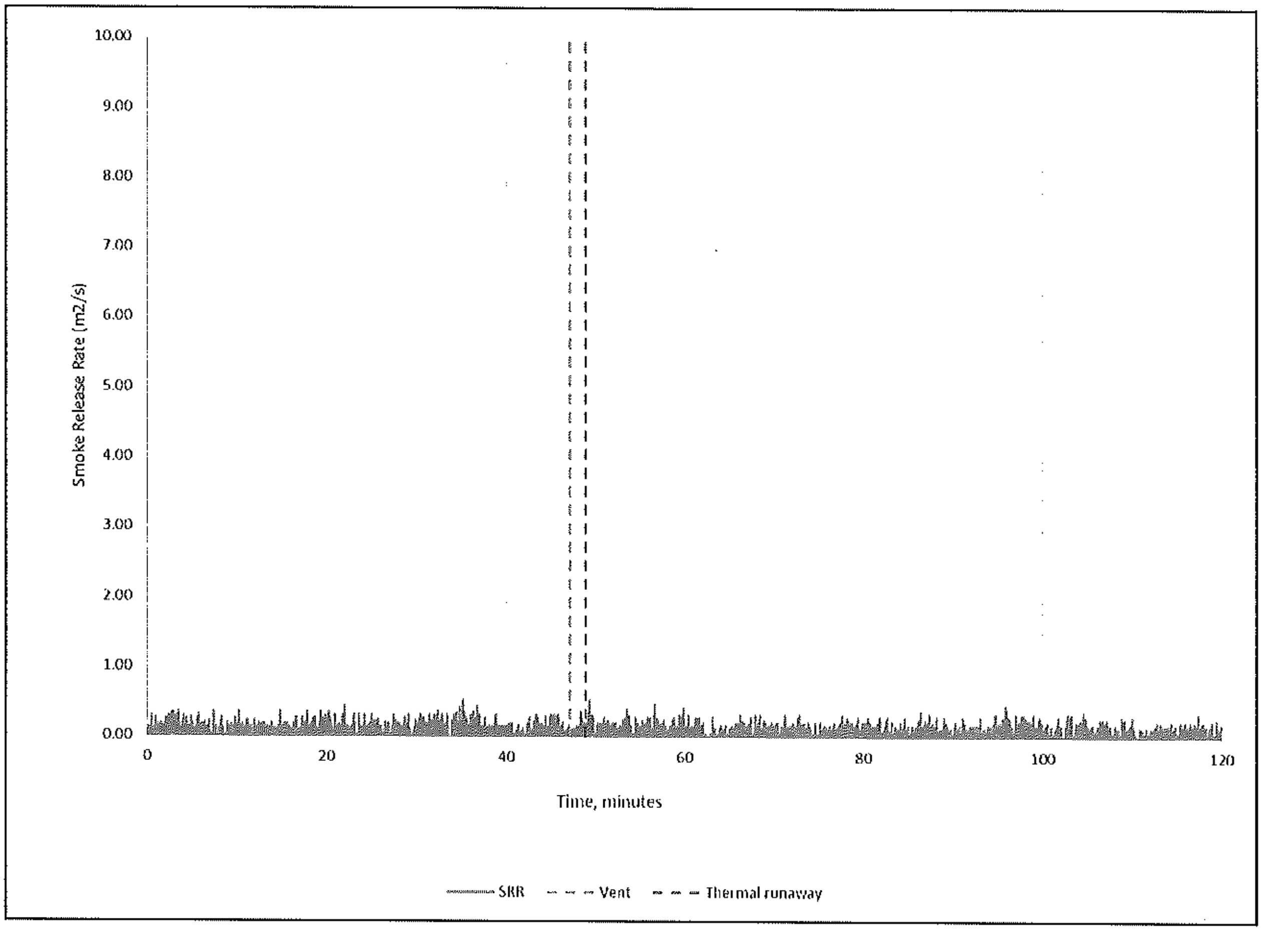


Figure 14: Smoke release rate

APPENDIX 4

Stormy Canady

Safety Architecture of Gridstack Pro system

	Description	Diagram / Table

Fire Detection and Alarm

System Overview

Each row of Battery Enclosures contains monitored data loops that connect Battery Enclosure fire alarm control units. They communicate faults or alarms to the Fluence OS and DAS. Each Core contains these safety components:

- Four multi-detector per Battery Enclosure
- Two H2 gas detector per Battery Enclosure
- Fire alarm control unit output to F-Stop on the CSE
- One Horn/Strobe and multi detector on the CSE

An aerosol canister is optionally available.

The I/O device allows connections to:

- Activate F-Stop to stop the chiller and HVAC units in the Battery Enclosure in case of fire
- Receive a signal from the aerosol canister (if installed)
- Receive a signal from the H2 gas detector for alarm and fault conditions
- Activate the Vent Panel and Combustible Concentration Reduction System (CCRS) when CO or H2 or smoke is detected inside the Battery Enclosure
- Receive a signal from the vent system to monitor Vent Panel position
- Receive a signal from CCRS to monitor the exhaust fan status

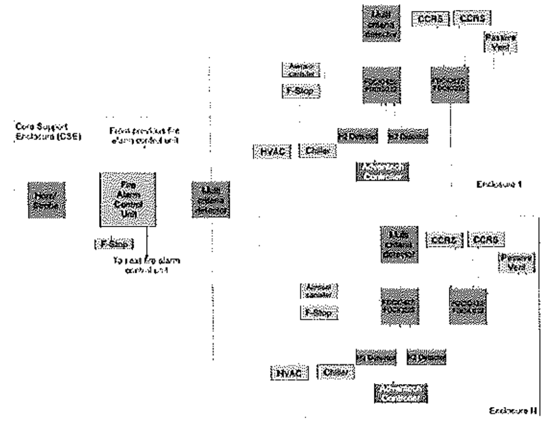


Figure 3 - 1: Example of Fire Alarm System

Enclosure Alarm Systems

Each Battery Enclosure contains two I/O modules, four multi-criteria smoke and CO sensor, two H2 gas detectors, HVAC and chiller. Some Battery Enclosures may have a thermally activated aerosol canister (optional). All devices conform to UL and EN/IEC standards. When triggered, the system activates an alarm and LED in the core and master fire alarm control unit, an exterior horn and light, and transmits a signal to Fluence supervisory central station and to the local fire department. Each incident varies depending on the battery size, system chemistry, and state of charge.

Table 3 - 1: Battery Enclosure Level Fire Detection and Alarm Devices

Device	Purpose / Description
Multi-criteria detector (CO, smoke, and temperature) (Location - Inside Battery Compartment) **UL Model OOHC941 + DB-11E** **EN/IEC Model OOHC740 + DB 721**	• **CO detector:** The presence of CO above 30 ppm indicates Off gas conditions. It operates the Enclosure Vent Panel and the CCRS exhaust fan is switched ON and activates Core F-Stop. It sends a signal to the Core fire alarm control unit which activates a site fire alarm. • **Smoke / Temperature detector:** If smoke is detected inside a Battery Enclosure or temperature is above 95 °C (203 °F). It operates the Enclosure Vent Panel and the CCRS exhaust fan is switched ON and activates the Core F-Stop. It sends a signal to the Core Fire alarm control unit which activates a site fire alarm.
Multi-criteria detector (smoke and temperature) (Location - Inside BCP Compartment) **UL Model OOH941 + DB-11E** **EN/IEC Model OOH740 + DB-721**	• **Smoke / Temperature detector:** If smoke is detected or temperature is above 95 °C (203 °F). It operates the Enclosure Vent Panel and the CCRS exhaust fan is switched ON and activates the Core F-Stop. It sends a signal to the Core fire alarm control unit which activates a site Fire alarm.
H2 gas detector **Model SPLCG10M4C+1122**	The presence of H2 gas indicates Off gas conditions. It operates the Enclosure Vent Panel and the CCRS exhaust fan is switched ON and activates the Core F-Stop. It sends a signal to the Core fire alarm control unit which activates a site fire alarm.
I/O Device **UL Model FDCIO422** **EN/IEC Model FDCIO222**	Provides an addressable digital input and digital output to devices installed in the Battery Enclosure to communicate with the Enclosure fire alarm control unit. • **Digital Input:** Connected to H2 gas detector to monitor the device alarm and fault condition, Vent Panel positions, and the CCRS exhaust fan status. • **Digital Output:** Connected to the F-Stop system inside the Enclosure to stop the HVAC and chiller units and operates the Vent Panel and CCRS exhaust fan.

Device	Purpose / Description
Aerosol canister (If installed)	An aerosol canister is available as an option in the Battery Enclosure. The aerosol canister is not dependent on external power. When activated, it discharges an ultra fine suspension of particles that is designed to suppress fire in non-battery components within the Enclosure. When activated, it sends a signal to the Fire alarm control unit.

Core Alarm Systems

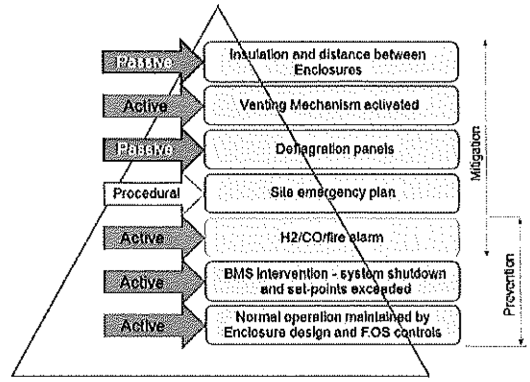
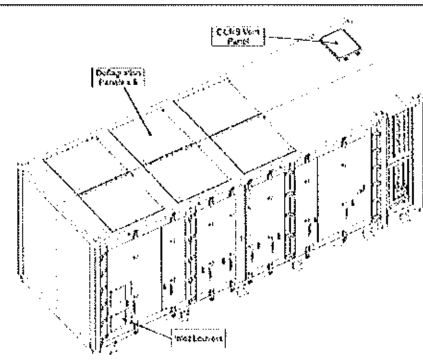
The Core-level devices are contained in the Core Support Enclosure (CSE).

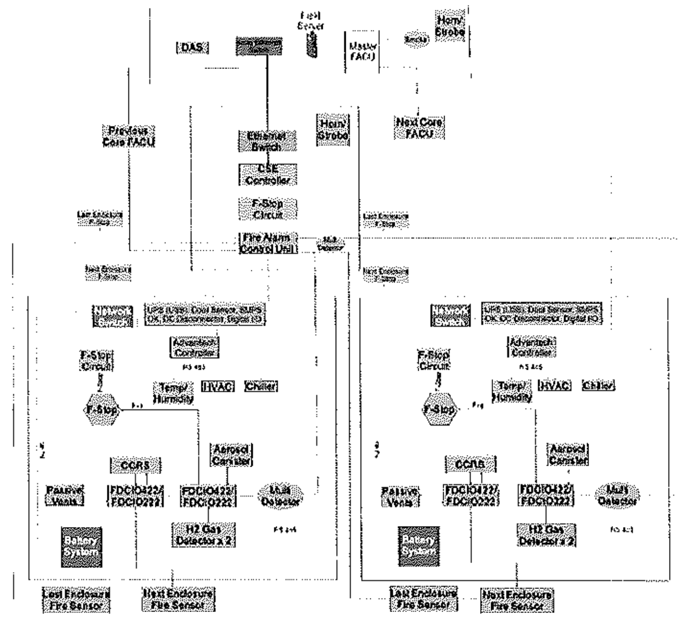
Table 3 - 2: Core-Level Fire Detection and Alarm Devices

Device	Model	Purpose/Description
Core fire alarm control unit		The Core fire alarm control unit provides up to four loops, where each loop covers one core/node of Battery Enclosures. The Core fire alarm unit uses a two-wire data loop which collects data from and monitors all devices connected to that loop. For I/O devices, the Core fire alarm unit also sends signals to control outputs of the device.
	UL model: FC924-US	A four-wire cable powers the devices. One 24V 18Ah battery supplies power to the horn and strobe for a minimum of five minutes and to monitor all devices for up to 24 hours.
	EN/IEC model, FC724-2A	A two-wire cable powers the devices. One 12V 25Ah battery supplies power to the horn and strobe for a minimum of five minutes and to monitor all devices for up to 24 hours.
Multi-criteria detector (CO, smoke, and temperature)	**UL Model. OOHC941** **EN/IEC Model: OOHC740**	• **CO detector:** The presence of CO above 30 ppm indicates Off gas conditions. It sends a signal to the Core fire alarm control unit which activates a site fire alarm. The Core F-Stop is also activated which shuts down the Core. • **Smoke / Temperature detector:** If smoke is detected inside a Battery Enclosure or temperature is above 95 °C (203 °F), the core F-Stop is activated which shuts down the core. It sends a signal to the Core fire alarm control unit which activates a site fire alarm.
Horn/Strobe device	**UL model: AS-75-R-WP**	The horn and strobe clearly identify the affected Core connected to the CSE.
	EN/IEC Model: FDS226-RR	The horn and strobe are activated when: • **H2 or CO is detected in any Battery Enclosure in the Core:** Specific sound and strobe. • **Smoke/Temperature is detected in any Battery Enclosure in the Core:** Fire alarm sound and strobe.

Compliance

The fire alarm system is an object detection and alarm system. As such, there are no mandatory NFPA nor EN standards. However, the system has been designed to comply with NFPA 69 and 72 (for UL regions) and with EN 54 (for IEC regions).
The core fire panels and the master fire panels have 24 hrs battery backup in standby mode and 30 minutes battery backup during alarm time in compliance with NFPA 110.

La[illegible]f Safety Concept	Battery Enclosures use the concept of Layers of Safety, as shown in Figure 4 - 1.	 Figure 4 - 1: Layers of Safety
Normal Operation	The first preventive layer of safety is the system design. The battery system is designed, built, and tested to operate within the specified normal operating conditions and prevent an event from happening in the first place. The Battery Enclosure is designed with enough cooling capacity to cover all foreseeable operating conditions. Inverter and battery are matched to assure that power, current and voltage will be within the allowed operating range for the battery system. Fluence's F.OS controls set-points to charge and discharge power as required for the different operating profiles. The Battery Enclosure is certified under UL9540 and IEC 61439 standards.	
BMS Intervention	The BMS provides the second preventive safety layer by disconnecting the battery system in case of excessive cell teperature, over- and under-voltage, and excessive current during charge or discharge. Safety functions as performed by the BMS have been designed and tested to comply with PL "c" of ISO13849-1/-2.	
The Fire Alarm system	The fire alarm system is the third layer of safety in the Battery Enclosure and provides both mitigation and prevention functions: It provides mitigation by shutting down the HVAC and chiller units in the originating Battery Enclosure in case of a H2/CO/smoke/fire alarm. •It provides mitigation through its local and remote alarm functions as described below. •The fire alarm system is designed, built, and tested to comply with NFPA 69 and 72, and its primary function is to make sure: The incipient off-gassing and fire can be very quickly identified before any significant volume of gases are released. •That the location of the originating Battery Enclosure can be easily identified. •That first responders are alarmed •That given the sound and visible alarms, following the site-specific emergency plan, evacuation from the affected location can happen. In terms of risk reduction, the fire alarm system parts and topology have been assessed by a third- party and determined to comply with a SIL 2 under IEC 61508. It is the most important safety function in terms of reducing overall exposure to the risk area in the proximity of the affected unit.	
Site Emergency Plan	In terms of Mitigation, the Site Emergency Plan (SEP) is key. It is the SEP together with the fire alarm system that makes sure employees, duly authorized visitors, first responders, and eventual service providers have been trained and informed how to quickly evacuate the site and how to further proceed in case of a fire or H2 or CO alarm, eliminating any undue exposure related to a potential event.	
Venting Mechanism	The venting mechanism is the fifth (mitigation) layer of safety and has been designed and tested to make sure that combustible gases cannot accumulate in large quantities inside the Battery Enclosure. The Vent Panel and CCRS is designed in accordance with NFPA 69 standards which ensure that the concentration of gas inside the Battery Enclosure is always maintained below 25% of Lower Flammability Limit (LFL) and hence explosion risk is mitigated.	
Deflagration Panels	The deflagration panels provide the sixth (mitigation) layer of safety to the Battery Enclosure. They act as a redundant system if the venting mechanism fails. Between the fire alarm being activated, indicating either the initial presence of combustible gases or fire in the Battery Enclosure, and the Vent Panel and CCRS opening, anything between 4 s to 30 s time can lapse. Should enough gas be accumulated in that period, the deflagration panels will be able to swiftly release the pressure of an eventual deflagration that would result from a combustible gas ignition event without damaging the Battery Enclosure.	
	COMBUSTIBLE CONCENTRATION REDUCTION SYSTEM (CCRS) The CCRS includes an air inlet and an outlet for combustible gases. The air inlet has two louvers at the front of the Battery Enclosure, the outlet has two exhaust fans pushing the combustible gases through a venting system. The CCRS reduces the concentration of gas in the Battery Enclosure below 25% of Lower Flammability Limit (LFL). DEFLAGRATION PANELS Each Battery Enclosure includes six deflagration panels, devices engineered to direct the force of an explosion should one occur inside the Battery Enclosure. These are located on the roof of the Enclosure, to direct any such forces upwards above the Battery Enclosure. The deflagration panels are tethered to the Enclosure to prevent the panels from flying free from the Battery Enclosure. The deflagration panels , vent Panel and CCRS are engineered according to NFPA 68 and 69 and serve as explosion control per Section 4.12.1 of NFPA 855. How Does the Vent System Work? The CCR system consists of a vent panel at the top of the Battery Enclosure along with two exhaust fans and inlet louvers at the front of the Battery Enclosure. If the fire alarm system detects smoke or CO or H2, it will operate the exhaust fans and open the inlet louvers and vent panel using power from the universal power system (UPS) in each Battery Enclosure. These fans run continuously. Upon conclusion of an event, the CCRS can be manually closed at the fire alarm control unit.	 Figure 5 - 4: Battery Enclosure Deflagration Panels and CCRS
TEST RESULTS	Deflagration panels are designed based on potential gas concentrations based on data from UL 9540A Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems of cell and module. In Battery Enclosure testing, explosions could not be created until gas concentrations exceeded the likely gas concentrations based on UL 9540A testing. Upon ignition, the deflagration panels successfully directed the force of the explosion upwards. The Battery Enclosure structure remained intact.	
SNOW LOAD	To simulate potential snow loads on the deflagration panels, sandbag testing was conducted. The deflagration panels were shown to successfully operate at loads of 130 kg/m2.	

Core Safety System Topology	The diagram is an example of the control topology for the Gridstack Pro safety systems. The example configuration contains two rows of Battery Enclosure.	 Figure 5 - 2: Core Safety System Topology

Stormy Canady

APPENDIX 5

1/23/25
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FOR
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AMADOR BESS ENERGY STORAGE
VAN ZANDT COUNTY, TX

FIRE ALARM SYSTEM FOR BATTERY ENERGY STORAGE SYSTEM

DRAWING INDEX

PG	DRAWING #	SHEET #	REV	SHEET DESCRIPTION
1	D14033-1	FA1.01	0	COVER SHEET AND DRAWING INDEX
2		FA1.02	0	SEQUENCE OF OPERATIONS & PROJECT NOTES, BILL OF MATERIALS
3		FA2.01	0	SITE PLAN
4		FA2.02	0	OUTDOOR CORE TELCO ENCLOSURES 01-06
5		FA2.02	0	OUTDOOR CORE TELCO ENCLOSURES 07-12
6		FA2.02	0	TYPICAL CORE FPP AND CUBE ENCLOSURE ONE LINE
7		FA3.01	0	TYPICAL MASTER CONTROL PANEL RISER DIAGRAM
8		FA3.02	0	MASTER CONTROL PANEL CALCULATIONS
9	D14033-2	FA5.01	0	MASTER FIRE ALARM CONTROL PANEL ENCLOSURE AND PANEL DETAIL
10		FA5.02	0	TYPICAL CORE / TELCO CABINET ENCLOSURE AND PANEL DETAIL
11		FA5.03	0	TYPICAL DEVICE & MOUNTING DETAILS

FIRE ALARM SYSTEM
SYSTEM HAS BEEN DESIGNED USING ALL UL LISTED AND/OR FM APPROVED EQUIPMENT

EDITION OF REFERENCED CODES AND STANDARDS
2024 EDITION – NFPA 1 FIRE CODE
2024 EDITION – NFPA 69 STANDARD ON EXPLOSION PROTECTION BY DEFLAGRATION VENTING
2023 EDITION – NFPA 70 NATIONAL ELECTRIC CODE.
2022 EDITION – NFPA 72 FIRE ALARM CODE.
2023 EDITION – NFPA 855 STANDARD FOR THE INSTALLATION OF STATIONARY ENERGY STORAGE SYSTEMS.

SCOPE OF WORK

ORR PROTECTION SYSTEMS, INC. AND FLUENCE CORPORATION ARE PROVIDING AND INSTALLING A FIRE ALARM SYSTEM THAT WILL PROTECT BATTERY ENCLOSURES AND RACKS AT THE AMADOR ENERGY STORAGE FACILITY IN VAN ZANDT COUNTY, TEXAS.

- PROVIDE AND INSTALL (2) FIRE ALARM SYSTEM MASTER PANELS.
- PROVIDE AND INSTALL (23) FIRE ALARM SYSTEM CORE PANELS.
- PROVIDE AND INSTALL (1) DUAL INPUT MODULES
- PROVIDE AND INSTALL (1) WEATHERPROOF DOUBLE-ACTION MANUAL PULL STATIONS.
- PROVIDE AND INSTALL (1) MINI MONITOR MODULES.
- PROVIDE AND INSTALL (46) 4-INPUT / 4-OUTPUT MODULES.
- PROVIDE AND INSTALL (208) SMOKE/CO DETECTORS.
- PROVIDE AND INSTALL (24) WEATHERPROOF HORN/STROBES.
- PROVIDE AND INSTALL (1) DACT & CELLULAR DIALER.

FLUENCE

ORR Protection

VAN ZANDT COUNTY, TX
FIRE ALARM
COVER SHEET & DRAWING INDEX

FA1.01

GENERAL ELECTRICAL NOTES

1. DO NOT ENERGIZE THE SYSTEM UNTIL IT HAS BEEN CHECKED OUT BY A FACTORY AUTHORIZED TECHNICIAN.
2. DETECTOR CIRCUITS ARE SUPERVISED AND MUST BE CONNECTED AS SHOWN.
3. 120/240VAC SUPPLY AND 24VDC BATTERY STANDBY SUPPLY (IF APPLICABLE) MUST BE DISCONNECTED BEFORE PERFORMING ANY TYPE OF SYSTEM MAINTENANCE.
4. REMOVED
5. METER ALL FIELD WIRING CIRCUITS TO INSURE CONTINUITY & FREEDOM FROM GROUND FAULTS, SHORTS, OPENS, STRAY OR INDUCED VOLTAGE FAULTS, ETC. ALL CIRCUITS MUST BE METERED FOR PROPER RESISTANCE VALUES, INCLUDING E.O.L. DEVICES.
6. ALL A.C. CIRCUITS TO BE RUN SEPARATELY FROM D.C. CIRCUITS.
7. ALL DEVICES AND AUXILIARY FUNCTION WIRING SHALL BE INSTALLED USING EMT CONDUIT. ISOLATE ALL AC WIRING FROM DEVICE AND AUXILIARY WIRING.
8. DO NOT LOOP WIRES UNDER SCREW TERMINALS. BREAK WIRES TO MAINTAIN PROPER SUPERVISION. CONDUCTORS SHALL BE SOLID OR STRANDED COPPER. TWO WIRES ON THE SAME TERMINAL MUST NOT DIFFER BY MORE THAN TWO GAUGES. COMPLIANCE WITH ALL LOCAL CODES IS REQUIRED.
9. ALL STRANDED WIRE SHALL BE TERMINATED WITH RING, FORKED OR PIN TERMINALS.
10. ALL CIRCUIT DEVICES ARE SUPERVISED AND SHOULD BE CONNECTED AS SHOWN. PARALLEL BRANCHING IS NOT ALLOWED EXCEPT FOR THE SLC LOOP WHERE IT IS NOT RECOMMENDED.
11. WHEN DISARMING THE CONTROL UNIT ALWAYS OBSERVE THE FOLLOWING SEQUENCE: FIRST, DISABLE RELEASE CIRCUIT, SECOND DISCONNECT THE BATTERIES, AND THEN DISCONNECT AC POWER.
12. UNLESS SPECIFICALLY NOTED OTHERWISE, ALL WORK IS TO BE DONE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS, NATIONAL ELECTRIC CODE, LOCAL CODES AND A.H.J.
13. ALL SHIELDS AT JUNCTIONS BOXES ON DEVICES ARE TO BE TWISTED TOGETHER AND INSULATED FREE OF GROUNDS FOR A CONTINUOUS PATH. GROUND THE SHIELDS AT THE PANEL ONLY.
14. DETECTOR AND NOTIFICATION APPLIANCE CIRCUIT POLARITY SHALL BE OBSERVED.
15. INSTALLATION MATERIALS (I.E. CONDUIT, WIRE, FITTINGS, HANGERS, AND STANDARD BOXES) ARE NOT SUPPLIED BY ORR PROTECTION SYSTEMS, INC.
16. POWER LIMITED CIRCUITS THAT SPECIFY 600V INSULATED WIRE EXCEED THE REQUIREMENTS FOR NATIONAL ELECTRIC CODE.
17. TYPE FPL CABLE IS ACCEPTABLE FOR POWER LIMITED CIRCUITS AND IS IN ACCORDANCE WITH NATIONAL ELECTRIC CODE.
18. ALL WIRING TO RELEASE CIRCUIT OUTPUT AND NOTIFICATION APPLIANCE CIRCUITS MUST BE SHIELDED OR ELECTRICALLY ISOLATED FROM EACH OTHER. SHIELDED CONDUCTORS, MI CABLE, EMT OR RIGID CONDUIT MAY BE USED. COMPLIANCE WITH NATIONAL AND LOCAL FIRE CODES IS REQUIRED.
19. CONTROL PANEL WIRING SHALL HAVE SEPARATE COLORS FOR POSITIVE (+) AND NEGATIVE (-).
20. DISTANCE IS CALCULATED SO THE VOLTAGE AT THE MOST REMOTE DEVICE DOES NOT DROP BELOW THE MINIMUM OPERATING VOLTAGE OF THAT DEVICE. VOLTAGE IS REGULATED.
21. POWER FOR INTERCONNECT CIRCUIT IS SUPPLIED FROM A SEPARATE DISCONNECT OUTSIDE OF THIS PANEL.

ORR/ORR SUB	OTHERS	WIRING RESPONSIBILITY
	X	CONTROL PANEL 120/240VAC INPUT POWER
	X	EQUIPMENT POWER SHUTOFFS TO HAZARD
	X	BLDG. OR REMOTE ALARM TRAN
	X	HVAC SHUTDOWN
	X	LOW VOLTAGE WIRING

WIRING CLASS	
CAT. TYPE	CLASS
SLC	CLASS B
IDC	CLASS B
NAC	CLASS B

SIEMENS FIRE ALARM CONTROL PANEL WIRE TABLE

SYM	DESCRIPTION	WIRE CLASS	DISTANCE	AWG	CONDUCTORS
A	[illegible]	[illegible]		[illegible]	[illegible]
C	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
D	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
E	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
F	[illegible]	[illegible]		[illegible]	[illegible]
J	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

INSTALLATION NOTES

1. FIRE DETECTION SYSTEM SHALL BE INSTALLED IN ACCORDANCE WITH APPLICABLE CODES AS STATED ON PREVIOUS SHEETS.
2. FUNCTIONAL TESTING OF THE DETECTION AND CONTROL EQUIPMENT SHALL BE PERFORMED ACCORDING TO NATIONAL AND LOCAL FIRE CODES.
3. ALL AIR MOVING DEVICES AND CRITICAL EQUIPMENT MUST BE SHUT DOWN THROUGH THE EQUIPMENT CONTACTS UNLESS AIR IS RECIRCULATING ONLY IN THE PROTECTED ENCLOSURE AND MAKE-UP AIR IS STOPPED OR DAMPERED SHUT.
4. LOCATIONS SHOWN FOR THE DETECTORS ARE APPROXIMATE. DETECTORS MUST BE LOCATED WHERE SUITABLE FOR THE APPLICATION AND IN ACCORDANCE WITH NFPA 72. DETECTORS MUST NOT BE LOCATED WITHIN 3 FEET OF A SUPPLY GRILL. DETECTORS MOUNTED IN CEILING TILES SHALL BE POSITIONED SO THEY ARE IN THE CENTERLINE OF THE TILE, AND PREFERABLY IN THE CENTER OF THE TILE ITSELF.
5. PROTECT EQUIPMENT FROM DUST, DRILLING RESIDUE AND DAMAGE AT ALL TIMES.
6. DETECTORS SHALL NOT BE MOUNTED IN DIRECT AIR STREAM OF AIR SUPPLY OUTLETS.
7. INSTALLING CONTRACTOR SHALL RETURN ONE SET OF ACCURATELY MARKED DRAWINGS FOR "AS BUILT" PURPOSES.
8. FOR ADDITIONAL INSTALLATION INSTRUCTIONS, REFER TO MANUFACTURER'S DATA SHEETS AND INSTALLATION INSTRUCTIONS.
9. WIRING SHALL BE IN ACCORDANCE WITH WIRE TABLE WITH RESPECT TO CONDUCTOR SIZE, TYPE, QUANTITY AND COLOR CODE. CONDUCTORS SHALL BE PERMANENTLY MARKED FOR FUTURE IDENTIFICATION.
10. ALL PENETRATIONS THROUGH WALLS, FLOORS OR CEILINGS SHALL BE SEALED AND COVERED WITH AN ESCUTCHEON PLATE. IF THE PENETRATION IS THROUGH A RATED ASSEMBLY, THEN AN APPROPRIATE FIRE STOPPING MATERIAL MUST BE UTILIZED.
11. ALL WALL MOUNTED NOTIFICATION DEVICES SHALL BE MOUNTED AT A HEIGHT OF 80" A.F.F. OR 6" BELOW DROPPED CEILING, WHICHEVER IS LESS.
12. ALL MANUAL PULL STATIONS SHALL BE MOUNTED 48" A.F.F. TO THE ACTIVATION DEVICE.
13. WHERE DETECTION IS NOT REQUIRED DURING CONSTRUCTION, DETECTORS SHALL TO BE INSTALLED UNTIL AFTER ALL OTHER CONSTRUCTION TRADES HAVE COMPLETED CLEANUP.
14. DETECTORS THAT HAVE BEEN INSTALLED PRIOR TO FINAL CLEANUP SHALL BE CLEANED OR REPLACED OR THEY WILL NOT BE PERMITTED.
15. WIRING SHALL RUN CONTINUOUS FROM FPP TO FIRST DEVICE ON A CIRCUIT AND THEN FROM DEVICE TO DEVICE WITHOUT SPLICING IN PULL BOXES OR OTHER BACK BOXES OF DIFFERENT CIRCUITS.
16. ALL WIRING SHALL BE METERED, VERIFIED TO BE CONTINUOUS, FREE OF GROUND FAULTS AND FREE OF SHORTS BETWEEN CONDUCTORS AND OTHER CIRCUITS PRIOR TO FINAL EQUIPMENT TERMINATION.
17. THE ELECTRICAL CONTRACTOR SHALL CLEAN ALL DIRT AND DEBRIS FROM THE OUTSIDE AND INSIDE OF THE FIRE ALARM BACK BOXES AND JUNCTION BOXES AFTER COMPLETION OF THEIR INSTALLATION.

1/23/25 ISSUED FOR PERMIT

SEQUENCE OF OPERATIONS

[illegible]	[illegible]

(2) SEQUENCE OF OPERATIONS
SCALE: N.T.S.

ORR Protection

Design Group
2100 Nelson Miller Pkwy
Louisville, KY 40223
Phone 502 244 4500
Fax 502 244 4554

Date: January 16, 2025
Project: FLUENCE - CONVERGENT VAUGHN 1E ENERGY STORAGE
Job No: [illegible]
Rev No: 90% DESIGN

BILL OF MATERIAL

ITEM	SYMBOL	TOTAL REQ	PART NO	MANUFACTURER	DESCRIPTION	REMARKS
1		2	FC922-US	SIEMENS	252-POINT SYSTEM WITH 170W POWER SUPPLY AND STANDARD OPERATOR INTERFACE. CONSISTS OF: ONE FC2025-U1, ONE FP2011-U1, ONE FC2025-U1	S54400-C144-A1
2		2	FHO2002-RO	SIEMENS	RED 2 HEIGHT UNIT 1 WINDOW ENCLOSURE KIT (FOR FC922, FC924) CONSISTS OF: ONE FHD2002-R1, ONE FHD2004-U1, ONE FHD2000-U1, ONE FHD2002-RO	S54400-C58-A2
3		2	FCA2002-U1	SIEMENS	BDM BATTERY DISCONNECT MODULE	S54400-B145-A1
4		2	FCI2011-U1	SIEMENS	NAC MODULE (1A/25)	S54400-A54-A1
5		1	FCA2015-U1	SIEMENS	DIALER MODULE (DACT)	S54400-A60-A1
6		2	FN2001-U1	SIEMENS	SAFEDLINK MODULE	S54400-A63-A1
7		25	FC924-US	SIEMENS	504-POINT SYSTEM WITH 170W POWER SUPPLY AND STANDARD OPERATOR INTERFACE. CONSISTS OF: ONE FC2025-U1, ONE FP2011-U1, ONE FC2013-A1	S54400-C19-A1
8		25	FHO2002-RO	SIEMENS	RED 2 HEIGHT UNIT 1 WINDOW ENCLOSURE KIT (FOR FC922, FC924) CONSISTS OF: ONE FHD2002-R1, ONE FHD2004-U1, ONE FHD2000-U1, ONE FHD2002-RO	S54400-C58-A2
9		25	FCA2002-U1	SIEMENS	BDM BATTERY DISCONNECT MODULE	S54400-B145-A1
10		25	FCI2011-U1	SIEMENS	NAC MODULE (3A/70)	S54400-A34-A1
11		25	FN2001-U1	SIEMENS	SAFEDLINK MODULE	S54400-A63-A1
12		208	DB-11	SIEMENS	LOW PROFILE SURFACE MOUNT BASE	500-094151
13		208	OOHC941	SIEMENS	MULTI-CRITERIA FIRE DETECTOR SMOKE / HEAT / CO	S54320-F6-A2
14		1	MSM-KO-WP	SIEMENS	WEATHERPROOF MANUAL PULL STATION	500-096713
15		1	XTRI-M	SIEMENS	SINGLE MINIATURE INPUT MODULE	S54370-D4-A1
16		1	XTRI-D	SIEMENS	DUAL INPUT MODULE, CLASS X CAPABLE, BUILT IN ISOLATOR	S54370-B2-A1
17		46	FDCIO422	SIEMENS	4-INPUT / 4-OUTPUT INTERFACE MODULE	
18		24	AS-PS-R-WP	SIEMENS	WEATHERPROOF HORN/STROBE	500-636010
19		46	BAT12-18	OPS	BATTERY 12V 18 AH	
20		4	BAT12-26	OPS	BATTERY 12V 26 AH	
21		1	TBD	TBD	COMMERCIAL FIRE ALARM COMMUNICATOR	PROVIDED BY RCS

(3) BILL OF MATERIALS
SCALE: N.T.S.

FLUENCE

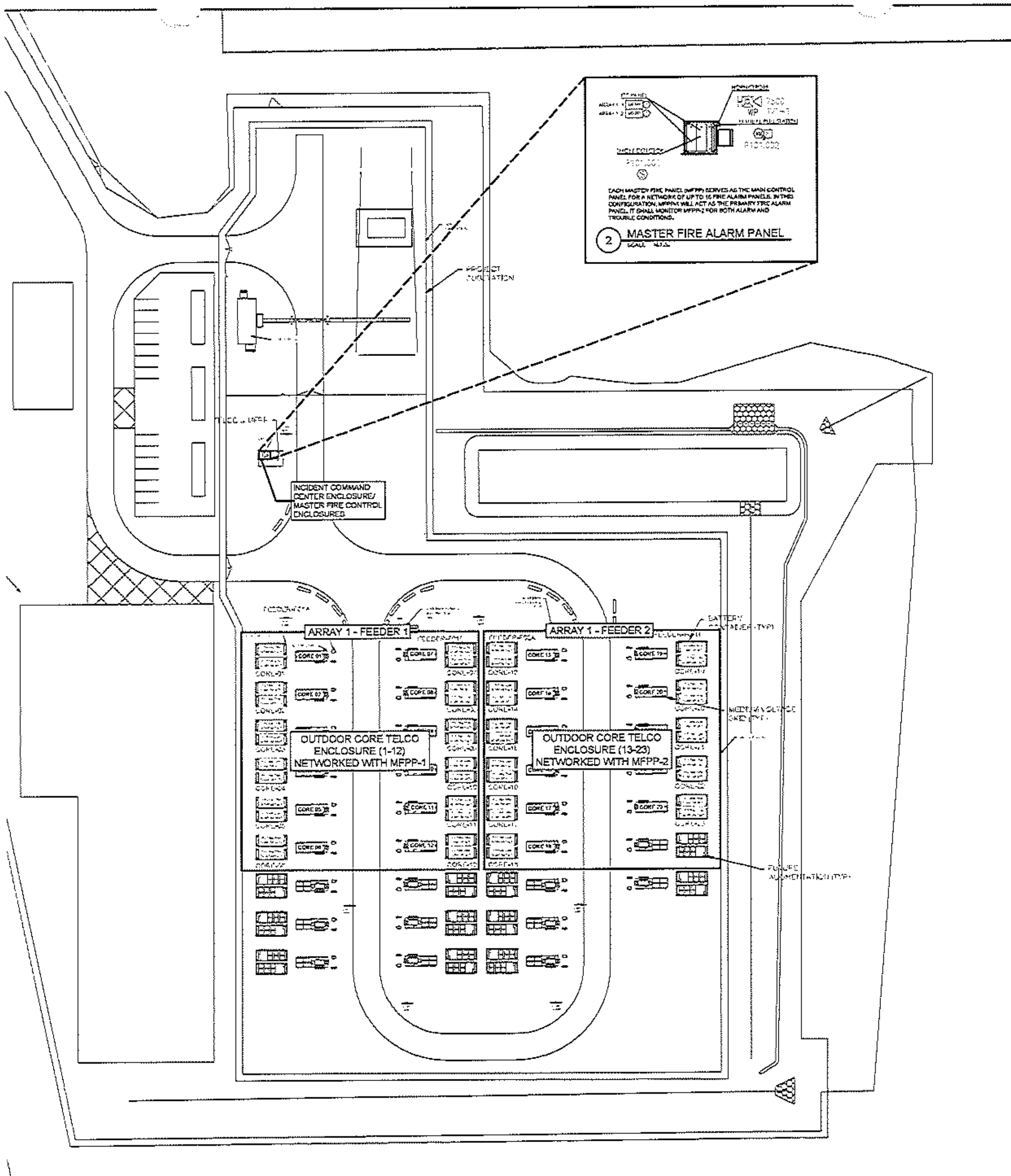
ORR Protection

REGIONAL OFFICE ADDRESS
421 JETSONS BLVD. #2
FRISCO, TX 75070

CORPORATE OFFICE ADDRESS
2100 NELSON MILLER PKWY
LOUISVILLE, KY 40223
TELEPHONE: 502-244-4500

	FLUENCE - AMADOR BESS
	VAN ZANDT COUNTY, TX
	FIRE ALARM
	[illegible]
	SEQUENCE OF OPERATIONS & PROJECT NOTES BILL OF MATERIALS
C. ENGLISH, S.E.T.	100595
M60096	09 DEC 2024
014023	NTS
[illegible]	23-Jan-25

FA1.02



1 SITE PLAN ENCLOSURE LAYOUT
SCALE: N.T.S.

ARRAY 1				
MASTER	TELCO CORE RACK #	TAG	NODES	ENCLOSURES PER NODE
MFPP 1	1	F13A-C01-CSF1	2	1
MFPP 1	2	F13A-C02-CSF1	2	1
MFPP 1	3	F13A-C03-CSF1	2	1
MFPP 1	4	F13A-C04-CSF1	2	1
MFPP 1	5	F13A-C05-CSF1	2	1
MFPP 1	6	F13A-C06-CSF1	2	1
MFPP 1	7	F13B-C01-CSF1	2	1
MFPP 1	8	F13B-C02-CSF1	2	1
MFPP 1	9	F13B-C03-CSF1	2	1
MFPP 1	10	F13B-C04-CSF1	2	1
MFPP 1	11	F13B-C05-CSF1	2	1
MFPP 1	12	F13B-C06-CSF1	2	1
MFPP 2	13	F12A-C01-CSF1	2	1
MFPP 2	14	F12A-C02-CSF1	2	1
MFPP 2	15	F12A-C03-CSF1	2	1
MFPP 2	16	F12A-C04-CSF1	2	1
MFPP 2	17	F12A-C05-CSF1	2	1
MFPP 2	18	F12A-C06-CSF1	2	1
MFPP 2	19	F12B-C01-CSF1	2	1
MFPP 2	20	F12B-C02-CSF1	2	1
MFPP 2	21	F12B-C03-CSF1	2	1
MFPP 2	22	F12B-C04-CSF1	2	1
MFPP 2	23	F12B-C05-CSF1	2	1

EACH FEEDER CORRESPONDS TO AN MFPP LOOP. THE NAMES OF THE FEEDERS WILL BE PROVIDED WITH 90% NETWORK TOPOLOGY DRAWINGS.

LEGEND	
LEGEND	DESCRIPTION
[symbol]	MASTER FIRE ALARM CONTROL PANEL
[symbol]	FIRE ALARM CONTROL PANEL
[symbol]	ADDRESSABLE MANUAL PULL STATION
[symbol]	MULTICRITERIA SMOKE DETECTOR
[symbol]	ADDRESSABLE INPUT/OUTPUT MODULE
[symbol]	ADDRESSABLE MINI MONITOR MODULE
[symbol]	ADDRESSABLE DUAL MONITOR MODULE
HSKWP	WEATHERPROOF HORN/STROBE
[symbol]	END OF LINE RESISTOR

ADDRESS LABEL CLARIFICATION

KEY NOTES
1. 120VAC SUPPLY

WIRE LABEL LEGEND		
SYM	DESCRIPTION	CONDUCTORS
A	ADDRESSABLE SLC LOOP	[illegible]
C	NOTIFICATION APPLIANCE CIRCUIT	[illegible]
D	24 DC POWER	[illegible]
E	[illegible]	[illegible]
F	120VAC SUPPLY	[illegible]
J	NETWORK CIRCUIT	[illegible]

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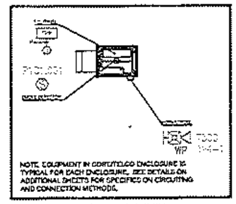
ORR Protection

FA2.01



3 TYPICAL CORE/ TELCO ENCLOSURE
SCALE: N.T.S.

ARRAY 1				
MASTER	TELCO CORE RACK #	TAG	NODES	ENCLOSURES PER NODE
MFPP 1	1	F11A-C01-CSF1	2	1
MFPP 1	2	F11A-C02-CSF1	2	1
MFPP 1	3	F11A-C03-CSF1	2	1
MFPP 1	4	F11A-C04-CSF1	2	1
MFPP 1	5	F11A-C05-CSF1	2	1
MFPP 1	6	F11A-C06-CSF1	2	1
MFPP 1	7	F11B-C01-CSF1	2	1
MFPP 1	8	F11B-C02-CSF1	2	1
MFPP 1	9	F11B-C03-CSF1	2	1
MFPP 1	10	F11B-C04-CSF1	2	1
MFPP 1	11	F11B-C05-CSF1	2	1
MFPP 1	12	F11B-C06-CSF1	2	1
MFPP 2	13	F12A-C01-CSF1	2	1
MFPP 2	14	F12A-C02-CSF1	2	1
MFPP 2	15	F12A-C03-CSF1	2	1
MFPP 2	16	F12A-C04-CSF1	2	1
MFPP 2	17	F12A-C05-CSF1	2	1
MFPP 2	18	F12A-C06-CSF1	2	1
MFPP 2	19	F12B-C01-CSF1	2	1
MFPP 2	20	F12B-C02-CSF1	2	1
MFPP 2	21	F12B-C03-CSF1	2	1
MFPP 2	22	F12B-C04-CSF1	2	1
MFPP 2	23	F12B-C05-CSF1	2	1

EACH FEEDER CORRESPONDS TO AN MFPP LOOP. THE NAMES OF THE FEEDERS WILL BE PROVIDED WITH 90% NETWORK TOPOLOGY DRAWINGS.

LEGEND	
LEGEND	DESCRIPTION
MFACP	MASTER FIRE ALARM CONTROL PANEL
FACP	FIRE ALARM CONTROL PANEL
	ADDRESSABLE MANUAL PULL STATION
	MULTICRITERIA SMOKE DETECTOR
	ADDRESSABLE INPUT/OUTPUT MODULE
	ADDRESSABLE MINI MONITOR MODULE
	ADDRESSABLE DUAL MONITOR MODULE
	WEATHERPROOF HORN/STROBE
	END OF LINE RESISTOR

ADDITIONAL LABEL CLARIFICATION

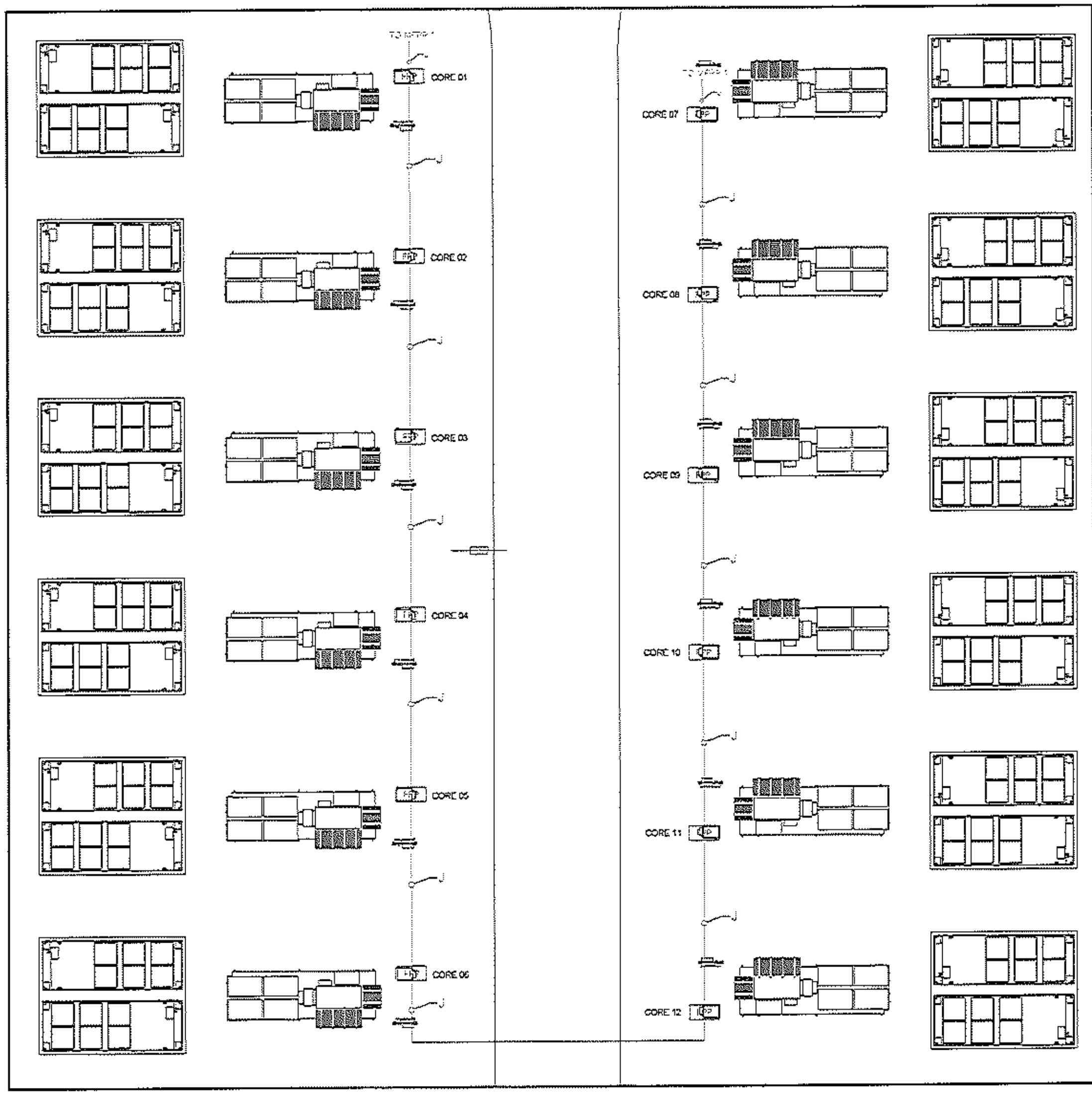
1V1-1

P1C1.001

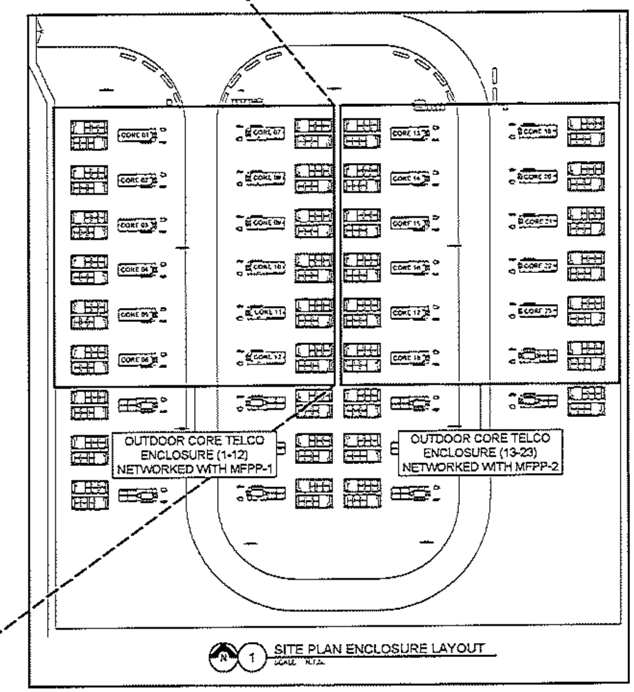
120VAC SUPPLY

WIRE LABEL LEGEND		
SYM	DESCRIPTION	CONDUCTORS
A	[illegible]	[illegible]
C	[illegible]	[illegible]
D	[illegible]	[illegible]
E	[illegible]	[illegible]
F	120VAC SUPPLY	[illegible]
J	NETWORK CIRCUIT	[illegible]

1/23/25 ISSUED FOR PERMIT



2 OUTDOOR CORE/TELCO ENCLOSURES (01-12) SITE PLAN & NETWORK WIRING



1 SITE PLAN ENCLOSURE LAYOUT
SCALE: N.T.S.

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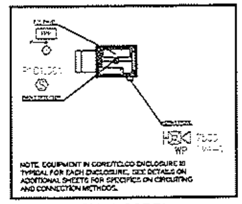
ORR Protection

FA2.02



③ TYPICAL CORE/ TELCO ENCLOSURE
SCALE: N.T.S.

ARRAY 1				
MASTER	TELCO CORE RACK #	TAG	NODES	ENCLOSURES PER NODE
MFPP 1	1	F11A-C01-CSF1	2	1
MFPP 1	2	F11A-C02-CSF1	2	1
MFPP 1	3	F11A-C03-CSF1	2	1
MFPP 1	4	F11A-C04-CSF1	2	1
MFPP 1	5	F11A-C05-CSF1	2	1
MFPP 1	6	F11A-C06-CSF1	2	1
MFPP 1	7	F11B-C01-CSF1	2	1
MFPP 1	8	F11B-C02-CSF1	2	1
MFPP 1	9	F11B-C03-CSF1	2	1
MFPP 1	10	F11B-C04-CSF1	2	1
MFPP 1	11	F11B-C05-CSF1	2	1
MFPP 1	12	F11B-C06-CSF1	2	1
MFPP 2	13	F12A-C01-CSF1	2	1
MFPP 2	14	F12A-C02-CSF1	2	1
MFPP 2	15	F12A-C03-CSF1	2	1
MFPP 2	16	F12A-C04-CSF1	2	1
MFPP 2	17	F12A-C05-CSF1	2	1
MFPP 2	18	F12A-C06-CSF1	2	1
MFPP 2	19	F12B-C01-CSF1	2	1
MFPP 2	20	F12B-C02-CSF1	2	1
MFPP 2	21	F12B-C03-CSF1	2	1
MFPP 2	22	F12B-C04-CSF1	2	1
MFPP 2	23	F12B-C05-CSF1	2	1

EACH FEEDER CORRESPONDS TO AN MFPP LOOP. THE NAMES OF THE FEEDERS WILL BE PROVIDED WITH 90% NETWORK TOPOLOGY DRAWINGS.

LEGEND	
LEGEND	DESCRIPTION
	MASTER FIRE ALARM CONTROL PANEL
	FIRE ALARM CONTROL PANEL
	ADDRESSABLE MANUAL PULL STATION
	MULTICRITERIA SMOKE DETECTOR
	ADDRESSABLE INPUT/OUTPUT MODULE
	ADDRESSABLE MINI-MONITOR MODULE
	ADDRESSABLE DUAL MONITOR MODULE
WP	WEATHERPROOF HORN/STROBE
	END OF LINE RESISTOR

ADDRESS LABEL CLARIFICATION

① 120VAC SUPPLY

WIRE LABEL LEGEND		
SYM	DESCRIPTION	CONDUCTORS
A		
C	NOTIFICATION APPLIANCE CIRCUIT	
D	24 DC POWER	
L		
F		
J		

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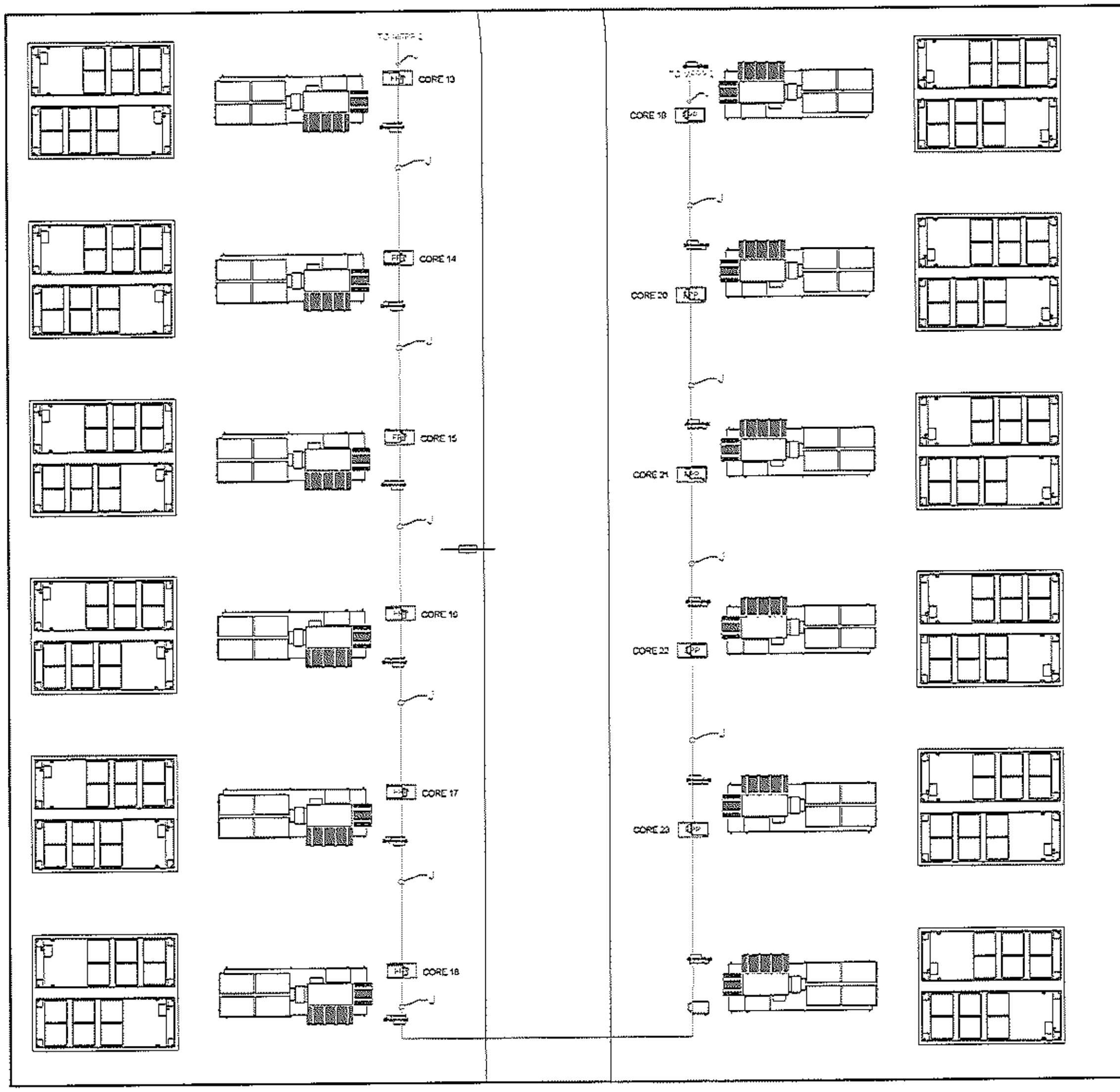
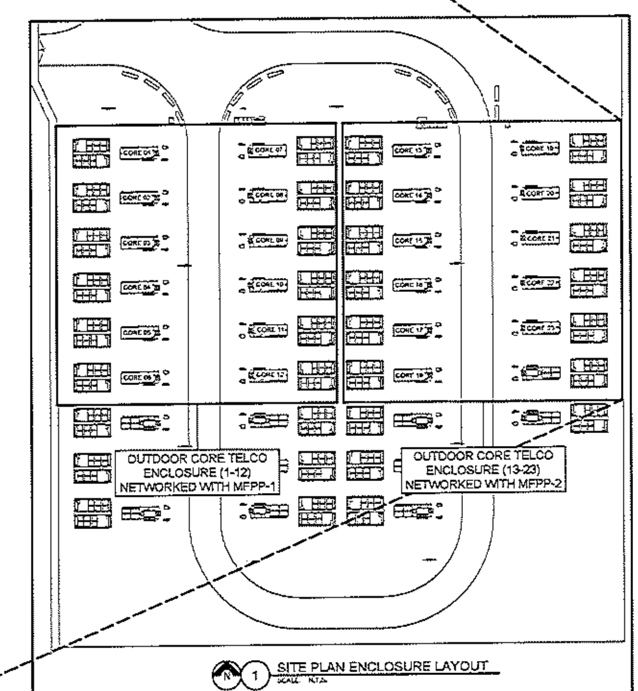


② OUTDOOR CORE/TELCO ENCLOSURES (13-23)
SITE PLAN & NETWORK WIRING



① SITE PLAN ENCLOSURE LAYOUT
SCALE: N.T.S.

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FLUENCE - AMADOR BESS

FIRE ALARM

FA2.03

LEGEND

LEGEND	DESCRIPTION
	MASTER FIRE ALARM CONTROL PANEL
	FIRE ALARM CONTROL PANEL
	ADDRESSABLE MANUAL PULL STATION
	MULTICRITERIA SMOKE DETECTOR
	ADDRESSABLE INPUT/OUTPUT MODULE
	ADDRESSABLE MINI-MONITOR MODULE
	ADDRESSABLE DUAL MONITOR MODULE
	WEATHERPROOF HORN/STROBE
	END OF LINE RESISTOR

ADDRESSABLE CLARIFICATION

1V1-1

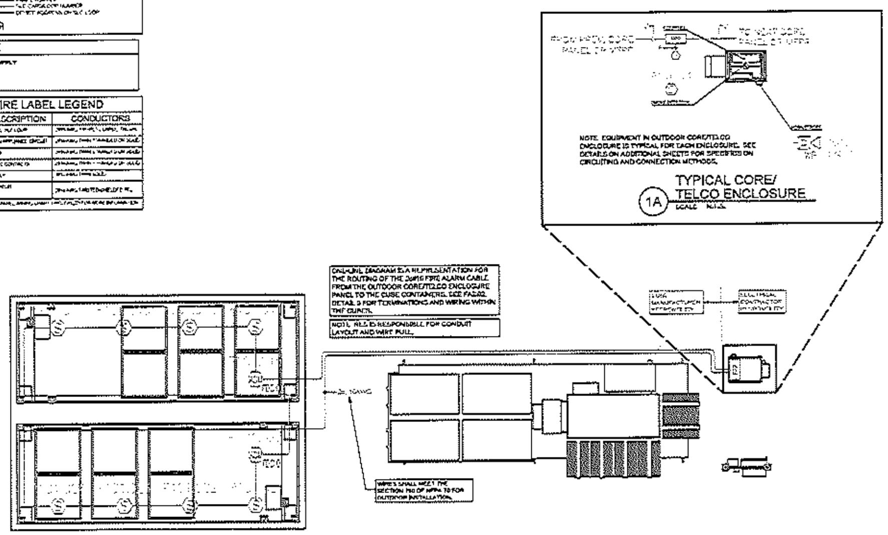
PRC1.001

[illegible]

① 120VAC SUPPLY

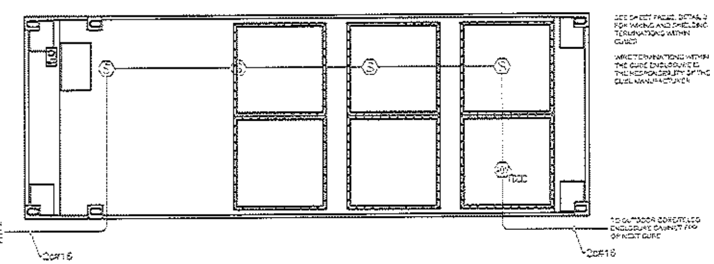
WIRE LABEL LEGEND

SYM	DESCRIPTION	CONDUCTORS
A	[illegible]	[illegible]
C	NOTIFICATION APPLIANCE CIRCUIT	[illegible]
D	24VDC POWER	[illegible]
E	RELAY FORM C CONTACTS	[illegible]
F	[illegible] SUPPLY	[illegible]
J	ACTUATOR CIRCUIT	[illegible]

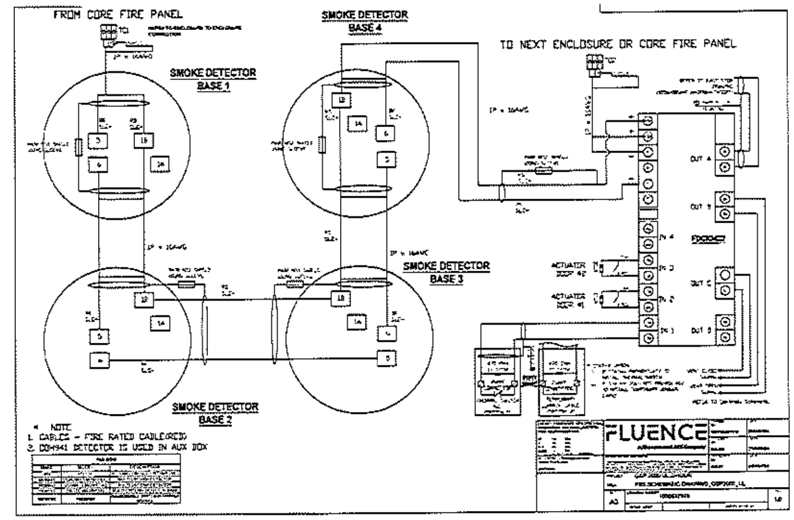


(1A) TYPICAL CORE/ TELCO ENCLOSURE
SCALE: N.T.S.

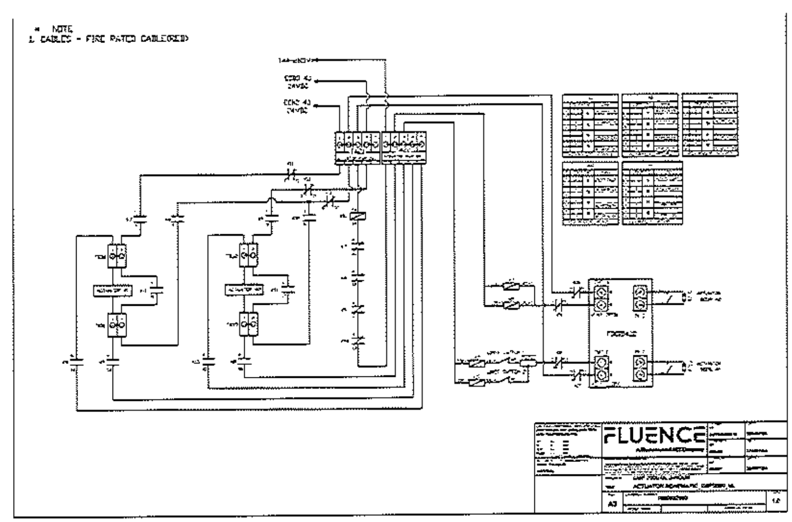
(1) TYPICAL TELCO/CORE AND ENCLOSURE ONE LINE



(2) TYPICAL ENCLOSURE LAYOUT DETAIL
SCALE: N.T.S.



(3) TYPICAL GSP-2000 WIRING
SCALE: N.T.S.



(4) TYPICAL ACTUATOR SCHEMATIC
SCALE: N.T.S.

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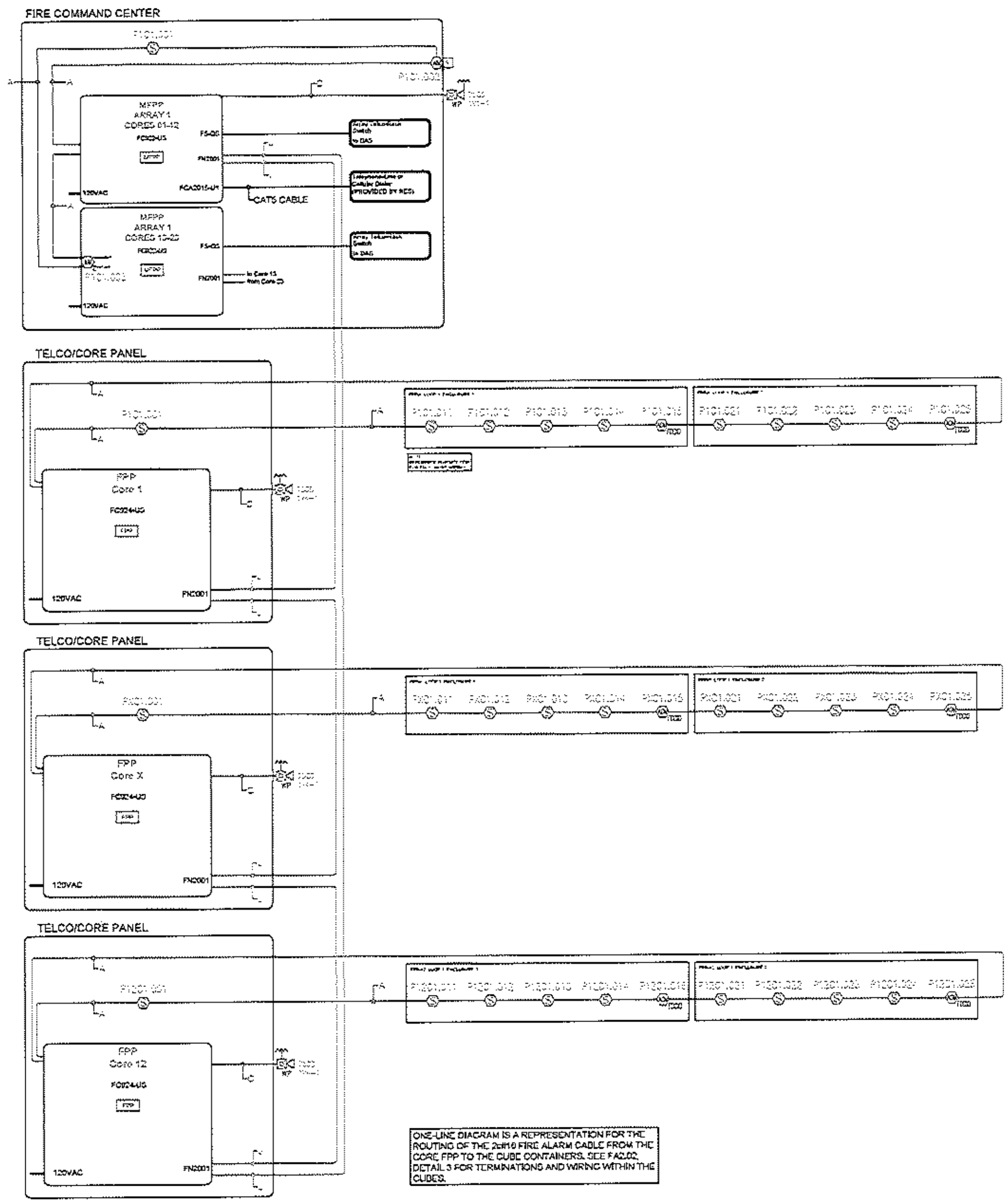
FLUENCE - AMADOR RCCD

FIRE ALARM

SIEMENS

TYPICAL TELCO/CORE CONTROL PANEL RISER SCHEMATIC

FA2.04



1 MASTER CONTROL PANEL RISER DIAGRAM
SCALE: N.T.S.

LEGEND

LEGEND	DESCRIPTION
	MASTER FIRE ALARM CONTROL PANEL
	FIRE ALARM CONTROL PANEL
	ADDRESSABLE MANUAL PULL STATION
	MULTICRITERIA SMOKE DETECTOR
	ADDRESSABLE AMPLIFIER/OUTPUT MODULE
	ADDRESSABLE MINI-MONITOR MODULE
	ADDRESSABLE DUAL MONITOR MODULE
	WEATHERPROOF HORN/STROBE
	END OF LINE RESISTOR

ADDRESS/LABEL IDENTIFICATION

KEYNOTES
1 120VAC SUPPLY

WIRE LABEL LEGEND

SYM	DESCRIPTION	CONDUCTORS
A	ADDRESSABLE SLC LOOP	[illegible]
C	NOTIFICATION APPLIANCE CIRCUIT	[illegible]
D	[illegible]	[illegible]
L	[illegible]	[illegible]
F	[illegible]	[illegible]
J	NETWORK CIRCUIT	[illegible]

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FA3.01

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Lawrence L. Clay — 23 JAN 2025

VOLTAGE DROP CALCULATIONS

Wire resistance is taken from Chapter 9, Table 8 of the NEC 760 (NFPA 70)

Circuit Name	Quantity	Alarm Current (amps)	Supply Voltage VDC	Wire Gauge	Resistance (per ft.)	Resistance Per Pair (per ft.)	Length of Circuit (ft.)	Total Voltage Drop (VDC)	Last Device Voltage	Voltage Drop (%)
[illegible] (MFPP-1)	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Voltage Drop = Resistance per Pair x Current x Length of Circuit										
Supply Voltage is calculated at 85% of primary input voltage per NFPA 72, 2019 edition, Paragraph 10.3.5										

MASTER PANEL (MFPP-1)
BATTERY CALCULATION

(1)

MASTER PANEL (MFPP-2)
BATTERY CALCULATION

(2)

VOLTAGE DROP CALCULATIONS

Wire resistance is taken from Chapter 9, Table 8 of the NEC 760 (NFPA 70)

Circuit Name	Quantity	Alarm Current (amps)	Supply Voltage VDC	Wire Gauge	Resistance (per ft.)	Resistance Per Pair (per ft.)	Length of Circuit (ft.)	Total Voltage Drop (VDC)	Last Device Voltage	Voltage Drop (%)
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Voltage Drop = Resistance per Pair x Current x Length of Circuit										
Supply Voltage is calculated at 85% of primary input voltage per NFPA 72, 2019 edition, Paragraph 10.3.5										

TYPICAL TELCO/CORE PANEL (2 ENCLOSURES)
BATTERY CALCULATION

(3)

FLUENCE

OMR Protection

ISO 9001 Certified

CONTROL PANEL, BATTERY CALCULATIONS

FA3.02

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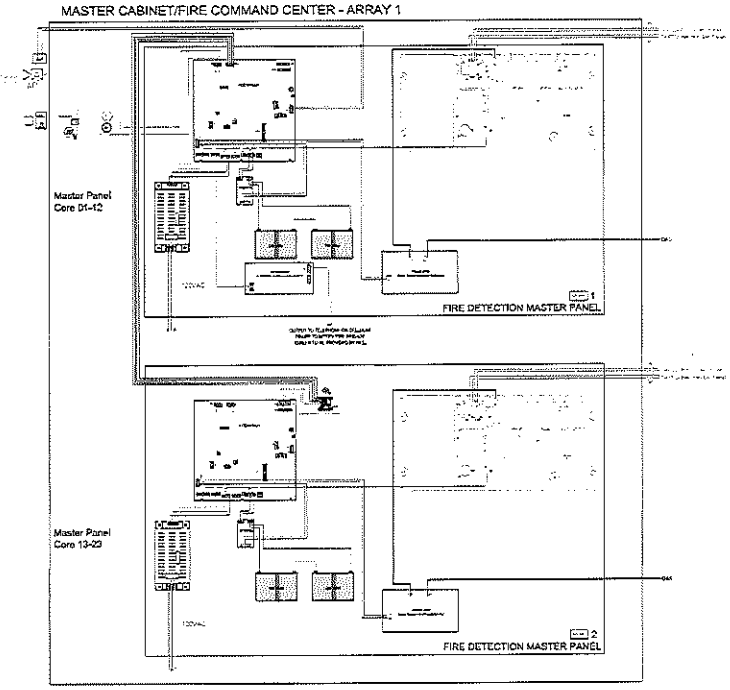
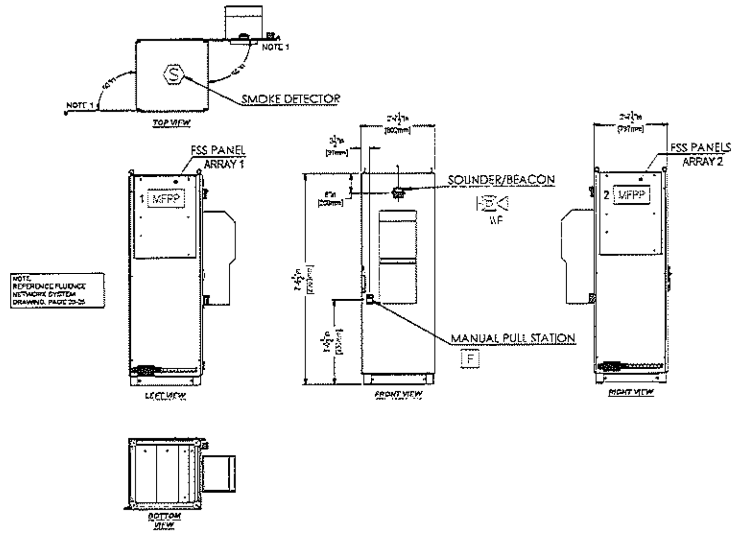


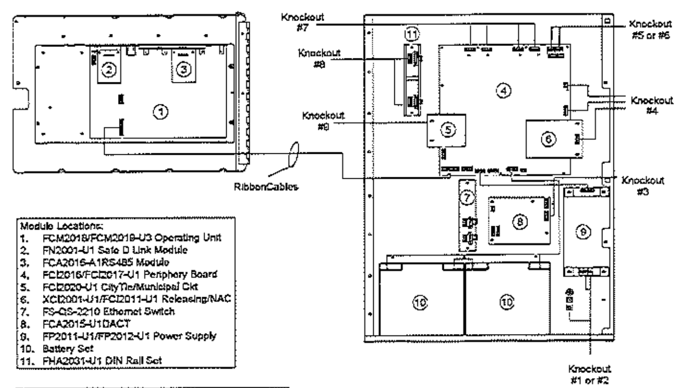
1 MASTER FIRE COMMAND ENCLOSURE DETAIL
SCALE: N.T.S.

NOTES:
1. USE STANDARD 130° HINGES ON REAR AND FRONT DOOR.
2. MFPP CABINET #1 AND #2 WILL BE PHYSICALLY IDENTICAL INCLUDING IDENTICAL POWER REQUIREMENTS. EXCEPT FOR LABELS.



DO NOT LIFT CABINET WITH CABLES AT 45°. CABINET MUST BE LIFTED WITH CABLES AT 90°		
SPECIFICATIONS		
WEIGHT		TBD
POWER CIRCUIT 1- MASTER FPP CABINETS	INPUT VOLTAGE	230 VAC (SINGLE PHASE)
	INPUT POWER (WATTS)	750
POWER CIRCUIT 2- HVAC AND INTERIOR LIGHTS	INPUT VOLTAGE	230 VAC (SINGLE PHASE)
	INPUT POWER (WATTS)	1400

2 MASTER FIRE COMMAND ENCLOSURE
SCALE: N.T.S.



Module Locations:
1. FCM2018/FCM2019-U3 Operating Unit
2. FN2001-U1 Safe D Link Module
3. FCA2016-A1RS485 Module
4. FCI2016/FCI2017-U1 Periphery Board
5. FCI2020-U1 CityTie/Municipal Ckt
6. XCI2001-U1/FCI2011-U1 Releasing/NAC
7. FS-QS-2210 Ethernet Switch
8. FCA2015-U1DACT
9. FP2011-U1/FP2012-U1 Power Supply
10. Battery Set
11. FHA2031-U1 DIN Rail Set

Recommend Wiring Routes:
Knockouts: 1,2,3,5,6 are Non-Power Limited wiring only
Knockouts: 4,7,8,9,10,11 are for Power Limited only

NOTE:
REFERENCE FLUENCE NETWORK SYSTEM DRAWING, PAGE 25-26

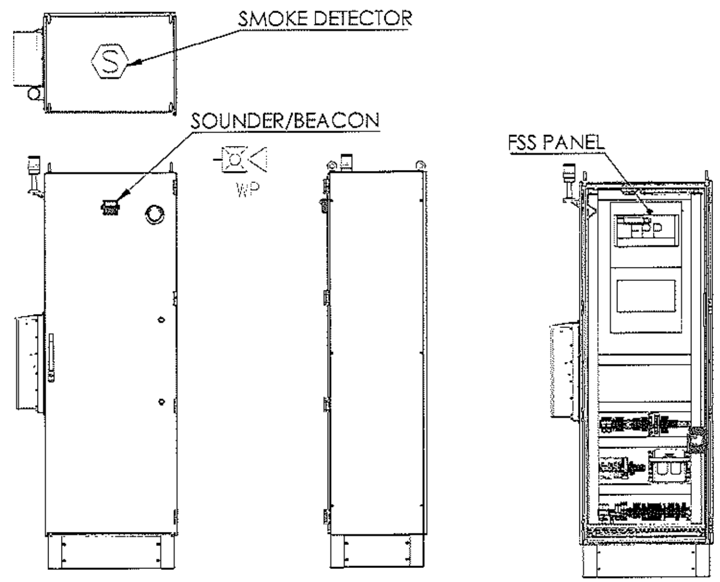
3 MASTER PANEL CABINET
FIRE ALARM CONTROL PANEL MODULE LOCATION
SCALE: N.T.S.

FLUENCE

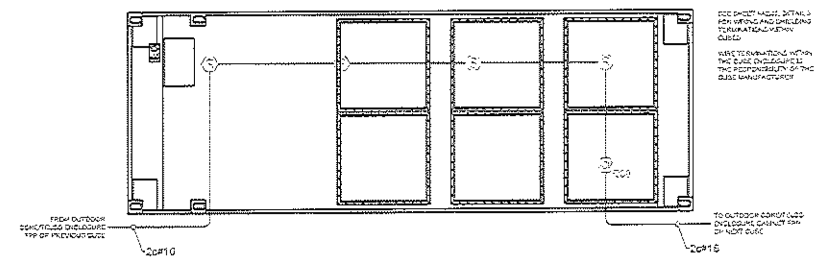
ORR Protection

FLUENCE - AMADOR DESS
VAN ZANDT COUNTY TX
FIRE ALARM
SIEMENS
MASTER FIRE COMMAND ENCLOSURE AND PANEL DETAILS
C. ENGLISH S.E.T.
06 DEC 2024
NTS
23 JAN 25

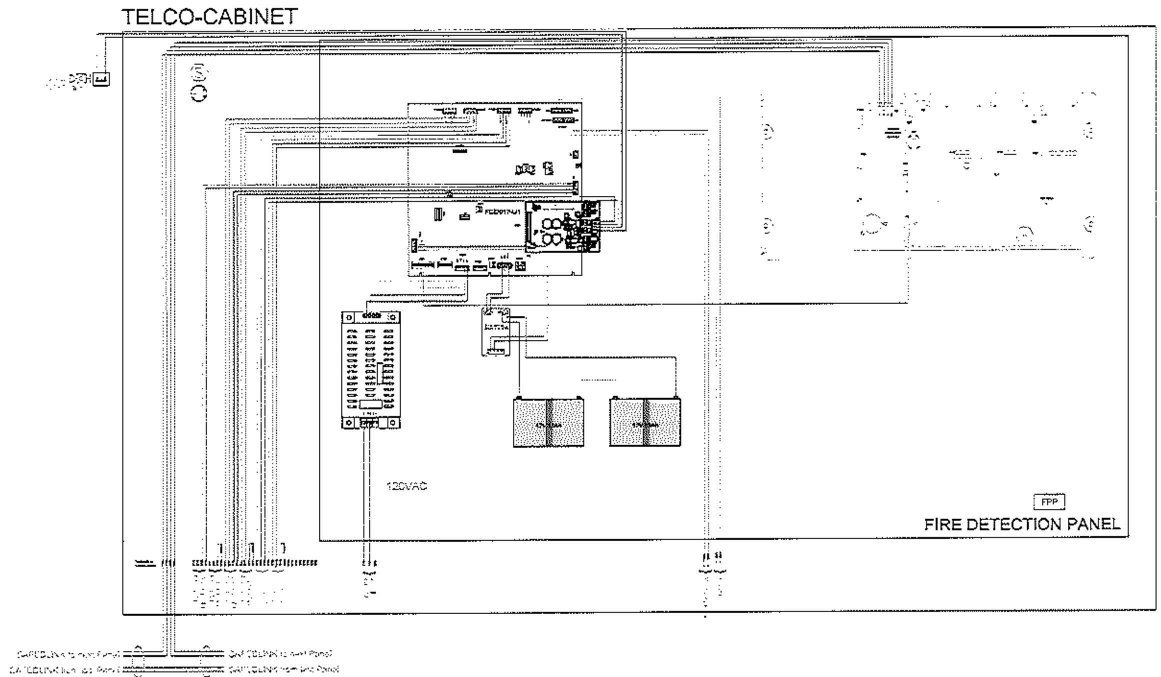
FA5.01



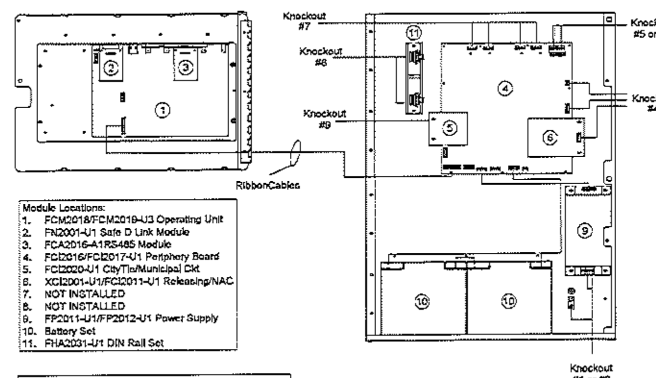
1 TELCO CABINET / CORE CABINET
SCALE: N.T.S.



3 TYPICAL CUBE LAYOUT DETAIL
SCALE: N.T.S.



2 TELCO CABINET / CORE CABINET
FIRE ALARM CONTROL PANEL SCHEMATIC
SCALE: N.T.S.



Module Locations:
1. FCM2018/FCM2019-U3 Operating Unit
2. FN2001-U1 Safe D Link Module
3. FCA2016-A1RS485 Module
4. FCI2016/FCI2017-U1 Periphery Board
5. FCI2020-U1 CityTie/Municipal Ckt
6. XCI2001-U1/FCI2011-U1 Releasing/NAC
7. NOT INSTALLED
8. NOT INSTALLED
9. FP2011-U1/FP2012-U1 Power Supply
10. Battery Set
11. FHA2031-U1 DIN Rail Set

Recommend Wiring Routes:
Knockouts: 1,2,3,5,6 are Non-Power Limited wiring only
Knockouts: 4,7,8,9,10,11 are for Power Limited only

4 TELCO CABINET / CORE CABINET
FIRE ALARM CONTROL PANEL MODULE LOCATION
SCALE: N.T.S.

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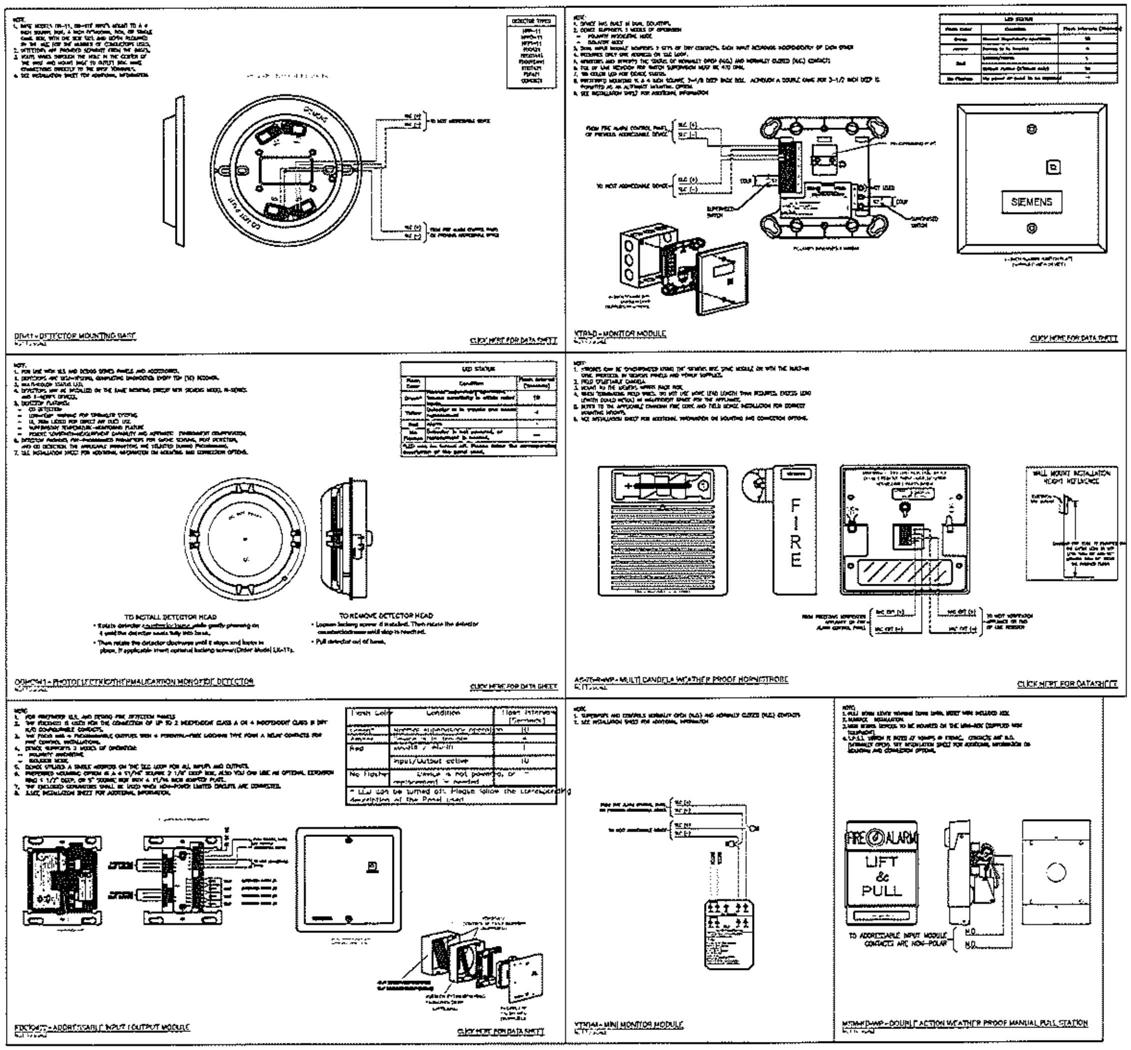
FLUENCE - HARBOR (?)
VAN ZANDT COUNTY, TX
FIRE ALARM
TYPICAL CORE TELCO CABINET & CUBE DETAILS

FA5.02



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ORR Protection

FLUENCE - AMAZON BESS

FIRE ALARM

TYPICAL DEVICE WIRING DETAILS

FA5.03

Stormy Canady

APPENDIX
6A

Integration Commissioning Plan

Amador

100MW / 200MWh

Contents

DRAFT

Revision History

Issue	Date	Change
00	02/03/2025	Initial Draft Release of the Template

DRAFT

Acronyms Table

Acronym	Description
AC	Alternating Current
BESS	Battery Energy Storage System
BMS	Battery Management System
BSE	Battery Storage Enclosure
CSC	Cell Supervision Circuit
DC	Direct Current
EMS	Energy Management System
ESF	Energy Storage Facility
ESS	Energy Storage System
HFRT	High Frequency Ride-Through
HMI	Human Machine Interface
HSQE	Health, Safety, Quality, Environmental
HVAC	Heating, Ventilation, and Air Conditioning
HVRT	High Frequency Ride-Through
IFC	Issued for Construction
IMM	Insulation Monitoring Module
JHA	Job Hazard Analysis
LFRT	Low Frequency Ride-Through
LOTO	Lockout Tagout
LVRT	Low Voltage Ride-Through
MBMU	Master Battery Management Unit
MCAN	CAN Bus communications between the MBMU and the SBMU
MSD	Module Safety Disconnect
PCS	Power Conversion System
POC	Point of Connection
PPE	Personal Protective Equipment
RES	Renewable Energy Systems
SBMU	Slave Battery Management Unit
UPS	Uninterruptible Power Supply

Introduction

This document delineates the commissioning activities and corresponding responsibilities concerning the **Amador Battery Energy Storage System** project. The BESS project consists of 45 *BESS Containers*, collectively designed to attain a projected system capacity of 100MW/200MWH. The Amador BESS project is comprised of 45 Battery Energy Storage System (BESS) containers situated in Van Zandt County, Texas.

The following document outlines the tasks, processes, procedures, and deliverables essential for the safe commissioning and validation of the functionality and performance of the BESS project and its components. Additionally, it highlights the primary objectives of each commissioning stage, outlines the expected tasks, establishes acceptance criteria for tasks, and provides detailed guidance for the proper documentation of these processes.

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Safety Measures

1. **Qualified Personnel:** Commissioning activities should be conducted exclusively by qualified individuals, defined as technically competent personnel well-versed in all safety information and established safety protocols.
2. **Daily Safety Meetings:** A mandatory safety meeting must be conducted each morning prior to commencing any commissioning or testing tasks.
3. **Hazard Identification:** All potential hazards are to be meticulously identified and documented in the Job Hazard Analysis (JHA).
4. **Communication Protocol:** Clear notifications signaling the commencement and cessation of each test must be promptly communicated to all parties involved in the process.
5. **Safety Signage:** Adequate warning and safety signs should be conspicuously posted in the immediate vicinity of the testing area both before and during the test.
6. **Personal Protective Equipment (PPE):** All participants in the testing process, including key personnel, are required to don PPE appropriate to the specific conditions and potential risk exposures associated with the test. PPE may encompass items such as hard hats, safety toe shoes, safety glasses, insulated gloves, safety vests, and flame-resistant clothing.
7. **Energization Protocol:** Prior to servicing or inspecting the system, it is imperative to safely de- energize both the AC and DC (Batteries) power sources of the energy storage inverters.
8. **Lockout/Tagout Procedures:** All site personnel are expected to rigorously adhere to the established electrical Lockout/Tagout procedures and practices designed for this project. Only authorized personnel are permitted to affix and remove Lockout/Tagout tags and locks.
9. **Safety Vigilance: Throughout these processes, all personnel must maintain a vigilant stance on safety issues.** All personnel bear the responsibility of halting work if they discern any potential safety hazards.
10. **Compliance Standards:** Employees of equipment suppliers, their representatives, subcontractors, and third-party personnel must strictly adhere to the guidelines established by RES HSQE Safety and Quality Programs. This compliance includes furnishing and utilizing task- appropriate PPE, participating in mandatory project orientation meetings, daily morning safety meetings, accurately signing in and out of the project site, and maintaining a daily log of activities completed.

Roles and Responsibilities

Company	Substation Mechanical Completion	BESS Mechanical Completion	Electrical Testing	Cold-Commissioning	Energization	Hot Commissioning	Site Acceptance & Performance Test
Taaleri/BV	N/A	N/A	N/A	N/A	Support	Support	Support
RES	Execute	Execute	Support	Support	Support	Support	Support
Fluence	Support	Execute	Execute	Execute	Execute	Execute	Execute
NEI	Support	Support	Execute	Support	Support	Support	Support
Power Wave	Execute	N/A	Execute	N/A	Support	Support	Support
QSE	N/A	N/A	N/A	N/A	N/A	Support	Support

Project Personnel Roles and Responsibilities

1. Project Manager: William Hammond
2. Project Commissioning Manager: Bradley Collier

Terminology

Execute: Performing tests; includes documenting the tests performed, the test results, and providing final test documentation.

Support: Witnessing commissioning as necessary; providing field support as necessary to commissioning activities (including switching activities, LOTO activities, and repair of installed work); includes reviewing & approving all commissioning documentation.

DRAFT

System Specifications Summary

1. Energy Storage Facility ("ESF") Output Parameters		
Parameter	Value	Notes
Project Nominal POC Power	100MW(AC)	
Project Nominal POC Energy	200MWh (AC)	
Interconnection voltage	138KV	High voltage connection through substation
Frequency	60	
Project POC Power Factor	0.95	
2. Energy Storage System ("ESS") Output Parameters		
Parameter	Value	Notes
Battery Storage Systems	45	
Make	Fluence	
Model	Gridstack Pro 5000	
Max C-rate	0.5C	
Real Power Capability	2444kW	
Configuration	2hr System	
Rated Energy Capacity	4888kWh	
Round-Trip Efficiency RTE	87%	At 25C Ambient Temperature
Battery Storage Enclosure Ambient Temperature	Designed for local conditions: N,"W in Van Zandt County, Texas	
Battery enclosure peak auxiliary voltage and load	VAC, Phase, Wire, Hz	
3. MVT		
Parameter	Value	Notes
	Transformer	
Transformer make/model	EPC Power M10	23 Total
Transformer rated power		
LV / MV voltage	kVA/kVA	
4. Environmental Conditions		
Parameter	Value	Notes
Outdoor temperature range	-13.4°C....+44.7°C	
Elevation	445ft	
5. Supporting Documentation		
Document Title	Description	Appendix
BESS Electrical IFC	BESS yard drawings	TBD
Substation Electrical IFC	Substation drawings	TBD
Civil IFC	Civil drawings	TBD
EMS Network Diagrams	SCADA Network Diagrams	TBD

Commissioning Stages and Objectives

1.1 Pre-Commissioning

Pre-commissioning activities are tailored to ensure that all systems and components are properly installed, inspected, and function as intended before the full commissioning phase begins. The successful completion of these pre-commissioning objectives is crucial for ensuring a smooth transition from the construction phase to the commissioning phase.

The pre-commissioning activities will be done at the final stage during construction. These activities will be used for the handover and acceptance from construction to the BESS OEM commissioning and the checklists will be used as a confirmation of installation and system readiness for BESS OEM.

1.1.1 OEM Pre-Commissioning Checklists

Please refer to the following appendices for the full set of pre-commissioning checklists and associated procedures. Checklists referred to as "per project" only need to be filled out once per project. Checklists referred to as "per feeder" must have one checklist filled out per feeder. For this project, there are 4 feeders. All the following checklists must be filled out before deployment.

Fluence, EPC Power, and Siemens to provide checklist templates and RES, to fill out and submit completed checklists to BESS OEM for review and approval.

Per project checklists:

Appendix	Pre-Commissioning Checklist Name	Revision # Date Published
	Fluence BESS Pre-Commissioning Checklist	REV00
	EPC Power MVT Pre-Commissioning Checklist	REV00
	Siemens MPT Pre-Commissioning Checklist	REV00
	RES Pre-Commissioning Checklist	REV00

Per feeder checklists:

Appendix	Pre-Commissioning Checklist Name	Revision # Date Published
	Per-Feeder Checklists – Feeder 1	REV00
	Per-Feeder Checklists – Feeder 2	REV00
	Per-Feeder Checklists – Feeder 3	REV00
	Per-Feeder Checklists – Feeder 4	REV00

1.2 Cold Commissioning

Cold commissioning activities are to be completed after BESS OEM has reviewed and approved all pre-deployment checklists.

1.2.1 Cold-Commissioning Roles and Responsibilities Table

Company	Cold-Commissioning	Notes
Taaleri/BV	N/A	
RES	Support	
Fluence	Execute	
NEI	Support	
Power Wave	N/A	
QSE	N/A	

1.2.2 BESS OEM Cold-Commissioning Procedures

The BESS OEM cold commissioning plan and pre-energization testing can be found in Appendix A:

Appendix	Procedure Name	Revision # Date Published
	Fluence BESS Cold-Commissioning Procedure	REV00

1.2.3 Top Level Controller/EMS OEM Cold-Commissioning Procedures

The Top Level Controller/EMS OEM cold commissioning plan and pre-energization testing can be found in Appendix TBD:

Appendix	Procedure Name	Revision # Date Published
	Fluence TLC/EMS Cold-Commissioning Procedure	REV00

1.2.4 PCS OEM Cold-Commissioning Procedures

The PCS cold commissioning plan and pre-energization testing can be found in Appendix D:

Appendix	Procedure Name	Revision # Date Published
	Fluence PCS Cold-Commissioning Procedures	REV00

1.3 Energization

Company	Energization	Notes
Taaleri/BV	Support	
RES	Support	
Fluence	Execute	
NEI	Support	
Power Wave	Support	
QSE	N/A	

1.3.1 High Voltage (HV) Energization Procedure

Please refer to the following appendix for the HV energization procedure:

Appendix	Procedure Name	Revision # Date Published
	HV Energization Procedure	REV00

1.3.2 Auxiliary (AUX) Energization Procedure

Please refer to the following appendix for the Aux energization procedures:

Appendix	Procedure Name	Revision # Date Published
	Auxiliary Energization Procedure	REV00

1.3.3 Medium Voltage (MV) Feeder Energization

Please refer to the following appendix for the MV energization procedures:

Appendix	Procedure Name	Revision # Date Published
	MV Energization Procedure	REV00

1.3.4 DC Energization Procedure

Please refer to the following appendix for the DC energization procedures:

Appendix	Procedure Name	Revision # Date Published
	DC Energization Procedure	REV00

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1.4 Hot Commissioning

Hot commissioning is the project phase wherein systems and processes undergo testing and adjustment to reach their operational state using actual processes and live loads. The primary aim of hot commissioning is to verify that the entire facility functions as intended, while also rectifying any issues that may arise during full operation. The success of hot commissioning is vital for ensuring a safe, efficient, and dependable facility. It acts as the final safeguard in identifying and resolving issues before full-scale operations commence.

Company	Hot-Commissioning	Notes
Taaleri/BV	Support	
RES – Project Manager	Support	
Fluence	Execute	
NEI	Support	
Power Wave	Support	
QSE	Support	

1.4.1 LV Hot Commissioning Procedure and Checklist

Please refer to the following appendices for the full set of LV hot commissioning procedures and checklists:

Appendix	Procedure Name	Revision # Date Published
	LV Hot Commissioning Procedure and Checklist	REV00

1.4.2 Fluence BESS Hot Commissioning Procedures

Please refer to the following appendices for the full set of BESS OEM hot commissioning procedures and checklists:

Appendix	Procedure Name	Revision # Date Published
	Fluence BESS Hot Commissioning Procedures	REV00

1.4.3 HV Supply Hot Commissioning Procedure and Checklist

Please refer to the following appendices for the full set of PCS OEM hot commissioning procedures and checklists:

Appendix	Procedure Name	Revision # Date Published
	HV Hot Commissioning Procedure and Checklist	REV00

1.4.4 Fluence Top Level Controller Hot Commissioning Procedures

Please refer to the following appendices for the full set of Top Level Controller/EMS hot commissioning procedures:

Appendix	Procedure Name	Revision # Date Published
	Fluence Top Level Controller Hot Commissioning Procedures	REV00

1.4.5 Fluence/ORR Fire Alarm Hot Commissioning Procedures

Please refer to the following appendices for the full set of fire alarm hot commissioning procedures:

Appendix	Procedure Name	Revision # Date Published
	Fluence/ORR Fire Alarm Hot Commissioning Procedures	REV00

1.4.6 Everon Security System Hot Commissioning Procedures

Appendix	Procedure Name	Revision # Date Published
	Everon Security System Hot Commissioning Procedures	REV00

1.5 Performance Testing

Performance testing occurs after hot commissioning is successfully completed. The results of performance testing will be recorded and used as proof that the system meets performance requirements as outlined in QSE Specifications. The following tests are outlined in QSE Specifications and executed as part of the sub-listed tests:

Company	Performance Testing	Notes
Taaleri/BV	Support	
RES	Support	
Fluence	Execute	
NEI	Support	
Power Wave	Support	
QSE	Support	

1.5.1 Fluence TLC/EMS Functional System Testing

Please refer to the following appendices for the full set of Top Level Controller/EMS functional system testing procedures and checklists:

Appendix	Procedure Name	Revision # Date Published
	Fluence TLC/EMS Functional System Testing	REV00
	Primary Frequency Response (PFR)	REV00
	Automatic voltage regulation (AVR)	REV00
	Energy Shifting	REV00
	System Power Control and Rate of Change Control	REV00

1.5.2 Taaleri Site Acceptance Testing

Please refer to the following appendices for the full set of Taaleri Site Acceptance Testing Requirements:

Appendix	Procedure Name	Revision # Date Published
	Electrical BOP Equipment Testin	REV00
	Energy Capacity Test Procedure	REV00
	Energy Capacity Test Calculation	REV00
	Round Trip Efficiency Calculation	REV00
	Power Accuracy Test	REV00
	Cycling Capability Test	REV00
	Power Factor Capability Assessment	REV00

	Response Time Test	REV00
	Loss of Mains and Restart Test	REV00
	PQ Curve Plot Test	REV00
	Power Factor Control	REV00
	Voltage Regulation Test	REV00
	Interconnection Agreement Commissioning Checklist Approval and Compliance Tests	REV00
	Specified Services pre-qualification tests (ERCOT Tests Referenced Below in 1.5.3)	REV00

See next page for Division of Responsibilities Table

1.5.3 ERCOT Interconnection Compliance Testing

Please refer to the following appendices for the full set of ERCOT interconnection compliance tests and procedures:

Appendix	Procedure Name	Revision # Date Published
	Regulation-Up	REV00
	Regulation-Down	REV00
	Response Reserve	REV00
	Fast Frequency Response	REV00
	Offline Non-spin	REV00
	Online non-spin w/online capacity (standing non-spin deployment)	REV00
	Online non-spin w/offline capacity	REV00
	FRRS-Up	REV00
	FRRS-Down	REV00
	Quick Start	REV00
	Hourly Capacity	REV00
	ECRS	REV00

See next page for Division of Responsibilities Table

1.5.4 Division of Responsibilities Table

Below is a table including each performance test, the responsible party, and support (as applicable)

Owner Required Tests						
Responsible → Test ↓	**ERCOT**	**Taaleri**	**Fluence**	**RES**	**BV**	**Power Wave**
Electrical BOP Equipment Testing.	Support	Support	Execute	Support	Support	Support
Energy Capacity Test	Support	Support	Execute	Support	Support	Support

Round Trip Efficiency Test	Support	Support	Execute	Support	Support	Support
Power Accuracy Test	Support	Support	Execute	Support	Support	Support
Cycling Capability Test	Support	Support	Execute	Support	Support	Support
Power Factor and Response Time Tests	Support	Support	Execute	Support	Support	Support
Power Factor Capability Assessment.	Support	Support	Execute	Support	Support	Support
Response Time Test.	Support	Support	Execute	Support	Support	Support
Loss of Mains and Restart Test.	Support	Support	Execute	Support	Support	Support
PQ Curve Plot Test.	Support	Support	Execute	Support	Support	Support
Power Factor Control.	Support	Support	Execute	Support	Support	Support
Voltage Regulation Test.	Support	Support	Execute	Support	Support	Support
Interconnection Agreement Commissioning Checklist Approval and Compliance Tests.	Support	Support	Execute	Support	Support	Support
Specified Services pre-qualification tests. (ERCOT Tests Referenced Below)	Support	Support	Execute	Support	Support	Support
ERCOT Required Tests						
Responsible → Test ↓	**ERCOT**	**Taaleri**	**Fluence**	**RES**	**BV**	**Power Wave**
Regulation Up	Witness	Support	Execute	Support	Support	Support
Regulation Down	Witness	Support	Execute	Support	Support	Support

Response Reserve	Witness	Support	Execute	Support	Support	Support
Fast Frequency Response	Witness	Support	Execute	Support	Support	Support
Offline Non-Spin	Witness	Support	Execute	Support	Support	Support
Online non-spin w/online capacity (standing non-spin deployment)	Witness	Support	Execute	Support	Support	Support
Online non-spin w/offline capacity	Witness	Support	Execute	Support	Support	Support
FRRS-Up	Witness	Support	Execute	Support	Support	Support
FRRS-Down	Witness	Support	Execute	Support	Support	Support
Quick Start	Witness	Support	Execute	Support	Support	Support
Hourly Capability	Witness	Support	Execute	Support	Support	Support
ECRS	Witness	Support	Execute	Support	Support	Support
EMS Required Tests						
Responsible → Test ↓	**ERCOT**	**Taaleri**	**Fluence**	**RES**	**BV**	**Power Wave**
Primary Frequency Response (PFR)	Support	Support	Execute	Support	Support	Support
Automatic voltage regulation (AVR) and capacitor bank control	Support	Support	Execute	Support	Support	Support
Energy Shifting	Support	Support	Execute	Support	Support	Support
System Power Control and Rate of Change Control	Support	Support	Execute	Support	Support	Support

Signature Approval

By signing below, each company representative agrees that they have reviewed and approved the above commissioning plan. If the table below is not signed, approval through Procore will be used in place of a signature.

Company	Representative Name	Representative Signature	Date
Taaleri			
Bureau Veritas			
Fluence			
RES			
Power Wave			
QSE			

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Appendices Log

The following appendices are provided as separate, individual documents due to being secured and as such are not explicitly embedded in this document:

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Appendix A:

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APPENDIX 6B

TAALERI - AMADOR PROJECT

ESSA – Exhibit C-6 – Contractor Commissioning Plan

Contents

1. **Introduction**

This document is an overview of the Fluence commissioning scope, approach, and process for getting the Energy Storage Systems to an operational state for performance testing through the completion of Core-level and Array-level functionality testing.

The Commissioning **Process** is a series of steps taken to bring Core(s) and applicable Array-level subsystems into working condition by verifying installation, design and operation.

Fluence Commissioning Team's **scope** during this process will focus on, but is not limited to, the following equipment:

- Array Telco Rack
- Core Aux Power Distribution Panel(s)
- Core Support Enclosure (CSE)
- Battery Enclosures – a modular, factory-built, standard form factor enclosure containing battery rack(s).
- Fluence Operating System (F.OS) between:
    - Battery System and Inverter
    - Multiple Core Operations (Core and Arrays)

A Commissioning **Schedule** is project-specific based on the number of Arrays, Cores, applications (software) and project-specific milestones/dates which is normally part of *Exhibit D – Fluence Project Milestone Schedule.*

Project Personnel roles and responsibilities:

a. Project Manager: Julio Lima
b. Project Engineer: Marco Esparza
c. Commissioning Manager: William Ward

These following tests for the GSP5000 should be provided in the final commissioning plan.

a. These tests of fire suppression,
b. Ventilation and exhaust systems,

1.1. Terminology[1]

Below is the main Fluence terminology of an energy storage system.

Node

A Node can be visualized two (2) ways:

- The physical layer, consisting of an individual DC bus for one inverter. The inverter may contain one or more DC buses and consequentially one or more nodes. This is sometimes referred to as a Row because of the physical layout.
- The controls layer, consisting of the Fluence Node controls bridging the battery system with the upstream device (Inverter or DC/DC converter).

Core

A Core can be visualized two (2) ways:

- The physical layer, consisting of one or more Nodes that connect to a central inverter and transformer.
- The controls layer, where the Core controls is the connection point between Array Controller and the Node(s).

Array

The Array can be visualized as:

- The physical layer:
  - The "Array" is all the equipment within the BESS.
  - The "Array controller" is a server that is installed within the Array Telco Rack.
- The controls layer: the Array is the top-level Fluence controller of all the Cores.

MDU

The Market Dispatch Unit is a software layer, on the Array server, which makes real-time changes in system operation based on market conditions. The MDU is where customer-specific applications and modes exist.

[1] Defined terms used in this document may be referred differently in the Equipment Supply and Services Agreement

2. **Commissioning Approach**

Commissioning is the process of bringing the Battery Energy Storage System (BESS) into an operational state. Commissioning services <u>begin</u> when:

- Owner-Provided Facilities and Services are available
- Equipment has been declared mechanically complete

2.1. One-Core Approach

The **process** outlined in this document is written from the perspective of 1-Core, all the subsystems within 1-Core and the steps needed to get 1-Core online.

Exhibit D – Project Milestone Schedule will take into consideration the overall Array (all Cores and different equipment quantities) and dates of the key milestones:

- Mechanical Completion
- Auxiliary Power Energization
- Internet Availability
- MV/Grid Energization with the ability to import and export power
- Substantial Completion

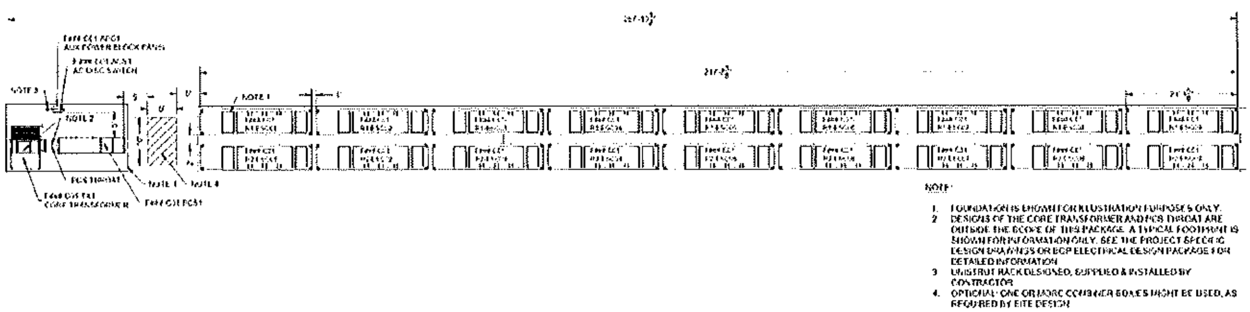


Figure 1: Basic Core Layout Example #1

2.2. Core Subsystems

A Core consists of the following subsystems:

Core Support Enclosure (CSE) An electrical outdoor enclosure that centralizes Core-level communications, control, and protective functions. It is the interface between many devices; Array Telco Rack, Inverter, and all battery enclosures including, Fire, F-Stop, and I/O signals from the Core inverter-transformer.

- Isolation-Transformer [2]
- Inverter(s)
- Core Battery System

[2], Installation of the isolation-transformer part of Customer's scope, unless stated in the *Exhibit containing the Division of Responsibility*.

The Core battery system consist of multiple modular, factory-built, standard form factor Fluence enclosures containing battery racks. The enclosure provides a safe and environmentally controlled environment for the batteries.

- DC Bus
  The DC Bus connecting battery enclosures to the inverter can take two (2) forms:
  - Parallel
    Each Enclosure is individually connected with separate cables to the inverter.[3]
  - Series
    Multiple enclosures are connected in series with flexible DC busbar to form a row.[4] Each row has a termination cabinet for the DC cables connecting the enclosures to the inverter.[3]
- Communications [5]:
  - Network Switches
  - Fiber, Ethernet, CAN communication loops connecting devices to the network
- Control System
  - Node-level Controls (Battery Controller + PCS or DC-DC Converter)
  - Core-level Controls (collection of Nodes)
- Safety Systems
  - Core Fire System
  - F-Stop circuits
- Core Balance-of-Plant (BoP)
  - Core Aux Power Distribution Panel [6]
  - HVACs/Chillers
  - I/O Input/Output; OCTE/CSE controller, Cube/Enclosure controllers

2.3. Array Subsystems

The Array is a collection of Cores connected in parallel and consists of the following subsystems:

- Medium-Voltage (MV) Equipment [7]
- Medium-Voltage (MV) Feed from Substation to Core Isolation-Transformers [8]
- Array Telco Rack/Cabinet
- Communications:

---

[3] Procurement, installation and testing of the DC cables between inverter block and Enclosure/Termination cabinet is part of Customer's scope, unless stated in the *Exhibit containing the Division of Responsibility*.

[4] Installation and testing of Enclosure-to-Enclosure cable kit including flexible DC Busbar is part of Customer's scope, unless stated in the *Exhibit containing the Division of Responsibility*.

[5] Procurement, installation and testing of communication cables between core telco racks, array telco rack, and other equipment is part of Customer's scope, unless stated in the *Exhibit containing the Division of Responsibility*.

[6] Procurement, installation and testing of site level auxiliary power, including auxiliary transformer, distribution panel(s) and cabling, that distributes aux power to all energy storage equipment is part of Customer's scope, unless stated in the *Exhibit containing the Division of Responsibility*.

[7] The procurement, installation and testing of the MV Equipment, including the energization of the MV Switchgear and feed circuit(s), is part of Customer's scope, unless stated in the *Equipment Supply and Services Agreement*.

[8] Procurement, installation, and commissioning of MV feed cabling to Core isolation-transformer(s), is part of Customer's scope, unless stated in the *Exhibit containing the Division of Responsibility*.

  - Network; Routers, Firewalls, Switches
  - VPN Tunnel
  - Fiber Loop(s) [5]
  - RTAC – connection to Customer/RTU
- Control System
  - MDU – Market Dispatch Unit; project specific applications/modes
  - Array Controller/Server (collection of Cores)
  - Core-level Controls (collection of Nodes); connection point between Array and Cores
- Data
  - Data Acquisition System (DAS)
  - Data Storage System (DSS)
- Metering
  - Array Power Meter [9]
  - Aux Power Meter(s) [10]
- Safety Systems
  - Master Fire Panel
  - F-Stop circuit (Site-Wide)

---

[9] Procurement and Installation of Array Meter is part of Customer's scope, unless stated in the *Exhibit containing the Division of Responsibility*.

[10] Procurement and Installation of Aux Meter(s) is part of Customer's scope, unless stated in the *Exhibit containing the Division of Responsibility*.

2.4. Simplified Commissioning Process

The Commissioning Process is a series of actions or steps taken to bring the BESS into working condition to begin the tests outlined in the *Exhibit containing the Performance Acceptance Tests.* Essentially, the commissioning team is verifying installation, design, and operation.

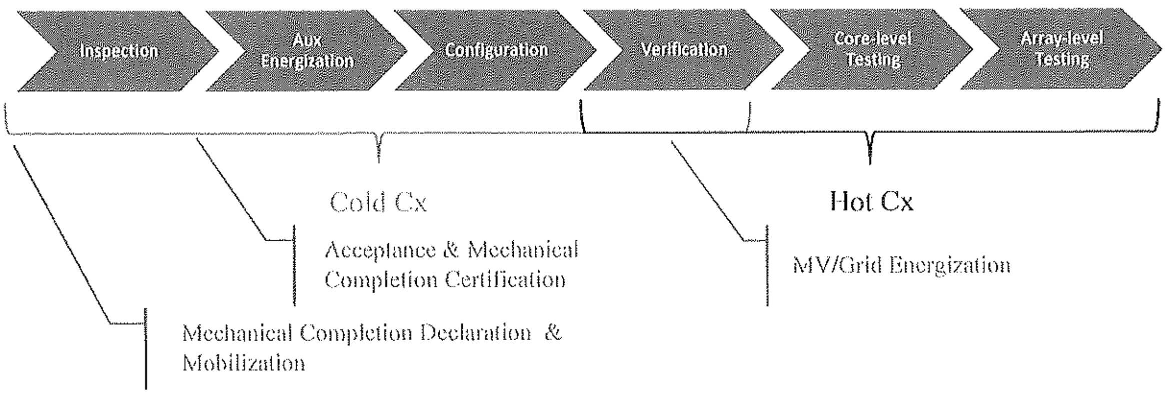


Figure 1: Commissioning Process

2.5. Installation & Design

During the **inspection** and **aux energization** stages, the Commissioning team focuses on equipment installation and powering up equipment to validate drawings, look for deficiencies, and identify punch list items. Inspections and energization precede any software/firmware **configurations** to equipment.

During the **verification** stage the Core will be evaluated if it can safely and reliably be connected to the grid. This stage will focus on the functionality of the:

- Communications
- Safety Systems (E-Stop, Fire)
- Battery Voltage & Polarity

2.6. Operations

From a Core-level operations perspective, Fluence ensures safety and compatibility between batteries and inverter, battery health, and power-energy.

From an Array-level operations perspective, Fluence evaluates the overall control system as well as ensure the BESS can operate at the technical specifications outlined in the *Exhibit B-1 containing the System Overview.*

2.7. Steps & Responsibility Matrix

The following steps are required to prepare 1-Core and the Array Telco for functional testing:

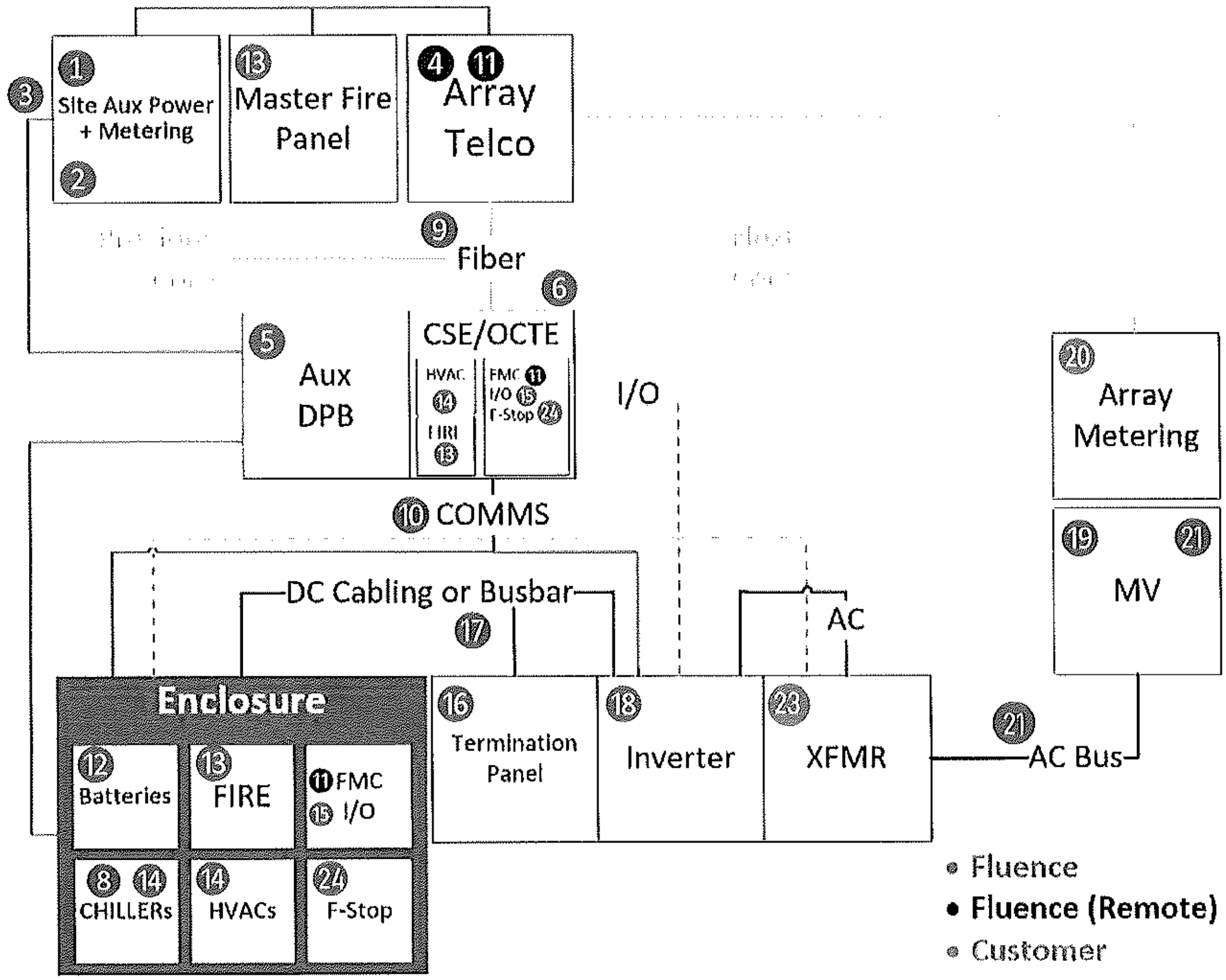


Figure 2: Step Diagram

Table 1: 1-Core Steps & Resources

Step	Responsible	
	Owner	Fluence
1. Site Aux Power Available; 400VAC supply for BESS	X[6]	
2. **Aux Metering**: Configuration & Verification		X[10]
3. Aux Cabling to Core Aux Power Distribution Block: Inspection & Test	X[6,13]	
4. **Array Telco**: Inspection & Aux Energization a. VPN Tunnel b. Array Telco Device Configuration		X[11]
5. **Aux Power Distribution Block**: Inspection & Energization		X
6. **CSE**: Inspection & Aux Energization		X
7. **Enclosure**: Inspection & Aux Energization		X
8. **Chiller** Inspection & (if applicable) Coolant Fill	X[12]	
9. **Fiber Loop(s)**: Inspection & Test	X[5,13]	
10. **Core Ethernet**/Comms: Inspection & Test	X[5,13]	
11. Fluence Multi-Purpose Controller (**FMC**) Deployment		X[11]
12. **Core Battery System**: Inspection & Configuration		X[14]
13. **Core Fire System**: Configuration & Test		X[15]
14. **Chiller/HVAC**: Configuration		X
15. **Core I/O**: Verification		X
16. (if applicable) Core Row Termination (**CRT**) Inspection		X
17. DC Bus Integrity Test(s)	X[3,13]	
18. **Inverter**: Inspection & Configuration		X[16]
19. MV Equipment	X[7]	
20. **Array Metering**: Configuration & Verification		X[9]
21. MV Cabling to Isolation Transformer: Inspection & Test	X[8,13]	
22. MV Energization	X	
23. Isolation Transformer	X[2,]	
24. Isolation Transformer: Inspection, Test & Soak		X
25. **F-Stop** Testing		X

[11] Configuration performed by Fluence remote support

[12] Coolant fill should be done prior to Fluence Commissioning teams arrival on site. If coolant filled at project site, all materials and labor associated with coolant fill are part of Customer's scope.

[13] Owner|Construction|Quality Team to do initial testing and document/provide results.

[14] Battery Manufacturer may provide commissioning support in conjunction with Fluence

[15] Performed by fire systems specialists in conjunction with Fluence

[16] Inverter Manufacturer may provide commissioning support in conjunction with Fluence

2.8. Supply Agreement Guidance

The following items are offered as **guidance** to Commissioning Services as the items listed below should be addressed in other parts of the official Equipment Supply & Service Agreement with the Owner.

NOTE: The 'Article' numbers and 'Exhibit' letters listed below are for reference purposes only and may vary for different projects.

2.8.1. Commissioning Milestones

The following milestones associated with Owner obligations directly impacting commissioning should be stated in *Exhibit D – Fluence Project Milestone Schedule*. Any delay in the Owner completing such milestones may entitle the Contractor (Fluence) to schedule and cost relief, as set forth in the Agreement. This relief shall include, but is not limited to, Contractor's time and cost to wait on Site, demobilize from Site, and remobilize to Site.

Mechanical Completion

Project-specific or system-level equipment should be listed in *Exhibit B-2 – Division of Responsibility. Exhibit C-1 – Mechanical Completion, Facilities, Services & Mobilization* describes the protocols of handover from Owner to Fluence after installation. For large projects, multiple mechanical completion dates may be listed in *Exhibit D – Fluence Project Milestone Schedule* to manage parallel execution activities between the Owner (doing installation) and Fluence (performing Commissioning).

Auxiliary Power Energization

Owner shall make available the site auxiliary power supply as part of *Exhibit B-2 – Division of Responsibility. Exhibit C-1 – Mechanical Completion, Facilities, Services & Mobilization* outlines the protocols for Auxiliary Power at the time of mechanical completion.

Internet Availability

Owner shall make available the permanent Internet connection to Array Telco Rack, which meets the requirements set forth in *Exhibit B8 – Internet Requirements*, at the time of Array Telco mechanical completion. This requirement is part of *Exhibit C-2 – Array Telco Rack Mechanical Completion Declaration* to ensure Fluence can perform its commissioning activities according to the project schedule and without delay.

Grid Energization

Owner shall make available Main power supply for operational testing, as set forth in *Exhibit B-2 – Division of Responsibility* and/or *Article 13 Acceptance Tests*. Without a grid connection, operation of BESS for acceptance testing is not possible.

2.8.2. Extension of Time

Any delays associated with the Owner completing their obligations past the date specified in *Exhibit D – Fluence Project Milestone Schedule* should be outlined in the:

- Owner-Caused Delays referenced in *Article 2 - Responsibilities Of Owner*

- Extension of time referenced in *Article 16 – Changes in the Work and Extension of Time.*

2.8.3. Acceptance Testing

All testing associated with Substantial Completion should be outlined in *Article 13 – Acceptance Tests; Minimum Performance Threshold* and detailed in *Exhibit G-1 Performance Acceptance Tests*, including any project-specific application modes.

Any specific Interconnection or grid operator tests are not part of acceptance testing, unless explicitly stated in Exhibit G-1 or a special exhibit.

2.8.4. Commissioning Documents and Reports

Fluence is only obligated to share the Commissioning Documents in accordance with *Exhibit B-3 – Deliverables List.*

3. **Detailed Commissioning Process**

Below is a detailed description of the Fluence commissioning process.

3.1.Inspection

Inspections begin once installation is complete and are part of the turnover process from Construction to Commissioning.

The Fluence commissioning team will review the construction team's Quality Inspection and Test Plans (ITPs), perform visual inspections, and spot checks (audits) to determine if equipment is acceptable for commissioning activities to continue. The goal of inspection is to ensure equipment is safe to energize.

Inspections will determine if the equipment is:

- Acceptable with or without deficiencies
- Deficient and needs to be corrected before continuing with the commissioning process.

3.1.1. Inspection Activities Overview

3.1.2. Array Telco Rack/Cabinet Inspection

The Array Telco Rack (ATL) is the top level Fluence controller of all Cores and the remote access point to the system via the VPN Tunnel. The intention of the inspection is to:

- Review Quality Inspection and Test Plans (ITPs) from Construction
- Visual inspection

- Ensure external connections properly landed
- Check that equipment is properly installed, connected and prepare the rack for official energization
- Confirm Array Telco drawing

This inspection can be performed by a Qualified Electrical Worker (QEW) with Fluence oversight.

3.1.3. Core Support Enclosure Inspection

Commonly referred to as the Core Support Enclosure (CSE) or the Outdoor Core Telco Enclosure (OCTE), this outdoor enclosure centralizes Core and Node communication, control, and protective functions. This enclosure is the Core's interface to the Array Telco Rack. The intention of the inspection is to:

- Review Quality Inspection and Test Plans (ITPs) from Construction
- Visual inspection
- Ensure external connections properly landed
- Prepare the enclosure for official energization
- Confirm drawings

This inspection can be performed by a Qualified Electrical Worker (QEW) with Fluence oversight.

3.1.4. Master Fire Panel (MFP) Inspection

The fire system should be commissioned by a certified professional, but it is still important to do a basic inspection prior to their arrival. The intention of the inspection is to:

- Review Quality Inspection and Test Plans (ITPs) from Construction
- Visual inspection
- Ensure external connections properly landed
- Prepare the panel for official energization
- Confirm Master Fire Panel drawing
- Find any major issues prior to certified Fire specialist arrival

This inspection can be performed by a Qualified Electrical Worker (QEW) with Fluence oversight.

3.1.5. Battery Enclosure Interconnections Inspection

The Battery Enclosure is the fundamental DC building block of a Battery Energy Storage System (BESS) and can consist of one or more Battery Enclosures interconnected to form larger DC sub-systems (Nodes and Cores). The intention of the inspection is to:

- Review Quality Inspection and Test Plans (ITPs) from Construction
- Visual inspection

- Ensure external connections properly landed
- Prepare the Battery Enclosures for official energization
- Confirm Battery Enclosures drawings

This inspection can be performed by a Qualified Electrical Worker (QEW) with Fluence oversight.

3.1.6. Aux Power Distribution Block Inspection

The source of Core auxiliary power is site dependent. The distribution panel supplies power to all the equipment in the Core; Core Support Enclosure, Battery Enclosures, Inverter(s), 120VAC transformer. The intention of the inspection is to:

- Ensure Aux Distribution Panel panel-schedule (layout and breaker sizing) is as per drawing
- Ensure panel circuit breakers are OFF; no circuits energized. Dependent on coolant fill

This inspection can be performed by a Qualified Electrical Worker (QEW) with Fluence oversight.

3.1.7. Cube Row Termination (CRT) Inspection (if applicable)

The Cube-Row Termination panel (CRT) provide a common connection point for the battery enclosures tied in series with busbars and the cabling to the inverter. The CRT is available in a single standardized version. However, on a project-specific basis, additional equipment or connections may be integrated into the CRT. Review site specific drawings and installation instructions for relevant installation guidance. The intention of the inspection is to:

- Review Quality Inspection and Test Plans (ITPs) from Construction
- Visual inspection

This inspection can be performed by a Qualified Electrical Worker (QEW) with Fluence oversight.

NOTE: Battery Enclosures connected in parallel to the inverter do not use a CRT.

3.1.8. Battery Enclosure to Inverter: DC Bus Inspection Tests

These tests should follow ANSI/NETA or local standards to ensure the system is free from short circuits and grounds and there is no high resistance of the bolted electrical connections and bus joints. The intention of the inspection is to:

- Review Quality Inspection and Test Plans (ITPs) from Construction; ensure electrical tests completed on DC Bus. These tests should include:
  - Insulation resistance tests to ensure the system is free from short circuits and grounds.
  - Torque checks and/or Low resistance testing of the bolted electrical connections and bus joints.
- Spot checks performed as necessary to verify that the equipment is properly installed and tested at Contractor's discretion.

This inspection can be performed by a Qualified Electrical Worker (QEW) with Fluence oversight.

3.1.9. Main and Aux Meter(s) Inspection

The intention of the inspection is to:

- Review Quality Inspection and Test Plans (ITPs) from Construction
- Visual inspection: verify meter(s) physical location and PT/CT ratios verified
- Meter(s) power supply properly documented
- NOTE: CT polarity is important; negative current = charge, positive current = discharge

This inspection can be performed by a Qualified Electrical Worker (QEW) with Fluence oversight.

3.1.10. Fiber Loop(s) Inspection

The site fiber runs (loops) must be laid out per drawings and landed in the proper location. Also, the fiber cables shall be continuity and quality tested as part of the construction process. The intention of the inspection is to:

- Review Quality Inspection and Test Plans (ITPs) from Construction; ensure tests completed on fiber loops
- Visual inspection: fiber is landed as per drawings
- Spot checks performed as necessary

This inspection can be performed by a Qualified Electrical Worker (QEW) with Fluence oversight.

3.1.11. Ethernet Loop(s) Inspection

The Ethernet loop consists of construction supplied cables and Fluence supplied cables that must support data rates of 1000 Mbit/s. The intention of the inspection is to:

- Review Quality Inspection and Test Plans (ITPs) from Construction; ensure tests completed ethernet loops
- Visual inspection: ethernet cables are landed as per drawing
- Spot checks performed as necessary

This inspection can be performed by a Qualified Electrical Worker (QEW) with Fluence oversight.

3.1.12. Core-Inverter(s) Inspection

The Core-Inverter (a.k.a. Power Conversion System, PCS) commissioning is normally performed by the inverter vendor, but it is still important to do a basic inspection prior to their arrival. The intention of the inspection is to:

- Review Quality Inspection and Test Plans (ITPs) from Construction
- Visual inspection
- Ensure external connections properly landed

This inspection can be performed by a Qualified Electrical Worker (QEW) with Fluence oversight.

3.1.13. Core-Transformer Inspection

The Core-Transformer is not generally commissioned by the Fluence Commissioning, but it is still important to do a basic inspection since this equipment is needed for BESS operations. The intention of the inspection is to:

- Review Quality Inspection and Test Plans (ITPs) from Construction
- Visual inspection
- Ensure external connections properly landed

This inspection can be performed by a Qualified Electrical Worker (QEW) with Fluence oversight

3.2. Aux Power Energization

Energization begins once equipment has been inspected and accepted. This part of the process pertains specifically to the 400VAC Aux energization, which is needed to configure and communicate to devices. It is not Medium-Voltage energization, which pertains to the energization of transformers and operation of inverters, and batteries.

The energization process is to walk through 400VAC > 230/120VAC > 24VDC circuit on the various equipment to ensure devices are being powered from proper circuits.

3.2.1. Energization Activities Overview

3.2.2. Array Telco Rack/Cabinet Energization

This is a structured approach to energizing the devices in the Array Telco Rack from the UPS through the PDUs. The approach is to

- Ensure all devices power up from proper circuit
- Observe network switch LEDs used to verify Ethernet connections

This energization can be performed by a Qualified Electrical Worker (QEW) with Fluence oversight

3.2.3. Master Fire Panel (MFP) Energization

The fire system should be commissioned by a certified professional and is important to have the equipment energized prior to their arrival. NOTE: MFPs are often project-specific and may contain multiple power feeds.

This energization can be performed by a Qualified Electrical Worker (QEW) with Fluence oversight.

3.2.4. Aux Distribution Power Block Energization

A structured approach to energizing the Core equipment one circuit at a time to ensure:

- The proper circuit energizes
- The proper voltage at each device/circuit

This energization can be performed by a Qualified Electrical Worker (QEW) with Fluence oversight.

3.2.5. Core Support Enclosure Energization

This is a structured approach to energizing the cabinet's internal circuits one circuit at a time to ensure:

- The proper circuit energizes
- The proper voltage at each device/circuit

This energization can be performed by a Qualified Electrical Worker (QEW) with Fluence oversight.

3.2.6. Battery Enclosure Energization

A structured approach to energizing each battery enclosure's internal circuits one at a time to ensure:

- The proper circuit energizes
- Proper voltage at each device/circuit
- NOTE: If the enclosure's HVACs and Chillers (if applicable) were energized during construction in order to control internal conditions, the circuits must still be verified by the commissioning team.

This energization can be performed by a Qualified Electrical Worker (QEW) with Fluence oversight

3.2.7. Main and Aux Meter(s) Energization

The goal of this energization is to ensure the meter(s) power up from correct source (panel, circuit breaker)

This energization can be performed by a Qualified Electrical Worker (QEW) with Fluence oversight

3.3. Configuration

Wi-Fi/Cellular must be available at the Array Telco Rack. Without this strong communication availability, the **VPN tunnel** cannot be configured at the Array Telco Rack.

Configuration involves, but is not limited to:

- IP-addressing
- Software and firmware downloads on various devices or equipment.
- Pre-F.OS Heartbeat (Array Telco)
- Fluence Operating System (F.OS) – Fluence operating or control system, which may be deployed after Inverter/Battery Hot Commissioning
- Fluence User Interface (F.OS UI) deployed after Inverter/Battery Hot Commissioning

NOTES:

- Most configuration activities take place with remote assistance via the **VPN Tunnel**.
- All cybersecurity details must be sorted prior to this stage of commissioning
- Any configuration activities performed by equipment vendors, i.e., Battery, Inverter and Fire System, as part of their commissioning activities will be documented in a separate vendor commissioning report.

3.3.1. Configuration Activities Overview

No.	Item	Page
3.3.2	VPN Tunnel (Array Telco) Configuration	22
3.3.3	Array Telco Rack Equipment Configuration	22
3.3.4	Master Fire Panel Cabinet HVAC Configuration	22
3.3.5	Core Support Enclosure Equipment Configuration	23
3.3.6	Battery Enclosure Equipment Configurations	23
3.3.7	Main and Aux Meter(s) Configuration	23
3.3.8	RTAC Configuration	23

3.3.2. VPN Tunnel (Array Telco) Configuration

The VPN Tunnel is the remote connection to the site. Without this connection path the site cannot be accessed remotely to configure any Fluence equipment. NOTE:

- This Configuration is performed remotely with local support
- Customer must provide two (2) Internet Service Provider (ISP) IP-Addresses for the routers and they must meet *Exhibit B-8 – Internet Requirements*
- Must have cell/Wi-Fi signal at Array Telco for remote connection assistance

3.3.3. Array Telco Rack Equipment Configuration

The configurations of the following devices can be performed in the factory or may be performed after telco installation by the Fluence Network & Software team:

- Routers (RTR)
- Firewalls (FRW)
- Console server (CONS)
- Network switches (SWH)
- Array server (CTRL)
- Data Aquisition Server (DAS)
- Data Storage Server (DSS)
- Real-time automation controller (RTAC)
- Windows based mini-desktop (if applicable)
- Power distribution units (PDU)
- Uninteruptible power supply (UPS)

3.3.4. Master Fire Panel Cabinet HVAC Configuration

The fire system is commissioned by a certified professional, who will configure all fire panels on site.

Should the MFP(s) be installed in an outdoor cabinet then the cabinet HVAC must be configured with the proper settings for ambient conditions.

NOTE:

- The MFPs may need IP-addresses assigned.
- These configurations may be performed in factory or locally/on-site

3.3.5. Core Support Enclosure Equipment Configuration

The configuration of the CSE's internal devices is only performed by Fluence. These activities can be performed in the factory, and some may be required at site. These activities may include:

- Network Switch configuration to allow remote communications and configuration of the other devices.
- Network Hardening (Security)
- Core Support Enclosure Controller
- Fluence Multipurpose Controllers (FMC)
- UPS
- HVAC settings based on ambient conditions
- Battery equipment, i.e. system-level controller(s), system battery management system, configurations may be documented in separate vendor commissioning report.

3.3.6. Battery Enclosure Equipment Configurations

The configuration of the internal devices of the battery enclosure is only performed by Fluence. These activities can be performed in the factory, and some may be required at site. These activities may include:

- Enclosure Controller used for I/O and temperature monitoring
- HVAC(s) settings based on ambient conditions
- Chillers (if applicable) settings based on BESS usage
- Battery equipment, i.e. rack controller(s), rack-level battery management system, configurations may be documented in separate vendor commissioning report.

3.3.7. Main and Aux Meter(s) Configuration

The goal of this Configuration is to:

- Set IP-address(es) locally
- Verify PT-CT ratios for Fluence-remote to finalize configuration

3.3.8. RTAC Configuration

The Real-Time Automation Controller is an Array Telco Rack device that has the secure SCADA communications protocols needed for customer system-level control by a RTU (remote terminal unit). This configuration consists of:

- Setting an IP-address if not previously done in factory
- Ensure RTAC/RTU points list is up-to-date and ready for verification testing with customer

3.4. Verification

The Verification part of the commissioning process ensures devices are communicating properly, all array-level (balance of plant) and safety equipment are functioning properly prior to operational testing. The stage will focus on the functionality of the:

- Communications
- Safety Systems (F-Stop, Fire System)
- Array-level (RTAC)

3.4.1. Verification Activities Overview

3.4.2. Communications Verification

Ensure all BESS data sources (devices) are connected, energized and visible in both the DAS and F.OS UI. The Fiber Loop/Ring redundancy check with a fiber optic tester is also performed as part of this verification by the Contractor.

3.4.3. F-Stop Verification

Verify all F-stop input devices trigger a shutdown of all output devices, response is visible in both the DAS and F.OS UI, and the F-stop circuit is resettable.

NOTE: All output devices should be online for this test, e.g., batteries and inverters.

3.4.4. Core-level I/O Verification

Ensure the Core's I/O in the Core Support Enclosure and battery enclosures function properly and are mapped correctly in DAS.

- The goal is to ensure all digital inputs, outputs, and analog inputs are functioning properly and correctly mapped to DAS.
- This testing can also include testing points with Fire System contractor

3.4.5. Battery Rack Checks

The purpose of this verification at the rack-level is to ensure:

- No shipping damage by performing voltage measurements and insulation resistance measurements at rack level
- No cabling issues between racks and DC bus by performing polarity checks. NOTE: These measurements will involve energizing the DC bus for the first time.

3.4.6. RTAC-to-Customer RTU Point Checkout

The Real-Time Automation Controller is an Array Telco Rack device that has the secure SCADA communications protocols needed for customer system-level control by a RTU (remote terminal unit). The purpose of this verification is to ensure the point-to-point check is complete and satisfactory between the Fluence Array Telco Rack RTAC and the customer RTU.

3.4.7. Control System Parameter Verification

This verification is done to ensure correct parameters were loaded as part of the Fluence control system deployment. The goal is to ensure the system is setup properly to provide max power and energy prior to any testing.

3.5. Operational Tests

When power is allowed to flow on the medium-voltage feed(s) is when operational testing can begin. Operational testing consists of two (2) main parts:

- Core-Level Testing
- Array-Level Testing

NOTE: Unless mutually agreed all operational testing will be performed using grid power.

3.5.1. Operational Tests Overview

No.	Item	Page
3.5.2	Core-Level Testing (Pre-F.OS Deployment)	27
3.5.3	Core-Level Testing (Post-F.OS Deployment)	28
3.5.4	Array-Level Testing (Post-F.OS Deployment)	29

3.5.2. Core-Level Testing (Pre-F.OS Deployment)

Prior to Fluence operating system (F.OS) deployment all battery and inverter operations are executed through vendor software/HMI. During this test, the PCS Hot Commissioning and the Battery System initial charge/discharge will be performed.

Items included in this type of testing:

- Setpoints and Limits verified
- AC Bus energized to Inverter
- DC Bus(es) energized and online racks verification
- Inverter(s) started and connected to grid
- Node-level dispatch performed (if applicable)
- Core-level dispatch performed. Power-step tests to P_{min}/P_{max} and short duration operation at P_{min}/P_{max} (<1hr)
- PCS Step Response (Ramp Rate) performed
- Manual Node Balancing (if applicable). Batteries are taken to a specific state-of-charge (SOC) and left to float/balance for a specific length of time to allow cells and racks to balance their voltage. Charging batteries to a specific SOC can be done at any power level. *NOTE: If charging at P_{max}, it is beneficial to wait until F.OS deployment.*

3.5.3. Core-Level Testing (Post-F.OS Deployment)

Core-level functionality and operational testing is performed after F.OS deployment and is intended to verify the Fluence controls are functioning properly between the Inverter(s) and batteries.

Items included in this type of testing:

- Node Functional Testing. Node-level testing to ensure the battery and inverter system can be taken online and offline (start/stop) through Fluence OS.
  - Node Service Mode Validation
  - Node: Power Cycle Validation
- Core Functional Testing. Core-level testing to ensure Nodes can be taken online and offline (start/stop) through Fluence OS.
  - Core Service Mode Validation
  - Core: Set Node Status Validation
  - PCS heartbeat timeout implemented and tested
  - Battery/BMS heartbeat timeout implemented and tested
- Core Real and Reactive Power Capacity. Power-step tests to P_{min}/P_{max} and short duration operation at P_{min}/P_{max} (<1hr) at the Node and Core-level once the F.OS parameters have been implemented.
- Core Battery Systems
  - Battery rack/module(s) beginning-of-life health evaluation
  - Battery cell balancing (if applicable)
  - Battery hot commissioning complete and performing per manufacturer's specifications given the project-specific system performance parameters
- Thermal Evaluation. During extended high-power operation (>75% Pmax), the thermal management systems of the inverters, battery and battery enclosures will be evaluated; regular cycling between upper and lower setpoints, no elevated temps or alarms.

3.5.4. Array-Level Testing (Post-F.OS Deployment)

These tests are to be performed once all Cores are online and must be completed prior to MDU-Level testing, i.e., Customer Acceptance Testing.

Items included in this type of testing:

- Functionality Testing
  - Array Functionality Testing. With Nodes and Cores in Automatic Response Control (ARC-mode), Array-level commands are executed ensure proper Core and Node response.
  - MDU Functionality Testing. With Nodes, Cores and Array in Automatic Response Control (ARC-mode), MDU-level commands are executed to ensure proper Array, Core and Node response.
- Operational Testing
  - Real Power Capacity
  - Reactive Power Capacity
  - Ramp Rate
  - Array Meter readings verified
  - Aux Meter(s) readings verified
  - Battery Energy Capacity Testing. This testing will prove the energy requirement of the battery manufacturer at the Rack and Node-level. This testing may be incorporated into *Exhibit G-1 Performance Acceptance Tests*.
  - MDU Applications Mode Pre-Test for ERCOT Market Application Bundle (including all ERCOT ancillary services) purchased by the Owner as part of the Long-Term Services Agreement.. Any specialty applications or modes beyond Manual Mode will go through shorter functional tests prior to any MDU-Level customer facing tests.

4. Pre-Operation Commissioning Checklist

The following items must be completed, except punch list items, prior to Array/MDU-level operations.

No.	Item	Page	Completion Date
4.1	Array Telco Rack Functional	31	
4.2	Permanent Site Auxiliary Power to all BESS Equipment	31	
Error! Reference source not found.	AllCore Support Enclosures Functional	31**Error! Bookmark not defined.**	
4.4	All Battery Enclosures Functional	31	
4.5	All Core Battery System Cold Commissioning Complete	31	
4.6	All Inverter Cold Commissioning Complete	31	
4.7	Fire System Functionality Verified	32	
4.8	F-Stop Verification complete for all Cores	32	
4.9	Core I/O Verification complete for all Cores	32	
4.10	Array/Aux Power Meter Visibility	32	

NOTES:

This sign-off signifies:

- All Fluence Commissioning Team activities listed above are complete
- The BESS is safe and ready to operate for Array-Level functional testing
- All punch list items not preventing safe operations have been documented and submitted to the Fluence Project Manager

Name: ______________________ **Name:** ______________________

Company: Fluence	**Company:**
Signature:	**Signature:**
Date:	**Date:**

4.1. Array Telco Rack Functional

Array Telco Rack has been inspected, energized, configured and:

- Accessible remotely via Fluence VPN
  - VPN Tunnel configured
  - All network equipment configured; firewalls, routers & switches
- Data Acquisition Server (DAS) and Data Storage Server (DSS) configured and accessible.
- UPS & PDUs configured and accessible via VPN.

4.2. Permanent Site Auxiliary Power

Permanent auxiliary power of the site has been energized and is properly supplying power to all the Cores and connected equipment.

4.3. Core Support Enclosures Functional

Commonly referred to as the Core Support Enclosure (CSE) or the Outdoor Core Telco Enclosure (OCTE), all of the cabinets have been inspected, energized and configured.

4.4. Battery Enclosures Functional

All of the battery enclosures have been inspected, energized and configured. Initial monitoring of enclosure HVACs and Chillers has been done to ensure proper temperature control.

4.5. Core Battery System Cold Commissioning

All Core/Node Battery Systems have completed their cold commissioning, which shall include:

- No shipping or installation damage detected through rack voltage measurements and insulation resistance tests.
- Battery system-level controllers are configured, communicating with their associated battery racks and visible on Fluence network.

4.6. Inverter Cold Commissioning

All inverters have completed their cold commissioning, are visible on Fluence network and ready for AC Bus (MV) energization.

4.7.Fire System Functionality

All fire panels should have completed their commissioning. A review of the fire system commissioning reports should be done to ensure:

- Proper operation and communication between Battery Enclosures and the Core Fire Panel. This includes interaction with Core F-stop circuit.
- Proper operation and communication between the Core Fire Panels and the Maser Fire Panel(s).
- Proper operation and communication between Master Fire Panel(s) and customer fire monitoring system (if applicable).

4.8.F-Stop Verification

F-Stop verification complete for all Cores and the circuits are functioning as per project design; correct system response to input and visibility in Fluence DAS.

4.9.Core I/O Verification

All Core-level I/O (Input-Output) devices have been tested and visible in the Fluence DAS.

4.10. Array/Aux Power Meter Visibility

Ensure/verify meters configured with correct PT/CT ratios, IP-address and are communicating to Fluence DAS.

5. Operational Commissioning Checklist

The following items must be accomplished, except punch list items, prior to any testing outlined in the *Exhibit G-1 – Performance Acceptance Tests*.

NOTE: Individual functional tests listed below, but tests can be done concurrently.

No.	Item	Page	Completion Date
5.1	All Inverter Hot Commissioning complete	34	
5.2	All Battery Systems Hot Commissioning complete	34	
5.3	System-level Communications verified	34	
5.4	Fluence Operating System (F.OS) Functional	34	
5.5	Fluence Operating System (F.OS) Operational	35	
5.6	Thermal Evaluation complete	35	
5.7	Fluence User-Interface (F.OS UI)	35	
5.8	MDU Applications Mode Pre-Test complete	35	
5.9	Array Meter Functional	35	
5.10	Aux Meter(s) Functional	36	
5.11	RTAC operational point check out completed	36	

NOTES:

This sign-off signifies:

- All Fluence Commissioning Team activities listed above are complete
- The BESS is operational and available for performance testing.
- All punch list items not preventing safe operations have been documented and submitted to the Fluence Project Manager

Name:	**Name:**
Company: Fluence	**Company:**
Signature:	**Signature:**
Date:	**Date:**

5.1. Inverter Hot Commissioning

All inverters have completed their hot commissioning and have performed per manufacturer's specifications given the project-specific system performance parameters. Final Software/Firmware versions and Parameter/Settings are recorded.

5.2. Battery Systems Hot Commissioning

All enclosure-level battery systems have completed their hot commissioning and have performed per manufacturer's specifications given the project-specific system performance parameters. Final Software/Firmware versions and Parameter/Settings should be recorded.

- Functional performance test of the battery system which includes communications, parameters, and battery rack/module(s) beginning-of-life health evaluation
- Detail any modules needing extended balancing or replacement after initial functional testing
- Battery Manufacturer Energy Capacity Testing
  If applicable, perform energy capacity tests to validate energy delivered at Node level. Only performed if different procedure outlined in Battery MSA and Equipment Supply and Services Agreement *Exhibit containing the Performance Test Guidelines*.

5.3. System-level Communications

All Node, Core and Array-level equipment is communicating with the Array Telco Rack and visible in:

- Fluence Data Acquisiton System (DAS)
- Fluence User-Interface (F.OS UI)
- Customer Remote Terminal (RTU)

NOTE: Fiber Loop redundancy must also be verified.

5.4. Fluence Operating System (F.OS) Functional

F.OS has been deployed and functionality tests have been performed to include the following:

- Node and Core-level testing to ensure the battery and inverter system can be taken on and offline (start/stop) through Fluence OS (F.OS)
- MDU – Market Dispatch Unit; project specific applications/modes
- Verify MDU/Global/Array/Core/Node Parameters and Limit have been properly configured

5.5.Fluence Operating System (F.OS) Operational

Array-level testing to ensure:

- Proper P+Q-limits seen at Core-level and Array Meter. See Equipment Supply and Services Agreement *Exhibit B-1containing the Technical Specifications* for further details.
- Proper power quality at point of interconnect. See Equipment Supply and Services Agreement *Exhibit B-1 containing the Technical Specifications* for further details.
- Proper ramp rate requirements detailed in Equipment Supply and Services Agreement *Exhibit B-1 containing the Technical Specifications*
- Proper load distribution from Array to all Cores and Nodes
- Impact of lost Core(s) at Array-level

5.6.Thermal Evaluation

During extended high-power operation, the thermal management systems of the inverters and battery enclosures will be evaluated

5.7.Fluence User-Interface (F.OS UI)

Evaluation of F.OS UI is done to ensure proper display and Node, Core, Array and MDU-level functionality.

5.8.MDU Applications Mode Pre-Test

Tests performed to ensure functionality of project-specific applications required as part of the Equipment Supply and Services Agreement

5.9.Array Meter Functional

Communication and readings in Fluence DAS and F.OS UI have been evaluated for:

- Correct magnitude of power (real & reactive)
- Correct current polarity
  - Charge power will be Negative power at the meter
  - Discharge power will be Positive power at the meter
- Correct units of measure being displayed, e.g., volts, amps, kilowatts.

5.10. Aux Meter(s) Functional

Communication and readings in Fluence DAS and F.OS UI have been evaluated for:

- Correct magnitude of real power
- Correct current polarity

  NOTE: Aux power is only consumption and should only read Positive power
- Correct units of measure being displayed, e.g., volts, amps, kilowatts.

5.11. RTAC operational point check out completed

RTAC operational point check out completed.

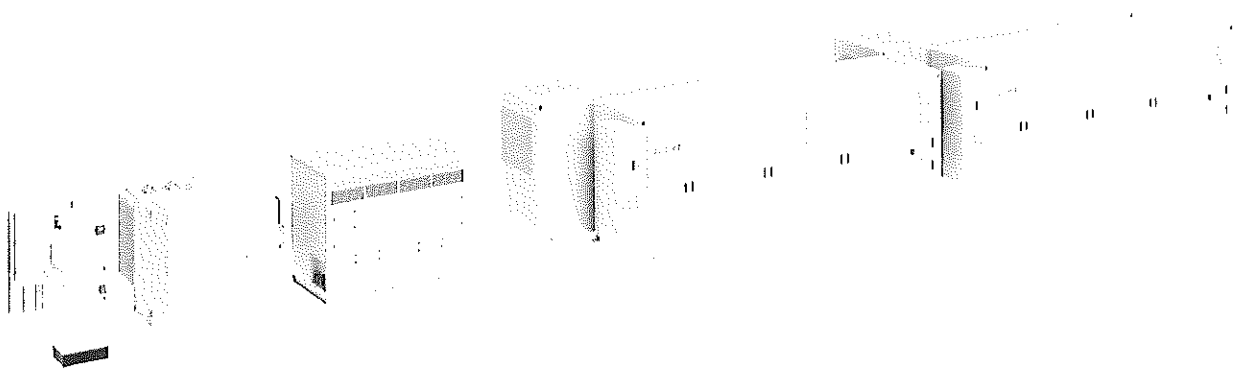
- Customer RTU able to see real values during operations
- Customer able to send commands to RTAC
- RTAC configured with final project-specific points list
- RTAC communicating with customer remote terminal unit (RTU)
- RTAC-to-RTU point check out completed with customer

5.12. Training for facility operation and maintenance staff

- Training for the operation and maintenance staff should be executed under the signed Long Term Service Agreement (LTSA), which has been contracted by Taaleri for the Amador Project.
- The training is schedule to be provided at the end of the commissionong plan by Fluence's service and operation team.
-

APPENDIX 7

FLUENCE
A Siemens and AES Company



BESS Decommissioning Guide

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FLUENCE SUPPORT CONTACT NUMBERS Contact Fluence Support Services 24 hours a day, 7 days a week:		
Technical Support	+1-703-635-7631	support@fluenceenergy.com
Emergency During Transport (for spills, leakage, damage)	Toll Free: +1-800-424-9300 (Reference CCN: 1014438)	Fluence Chemtrec Services
Emergency On-Site	Contact site personnel	

Warranty

Use Fluence's Return Material Authorization to return faulty components. Unauthorized component repairs may void the part warranty.

Return Material Authorization Process

1. Prior to contacting the Fluence team, collect the following information:
   - Manufacturer part number or part information
   - Serial number
   - Quantity needed
   - Fault description
   - Location for part to be shipped and contact name
2. If this site has Fluence LTSA or warranty, contact Fluence Support Services or Fluence Area Service Manager; otherwise, contact the part manufacturer directly.

Return Material Authorization (RMA) Form
0000-INS-GEN-90-002

Warranty Claim Form
0000-PRO-GEN-10-001

Revision History

Revision	Date	Department	Change Summary	Pages
07.0	10 OCT 2024	Engineering and Technical Documentation	Updated the manual to incorporate Gridstack Pro 5000 series and revamped the guide	5-55
06.0	03 JUN 2024	Safety	Updated the manual to incorporate Girdstack Pro 2000 series	6-13, 19, 23, 24, 27-33, and 38
05.0	09 FEB 2024	Safety	Critical safety updates to evacuation distance.	13
04.0	22 NOV 2023	Technical Documentation	Updated for new recycling procedure, spill information, and other minor changes.	See comparison document for multiple updates.
03.0	30 MAY 2023	Services	Incorporated BESS Decommissioning information	14-20, 43-46
02.0	19 FEB 2022	Engineering	Updated for Germany requirements	
01.0	07 DEC 2021	Engineering	Initial Release	All

Safety

WARNING - READ AND UNDERSTAND MANUAL - To prevent loss of life, personal injury, or damaged equipment and property, follow all safety precautions and instructions given or referenced in this manual. Wherever federal, state, local regulations, buyer, contractor or subcontractor health, safety, and environmental requirements differ, the more stringent requirements shall apply. Refer to applicable OEM manuals and Safety Data Sheets for chemicals, batteries, and other systems.

Explanation of Symbols

DANGER - Indicates a hazardous situation which could result in severe injury or death, if not avoided.

WARNING - Indicates a hazardous situation which could result in personal injury, if not avoided.

CAUTION - Indicates a hazardous situation which could result in minor injury, if not avoided.

NOTE - Indicates important information or tips for best results.

Key Safety Points

DANGER - ENERGIZED EQUIPMENT - Accidental release of stored energy can result in death or severe injury. Validate zero energy is present before applying LOTO. Make sure LOTO devices are properly applied to prevent accidental startup of normally energized equipment. Follow site LOTO procedure.

DANGER - EVENT OCCURRING - Do not approach the system while the F-Stop, horn and strobe is activated. Assume a hazardous event is occurring and keep back at least 150 feet (45 m). Follow the site Emergency Action Plan.

DANGER - VALIDATE ENCLOSURE SAFETY - Do not service a Battery Enclosure that was shut down by F-Stop function until the cause is resolved and BESS is validated safe to approach and service. If components are damaged or operating incorrectly, do not electrically connect or initiate BESS.

WARNING - PPE REQUIRED - All personnel must wear necessary PPE at all times. Refer to the site's Job Safety Analysis (JSA) and Job Hazard Analysis, as well as the site's HSE plan.

WARNING - SDS AVAILABILITY - SDS documents must be available, either on site or through Fluence Support Services, to personnel performing installation, operations, or maintenance on critical components of the Battery Energy Storage System (BESS).

WARNING - ONLY TRAINED PERSONNEL - Only trained and qualified personnel are permitted to install, operate, or maintain the equipment and all its components.

WARNING - SITE ORIENTATION - A site orientation is required for all persons who work on or visit a BESS site, including site safety information, hazard notifications, pre-job briefing, F-stop and fire alarm locations, and site-specific emergency exit paths and procedures. Provide Job Hazard Analysis (JHA).

WARNING - RISK OF ELECTROMAGNETIC INTERFERENCE - Pacemaker users should not enter the site while BESS is in operation.

WARNING - VERIFY STATE OF OPERATION - Do not service a Battery Enclosure without first identifying its state of operation and understanding any alarms or status indicators reported.

WARNING - USE APPROVED PARTS - Do not use equipment or parts not specified by Fluence. Replacement of an incorrect battery type can result in a fire or explosion.

CAUTION - BE COMPLIANT - The Battery Enclosure must only be operated in full compliance with applicable safety procedures, regulations, codes, standards, and/or other requirements.

CAUTION - STOP WORK AUTHORITY - All technicians are authorized and responsible to stop work if something appears unsafe. Do not continue work until the unsafe condition is assessed and corrected.

Potential Hazards

EXTREME CONDITIONS

Extreme conditions may surpass the design limits of the Core and Battery Enclosure equipment. Such conditions include (but are not limited to) flooding, earthquake, hurricanes and other severe weather, mechanical abuse of the Battery Enclosure, and corrosion/erosion fatigue. Extreme conditions can damage equipment and increase hazards associated with the equipment Battery Enclosure.

When extreme conditions are present or imminent, the entire system must be stopped. Remote stoppage of the installation using the Fluence OS is recommended. When extreme conditions are present, do not work on the equipment, even to shut the system down. All persons must leave the vicinity around the Battery Enclosures.

Consult Fluence before working on a Battery Enclosure that has been dented, tipped, flooded, or is otherwise in a visibly abnormal condition.

OPERATIONAL HAZARDS

⚠ **DANGER - RISK OF INJURY WHEN LIFTING -** Incorrectly sized forklifts and cranes can cause property and equipment damage, serious injury, or loss of life. Use correctly sized forklifts and cranes. Heavy equipment operators must be trained and qualified for the specific equipment they operate.

⚠ **DANGER - RISK OF CRUSH -** A high center of gravity can cause equipment to tip over and cause property damage, serious injury, or death. Do not lean on equipment. Brace, block, or anchor promptly.

⚠ **WARNING - RISK OF INJURY USING SCISSOR LIFT -** Scissor Lifts in motion can pinch, push, or bend. Keep all items and persons away from Scissor Lifts in motion.

⚠ **WARNING - RISK OF FALL FROM HEIGHTS -** Working at heights has the risk of falling and causing severe injury. Fall protection is required. Safe ladder and lift use must be observed. Use a safety line to a safety loop on the top of the enclosure.

⚠ **WARNING - RISK OF CRUSH INJURY -** Wind can swing an unsecured door hard enough to cause severe injury. Always secure doors to prevent swinging.

⚠ **CAUTION - RISK OF DAMAGE BY EXTREME WEATHER -** Do not open vent panels during extreme weather. External matter, like water or sand, can enter the enclosure and damage battery modules or other critical components.

⚠ **CAUTION - RISK OF CUT INJURY -** Equipment, including battery modules, have sharp edges. Wear required PPE and use caution to avoid injury.

ELECTRICAL HAZARDS

DANGER - RISK OF ARC FLASH - Adhere to boundary notices. Always use a delay timer, actuator, or long pole to switch the Core AC disconnect. Use required PPE and tools.

DANGER - RISK OF ELECTRICAL SHOCK - Multiple energy sources exist. Follow site LOTO procedure. Always use voltmeter to verify no voltage before working. Use required PPE and tools.

WARNING - RISK OF ELECTRICAL SHOCK - When F-Stop is activated, auxiliary power is still connected. F-Stop stops the inverter (DC may remain connected), disconnects the battery system, and stops the HVAC and Chiller in the originating Battery Enclosure. Follow site LOTO procedure. Always use voltmeter to verify no voltage before working. Use necessary PPE and tools.

FIRE HAZARDS

DANGER - RISK OF FIRE OR EXPLOSION - Damaged or compromised batteries and electrical connections may cause a fire or explosion. Adhere to fire safety codes and wear appropriate PPE. Keep back at least 150 feet (45 m) when hazard is present. **DO NOT USE WATER ON A BATTERY FIRE**, unless there is imminent danger to human life or authorized by site management.

DANGER - EXPLOSIVE AND EXTREMELY FLAMMABLE GAS - Applicable to R32 refrigerant for the chillers and HVAC, when concentrated or under pressure. Verify refrigerant type before servicing. Only qualified personnel shall service the high-pressure refrigerant circuit, and only in a well-ventilated area. Only professional HVAC service companies and qualified HVAC technicians shall service the compressor or any other part of the refrigerant circuit.

WARNING - RISK OF RESPIRATORY INJURY - Do not enter the site when smoke or fire is present unless there is imminent danger to human life. Personnel who approach the fire source must wear positive pressure self-contained breathing apparatus (SCBA).

CHEMICAL HAZARDS

Batteries are sealed, but if broken open or severely damaged, they can be hazardous. Coolant and refrigerant can also have chemical hazards. Review all manufacturer instructions and SDSs for proper procedures for handling and storage of components.

DANGER - TOXICITY - Battery contents, chiller coolant, and HVAC refrigerant are toxic. Do not ingest! Seek medical help immediately, if ingested.

WARNING - CORROSIVE MATERIALS - Battery contents are corrosive to skin. Do not touch without PPE. If accidental contact, flush immediately with water and seek medical attention.

WARNING - RISK OF RESPIRATORY INJURY - Damaged batteries may vent hazardous gases. Do not inhale hazardous gases.

WARNING - RISK OF FROSTBITE - Liquid contact with coolant or refrigerant may cause frostbite. Use appropriate PPE to prevent contact.

WARNING - RISK OF RESPIRATORY INJURY - Refrigerant can cause asphyxiation if excessively inhaled. Avoid inhalation.

Table of Contents

1. Scope

The BESS (Battery Energy Storage System) Decommissioning Guide provides a comprehensive framework and best practices for the safe and efficient decommissioning of BESS installations. This document outlines the necessary steps, considerations, and protocols for the decommissioning process, covering aspects such as:

- **Safety Procedure**: Instructions to make sure of safety personnel and the environment during the decommissioning process, including hazard identification and mitigation strategies.
- **Regulatory Compliance**: Guidance on relevant regulations and standards that govern BESS decommissioning and make sure of adherence to legal requirements and allowable procedures.
- **Environmental Impact Mitigation**: Strategies to minimize the environmental impact of BESS decommissioning, including proper waste disposal and pollution prevention measures.
- **Asset Recovery and Recycling**: Recommendations for the responsible disposal, recycling, or reusing of BESS components to maximize resource recovery and minimize waste.
- **Documentation and Reporting**: Guidelines for documenting decommissioning activities, maintaining records, and reporting to relevant stakeholders, including regulatory agencies and project stakeholders.
- **Stakeholder Communication**: Strategies for effective communication with stakeholders, including project owners, local communities, and regulatory authorities, to ensure transparency and address concerns during the decommissioning process.
- **Risk Management**: Identification and mitigation of potential risks associated with BESS decommissioning, including financial, operational, and reputational risks.
- **Lessons Learned**: Incorporation of lessons learned from previous BESS decommissioning projects to improve future decommissioning processes and outcomes.

The scope of this guide includes all stages of BESS decommissioning, from initial planning and preparation to site restoration and closure. It aims to serve as a valuable resource for project managers, engineers, regulators, and other stakeholders involved in the decommissioning of BESS installations.

> The scope of this document is applicable to Gridstack Pro, Gridstack, Sunstack, Edgestack, and Advancion 5.

The scope of this guide provides general guidelines for decommissioning Fluence core equipment only. Based on the agreed project scope (EPC), Fluence may supply some non-core equipment. This document partly covers guidelines for non-core components. The original equipment manufacturer documents shall cover the detailed decommissioning procedure for non-core components.

Core Equipment (Fluence scope)	Non-Core Equipment
Battery Enclosure	Master Fire Alarm Control Unit
OCTE/CSE	Core Auxiliary AC Disconnect Switch
Cube Row Termination	Core LV Panel
Power Conversion System	Array Auxiliary Panelboard
Core Transformer	Array Transformer
Telco Array Rack	Switchyard components
Core Fire Alarm Control Units	MV/LV Switchgear
	Any other item not included in the Core equipment

2. Overview

Always refer to specific battery OEM specifications and manual.

In this manual for the Gridstack, Sunstack and Edgestack the Battery Enclosure is also referred to as Cube.

This document is a supplement to the Core and Enclosure operations and maintenance manual:

Core and Enclosure OAM Manual - Gridstack Pro 2000 Series
0PLM-MAN-BSC-00-005

Core and Cube Operations and Maintenance Manual - CATL
0PLM-OAM-FLN-90-002

Core and Cube Operations and Maintenance Manual - Samsung
06-01-0001-OAM-003

Core and Cube Operation and Maintenance Manual - AESC
06-01-0001-OAM-004

Core and Cube Operation and Maintenance Manual - Northvolt
0PLM-MAN-BSC-00-002

This document is intended only for use by trained and qualified personnel.

2.1 Personnel Qualifications

Only qualified and trained personnel are authorized to operate, maintain, and examine equipment. These personnel must be trained in equipment specifications and their operation.

Typical personnel requirements:

- One person to do visual inspections
- One person to do electrical work and one person to act as a spotter
- Two persons to test equipment
- One person to operate lifting equipment and one person to act as a spotter

2.2 Tools and Equipment

For inspection or maintenance, the following tools may be necessary

- Calibrated electrical multimeter rated up to 1500V
- Tools with correct electrical insulation rating
- LOTO locks and tags if applicable
- Boundary tape or rope if applicable
- Rags
- Flashlight or other lighting
- If testing is necessary, 5000 VDC insulation resistance test
- Lift equipment with correct lifting capacity
- Ladder or Step Ladder
- Fire extinguisher: Novec 1230, FM-200®, CO^2 extinguisher, solid aerosol.

2.3 Before Work Begins

Do the steps below before you start the work:

- Read all the posted Arc Flash Boundary notices.
- You must stay at minimum distance away from the Core AC Breakers when a switch event is possible.
- Make sure you always switch the Core AC Breakers indirectly with a delay timer, remote actuator, or a long pole.
- You must always wear appropriate Personal Protective Equipment (PPE).
- You must stay at minimum distances as posted.
- Make sure you designate an area to keep new or replacement batteries.

2.4 Communication Protocols

Follow the communication protocols as below:

- Conduct a pre-job briefing or a job safety analysis.
- Make sure the scope of work, system conditions, and individual responsibilities are documented.
- Make sure the scope of work is approved by the Fluence Area Service Manager.
- Upon arriving on site, communicate the scope of work to be performed to Fluence Support personnel and all appropriate control room or controlling entities.
- Communicate any change to system status to the Fluence area service manager while you work.

2.5 Equipment Condition

Shut down the system and do Lockout/Tagout (LOTO) for maintenance, troubleshooting, and repair procedures.

Complete all procedures necessary to shut down the system (where applicable) and make sure that LOTO is completed on the Battery Enclosure electrical systems. For details, see:

Fluence Cube System Start-up and Shutdown
0000-PRO-FLN-GEN-90-7004

Control of Hazardous Energy Lockout Tagout LOTO
Fluence_GLO_GSQ_PL_Control_Of_Hazardous_Energy_Lockout_Tagout

Core and Enclosure OAM Manual - Gridstack Pro 2000 Series
0PLM-MAN-BSC-00-005

3. End of Life

The purpose of this section is to outline both the sequence of events that occur at the end of life of either a part of Fluence Battery Energy Storage site or a full Fluence Battery Energy Storage site. It also describes the regulatory requirements. The intended audience is Fluence personnel or Fluence customers working directly or indirectly on the End of Life for a Fluence project.

Project Location

The contents of this section depend on the recycling regulations of the country where the site is located. This document outlines the major sections in most recycling regulations.

> For guidance, UK and Germany regulations are shown as an example throughout.
> All examples that follow are examples only, are time-stamped at release date, and inclusion here does not imply comprehensive or current information.

Service Agreement Type

This document assumes that the Project is under Long Term Service Agreement (LTSA). If the project is not under an LTSA, the document gives a recommendation to the customer.

> In certain countries, Fluence (being the importer of batteries) is legally obligated to responsibly dispose of batteries at their end of life.

Damaged Batteries

If a battery module is potentially damaged, refer to the following guide for detailed information about battery inspection and handling process.

> Battery Module Handling
> 0000-PRO-FLU-GEN-90-6093

> Damaged batteries shall be **inspected within 24 hours of discovery** in order to identify the type and extent of damage, as well as allow site personnel to isolate the damaged batteries, as necessary, in a timely fashion.

> Batteries that are defective need to be isolated, inspected, and prepared for pick up. Recycling steps **must be completed within 10 days of discovery.**

3.1 Finding Regulatory Compliance

All examples that follow are examples only, are time-stamped at release date, and inclusion here does not imply comprehensive or current information.

3.1.1 REGULATION NAME AND GOVERNING BODY

The first step is to find the regional governing entity and the regulation that dictates the handling and disposal of lithium-ion batteries at the end of life.

For example in Germany:

The Batteriegesetz (BattG)[1] implements the European Battery Directive (2006/66/EC), as well as applicable revisions and secondary regulation. An overview of European legislation on batteries and accumulators can be found on the European Commission website, including the Proposal for a new Battery Regulation (COM/2020/798 final) repealing the previous directive.[2]

The Batteriegesetz regulates the placing on the market, the return and the environmentally friendly disposal of batteries and accumulators in Germany. The law first came into force in 2009 and was updated in 2021 (BattG2) and is expected to see a new revision following the expected adoption of above mentioned Battery Regulation (COM/2020/798 final).

Further relevant legislation includes the "DIRECTIVE 2012/19/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 4 July 2012 on waste electrical and electronic equipment (WEEE)"[3] , which finds implemented via the Elektro- und Elektronikgerätegesetzes (ElektroG) in Germany.

For example, in the UK:

The "DIRECTIVE 2012/19/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 4 July 2012 on waste electrical and electronic equipment (WEEE)" Directive shall be followed.
http://www.legislation.gov.uk/uksi/2009/890/contents/made

[1] *https://www.bmuv.de/gesetz/gesetz-ueber-das-inverkehrbringen-die-ruecknahme-und-die-umweltvertraegliche-entsorgung-von-batterien-und-akkumulatoren*

[2] *https://ec.europa.eu/environment/topics/waste-and-recycling/batteries-and-accumulators_de*

[3] *https://ec.europa.eu/environment/topics/waste-and-recycling/waste-electrical-and-electronic-equipment-weee_en*

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3.1.2 REGISTRATION

If the code requires that the batteries be registered with the local government, this must be done. Contact the Fluence Safety and Quality Manager and register the batteries. Note the registration number for future reference.

For example, in Germany:

Producers as well as entities that place batteries into the market, must register via the ear-portal.[1]

For example, in the UK:

Producers must register each year they place EEE on the market to comply with their obligations under the Regulations. This can be done by:

- *Joining a Producer Compliance Scheme*
- *Register directly with the relevant Agency/Body if you are a small EEE producer*

http://npwd.environment-agency.gov.uk/

3.1.3 STORAGE ON SITE

Remove the battery modules to be recycled are removed from the rack and keep safely on site. The method of storage depends on if the module is damaged or not. Please refer to the Fluence Battery Module Handling Guide for more information.

Battery Module Handling
0000-PRO-FLU-GEN-90-6093

3.1.4 TRANSPORT

Lithium-Ion batteries are considered dangerous goods under most regulations. Make sure that battery module transport vendors have necessary licenses and/or certificates.

For example, in Germany:

The transport of batteries is regulated by the Übereinkunft über die internationale Beförderung gefährlicher Güter auf der Straße (ADR) and other associated regulations, such as the Gefahrgutkontrollverordnung (GGKONTROLLV).[2]

For example, in the UK:

Transport requirements can be found here: https://www.gov.uk/guidance/moving-dangerous-goods

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[1] *https://www.stiftung-ear.de/en/topics/battg/producers-aa/registration*

[2] *https://www.bmvi.de/SharedDocs/DE/Artikel/G/Gefahrgut/gefahrgut-recht-vorschriften-strasse.html*

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3.1.5 DISPOSAL

If the code requires it, Fluence is obliged to ensure that the waste batteries are taken back and delivered to an approved battery treatment operator or an approved exporter for treatment.

For example, in Germany:

More details on take back and disposal requirements in Germany can be found on the outlined sources under Section *3.1.1 on page 17*

For example, in the UK:

Disposal requirements can be found here:
https://www.gov.uk/guidance/regulations-batteries-and-waste-batteries

3.2 Process Flow and Procedure

This section describes the procedure for handling battery modules at their end of life. Make sure the batteries are registered with the regional Government at the beginning of the project.

> The Battery modules that are identified as damaged are typically returned to the supplier during normal operation. They may be included in the End of Life process only under approval from the battery supplier.

3.2.1 PROCESS OVERVIEW

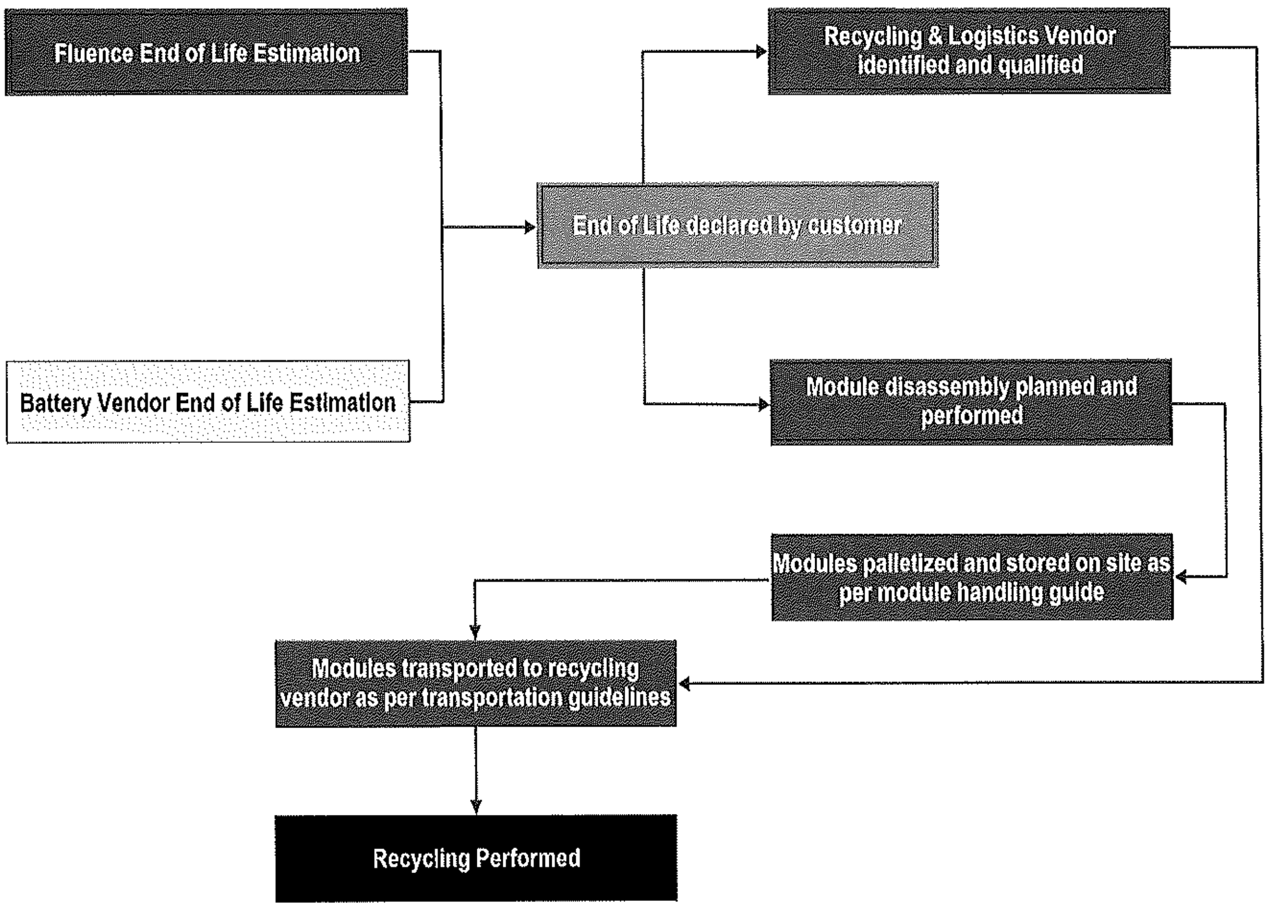

Figure 3 - 1: Battery End of Life Process Flow

3.2.2 MODULE REMOVAL, CLASSIFICATION AND STORAGE

Refer to the following for information to prepare modules for removal from the site:

1. Battery Racks must be put out of service using Fluence Operating System (OS), Human Machine Interface (HMI), Data Acquisition System (DAS).
2. Follow all local operational procedures to safely lockout and tagout the Battery Enclosure for batteries to be removed.
3. Remove the battery modules to be recycled from the rack and keep them on site safely. The method of storage depends on if the module is physically damaged or not. Refer the Fluence Battery Module Handling Guide for more information.

   Battery Module Handling
   0000-PRO-FLU-GEN-90-6093

4. Since the Batteries are considered EEE waste, they must be collected separately from other waste, and it is necessary to be clearly labeled with the symbol as shown in Figure 3 - 2: EEE Waste Collection Symbol on the outside.

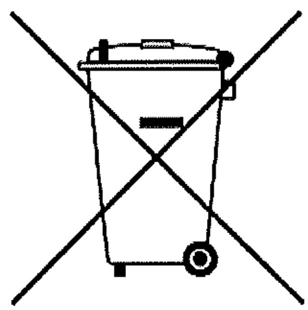

Figure 3 - 2: EEE Waste Collection Symbol

3.2.3 RECYCLING VENDORS

Maks sure of qualification and compliance of recycling vendor that typically includes (but not limited) to the factors as follows:

- Find recycling vendor for the disposal of battery modules per the recycling requirements specified by the regional regulations.
- Recycling vendor must dispose of the batteries separately from other hazardous waste classification.
- Operators with required permits or certifications are authorized to collect hazardous waste per local regulations and requirements.
- Other than the preparation of re-use, and recovery or recycling operations, Recycler must remove all fluids and make sure to do selective treatment.
- Make sure that the recycling vendor has minimum recycling efficiency as defined by the latest regulation for Lithium-ion batteries.
- Record and keep the recycling certifications from the vendor.

3.2.4 MODULE TRANSPORT

Make sure of certified logistics vendors as follows:

- Make sure that logistics vendor obeys regulatory standards for hazardous goods transportation.
- Give the Battery Module Safety Datasheet to logistics vendor for regulatory compliance, and to plan the safe transport method and conditions.
- Make sure that logistics vendor has the necessary certification to transport dangerous goods like damaged or waste lithium-ion batteries.
- Record and keep logistics vendor certification and details of the transportation.

4. Decommissioning Overview

Decommissioning is defined as the process necessary to permanently remove a functional or damaged BESS from service and restore the area on which the Battery Energy Storage System (BESS) is found to its original condition before installation. This process can be either partial decommissioning or full decommissioning which depends on the extent of decommissioning requirement, See Decommissioning Procedure on page 29.

The BESS components of Fluence are Enclosure, PCS, Core Transformer, Auxiliary Transformer, Outdoor Core Telco Enclosure/Core Support Enclosure (OCTE/CSE), Telco Array Rack, Core Auxiliary Panel, Core Auxiliary AC Disconnect Switch, Core Fire Protection Panel, Master Fire Alarm Control Units (MFACU), Array level Auxiliary panel.

Many energy storage facilities also include non-Fluence array-level components that will also require decommissioning, such as substations, power transformers, distribution transformers and switchboards, master fire protection systems, lighting, fencing, security systems, SCADA buildings, and other equipment. While this document will briefly cover non-Fluence system site components for completeness, detailed instructions for decommissioning other array-level components will have to be provided by the relevant site designer or Engineer of Record (EoR).

All projects undergo commissioning when entering service. Owners must plan for the end of the project's life and its decommissioning. This can happen when the BESS reaches the end of its normal operating life or when it experiences damage from a fire or other unforeseen event. Owners must plan to decommission the system and return the site to its prior condition.

> This document pertains to the Fluence's products Gridstack Pro, Gridstack, Sunstack, Edgestack, and Advancion 5 only.
>
> For systems earlier than Advancion 5, contact Fluence Support for guidance.

4.1 Decommissioning Process

The decommissioning process has three major phases, and they are System shutdown, Equipment de-installation and Physical demolition.

See Figure 4 - 1 for the decommissioning process overview of the Fluence Gridstack Pro, Gridstack, Sunstack, Edgestack and Advancion 5 products. While each Fluence Core shares similar design elements, each individual site has its own unique equipment configuration and site-specific design. Consult with the site designer or Engineer of Record (EoR) for specific guidance for each site.

> The procedure in this section applies to an intact BESS with no major defects. For systems with damage from fire or other event, see Considerations for a BESS Damaged by Fire on page 26 and see Considerations for a BESS Damaged by Other Event on page 27.

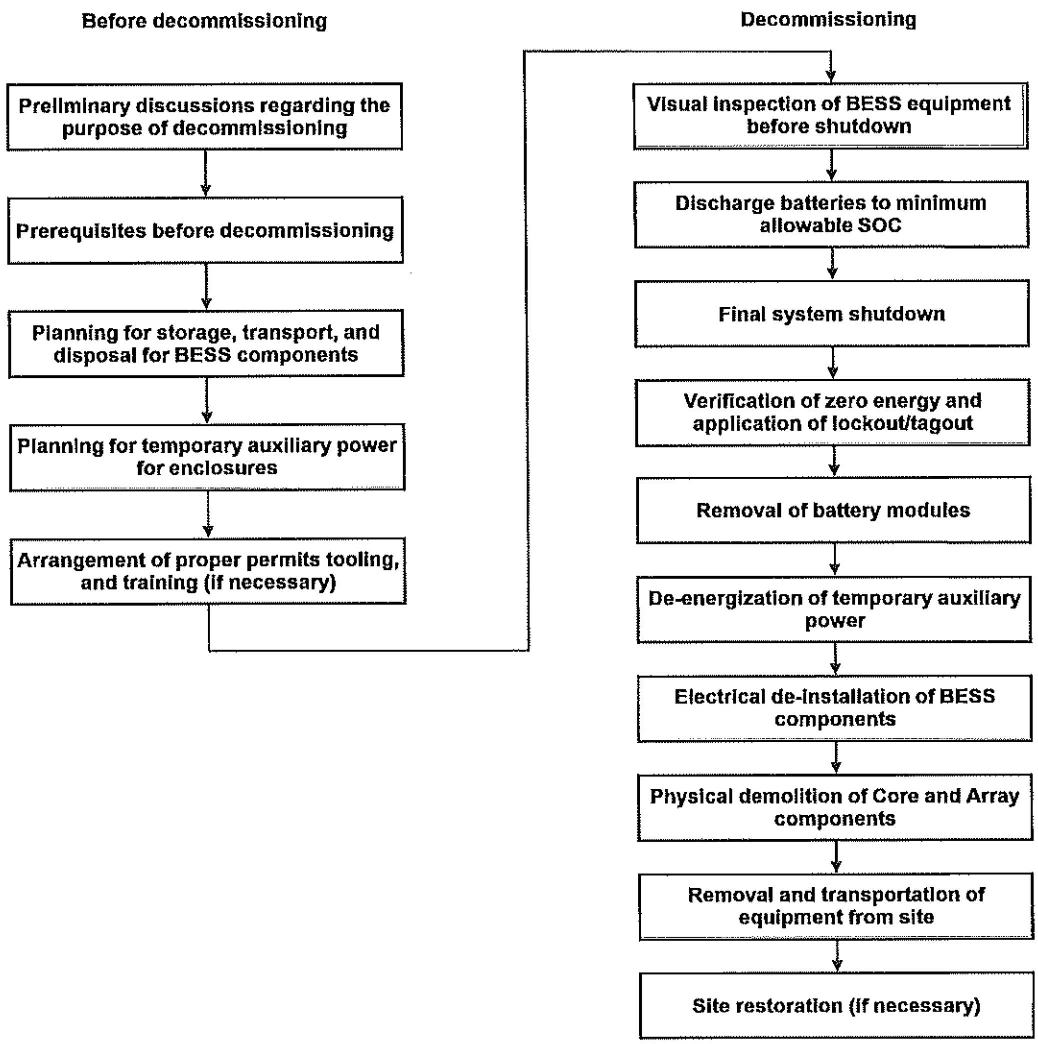

Figure 4 - 1: Decommissioning Process Overview

4.2 Decommissioning Prerequisites

Before decommissioning the BESS, consider why the BESS is to be removed from service and make proper arrangements first as mentioned in 4.2.1 Remove an Operational BESS from Service and 4.2.2 Required Site Conditions and Other Considerations.

4.2.1 REMOVE AN OPERATIONAL BESS FROM SERVICE

A site owner may decide to permanently remove an operational Fluence BESS from service when the system reaches the end of its designed life. This can also occur when upgrading equipment or changing land use.

When preparing to remove the BESS from service, make sure to consider the following:

- Will the absence of the rated energy/power from the BESS cause a shortage or other disturbance on the local utility grid? If so, can the operational state of the BESS be augmented or extended until the potential grid shortage is addressed?
- Is it still economically possible to continue to operate the BESS in the local utility market, or have the local market fundamentals changed since the BESS was originally built?
- Would a different site owner continue to operate the BESS?
- Have changes occurred in the local area that make the BESS less safe to operate, either for the site itself or for the surrounding area?
- Does the BESS equipment still have resale value as spare parts for other facilities?
- Are there adequate recycling or disposal sites available to properly and safely dispose of batteries and other hazardous materials?

This list is not exhaustive and may include other concerns related to specific locations. See End of Life on page 16.

4.2.2 REQUIRED SITE CONDITIONS AND OTHER CONSIDERATIONS

When the concerned parties decide on full decommissioning of the site, prepare the site for the final shutdown as follows:

- Tell the local utility grid that the BESS will be permanently removed from service and its energy output will no longer be available.
- Tell the local fire department and/or authority having jurisdiction (AHJ) that fire protection services will no longer be needed for the facility after decommissioning is complete.
- Apply for and obtain any relevant permits for construction, demolition, and excavation from the applicable AHJ/Related Regional Authorities to begin work (if necessary).
- Prepare for the transportation and disposal of hazardous substances offsite per local, state, and national regulations. Special concern is necessary to transport and recycle used battery modules per manufacturer recommendations. Some battery recycling facilities may have specific requirements for battery condition that may require enclosure auxiliary power to stay energized until battery modules are removed from the enclosure.
- If enclosure auxiliary power is necessary to remove the battery modules, and if station service power is unavailable when the BESS is disconnected from the utility grid, make sure that a temporary power source is available to remove the battery modules.
- Inspect the components that are still within their service life to find if they have resale value for use at another facility. Check with the applicable manufacturer documentation and subject matter experts for guidance about the inspection of the operational value of BESS equipment.

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> Some equipment manufacturers may need to give approval before reuse at another facility. If there is any doubt, contact the manufacturer for confirmation.

- Check with local, state, or national environmental regulations about how the land on which the BESS is located must be restored after decommissioning is complete. Make sure if there are any specific requirements to plant vegetation, soil test, or other steps to be taken once the BESS components have been removed from the site.

4.2.3 CONSIDERATIONS FOR A BESS DAMAGED BY FIRE

All battery enclosures have potential risks for electrical fires or thermal runaway from lithium-ion batteries. Any BESS components or subsystems damaged by a fire must be immediately removed from service.

> If a fire has occurred within a Fluence BESS, contact Fluence Support immediately when the fire goes out.

> Emergency response is not the scope of this document. Each BESS site must have emergency response plans in place containing specific information regarding the facility's particular equipment, location, and available emergency response services. Follow all applicable response procedures for events described in this section.

If a detector senses smoke or high levels of carbon monoxide, or if the temperature is more than 95 °C (203 °F) within a Battery Enclosure or OCTE/CSE, the detection systems automatically trigger a site alarm. Depending on the architecture, the detector also activates a strobe and horn on the battery enclosure unit or in OCTE/CSE.

Fluence Battery Enclosures have an option to install an aerosol canister in the Auxiliary Power Circuit. If a fire is in the Auxiliary circuit, the aerosol canister will activate and discharge an ultra-fine cloud of condensed extinguishing agent that acts on non-battery components within the Battery Enclosure.

Do the steps below when the BESS is damaged by fire or when the aerosol canister is activated in battery enclosure:

1. Put the enclosures out of service when it is damaged by battery fire, electrical fire, or aerosol canister discharge (battery enclosure).

   > Electrical fires emit smoke particles that affect the quality and reliability of those components. The aerosol agent contains a nitrate salt that becomes corrosive in the presence of humidity, which can damage electrical equipment.

2. Inspect the enclosure and electrical equipment for damage.
3. Contact Fluence Support or the equipment manufacturer for guidance when other equipment within the BESS that is damaged by fire, including the Cube Row Termination (CRT), Outdoor Core Telco Enclosure (OCTE)/Core Support Enclosure (CSE), inverter, auxiliary transformer, and auxiliary panelboard. It is likely that the component damaged by fire must be replaced.
4. Contact the site designer or Engineer of Record (EoR) for guidance when the equipment outside the

Fluence BESS that damaged by fire, including (but not limited to) the core transformer, substation, master fire alarm control unit, array controller, lighting, and fencing.

4.2.4 CONSIDERATIONS FOR A BESS DAMAGED BY OTHER EVENT

BESS components or subsystems can be damaged by other events that can cause it to be decommissioned.

Natural Disasters Damage Response Procedure

Damage to a BESS from a natural disaster can cause different problems depending on the type of disaster. Do the damage assessment from the natural disaster as follows:

- Natural disasters such as earthquakes, tornadoes, and volcanic eruptions can cause sudden damage to a BESS, leading to different problems.
- When a natural disaster happens, the BESS may be actively importing or exporting power to the utility grid, which can cause serious system damage. This can result in:
  - Arc flash events from energized electrical surfaces that contact grounded surfaces or other electrical phases.
  - Battery module ruptures that cause electrical fires or thermal runaway.
  - Loss of communication between the array controller and the BESS or the BESS to remote gateways.
  - Malfunctions of the fire protection system and other potential hazards.

When decommissioning a damaged BESS by a natural disaster, treat the system as if all possible damages has occurred until a full array-wide system inspection is complete. Do an inspection as follows:

- Energized conductors possibly hanging in the air or touching ungrounded surfaces.
- Heavily damaged door hinges or mechanical connections that may break.
- Controls may get interrupted by damage, which can cause some battery enclosures to export power even when the array is shut down.

Do the following to maximize the safety of the site:

- Certify BESS equipment in earthquake-prone areas to specific seismic standards to minimize potential damage during seismic events.
- Take additional actions during the project design phase to mitigate the effects of potential natural disasters.

Prepare for hurricanes and floods as follows:

- Hurricanes and floods occur gradually that gives time for site operators to shut down the BESS and secure the system in advance.
- Make sure to fully shut down the BESS and remove all sources of electrical energy, including auxiliary power, before hurricane or flash flood approaches.
- Water intrusion and flooding can damage high-power electrical equipment. Depending on the salinity of the floodwater and when water touches the energized electrical components, particularly battery modules can cause discharge or circulating currents within the enclosure, leading to premature equipment failure.

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Do the following after the natural disaster stops:

- After the natural disaster stops, wait until all floodwater has receded and drained from any submerged BESS components before the decommissioning process.
- Do a physical inspection of all components immediately.
- If the components or subsystems were underwater during the flood, remove and install new components or subsystem. Do not reinstall or reuse these parts unless you get specific written approval from the manufacturer confirming it is safe to reinstall or reuse.
- Remove and install the new current-carrying components, such as wires, termination lugs, or busbars, showing signs of water damage or rust before re-energizing the system.

Contact Fluence Support for special guidance for each specific situation.

Human Action Damage Response Procedure

Follow the instructions below to find damage and secure the site:

- Confirm if deliberate human actions, such as cyberattacks, arson, sabotage, terrorism, or accidental system mis-operation caused the damage.
- If a physical attack is confirmed, work with local authorities to make sure the full site area is free from other potential traps or follow-up attacks.
- When the site is secure, do a physical inspection of all BESS components, subsystems, array-level equipment, and site facilities for equipment damage.

Do an extensive physical damage inspection as follows:

- Any concentrated physical strike (arson, bombing, or physical sabotage) is unlikely to inflict dangerous damage due to the dispersed nature of the battery storage array, important electrical chokepoints such as PCS, transformers, and substations can be targeted for significant damage.
- Do an extensive physical inspection to find superficial damage or hidden collateral damage that might be caused by an attack.

Damage from a cyberattack or system error can be more severe than a physical strike. This is because it can affect the entire array, not just a few components. Follow the instructions below for cyberattack or system mis-operation:

- Mobilize relevant personnel immediately to disconnect remote operator control (if possible) and regain local control of the array.
- If BESS equipment does not respond to local control, isolate the array from the utility grid and open all manual disconnects, such as BMS and enclosure disconnects onsite.
- Always think that the Array may operate unpredictably or unintentionally until the completion of full inspection and review of the Array, Core, and Node controllers.
- Cybersecurity specialists must inspect the control system for viruses, bugs, or other malicious software.
- Contact Fluence Support for specific guidance in the case of a cyberattack or system mis-operation.

If the decision is made to decommission the system because of these events, follow the Decommissioning Procedure on the next page and manufacturer's instructions after the equipment is fully secured and confirmed no further damage can occur.

4. Decommissioning Procedure

The decommissioning procedure provides trained and qualified personnel with the information needed to do partial decommission or full decommission and removal of Fluence Battery Energy Storage System (BESS) from service and site on which it is located.

The Decommissioning procedure consists of

- Partial Decommissioning Procedure and
- Full Decommissioning Procedure.

Do the Full Decommissioning Procedure when the parties concerned decide to fully decommission the BESS from the site or do the Partial Decommissioning Procedure if any of the BESS component is damaged by fire or any other event.

4.1 Full Decommissioning Procedure

Do full decommissioning when the entire BESS is necessary to permanently remove from service, because of its end of operation life or dangerous damage. This comprehensive process involves shut down of the entire system, removal of all components, and restoration of the site.

4.1.1 SYSTEM SHUTDOWN

Prepare for System Shutdown

Do the steps below for inspection before shutting down the entire system:

1. Do visual inspection on each component before shutting down the entire system for the last time.
2. Make sure that the BESS is at the correct State of Charge (SOC) as specified by the battery manufacturer.
3. Do an inspection on each piece of equipment at the Core and Array level to find any abnormality or physical defects.

Do the steps below to discharge the batteries to minimum State of Charge:

1. Discharge the batteries to the recommended SOC level for safe package and transport of the batteries to dispose per the battery manufacturer's instructions.
2. Make sure of the SOC status on the F. OS/HMI after the completion of battery discharge.
3. If system control prevents the batteries from discharge to the recommended SOC level, contact Fluence Support.

Array Shutdown

Make sure the shutdown process of the system and disconnection from the grid is complete before the complete removal of the BESS from the site.

Do the steps below for array shutdown of the Gridstack Pro, Gridstack, Sunstack, and Edgestack.

1. Use Fluence OS (F. OS) to stop each Core and disconnect them from the utility grid.
2. Repeat for all Cores until all the Array is offline.
    a. Make sure the Array is disconnected from the utility grid at this time.
    b. Make sure in the Fluence OS that the array exports 0 MW and 0 MVAR to the grid.
3. Check the Array revenue meter to make sure of no power imports or exports from the BESS to the utility grid, except for battery enclosure climate controls.

Do the steps below for array shutdown of the Advancion 5:

1. Use the HMI to stop each Core and disconnect them from the utility grid.
2. Repeat for all Cores until all the Array is offline.
    a. Make sure the Array is disconnected from the utility grid at this time.
    b. Make sure on the MDU screen that the array exports 0 MW and 0 MVAR to the grid.
3. Check the Array revenue meter to make sure of no power imports or exports from the BESS to the utility grid, except for battery enclosure climate controls.

Core Auxiliary Transformer and Auxiliary Panelboard Shutdown

Do the steps below for Core Auxiliary Transformer and Auxiliary Panelboard before the shutdown:

1. The site designer provides the auxiliary power source. It may be routed through the existing auxiliary transformer and auxiliary panelboard or delivered via a separate connection.
2. Consult the site designer or Engineer of Record (EoR) for guidance.
3. If the Core auxiliary transformer and panelboard are used for temporary power, keep it running until temporary power is no longer needed. Otherwise, de-energize the Core auxiliary transformer and panelboard.

Disconnection of Array from utility grid

Do the steps below to disconnect the Array from the utility grid:

1. Open the feeder breaker(s) to the array after disconnection of the array from the utility grid.
2. De-energize the substation to electrically isolate the array from the grid.
3. If there is no dedicated substation, open the main circuit breaker at the Point of Interconnect (POI) and do a correct safety grounding.
4. Make sure of electrical isolation within the system to do LOTO for the Array equipment.
5. Follow the standard operating procedure for the specific facility to de-energize the system. If no procedure exists, consult the site designer or Engineer of Record (EoR).

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Core System Shutdown

Follow the steps below to shut down each component in each core. Consult with site designer or Engineer of Record (EoR) for any facility-specific contingencies.

> **DANGER - ENERGIZED EQUIPMENT -** Accidental release of stored energy can result in death or severe injury. Validate zero energy is present before applying LOTO. Make sure LOTO devices are properly applied to prevent accidental startup of normally energized equipment. Follow site LOTO procedure.

> Repeat the steps for all Cores in the Array.

Core Transformer Shutdown

Do the steps below to shut down the Core transformer safely:

1. Open the manual disconnect for the Core transformer.
2. Follow any special arc flash Personal Protective Equipment (PPE) requirements as noted by the arc flash sticker or in compliance with NFPA 70E Electrical Safety in the Workplace.

Power Conversion System Shutdown

Do the steps below to shut down the Power Conversion System (PCS) safely:

1. Open the AC disconnect and then open the DC disconnect at the Core PCS.
2. Consult with inverter manufacturer instructions for specific guidance and instructions for de-energization.

Enclosure Shutdown

Battery Enclosure Shutdown

Do the steps below to shut down and disconnect the battery enclosures of the Gridstack Pro, Gridstack, Sunstack, and Edgestack from the grid:

1. Open the Enclosure main DC disconnect for each battery enclosure.
2. Open battery rack DCPM DC disconnector for each battery rack.

Do the steps below to shut down and disconnect the battery enclosures of the Advancion 5 from the grid:

1. Open the Core circuit breaker at each Core.
2. Open battery rack DCPM DC disconnector at each battery rack.

Outdoor Core Telco Enclosure (OCTE)/Core Support Enclosure (CSE) Shutdown

Do the steps below to shut down the Outdoor Core Telco Enclosure (OCTE)/Core Support Enclosure (CSE):

1. If auxiliary power is used for the battery enclosures, keep the OCTE/CSE energized at the start of decommissioning.
2. Monitor the HVAC system, chiller systems and fire detection systems until the removal of battery modules.
3. Remove all the battery modules from all the enclosures in the core and when the auxiliary power is not necessary for battery enclosures then shut down the OCTE/CSE.

> In Gridstack/Sunstack/Edgestack, the communication enclosure is referred as Outdoor Core Telco Enclosure (OCTE). In Gridstack Pro, the corresponding terminology is Core Support Enclosure (CSE).

Apply Lockout/Tagout

> **DANGER - ENERGIZED EQUIPMENT -** Accidental release of stored energy can result in death or severe injury. Validate zero energy is present before applying LOTO. Make sure LOTO devices are properly applied to prevent accidental startup of normally energized equipment. Follow site LOTO procedure.

Do the steps below to apply Lockout/Tagout (LOTO):

1. Follow all site safety policies or consult NFPA 70E Electrical Safety in the Workplace for further guidance.
2. Make sure to fully de-energize each Core.
3. Make sure there is zero energy present on each medium voltage AC circuit and Core DC bus.
4. Apply LOTO to all the necessary devices.

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5. For detailed instructions, contact the site designer or Engineer of Record (EoR).

> Note that if auxiliary power is still available, it is necessary for HVAC and chiller systems to remain operational until the battery modules are racked out.

4.1.2 EQUIPMENT DEINSTALLATION

Make sure that the shutdown process of the system and disconnection from the grid is complete. Make sure that zero energy is present in the system and apply Lockout/Tagout before the removal of BESS equipment.

> You can start to de-install the components from any level that is accessible.

Array System Deinstallation

Core Auxiliary Transformer and Auxiliary Panelboard Deinstallation

Do the steps below to deinstall Core Auxiliary Transformer and Auxiliary Panelboard:

1. Make sure if the Core auxiliary transformer and Auxiliary panelboard provide temporary auxiliary power or not before de-installation.
2. If the Core auxiliary transformer and panelboard provide temporary auxiliary, remove all battery modules from the Core before de-energizing the temporary power source.
3. Make sure that zero energy is present in the system.
4. Apply Lockout/Tagout to the temporary power source.

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5. If a separately fed source supplies temporary power, do the de-installation after the completion of Lockout/Tagout to the Array.
6. If temporary power comes from a different source that is not connected to the main system, start the de-installation of the core auxiliary transformer and panelboard after the completion of Lockout/Tagout to the Array.
7. Do the electrical de-installation when it is safe and remove all the external cabling to the auxiliary transformer and panelboard.

Telco Array Rack Deinstallation

Do the steps below to de-install the Telco Array Rack:

1. Disconnect all the power, data, and network cables from the devices in the Telco Array Rack.
2. Remove each device. For example, servers and switches.
3. Keep each device in the correct space for removal from the site.

Master Fire Alarm Control Units Deinstallation

Do the steps below to de-install the Master Fire Alarm Control Units (MFACU):

1. Disconnect the main power supply to the MFACU.
2. If the MFACU has a UPS backup battery, follow the safety procedures provided by the UPS manufacturer to disconnect and remove it.
3. Remove all control cables from the panel.

Non-Fluence Equipment

The BESS project will also have additional equipment, for example Diesel generator and Substation equipment. Follow the instructions provided by the equipment manufacturer for de-installation of any additional equipment.

Core System Deinstallation

After the array is safely shut down and isolated, zero energy is confirmed, and lockout/tagout is applied, prepare the BESS equipment for removal.

> All steps must be repeated for all Cores in the Array.

Core Transformer Deinstallation

Do the steps below to de-install the Core Transformer:

1. Disconnect power cables from both windings of the Core transformer.
2. Disconnect instrumentation cabling from the transformer terminal box to OCTE/CSE.
3. Drain the transformer oil and dispose of it per site policy or applicable regulations.

Power Conversion System Deinstallation

Do the steps below to de-install the Power Conversion System of the Gridstack Pro:

1. Disconnect the cables between the PCS and each Enclosure.
2. Remove the busbars/cables between the PCS and Core transformer.

   > In some cases, bus throat connections may be present between PCS and Core transformer.

3. Consult the PCS manufacturer for detailed instructions.

Do the steps below to de-install the Power Conversion System (PCS) of the Gridstack, Sunstack, Edgestack and Advancion 5:

1. Disconnect the cables between the PCS and Cube Row Termination (CRT).
2. Remove the busbars/cables between the PCS and Core transformer.

   > In some cases, bus throat connections may be present between PCS and Core transformer.

3. Consult the PCS manufacturer for detailed instructions.

Cube Row Termination Deinstallation

Do the steps below to de-install the Cube Row Termination:

1. Disconnect the cables from the PCS.
2. Remove the thick flexible braids or busbars from the first Battery Enclosure.
3. Install a temporary cover, if necessary.

Enclosure De-installation

Battery Enclosure Deinstallation

Do the steps below to de-install the enclosures of the Gridstack Pro, Gridstack, Sunstack , Edgestack and Advancion 5:

1. Turn off the auxiliary power, circuit breaker, and UPS.
2. Make sure that zero voltage is present and remove the DCPM cables, DCPM, and Battery Modules.

> Note that any availability of temporary power may prevent you to do other electrical de-installation steps.

3. Disconnect the battery modules from the power supply and remove interconnections between modules.
4. Drain the coolant and dispose before the removal of the battery modules from the liquid-cooled Fluence Battery Enclosure.
5. Remove battery modules from the enclosure and keep the battery modules safe according to the battery manufacturer's instructions.
6. Consult chiller manufacturer instructions and coolant safety data sheet (SDS) for information on draining the cooling system. Contact Fluence Support for further aid.
7. Contact Fluence Support or the battery manufacturer for guidance if the battery modules are damaged.
8. Remove all the battery modules from the enclosure and de-energize the temporary auxiliary power (if applicable).
9. Disconnect all external electrical connections to the enclosure.
10. Make sure of zero energy present and apply lockout/tagout to the temporary power source.

Do the steps below to disconnect all the external electrical connections to the enclosure, at this time:

1. Disconnect the external electrical connections of the Gridstack Pro.
   a. Open the DC Disconnector section door.
   b. Disconnect the 1500V DC cables.
   c. Open the AC Auxiliary compartment door.
   d. Disconnect the AC Auxiliary power cable, control cables, and communication cables.
   e. Make sure all the external electrical connections of the Gridstack Pro are disconnected.
2. Disconnect the external electrical connections of the Gridstack, Sunstack, and Edgestack.
   a. Remove the bellows cover at the overhead transition piece to the adjacent Battery Enclosure or Cube Row Termination (CRT).

   b. Remove the flexible braids to the Core DC bus.
   c. Remove the cover at the bottom right corner of the Battery Enclosure front panel.
   d. Disconnect all the cable connections.
   e. Make sure all the external electrical connections of the Gridstack, Sunstack, and Edgestack are disconnected.
3. Disconnect the external electrical connections of the Advancion 5.
   a. Follow site-specific electrical design.
   b. Consult enclosure drawings or contact Fluence Support for specific guidance.

Outdoor Core Telco Enclosure (OCTE)/Core Support Enclosure (CSE) Enclosure Deinstallation

Do the steps below to de-install the Outdoor Core Telco Enclosure (OCTE)/Core Support Enclosure (CSE):

1. If the auxiliary control power is operational, make sure to remove all the battery modules in the core.
2. De-energize auxiliary control power to the OCTE/CSE.
3. Make sure that zero energy is present and apply lockout/tagout to the temporary power source.

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4. Remove the UPS and fire panel battery fuses and batteries, and make sure that zero energy is present.
5. Remove the field wiring including power cables, auxiliary cables, alarm contacts, communication cables, CAN bus resistor(s), any installed jumpers, and the strobe LED.

> In Gridstack/Sunstack/Edgestack, the communication enclosure is referred as Outdoor Core Telco Enclosure (OCTE). In Gridstack Pro product family, the corresponding terminology is Core Support Enclosure (CSE).

For specific guidance, see:

> Core Support Enclosure (CSE) Installation Manual
> 00TE-MAN-BSC-00-001

> Outdoor Core Telco Enclosure (OCTE) Installation Manual
> 06-05-00XX-PRO-001

4.1.3 PHYSICAL DEMOLITION

Make sure that de-installation of all the BESS components is complete. Designate an area to keep removed equipment before the physical demolition of the BESS and its removal from site.

> All steps must be repeated for all Cores in the Array.

Enclosure Demolition

Do the steps below to remove the enclosures of Gridstack Pro, Gridstack, Sunstack, Edgestack, Advancion 5, CRT, and OCTE/CSE enclosures and demolish its foundation:

1. Remove the grounding cables and mounting bolts from the enclosure base.
2. Use a forklift or crane to lift and remove the enclosure from the base.
3. Move the enclosure to the storage location for removal procedure.
4. Contact Fluence Support for guidance, if necessary.
5. Demolish the concrete base of the enclosure.
6. Make sure to remove any metal parts or debris remaining after the demolition of the enclosure concrete base.

> For some Advancion 5 enclosure's, the unit HVAC may need to be disconnected from the enclosure prior to removal.

Core-level Components Demolition

Power Conversion System Demolition

Do the steps below to remove the Power Conversion System (PCS) and demolish its foundation:

1. Consult PCS manufacturer instructions for guidance on disconnecting mounting hardware and grounding connections.
2. Follow PCS manufacturer guidance and use the forklift or crane to safely lift and remove the PCS from its foundation.
3. Move the PCS to the storage area for removal procedure.
4. Demolish the concrete base of the PCS.
5. Make sure to remove any metal parts or debris remaining after the demolition of the PCS concrete base.

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Core Transformer Demolition

Do the steps below to remove the Core Transformer and demolish its foundation:

1. Follow the core transformer manufacturer instructions to disconnect mounting hardware and grounding connections.
2. Inspect for oil leakage before the removal of the core transformer.
3. Drain any liquid found in the containment basin and dispose per site policy.
4. Drain the core transformer oil tank and dispose of contents per site policy.
5. Use the forklift or crane to safely lift and remove the core transformer from its foundation.
6. Move the core transformer to the storage area for the removal procedure.
7. Demolish the concrete base of the core transformer.
8. Make sure to remove any metal parts or debris remaining after the demolition of the core transformer concrete base.

Core Auxiliary Transformer Demolition

Do the steps below to remove the Core Auxiliary Transformer and demolish its foundation:

1. Follow the core auxiliary transformer manufacturer instructions to disconnect mounting hardware and grounding connections.
2. Inspect for oil leakage before the removal of the core auxiliary transformer.
3. Drain any liquid found in the containment basin and dispose per site policy.
4. Drain the core auxiliary transformer oil tank and dispose of contents per site policy.
5. Use the forklift or crane to safely lift and remove the Core auxiliary transformer from its foundation.
6. Move the core auxiliary transformer to the storage area for the removal procedure.
7. Demolish the concrete base of the core auxiliary transformer.
8. Make sure to remove any metal parts or debris remaining after the demolition of the core transformer concrete base.

Auxiliary Panelboard Demolition

Do the steps below to remove the Auxiliary Panelboard and demolish its foundation:

1. Remove the grounding cables and mounting bolts from the auxiliary panelboard foundation.
2. Use the forklift or crane to safely lift and remove the auxiliary panelboard from its foundation.
3. Move the panelboard to the storage location for the removal procedure.
4. Contact Fluence Support for guidance, if necessary.
5. Demolish the concrete base of the panelboard.
6. Make sure to remove any metal parts or debris remaining after the demolition of the auxiliary panelboard concrete base.

Other Electrical Equipment Demolition

Do the steps below to remove the other electrical equipment and demolish its foundation:

1. Remove any remaining interconnecting cables, conduits, and other electrical components from above and under the surface.
2. Use the forklift or crane to safely lift and remove other electrical equipment from its foundation.
3. Move other electrical equipment to the storage location for the removal procedure (if necessary).
4. Demolish other electrical equipment concrete foundations.
5. Make sure to remove any metal parts or debris remaining after the demolition of any other electrical equipment concrete base.
6. Consult with the site designer or Engineer of Record (EoR) for guidance.

Physical Demolition: Array-level Components

> Except array controller, most Array-level components are not supplied by Fluence. Consult with the site designer or Engineer of Record (EoR) for specific guidance.

> If auxiliary power is still present within the substation, consult site designer or Engineer of Record (EoR) to permanently remove the power source.

Array-level Auxiliary Transformer Demolition

Do the steps below to remove the Auxiliary Transformer and demolish its foundation:

1. Follow the auxiliary transformer manufacturer instructions to disconnect mounting hardware and grounding connections.
2. Inspect for oil leakage before the removal of the auxiliary transformer.
3. Drain any liquid found in the containment basin and dispose per site policy.
4. Drain the auxiliary transformer oil tank and dispose of contents per site policy.
5. Use the forklift or crane to safely lift and remove the auxiliary transformer from its foundation.
6. Demolish the concrete base of the auxiliary transformer.
7. Make sure to remove any metal parts or debris remaining after the demolition of the auxiliary transformer concrete base.

Master Fire Alarm Control Unit Demolition

Do the steps below to remove the Master Fire Alarm Control Unit (MFACU) and demolish its foundation (if housed separatly):

> The design and configuration of MFACU varies due to location.

1. Consult with the site designer, Engineer of Record (EoR), or Fluence Support for specific guidance and for design and configuration of MFACU.
2. Use the forklift or crane to safely lift and remove the MFACU from its foundation, if the MFACU is housed in a separate building.
3. Demolish the concrete base of the MFACU.
4. Make sure to remove any metal parts or debris remaining after the demolition of the MFACU concrete base.

Telco Array Rack Demolition

Do the steps below to remove the Telco Array Rack and demolish its foundation:

> The design of Array Telco Rack varies by facility.

1. Consult with site designers, Engineer of Record (EoR), or Fluence Support for specific guidance and for array telco rack design.

Non-Fluence Array-level components Demolition

Do the steps below to remove Substation/Point of Interconnection:

> The substation or other point of interconnection (POI) is normally not designed by Fluence.

1. Consult with site designers, Engineer of Record (EoR), or Fluence Support for specific guidance.

Do the steps below to remove the External Cabling, Lighting, Fencing, and Security Systems and demolish its foundation (if applicable):

1. Remove external cabling, lighting, and security systems from the site.
2. Dispose of these components as instructed by the site designer or Engineer of Record (EoR).
3. Demolish any remaining concrete bases of the Lighting, Fencing and Security System.
4. Make sure to remove any metal parts or debris remaining after the demolition of the Lighting, Fencing and Security System concrete base.

Do the steps below to remove the grounding grid:

1. Dig up the site grounding grid and remove all the cables.
2. Consult site electrical drawings, site designer, or Engineer of Record for specific guidance.

Do the steps below after the demolition of all core-level and array-level components for site restoration:

1. Make sure to remove any metal parts or debris remaining after the demolition of the core-level and array-level components.
2. Do landscaping tasks such as leveling soil or planting vegetation.
3. Make sure that the site, project, or local permitting conditions are in minimum allowable state of restoration before the decommissioning process can be marked as complete.
4. Consult with the site designer or Engineer of Record for specific guidance as the requirements change by facility and site location.

4.1.4 RECYCLING

Make sure that the physical demolition of the system is complete. Prepare the BESS equipment for storage, transport, and correct offsite recycling. Contact the equipment manufacturer, the Engineer of Record (EoR), or Fluence Support for guidance for each specific equipment and site.

Find Applicable Rules and Regulations

Make sure to find applicable rules and regulations as follows:

- Many BESS components may be classified as hazardous waste or universal waste or electrical and electronic waste (e-waste) that includes (but not limited to) smoke detectors, aerosol canisters, and liquid chemicals such as chiller coolant and transformer oil.
- Find the regional governing entity and regulations for handling and disposing of lithium-ion batteries and other waste categories.
- Battery modules shall be recycled at the end of life. See Appendix A.1 Battery Recycling Vendors for a list of recommended battery module recycling vendors. Vendors shall provide a certificate of destruction (COD) to confirm the recycling of the battery module.
- Create a disposal and shipment plan for all BESS components. This plan shall include an inventory of parts and components to be removed from the site, along with specific action items and destinations for each item to transport, remove, and/or resale of each part and component.
- Many jurisdictions have specific rules and regulations about the transportation and/or disposal of e-waste, hazardous waste and universal waste, such as the Waste Electrical and Electronic Equipment (WEEE) Directive in the European Union. All vendors providing packaging, transportation, disposal, recycling or storage services for these waste types shall provide proof that they have all necessary permits to provide their respective services.
- Consult the site designer, Engineer of Record (EoR), or Fluence Support for guidance on these regulations.

> Always comply with applicable local, state, and national laws, rules, and regulations regarding waste disposal and shipment for lithium-ion batteries, electronic waste (e-waste), general waste, and hazardous substances.

Lithium-Ion Battery Modules

Do the steps below to discharge the lithium-ion battery modules and dispose:

> Make sure that correct PPE is always worn while handling battery modules.

1. Consult the battery manufacturer for specific instructions before the removal, storage, transportation, and/or disposal of the lithium-ion battery modules safely.
2. Follow manufacturer instructions to manually discharge the batteries beyond the minimum state of charge (SOC) before the removal of the batteries.
3. Use special equipment to connect the battery terminals and discharge the batteries to the necessary voltage as instructed by the manufacturer.
4. Make sure that zero voltage is present across the terminals.
5. Contact the battery manufacturer for guidance on discharging and handling batteries.
6. Remove the battery modules from the racks of enclosures and immerse the battery modules in a neutralizing compound like brine until the charge fully dissipates.

Recycling Vendor

Make sure of battery recycling vendor's SOP, compliance and efficiency as follows:

> Battery Module Handling
> 0000-PRO-FLU-GEN-90-6093

- Make sure that the recycling vendor disposes of batteries separately from other hazardous waste and obeys local regulations.
- Make sure that the recycling vendor has the necessary permits or certifications to collect hazardous waste.
- Make sure recycling vendor removes all fluids and conducts selective treatment with batteries.
- Make sure that the recycling vendor gets the minimum recycling efficiency for lithium-ion batteries by the latest regulation standard.
- Get the Certificate of Destruction from the recycling vendor to confirm the batteries are accepted and recycled.

For a sample list of recycling vendors in North America and Europe, see Appendix A.1 Battery Recycling Vendors.

Battery Modules Storage

Do the steps below to safely keep the battery modules in the designated area for storage:

1. Move the removed battery modules from the enclosures to the designated area for storage.
2. Do an inspection and keep the damaged battery modules isolated from other undamaged battery modules and other equipment.

> Do not stack the unpackaged battery modules.

3. Follow battery manufacture marking guidance (if applicable) and use caution tape or signage to mark defective batteries.
4. Keep both the damaged and undamaged battery modules shielded from direct sunlight in a dry and non-condensing environment.

Inspection and Transportation

Do the steps below to inspect the battery modules before the transportation for disposal:

> Battery Module Handling
> 0000-PRO-FLU-GEN-90-6093

1. Inspect battery modules to find their condition and examine damage severity before you transport the battery modules.
2. Use Fluence's Category 1/Category 2/Category 3 classification system based on open circuit voltage measured between the terminals.
3. Follow the SOP for specific guidance to classify the battery modules before transportation.
4. If the battery is damaged, do an electrolyte leakage inspection to the battery, which may be visible or by a pungent, sweet smell like acetone (nail polish remover) or isopropyl alcohol (rubbing alcohol).

> If a leak is visible or this smell is detected, Fluence recommends personnel evacuate the area and immediately contact the Emergency Number for spills and leakage.

For Battery Module Leakage or Spills, immediately contact:		
Emergency during transportation (for spills, leakage, damage)	Toll Free: +1-800-424-9300 Local: +1-703-527-3887	Fluence Chemtrec Services (Reference CCN: 1014438)
Emergency On-Site	Contact site personnel	

Make sure of safe transportation of battery modules as follows:

> Do NOT ship battery modules if a leak is detected!

- Obey with local, state, and national regulations to transport hazardous materials like lithium-ion batteries (Example - Hazardous Materials Regulations (HMR) from the U.S. Department of Transportation).
- Consult the site designer, Engineer of Record (EoR), or Fluence Support for guidance to transport the battery module.
- Make sure that the logistics vendors who transport battery module must meet the regulatory compliance and make sure of plan and method for battery module transportation.
- Make sure to give the battery module safety datasheet to logistic vendor.
- Repackage used battery modules in their original packaging or as arranged by the battery manufacturer.

Electrical and Electronic Waste

Do the steps below to dispose the electrical and electronic waste:

1. Find e-waste within BESS components like the battery rack, enclosure, inverter, core and array telco racks, aerosol canister, and other systems.
2. Follow local regulations for the transportation and disposal of e-waste.
3. Remove and dispose of batteries and electronics components separately.
4. Contact Fluence Support for guidance to dispose of BESS components.

Liquid Chemical Waste

Do the steps below to dispose the liquid chemical waste:

1. Find liquid chemical waste in areas like the chiller system for liquid-cooled battery enclosure and transformer oil for transformers.
2. Follow local regulations to dispose of liquid chemical waste.
3. Consult the site designer, Engineer of Record, or Fluence Support for guidance.

> Do not dispose of liquid chemical waste down storm drains or in general trash.

Other Hazardous Waste

Do the steps below to dispose other hazardous waste:

1. Refer to vendor documentation or Safety Data Sheets (SDS) to find special hazards to dispose of specific components.
2. Contact Fluence Support for guidance on hazardous waste disposal.

General Waste

Do the steps below to dispose general waste:

1. General waste that does not fall into the category of e-waste, liquid chemical waste, or other types of hazardous materials shall be disposed in the trash.
2. Obey local, state and national local regulations.
3. Consult the site designer, Engineer of Record, or Fluence Support for guidance to dispose of general waste.

Waste from the Components that are Damaged by Fire or Other Event

Do the steps below to dispose the waste from components that are damaged by fire or other event:

1. Inspect and review BESS components damaged by fire or other events before disposal.
2. Do not remove or handle damaged BESS equipment without notifying Fluence Support and the affected equipment manufacturer.
3. Make sure to keep the evidence safe for root cause analysis.
4. Consult the site designer, Engineer of Record, or Fluence Support for guidance to dispose of individual system components.

4.2 Partial Decommissioning Procedure

Partial decommissioning is necessary when only a part of the BESS component is damaged by fire or other event and needs to be removed while the rest of the system stays operational. This process involves specific actions to make sure of the safe and effective removal of the damaged or obsolete components. General procedures for partial decommissioning are defined in Table 4 - 1: General Guideline for Partial Decommissioning and these procedures are only guidelines. Contact Fluence before the partial decommissioning.

> The partial decommissioning steps varies from case to case basis as per project specific architecture. Contact Fluence to get project specific instructions before you do partial decommissioning.

4.2.1 PREPARE FOR SYSTEM SHUTDOWN

Do the steps below before shutting down the system:

1. Contact Fluence to get project-specific instructions before partial decommissioning.
2. Inspect the BESS component, when any of the BESS components is damaged by fire or other event.
3. Make sure to remove any electrical components from the grid.
4. Inspect each piece of equipment at the core and array levels for any abnormalities or physical defects.
5. If any abnormalities in the HVAC and chiller systems are found, isolate the defects, and troubleshoot the systems before the decommissioning process.
6. Keep auxiliary power energized to HVAC and chiller systems to protect battery modules from degradation before removal.
7. Make sure to isolate the system from other active equipment.

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Table 4 - 1: General Guideline for Partial Decommissioning

Equipments	Action Required for Partial Decommissioning
Batter Energy Storage Core Equipment	
Battery Enclosure	Do the steps below to partially decommission the Battery Enclosure if the Battery Enclosure is damaged by fire or other event. 1. See Battery Enclosure Shutdown on page 31 2. See Battery Enclosure Deinstallation on page 35 3. See Enclosure Demolition on page 37
Power Conversion System (PCS)	Do the steps below to partially decommission the PCS if the PCS is damaged by fire or other event. 1. See Power Conversion System Shutdown on page 31 2. See Power Conversion System Deinstallation on page 34 3. See Power Conversion System Demolition on page 37
Core Transformer	Do the steps below to partially decommission the Core Transformer if the Core Transformer is damaged by fire or other event. 1. See Core Transformer Shutdown on page 31 2. See Core Transformer Deinstallation on page 34 3. See Core Transformer Demolition on page 38
Auxiliary Power and Control Equipment	
Core Auxiliary Transformer and Auxiliary Panel	Do the steps below to partially decommission the Core Auxiliary Transformer and Core Auxiliary Panel if they are damaged by fire or other event. 1. See Core Auxiliary Transformer and Auxiliary Panelboard Shutdown on page 30 2. See Core Auxiliary Transformer and Auxiliary Panelboard Deinstallation on page 33 3. Do step 4 for Core Auxiliary Transformer demolition or step 5 for Auxiliary Panelboard demolition. 4. See Core Auxiliary Transformer Demolition on page 38 5. See Auxiliary Panelboard Demolition on page 38
Outdoor Core Telco Enclosure (OCTE)/Core Support Enclosure (CSE)	Do the steps below to partially decommission the OCTE/CSE if the OCTE/CSE is damaged by fire or other event. 1. See Outdoor Core Telco Enclosure (OCTE)/Core Support Enclosure (CSE) Shutdown on page 32 2. See Outdoor Core Telco Enclosure (OCTE)/Core Support Enclosure (CSE) Shutdown on page 32 3. See Enclosure Demolition on page 37

Proprietary & confidential information of Fluence
Shared under NDA

Equipments	Action Required for Partial Decommissioning
Telco Array Rack	Do the steps below to partially decommission the Telco Array Rack if the Telco Array Rack is damaged by fire or other event. 1. See Telco Array Rack Deinstallation on page 33 2. See Telco Array Rack Demolition on page 40
Master Fire Alarm Control Unit (MFACU)	Do the steps below to partially decommission the Master Fire Alarm Control Unit if the Master Fire Alarm Control Unit is damaged by fire or other event. 1. See Master Fire Alarm Control Units Deinstallation on page 33 2. See Master Fire Alarm Control Unit Demolition on page 40
Array-level Auxiliary Transformer	Do the steps below to partially decommission the Array-level Auxiliary Transformer if the Array-level Auxiliary Transformer is damaged by fire or other event. 1. See Array-level Auxiliary Transformer Demolition on page 39

Proprietary & confidential information of Fluence
Shared under NDA

A. APPENDICES

A.1 Battery Recycling Vendors

All examples that follow are examples only, are time-stamped at release date, and inclusion here does not imply comprehensive or current information.

A.1.1 NORTH AMERICA

Battery Solutions

Valid for all of North America	
Telephone	800-852-8127
Website	https://www.batterysolutions.com

Li-Cycle

Valid for all of North America	
Telephone	877-542-9253
Website	https://www.li-cycle.com/

American Battery Technology Company

Valid for all of North America	
Address	2500 Peru Drive, McCarran, NV 89437
Telephone	777-473-4744
Email	recycling@abtc.earth
Website	https://www.americanbatterytechnology.com/

Bluewater Battery Logistics

Valid for all of North America	
Telephone	805-539-2001
Website	http://www.bluewaterbattery.com/

US

Retriev Technologies

Anaheim, CA - Corporate HQ; consolidation point for batteries destined for recycling facilities	
Address	125 E Commercial St. A Anaheim, CA, 92801
Telephone	855-473-8743
Fax	714-278-9745
Lancaster, OH - Recycling center for Lithium Ion and others	

FLUENCE
A Siemens and AES Company

Retriev Technologies	
Address	265 Quarry Rd, Lancaster OH, 43130
Telephone	740-653-6290
Fax	740-653-3240
Baltimore, OH - Consolidation and sorting point for batteries being sent for recycling	
Address	8090 Lancaster-Newark Rd NE Baltimore, OH, 43105
Telephone	740-862-9013
Fax	740-653-2320

BRME (Battery Recycling Made Easy) LLC	
Address	1 E. Porter St, Cartersville GA, 30120
Telephone	678-721-0022
Fax	678-721-0266

Call2Recycle	
Customer Service Batteries exceeding 300 Wh or 5g Li equivalent require special handling, as do damaged, defective, or recalled batteries; make specific mention of these when contacting Customer Service to arrange shipping.	
Telephone	877-723-1297
Website	https://www.call2recycle.org

Asset Recycling and Recovery, LLC	
Tennessee (Processing)	
Address	117 Lee Parkway Suite 102 C Chattanooga, TN, 37421
Telephone	423-667-6686
Website	http://www.ailsold.com
Georgia (Warehouse)	
Address	396 Cross Plains Blvd SE Dalton, GA, 30721
Telephone	423-667-6686
Website	http://www.ailsold.com

Canada

Retriev Technologies

Trail, BC - Ultimate recycling facility, capable of recycling Lithium metal and Lithium ion	
Address	9384 Highway 22A Trail, BC, V1R 4W6
Telephone	250-367-9882
Fax	250-368-7409

Call2Recycle

Customer Service	
Telephone	888-224-9764
Website	https://www.call2recycle.ca

A.1.2 EUROPE

Finland

uRecycle

Head Office	
Address	Sepänkatu 20, 90100 Oulu, Finland
Telephone	+358 8 415 413 04

Sweden

uRecycle

Address	Magasinvägen 5, 69142 Karlskoga, Sverige
Telephone	+46(0) 586-20 55 30

Northvolt Systems AB

Address	Alströmergatan 20 - 11247
Email	axel.eriksson@northvolt.com

UK

uRecycle

uRecycle Ltd UK	
Address	20-22 Wenlock Road, London N1 7GU, United Kingdom
Telephone	+44 203 608 6387

G&P Batteries

Head Office	
Address	Willenhall Road, Darlaston, WS10 8JR
Telephone	0121 568 3200
Fax	0121 270 3707
Website	www.g-pbatt.co.uk

Spain

A3 (Aprofitament Assessorament Ambiental)

Head Office	
Address	Carrer Cal Ros dels Ocells 15-17 Coll de la Manya Industrial Estate 08403 Granollers (BCN) – Spain
Telephone	+34 902 367 103

France

Recupyl

Corporate Office	
Address	Rue de la Métallurgie, 38420 Domène, France
Telephone	+33 4 76 77 43 97

Poland

Recupyl

Recupyl Polska SP Zoo	
Address	ul Teatrlna 49, 66400 Gorzow, Poland
Email	contactinfo@recupyl.com

Italy

TRED CARPI S.p.A.

TRED CARPI S.p.A.	
Address	27/A Via Remesina Esterna - 41012
Email	giuseppe.scandale@stenametall.it

Switzerland

Li-Cycle AG

Li-Cycle AG	
Address	Neuhofstrasse 6 - 6340
Email	marcus.scholz@li-cycle.com

Germany

Electrocycling GmbH

Electrocycling GmbH	
Address	Landstraße 91, Zip Code: 38644, City: Goslar
Telephone	49(0)5321 / 3367-0
Email	isabell.eule@electrocycling.de
Fax	+49(0)5321 / 3367-11

TES-AMM

TES-AMM comprises 34 facilities across the US, Western Europe, East Asia, and Oceania. Due to the multinational nature of TES-AMM, they may serve as a single point of service for all of Fluence's recycling needs.	
Website	https://www.tes-amm.com/en-US/enquiry_serviceSupport.aspx

A.2 References

Advancion 5 O&M Manual
0000-OAM-FLU-ADV-03-5001

Core and Enclosure OAM Manual - Gridstack Pro 2000 Series
0PLM-MAN-BSC-00-005

Gridstack Pro 2000 Safety Systems Guide
00SQ-GUD-BSC-00-002

Core Support Enclosure (CSE) Installation Manual
00TE-MAN-BSC-00-001

CSE Operation and Maintenance Manual
0PLM-MAN-BSC-00-003

Outdoor Core Telco Enclosure (OCTE) Installation Manual
06-05-00XX-PRO-001

Core and Cube Operations and Maintenance Manual - CATL
0PLM-OAM-FLN-90-002

Core and Cube Operations and Maintenance Manual - Samsung
06-01-0001-OAM-003

Core and Cube Operation and Maintenance Manual - AESC
06-01-0001-OAM-004

Core and Cube Operation and Maintenance Manual - Northvolt
0PLM-MAN-BSC-00-002

OCTE Operation & Maintenance Manual
06-05-00XX-OAM-001

Advancion-DAS User Manual 0000-INS-FLU-ADV-90-6003
Battery Module Handling 0000-PRO-FLU-GEN-90-6093
Fluence Cube Lockout/Tagout 0000-PRO-FLN-GEN-90-6171
Battery Enclosure Datasheet 06-01-0001-DSH-012
Fluence Liquid-cooled Cube Product Safety Datasheet 06-01-0001-DSH-005
Fluence Air-cooled Cube Product Safety Datasheet 06-01-0001-DSH-013
Fluence Cube System Start-up and Shutdown 0000-PRO-FLN-GEN-90-7004
Control of Hazardous Energy Lockout Tagout LOTO Fluence_GLO_GSQ_PL_Control_Of_Hazardous_Energy_Lockout_Tagout

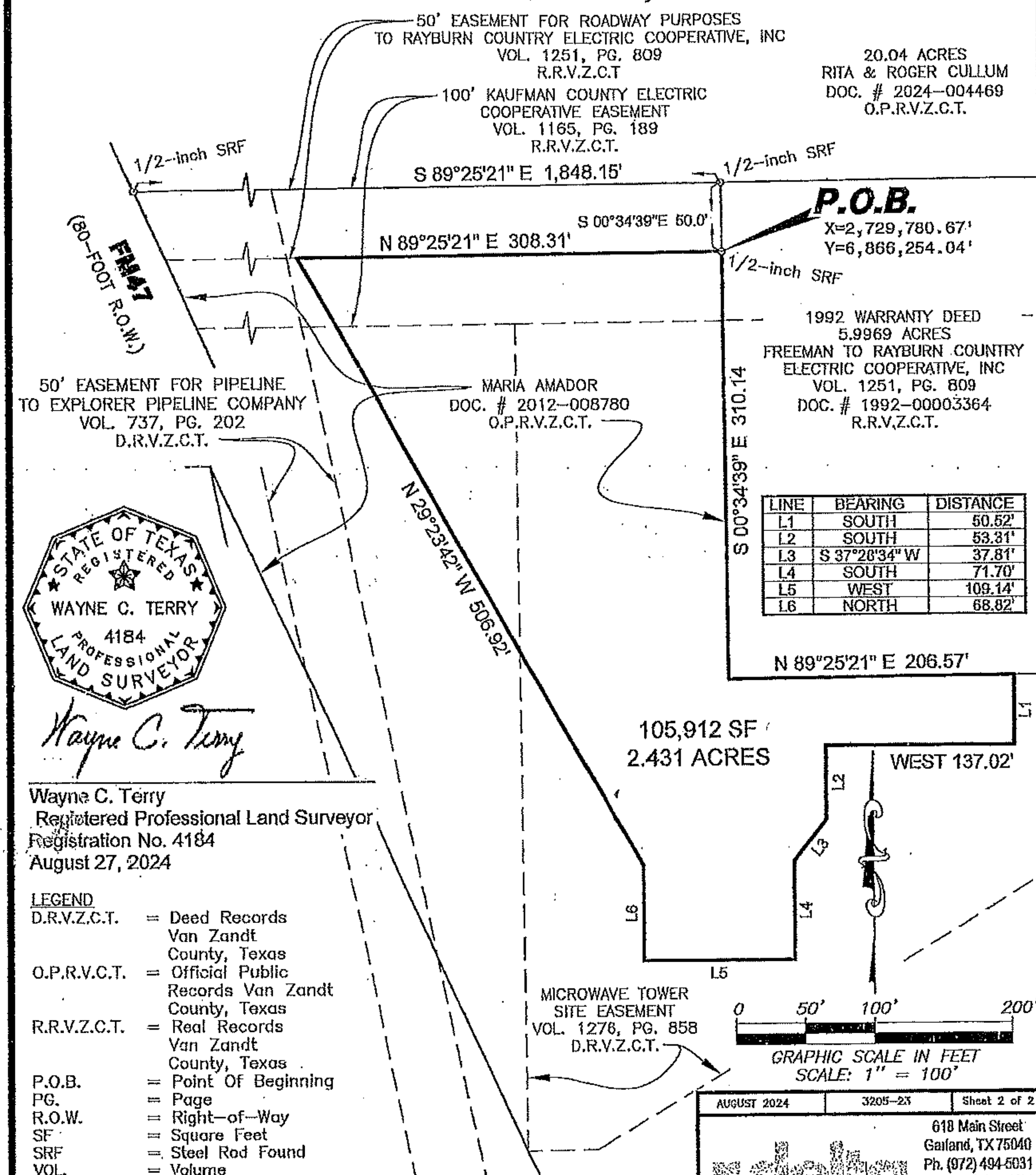
NFPA 70E	Standard for Electrical Safety in the Workplace

EXHIBIT
E

2024-010962 12/19/2024 03:41:41 PM Page 7 of 10

EXHIBIT A

2.431-ACRE EASEMENT
PART OF THE W. WARENSHOLD SURVEY, ABST. No. 942
IN VAN ZANDT COUNTY, TEXAS



LINE	BEARING	DISTANCE
L1	SOUTH	50.52'
L2	SOUTH	53.31'
L3	S 37°26'34" W	37.81'
L4	SOUTH	71.70'
L5	WEST	109.14'
L6	NORTH	68.82'

Wayne C. Terry
Registered Professional Land Surveyor
Registration No. 4184
August 27, 2024

LEGEND

- D.R.V.Z.C.T. = Deed Records Van Zandt County, Texas
- O.P.R.V.C.T. = Official Public Records Van Zandt County, Texas
- R.R.V.Z.C.T. = Real Records Van Zandt County, Texas
- P.O.B. = Point Of Beginning
- PG. = Page
- R.O.W. = Right-of-Way
- SF = Square Feet
- SRF = Steel Rod Found
- VOL. = Volume

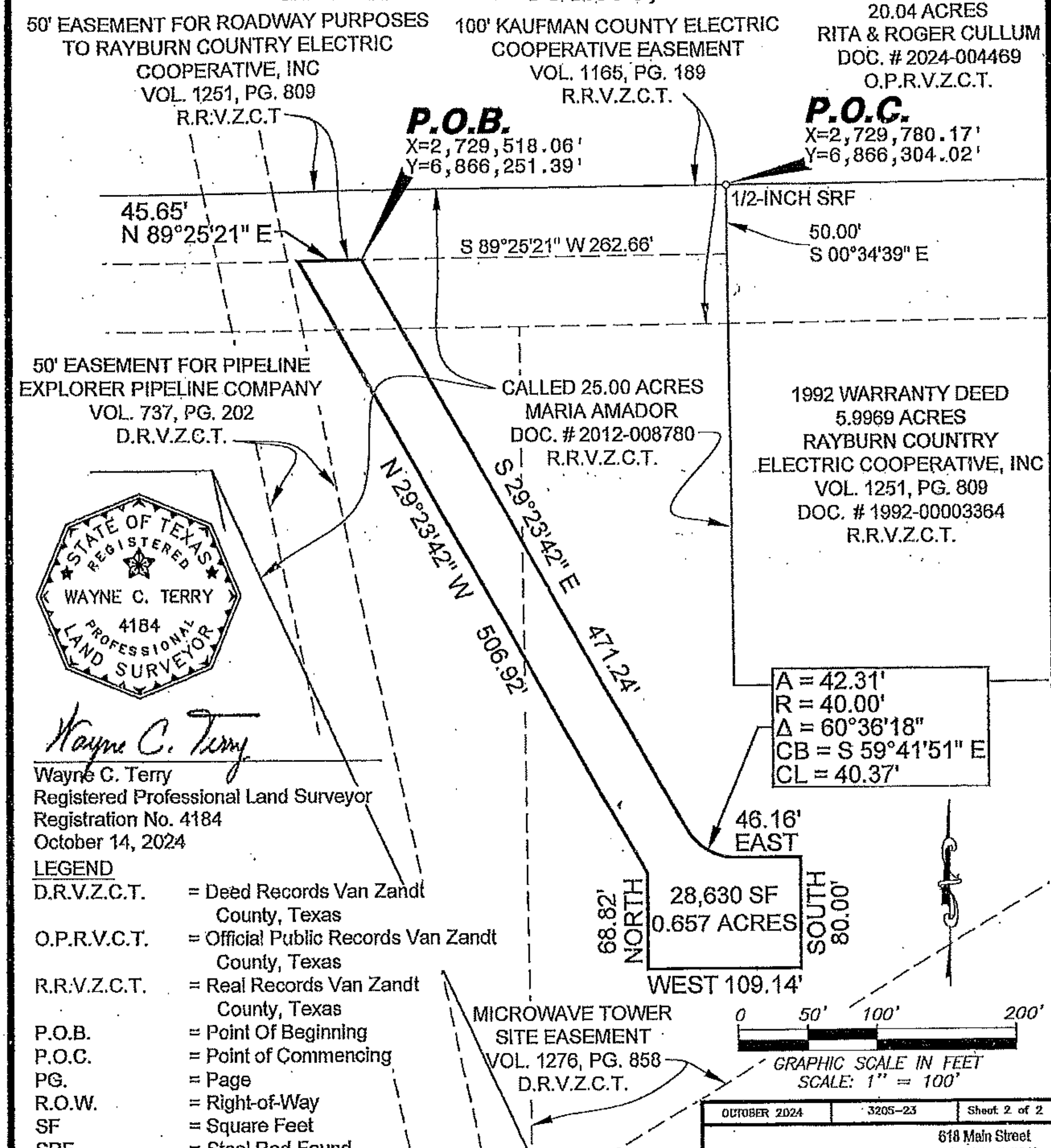
The coordinates and bearings shown hereon are tied to the Texas Coordinate System of 1983, North Central Zone (4202). All distances are measured in U.S. Survey Feet.

AUGUST 2024	3205-23	Sheet 2 of 2

rdelta ENGINEERS
618 Main Street
Garland, TX 75040
Ph. (972) 494-5031
Fax (972) 487-2270
www.rdelta.com
TBPE No. F-1515
TBPLS No. 10155000

EXHIBIT A-1

0.657-ACRE PARTIAL ASSIGNMENT AREA
PART OF THE W. WARENSHOLD SURVEY, ABST. No. 942
IN VAN ZANDT COUNTY, TEXAS



Wayne C. Terry
Registered Professional Land Surveyor
Registration No. 4184
October 14, 2024

LEGEND

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OCTOBER 2024	3205-23	Sheet 2 of 2

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EXHIBIT
E

EXHIBIT A

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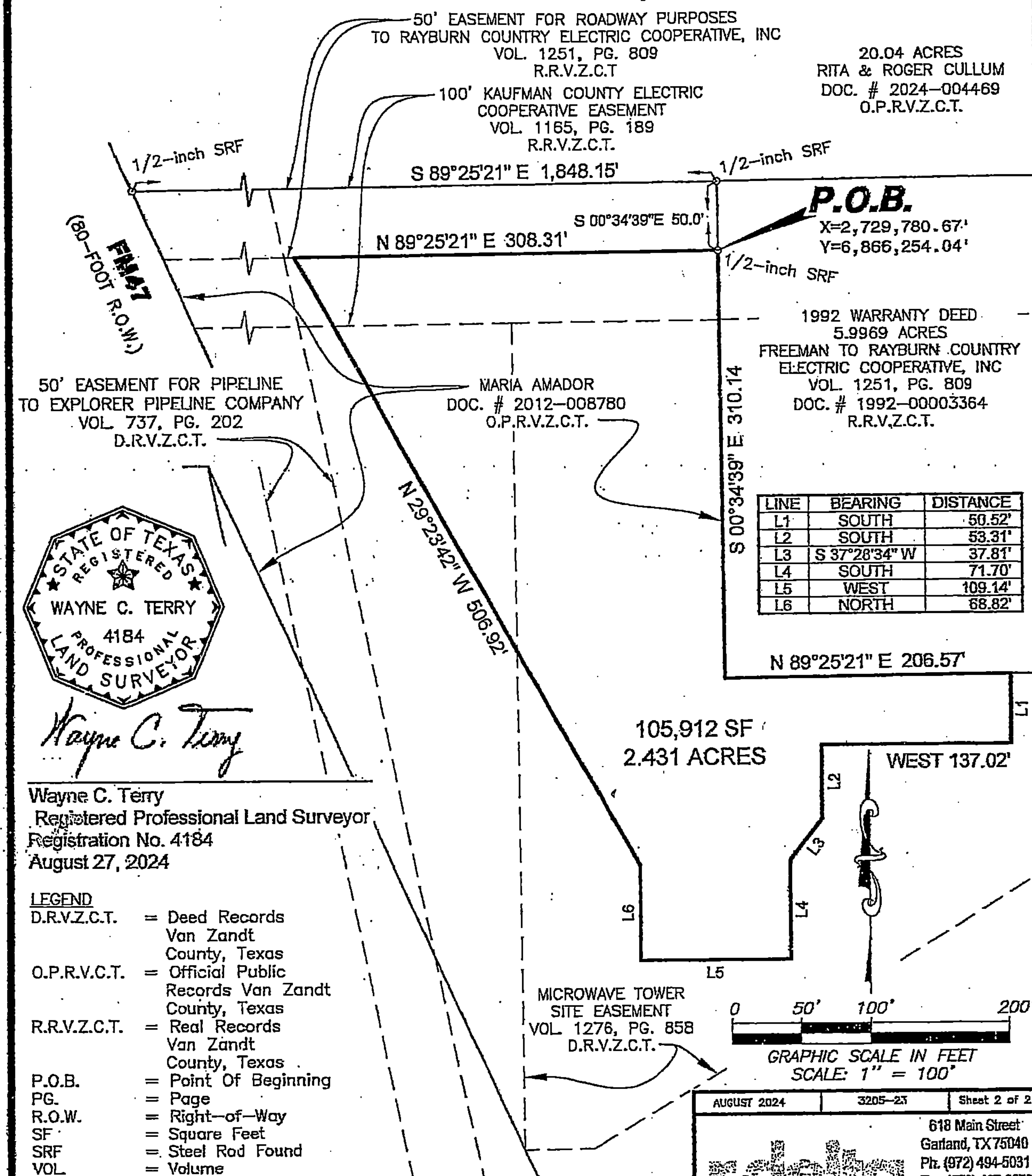
IN VAN ZANDT COUNTY, TEXAS



LINE	BEARING	DISTANCE
L1	SOUTH	50.52'
L2	SOUTH	53.31'
L3	S 37°28'34" W	37.81'
L4	SOUTH	71.70'
L5	WEST	109.14'
L6	NORTH	68.82'

STATE OF TEXAS
REGISTERED
WAYNE C. TERRY
4184
PROFESSIONAL LAND SURVEYOR

Wayne C. Terry

Wayne C. Terry
Registered Professional Land Surveyor
Registration No. 4184
August 27, 2024

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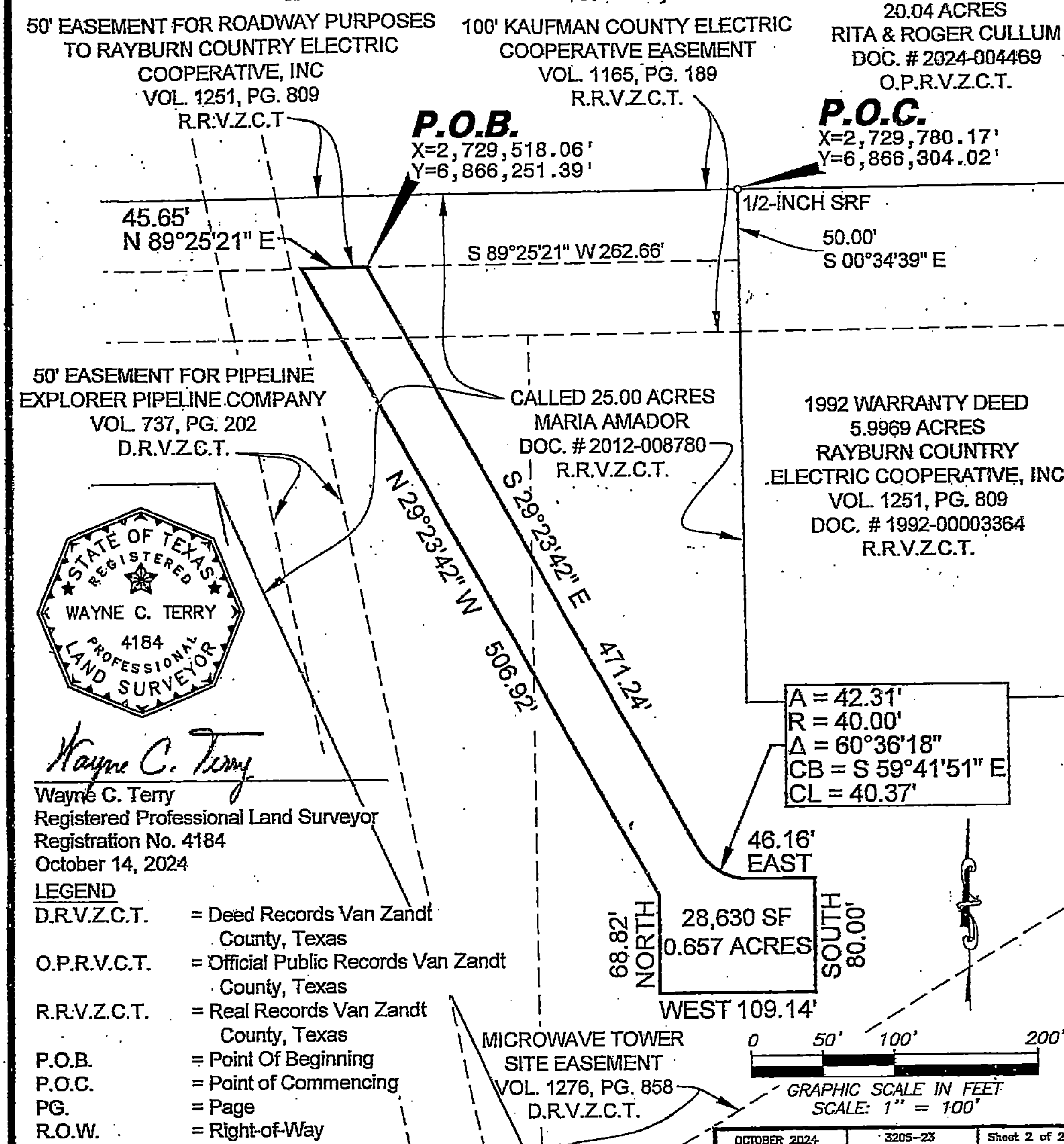

Wayne C. Terry
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OCTOBER 2024 | 3205-23 | Sheet 2 of 2

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www.rdelta.com
TBPE No. F-1515
TBPLS No. 10155000

Stormy Canady

EXHIBIT F

VAN ZANDT COUNTY
FIRE MARSHAL'S OFFICE

24634 ST HWY 64
CANTON, TX 75103
903-567-6026

FIRE MARSHAL ORDER

Location: FM 47 and FM 1651, Canton, TX 75103

Date and time of incident: December 2024- Present

To: Taaleri Energia- (Project Amador)

Deadline: You are hereby **ordered** to comply with all the listed requirements below no later than April 7th, 2025. **Under no circumstance may any of the batteries enter Van Zandt County until all requirements have been met.**

Overview:

All commercial properties are required to be permitted through the Van Zandt County Fire Marshals office (VZCFMO) prior to construction. As a part of this process, you (Project Amador) must also conform to all applicable National Fire Protection Association (NFPA) standards Per Texas Government Code 352. In December of 2024, you started construction on a Battery Energy Storage (BESS) facility (Project Amador) located near the intersection of FM 47 and FM 1651 You did not obtain the required permits through VZCFMO. You are hereby **ORDERED** to conform with all applicable codes.

Current Violations:

1. NFPA 1 (2021 ed.) Chapter 52 (52.1.2.2)- Prior to installation, plans shall be reviewed and approved by the Authority Having Jurisdiction (AHJ). (52.1.7) Those plans shall be in accordance with NFPA 855.
    a. Documentation was not sent to the County until February 3rd, 2025, after a letter the county sent on December 20th, 2024, requesting this documentation.
    b. You have not paid the permit fee per the VZCFMO permit fee schedule. You are hereby **ordered** to pay the required fee. I am attaching the Fee Schedule and application. The amount for the permit is based on the total valuation of the project. Please be aware that if valuation is undervalued or is inaccurate, that is fraud.

INITIALS [handwritten initials]

2. NFPA 855 (2020 ed.) All test reports shall be provided to the AHJ for review and *approval*.
    a. Project Amador has submitted 2 of the 3 relevant test results.
    b. The test for the battery cell was reviewed and **NOT** approved as it failed the thermal runaway and flammable gas test.
    c. The test for the battery cell module was reviewed and **NOT** approved as this test failed the flammable gas test.
    d. The Container test has not been submitted to this office as of today.
        i. You are hereby **ordered** to submit the container test conducted by the Underwriters Laboratory (UL).
3. In the letter you submitted on 2/3/2025, you noted that you are constructing your facility in a remote location as defined by NFPA 855. However, you did not submit a survey showing all relevant infrastructure on the leased property to show that you are in a remote location. Of particular concern is the exact location of a gas pipeline that runs either on the leased property or adjacent to it. Therefore, you are hereby **ordered** to submit a survey to the VZCFMO's office for review and approval to show that you are a remote facility.
4. Project Amador submitted a hazard mitigation and emergency Response plan. Those plans were **NOT** approved as they were not site specific.
    a. You are hereby **ordered** to submit a site-specific hazard mitigation plan.
    b. You are hereby **ordered** to submit a site-specific emergency response plan.
5. Project Amador has failed to provide documentation that they will have a permanent water source available at this location per NFPA 855.

This is not an all-inclusive list as it is the burden of Project Amador to know, understand, and follow State and local codes, ordinances and laws.

Project Amador is hereby **ordered** to comply with all relevant fire codes and permitting process by **4/7/2025 and prior to any of the batteries arriving in Van Zandt County.**

Sec. 352.022. PENALTY FOR FAILURE TO COMPLY WITH ORDER. An owner or occupant who is subject to an order issued under Section 352.016 or 352.0165 commits an offense if that person fails to comply with the order. Each refusal to comply is a separate offense. The offense is a Class B misdemeanor unless it is shown on the trial of the offense that the defendant has been previously convicted two or more times under this section, in which event the offense is a state jail felony.

Respectfully,

KEVIN D. PALMER
Fire Marshal

INITIALS ____

FY 2025 VAN ZANDT COUNTY FIRE MARSHAL OFFICE FEE SCHEDULE

BUILDING PERMIT FEE SCHEDULE

TYPE OF PERMIT & SERVICES	FEES
NEW CONSTRUCTION PERMIT ** Review of building plans ** Meetings with engineers, contractors, architects, etc. ** Conducting a minimum of 3 site inspections ** Final completion inspection ** Includes Fixed Pipe System Permit, Fire Alarm System Permit, and Fire Protection Systems Permit Additional meetings and inspections may be included, depending upon the scope of the project	The fee is based on the valuation of the project ** For projects valued at less than $200,000 the fee is $500 ** For projects valued at $200,000 but less than $1,000,000 the fee is $500 for the first $200,000, plus $1.75 per $1000, or fraction thereof, for the value over $200,000 ** For projects valued at $1,000,000 but less $5,000,000 the fee is $2700 for the first $1,000,000, plus $1.00 for every $1000, or fraction thereof, for the value over $1,000,000 ** For projects valued at $5,000,000 or more, the fee is $10,140 for the first $5,000,000, plus $0.50 for every $1000, or fraction thereof, for the value over $5,000,000
FIXED PIPE SYSTEM PERMIT ** Plan Review ** Witnessing of testing ** Inspection of fire extinguishing systems in commercial kitchens, vent hoods, and ducts	The fee is $300 The fee is due when the plans are submitted for review
FIRE ALARM SYSTEM PERMIT ** Plan review ** Witnessing of testing ** Inspection of fire alarm system or additions to existing systems	** For systems with 200 or fewer initiating or signaling devices, the fee is $300 ** For systems with 201 or more initiating or signaling devices, the fee is $300, plus $0.50 for each device in excess of 200 The maximum fee is $2000 The fee is due when the plans are submitted for review
FIRE PROTECTION SYSTEMS PERMIT ** Plan review ** Witnessing of hydrostatic testing ** Inspection	Residential (13D): The fee is $200 Commercial: The fee is $200-$500 depending on square footage The fee is due when the plans are submitted for review
PRE-SUBMITTAL PLAN REVIEW ** Preliminary plan review ** Meetings conducted prior to formal submission of construction plans	The fee is $75 for each hour of meeting & review The fee is due within 30 days of the actual meeting or review of submitted plans

REINSPECTION & RETESTING ** A single reinspection of a building or a single retest of any system due to the following: - Failure of the previous inspection or test -Attempted inspection or test when the approved plans are not on site	The fee is $75 for each reinspection or retest The fee is due before the final release of public utilities and the issuance of a Certificate of Compliance
DUPLICATE PERMIT ** The issuance of duplicate permits	The fee is $50 for each duplicate permit The fee is due before the permits are issued
TEXAS ALCOHOLIC BEVERAGE COMMISSION LICENSE INSPECTION ** One inspection and one reinspection in case of failure for one location	The fee is $500 for each annual inspection for each bar, club, or retail establishment The fee is due within 30 days of issuance of a report on the inspection
FIRE WATCH / STANDBY ** For qualified personnel for the purpose of identifying and controlling fire hazards	The fee is $100 per hour or a portion of an hour for each required person The fee is due within 30 days of the issuance of an invoice for services provided

2024 VAN ZANDT COUNTY FIRE MARSHAL OFFICE FEE SCHEDULE

Type of Occupancy	Fee
All Commercial or Public Occupancies Other than Certain types listed below	$100.00
Occupancy less than 10,000 sq. ft	$100.00
10,000 to 40,000 sq ft	$150.00
More than 40,000 sq ft	$225.00
Service Stations and other flammable liquid or oxidizer storage facilities	$250.00
Game Room	$1000
Per Game	$15
Fireworks	
Walk-up Firework stand	$100.00
Indoor Firework site	$200.00
Public Display (1.3) site plan approval	$100.00
Public Display (1.3) display observation	$200.00
Day Care Centers	
Licensed for 1-25 children	$100.00
Licensed for 26-49 children	$125.00
Licensed for 50-99 children	$150.00
Licensed for 100-149 children	$175.00
Licensed for more than 150 children	$200.00
Schools	$250.00
Tier II Facilities (ANNUAL)	$150.00
Any Re-inspect on all above items	$75.00

Type of Occupancy	Fee
Foster Homes/Group Homes	
Licensed for 1-6 children	$75.00
Licensed for 7-12 children	$125.00
Hospitals and Nursing Homes	
Licensed for 1-99 beds	$300.00
Licensed for 100-199 beds	$350.00
Licensed for 200-299 beds	$400.00
Licensed for more than 300 beds	$450.00
Other 24 hour Care Facilities, such as residential treatment, personal care, maternity homes, and similar facilities	
Licensed for 1-16 occupants	$150.00
Licensed for 17-49 occupants	$20.00
Licensed for 50 or more occupants	$400.00
Multi Family Dwellings (4 or more units	
Occupancy change per unit	$100.00
Access Gate/Building ID	$100.00
Other inspections and Special Fees	$75.00
Mass Gathering Permit Amusement parks, carnivals, fairs, public gatherings, plan reviews, tents, stages, emergency vehicles access	$400.00

<u>OSSF Fees</u>

Single Family Dwelling	$400.00
Commercial Business	$650.00
OSSF Modification	$200.00
Yearly Maintenance Contract	$30.00
Re-Inspect Fee	$200.00
Late Fee for Maintenance Contract	$50.00

VAN ZANDT COUNTY FIRE MARSHAL
24634 STATE HWY 64
CANTON, TX 75103
903-567-6026 / firemarshal@vanzandtcounty.org

PERMIT APPLICATION

Incomplete Applications will be returned without processing. (Please print or type)

Project Information	DEPT. USE ONLY
Name:	Date approved: ________
Address:	
Contractor Information	Fee: $________ ( ) paid
Name: Contact Person:	Receipt # ________
Address: Phone:	
Email:	

Type of Permit

	Single Family Fire Sprinkler		Mobile Food Unit		Fuel Tank Removal – Type:
	Commercial Fire Sprinkler		Gate/Access Control System		Fuel Tank Installation – Type:
	Multifamily Fire Sprinkler		Firework Stand		Mass Gathering, Amusement Park, Carnival, Fair
	Underground Fire Line		Firework Public Display		Foster Home
	Kitchen Hood System		Certificate of Compliance		Child Care Facility
	Fire Alarm System		Demolition		Adult Care Facility
	Spray Booth Installation		Elevator Installation		Tier II Facility

Details regarding the above request must be provided when application is made and whenever requested by the Fire Marshal. It is the applicant's responsibility to ensure that conditions are in accordance with applicable codes and regulations. No work is to commence until plans are approved and a permit is issued. Violation of work without a permit can result in the issuance of a fine, permit revocation or both. Approved drawings, plans, and or details must always remain present at the location of the project.

Signature of Applicant: ______________________________ **Date:** ____________________

Fee Schedule

Automatic Fire Sprinkler Systems Commercial & Multifamily 13 and 13R Systems	Re-Inspection Fee
0 - 100,000 SQFT = $0.05 per SQFT or $100 minimum	
100,001-300,000 SQFT = $3,000.00 for first 100,001 + $0.02 for each additional SQFT	$100.00
300,001 + SQFT = $5,000.00 for first 300,000 + $0.015 for each additional SQFT.	
Single Family (only) = $100.00 per system.	Per Tag
Total Square Feet: ________	

Fire Alarm systems

0-10 Devices	$100.00 per building	11-25 Devices	$125.00 per building
26-99 Devices	$200.00 per building	100-199 Devices	$250.00 per building
200+ Devices	$450.00 per building	Total # of Devices: ____________	

Kitchen Hood System	$150.00 per system	Mobile Food Unit	$100.00 per vehicle
Gate/Access Control System	$150.00 per system	Firework Public Display	$150.00 per display
Underground Fire Line	$100.00 per system	Firework stand	$100.00 per stand
Mass Gathering	$400.00 per event	Spray Booth	$150.00 per Booth
Fuel Tank Installation	$150.00 per tank	Fuel Tank Removal	$150.00 per tank
Mass Gathering, Fair Amusement Park, Carnival	$400.00 per event	Foster / Group Home 1-6 Foster / Group Home 7-12	$75.00 per insp. $125.00 per insp.
Elevator Installation Demolition Certificate of Compliance	$100.00 per elevator $100.00 per building $150.00 per occupancy	Childcare Facility 1-25 Childcare Facility 26-99 Childcare Facility 100 +	$75.00 per insp. $100.00 per insp. $150.00 per insp.
Tier II Facility	$100.00 per insp.	Adult care Facility	$250.00 for 1-99 beds $300.00 for 100-199 $350.00 for 200+

FOR DEPT. USE ONLY

Permit Approved By: ______________________________ Date: ____________

EXHIBIT G

Stormy Canady

TAALERI
Energia

Confidential – For Authority Having Jurisdiction use only.
Unauthorized disclosure is prohibited.

Ville Rimali
Investment Director, Energy Storage
Taaleri Energia
Kasarmikatu 21 B
00130 Helsinki, Finland
ville.rimali@taaleri.com
+358 41 435 6268

April 7, 2025

Kevin D. Palmer
Fire Marshal
Van Zandt County Fire Marshal's Office
24634 State HWY 64
Canton, TX 75103
kpalmer@vanzandtcounty.org
(903) 910-8602

Subject: Response to Fire Marshal Order

We respectfully disagree with the assertion that our project is currently in violation of NFPA codes. However, we remain committed to full compliance with the requirements of the NFPA and working together to move the project forward towards installation and commissioning.

As per the recommendation in your letter dated February 11, 2025, we attempted to visit the Van Zandt County Fire Marshal's Office on February 13, 2025. During our visit, we found that no one was aware of a "new construction permit" for battery energy storage projects or any related application fees. Additionally, we were unable to locate information regarding the "new construction permit" on the Fire Marshal's Office website. Your order was the first document to provide us with guidance regarding the application process and associated fees. We appreciate you providing this information.

To date, only civil, piling, and substation work has been conducted at the project site. The installation of the Battery Energy Storage System, which falls under the scope of NFPA 855 and related documentation, is scheduled to commence only at the end of April 2025.

Responses to Your Requests Under the Fire Marshal Order

1. **Permit Application:** We have submitted the new construction permit application and have paid the associated application fee. This application was submitted on April 4, 2025 and is Appendix 1 to this letter. The associated application fee of $ 50,840.00 was paid on April 7, 2025.

2. **Fire Testing:** A unit-level large-scale fire test in accordance with UL 9540A has been conducted and successfully passed by an independent laboratory in the United States. This testing complies with NFPA 855 (2020 edition) section 4.1.5, as detailed in Appendix 2. The UL 9540A test process follows a sequential approach, progressing from cell to module, module to unit, until pass is achieved. Consequently, it was anticipated that the cell and module tests might not fully pass, whereas the unit-level test successfully met the requirements. If you have any questions regarding this approach, we would appreciate the opportunity to better explain the battery testing process.

3. **Site Location Compliance:** As per NFPA 855 (2020 edition) section 4.4.3.1, *Remote outdoor locations include ESS located more than 100 ft (30.5 m) from buildings, lot lines that can be built upon, public ways, stored combustible*

materials, hazardous materials, high-piled stock, and other exposure hazards not associated with electrical grid infrastructure. Appendix 3 provides evidence that the project site complies with this requirement, being over 100 feet from any of the listed exposure hazards.

4. **Hazard Mitigation and Emergency Response:** The site-specific Hazard Mitigation Analysis (HMA) is included in Appendix 4. Additionally, the Emergency Response Plan (ERP) for the project is attached as Appendix 5.

5. **Water Supply Compliance:** NFPA 855 (2020 edition) section 4.13.2 states that, *where no permanent adequate and reliable water supply exists for fire-fighting purposes, the requirements of NFPA 1142 shall apply.* NFPA 1142 section 1.1.1 outlines methods for *determining the minimum requirements for alternative water supplies for structural firefighting purposes in areas where the authority having jurisdiction (AHJ) determines that adequate and reliable water supply systems for firefighting purposes do not otherwise exist.* An independent fire protection engineer has calculated the minimum water supply requirements under NFPA 1142 section 4, concluding—with all safety margins accounted for—that a 30,000-gallon water tank is appropriate and typical for similar projects in Texas. Details are provided in Appendix 6. Currently, the project site has two 20,000-gallon frac tanks, which exceed the 30,000-gallon requirement. These tanks, or equivalent frac tanks, will remain onsite during the operational period. Additionally, the project company will contract a water supplier with a source located nearby Dallas to ensure a continuous water supply, even in the event of a prolonged fire, in compliance with NFPA 1142 requirements.

We are fully committed to ensuring the highest level of safety for this project and maintaining close cooperation with Van Zandt County Fire Marshal's Office. We recommend scheduling a call to discuss this response in further detail and address any questions you may have. Should you require additional information or clarification, please do not hesitate to contact us.

Sincerely,

DocuSigned by:
Ville Rimali
30FC3AF8DD26466...

Ville Rimali
Investment Director, Energy Storage
Taaleri Energia

Appendices:

- Appendix 1: Van Zandt County New Construction Permit Application
- Appendix 2: Fluence Gridstack Pro 5000 UL9540A Unit Level Test Report
- Appendix 3: Project Amador Layout
- Appendix 4: Project Amador Preliminary Hazard Mitigation Plan (HMA)
- Appendix 5: Project Amador Preliminary Emergency Response Plan (ERP)
- Appendix 6: Project Amador NFPA 1142 Minimum Fire Water Supply Calculation

Docusign Envelope ID: 3281F635-3EB9-459C-82FD-C9F5EF4C8E22

VAN ZANDT COUNTY FIRE MARSHAL
24634 STATE HWY 64
CANTON, TX 75103
903-567-6026 / firemarshal@vanzandtcounty.org
PERMIT APPLICATION
Incomplete Applications will be returned without processing. (Please print or type)

Project Information	DEPT. USE ONLY
Name: Amador Batter Energy Storage Project	Date approved: ______
Address: 32021 FM 47, Canton, TX 75103	
Contractor Information	Fee: $______ ( ) paid
Name: BT Amador Storage LLC Contact Person: Ville Rimali	
Address: C T Corporation System 1999 Bryan Street, Suite 900, 75201 Dallas Phone: +358 41 435 6268 Email: ville.rimali@taaleri.com	Receipt # ______

Type of Permit

	Single Family Fire Sprinkler		Mobile Food Unit		Fuel Tank Removal – Type:
	Commercial Fire Sprinkler		Gate/Access Control System		Fuel Tank Installation – Type:
	Multifamily Fire Sprinkler		Firework Stand		Mass Gathering, Amusement Park, Carnival, Fair
	Underground Fire Line		Firework Public Display		Foster Home
	Kitchen Hood System	X	Certificate of Compliance		Child Care Facility
	Fire Alarm System		Demolition		Adult Care Facility
	Spray Booth Installation		Elevator Installation		Tier II Facility

Details regarding the above request must be provided when application is made and whenever requested by the Fire Marshal. It is the applicant's responsibility to ensure that conditions are in accordance with applicable codes and regulations. No work is to commence until plans are approved and a permit is issued. Violation of work without a permit can result in the issuance of a fine, permit revocation or both. Approved drawings, plans, and or details must always remain present at the location of the project.

Signature of Applicant: DocuSigned by: 7AEB18D17BDF4CA… Signed by: Ville Rimali B2E45A71B28D181… **Date:** 4/4/2025

Fee Schedule

Automatic Fire Sprinkler Systems Commercial & Multifamily 13 and 13R Systems	Re-Inspection Fee
0 - 100,000 SQFT = $0.05 per SQFT or $100 minimum 100,001-300,000 SQFT = $3,000.00 for first 100,001 + $0.02 for each additional SQFT 300,001 + SQFT = $5,000.00 for first 300,000 + $0.015 for each additional SQFT. Single Family (only) = $100.00 per system. **Total Square Feet:** ______	**$100.00** **Per Tag**

Fire Alarm systems

0-10 Devices	$100.00 per building	11-25 Devices	$125.00 per building
26-99 Devices	$200.00 per building	100-199 Devices	$250.00 per building
200+ Devices	$450.00 per building	**Total # of Devices:** ______	

Kitchen Hood System	$150.00 per system	Mobile Food Unit	$100.00 per vehicle
Gate/Access Control System	$150.00 per system	Firework Public Display	$150.00 per display
Underground Fire Line	$100.00 per system	Firework stand	$100.00 per stand
Mass Gathering	$400.00 per event	Spray Booth	$150.00 per Booth
Fuel Tank Installation	$150.00 per tank	Fuel Tank Removal	$150.00 per tank
Mass Gathering, Fair Amusement Park, Carnival	$400.00 per event	Foster / Group Home 1-6 Foster / Group Home 7-12	$75.00 per insp. $125.00 per insp.
Elevator Installation Demolition Certificate of Compliance	$100.00 per elevator $100.00 per building $150.00 per occupancy	Childcare Facility 1-25 Childcare Facility 26-99 Childcare Facility 100 +	$75.00 per insp. $100.00 per insp. $150.00 per insp.
Tier II Facility	$100.00 per insp.	Adult care Facility	$250.00 for 1-99 beds $300.00 for 100-199 $350.00 for 200+

New Construction BESS facility permit application. Valuation of the project: $ 86 400 000. Permit fee: $ 50 840

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Permit Approved By: ______________________ Date: __________

CSA GROUP

Laboratory Test Data - UL 9540A Checklist and Test Result (Unit Level)

ORIGINAL TEST DATA

The results relate only to the items tested.
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Master Contract:	301546	Model:	GSP 5000 306	Page number 1 of 56
Project / Network:	80229152	Description:	Gridstack Pro 5000 306Ah 2hr+ with CATL modules	

Standard(s): ANSI/CAN/UL 9540A:2019 Fourth Edition, Dated November 12, 2019 - Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems

Testing Laboratory Name: CSA Group - Cleveland
Address: 8801 E. Pleasant Valley Road, Independence, OH 44131 USA
Testing Program: **Custom Test** : Cover Letter ☒, Testing Only ☐

If tests were performed at another facility, then described below:

Testing Laboratory Name: SAFE Laboratories and Engineering Corp.
Address: 5901 Elwin Buchanan Dr, Sanford, NC 27330 USA
Facility Qualification Number: ---

As above / or describe otherwise
Customer: Fluence Energy, LLC
Address: 4601 N. Fairfax Drive, Suite 600, Arlington, VA 22203-1546 USA

Tested By: SAFE Laboratories and Engineering Corp.
Name, Title

Signature on file ----
Signature *Date (YYYY-MM-DD)*

☒ **Reviewed by:** Chris Reed, Product Safety Engineer II
☐ **Witnessed by:**
Name, Title

Chris Reed 2025-03-28
Signature *Date (YYYY-MM-DD)*

Version6 : 2022-08-02

Cell Level Test Summary	
Name of test laboratory perform cell level testing:	UL (Changzhou) Quality Technical Service Co., LTD
Unique identification of test report:	4790838636.3
Standard and its edition used for testing:	UL 9540A:2019 ED4
Manufacturer:	Contemporary Amperex Technology Co., Limited
Brand name / Trademark:	N/A
Model number:	CBDD0
Nominal cell voltage, (V)	3.2
Cell capacity, (Ah)	306
Cell chemistry:	LFP
Physical format of cell:	Prismatic
Approximate dimension, (mm)	174.3 x 71.6x 207.3
Mass, (g)	5500
Method used to initiate thermal runaway:	Film heater
Average temperature at which cell first vented excluding gas collection sample, (°C)	154
Average temperature prior to thermal runaway excluding gas collection sample, (°C)	241
Total gas generation, (Liter)	204
Lower flammability limit (LFL) at ambient temperature (25 ± 5°C), (%)	8.60
Lower flammability limit (LFL) at average gas vent temperature, (%)	7.24
Burning velocity, (Cm/Sec)	54.20
Maximum pressure P_{max}, (psig)	102.74
Gas composition:	See table

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Master Contract:	301546	Model:	GSP 5000 306	
Project / Network:	80229152	Description:	Gridstack Pro 5000 306Ah 2hr+ with CATL modules	

Cell Level Test Summary

Gas		Measured %
Carbon Monoxide	CO	14.596
Carbon Dioxide	CO_2	26.925
Hydrogen	H_2	43.066
Methane	CH_4	7.051
Acetylene	C_2H_2	0.119
Ethylene	C_2H_4	3.289
Ethane	C_2H_6	1.060
Propylene	C_3H_6	0.686
Propane	C_3H_8	0.260
-	C4 (Total)	0.865
-	C5 (Total)	0.399
-	C6 (Total)	0.148
1-Heptene	C7H14	0.025
Styrene	C8H8	0.013
Benzene	C_6H_6	0.082
Toluene	C_7H_8	0.012
Dimethyl Carbonate	$C_3H_6O_3$	1.304
Ethyl Methyl Carbonate	$C_4H_8O_3$	0.101
Total	-	100

Module Level Test Summary

Name of test laboratory perform module level testing:	UL (Changzhou) Quality Technical Service Co., LTD
Unique identification of test report:	4790931782
Standard and its edition used for testing:	UL 9540A:2019 4th Edition
Manufacturer:	Contemporary Amperex Technology Co., Limited
Brand name / Trademark:	N/A
Model number:	M02306P05L01
Nominal voltage rating, (V)	166.4
Nominal capacity rating, (Ah)	612 Ah
Approximate dimension, (mm)	830 x 2235 x 250
Method used to initiate thermal runaway:	Film heater
Number of cells used for initiating thermal runaway:	1
Number of cells exhibited thermal runaway within module:	4 (including initiating)
Cell to cell propagation condition:	Propagation occurred
Peak chemical heat release rate, (kW)	No flaming observed
Total gas generation, (Liter)	See below table

The results relate only to the items tested.
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Master Contract:	301546	Model:	GSP 5000 306	
Project / Network:	80229152	Description:	Gridstack Pro 5000 306Ah 2hr+ with CATL modules	

Weight loss, (%)	Before: 655.5 kg Post: 653.5 kg 0.31% loss
Gas composition:	See table

Gas Compound	Gas Type	Pre-Flaming (L)	Flaming (L)	Minimum detectable flow rate (LPM)
Total Hydrocarbons (Propane Equivalent)	Hydrocarbons	260.29	No flaming	0.50
Carbon Dioxide	Carbon Containing	217.03	No flaming	1.82
Carbon Monoxide	Carbon Containing	77.57	No flaming	0.61
Hydrogen	Hydrogen	263.37	No flaming	14.29

Additional Information: Thermal runaway was contained by module design, no flaming observed

Unit Level Test Summary	
Manufacturer:	Fluence Energy, LLC
Brand name / Trademark:	Gridstack Pro 5000 2hr+
Model number:	GSP5000 306
Nominal voltage rating, (V)	1331
Nominal capacity rating	4888 kWh
Approximate dimension, (mm)	6820 x 2438 x 2896 (22.38 x 8.0 x 9.5) ft
BESS test configuration/intended installation:	Outdoor ground mounted non-residential
Unit certification available?, (Yes/No)	No
Standard(s) used to certify product:	N/A
Certification organization name and its certificate number:	N/A
Electrical configuration of module in BESS:	8S6P
Number of modules in BESS:	48
Fire detection and suppression system integral part of BESS: (Yes/No)	Yes, fire detection is integral part of BESS. Suppression system is optional.
Test conducted with fire detection and suppression system: (Yes/No/Not Applicable)	Yes, fire detection system utilized. Detection system detects flammable gas and opens the vent panels. No suppression system used for this test
Method used to initiate thermal runaway:	External Film heater

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Master Contract:	301546	Model:	GSP 5000 306	Page number 5 of 56
Project / Network:	80229152	Description:	Gridstack Pro 5000 306Ah 2hr+ with CATL modules	

Unit Level Test Summary	
Number of cells used for initiating thermal runaway:	1
Number of cells exhibited thermal runaway within initiating module:	4
Number of modules exhibited thermal runaway within initiating BESS:	1, initiating only
Cell to cell propagation condition:	Propagation occurred
Peak chemical heat release rate, (kW)	N/A, outdoor only installation
Peak convective heat release Rate, (kw)	N/A, outdoor only installation
Flammable gas generation, (Liter)	N/A, outdoor only installation
Total gas generation, (Liter)	N/A, outdoor only installation
Gas composition:	N/A, outdoor only installation
Maximum wall surface temperature, (°C)	2.5
Maximum target BESS temperature, (°C)	13.0
Maximum ceiling or soffit surface temperatures, (°C)	N/A, outdoor only installation
Maximum incident heat flux on target wall surfaces, (kw/m^2)	0.0
Maximum incident heat flux on target BESS, (kw/m^2)	0.0
Maximum incident heat flux of egress path, (kw/m^2)	0.0
Maximum incident heat flux on target ceiling or soffit surfaces, (kw/m^2)	N/A
Total smoke release, (m^2)	N/A, outdoor only installation
Peak smoke release rate, (m^2/s)	N/A, outdoor only installation
Additional Information:	None

The results relate only to the items tested.
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Master Contract:	301546	Model:	GSP 5000 306	
Project / Network:	80229152	Description:	Gridstack Pro 5000 306Ah 2hr+ with CATL modules	

Performance Unit Level Test (Non – Residential Outdoor Ground Mounted)		
Requirement	**Comments**	**Verdict**
If flaming outside of the unit is observed, separation distances to exposures shall be determined by greatest flame extension observed during test.	No flaming observed outside of the unit	P
Surface temperatures of modules within the target BESS units adjacent to the initiating BESS unit do not exceed the temperature at which thermally initiated cell venting occurs	Cell temperature at venting from cell level report 154°C Highest surface temperature 13.0°C	P
For BESS units intended for installation in locations with combustible constructions, surface temperature measurements on wall surfaces do not exceed 97°C (175°F) of temperature rise above ambient	Starting ambient temperature 1.8°C Highest wall temperature 2.5°C	P
Explosion hazards are not observed, including deflagration, detonation or accumulation (to within the flammability limits in an amount that can cause a deflagration) of battery vent gases	Explosion hazards are not observed	P
Heat flux in the center of the accessible means of egress shall not exceed 1.3 kW/m^2	Highest heat flux observed 0.0 kW/m^2	P
Summary of Result: This unit level test meets the applicable performance criteria noted above from section 9.8 of UL 9540A 4th Edition and is considered compliant.		

Possible test case verdicts:

- Test object does not apply to the test object: N/A
- Test object does meet the requirement: P (Pass)
- Test object does not meet the requirement: F (Fail)
- Test object waived based construction detail: W (Waived)

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Master Contract:	301546	Model:	GSP 5000 306	
Project / Network:	80229152	Description:	Gridstack Pro 5000 306Ah 2hr+ with CATL modules	

Clause	Requirement + Test	Result - Remark	Verdict
	Construction		
5	**General**	---	---
5.3	**Battery energy storage system unit**	---	---
5.3.1	Battery system certification available? (Yes/No)	No	---
	Standard(s) used to certify product:	N/A	---
5.3.2	Battery system component documentation	☐ Battery system certification was available – Component detail not documented. ☒ Battery system certification was not available – See list of critical components in attachment section. ☐ Other(explain):	---
	Battery system enclosure approximate dimension, (mm)	6820 x 2438 x 2896	---
	Battery system enclosure material:	Metallic, IP 55 rated	---
	Based on configuration of BESS, test conducted on:	☐ BESS ☒ Battery system	---
5.3.3	Fire detection system	☒ Integral part of DUT, test conducted with fire detection system. ☐ Integral part of DUT, test conducted without fire detection system. ☐ Not integral part of DUT	---
	Fire suppression system	☐ Integral part of DUT, test conducted with fire suppression system. ☒ Integral part of DUT, test conducted without fire suppression system. ☐ Not integral part of DUT	---
5.3.4	Unit level test report	CSA Report 80229152	---
	Performance		
9	**Unit level**	---	---
9.1	**Sample and test configuration**	---	---
9.1.1	The unit level test was conducted with BESS units installed as described in the manufacturer's instructions and this section.	Units installed under test plan CSA 80229151 agreed by client, CSA, and testing facility	P
	BESS test configuration:	See Attachment 3	---
9.1.2	Unit level test was conducted in which internal fire condition created as per module level test.	Film heater method used	P

The results relate only to the items tested.
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Master Contract:	301546	Model:	GSP 5000 306	Page number 8 of 56
Project / Network:	80229152	Description:	Gridstack Pro 5000 306Ah 2hr+ with CATL modules	

Clause	Requirement + Test	Result - Remark	Verdict
	Test setup include initiating BESS unit and target BESS unit representative of an installation.	1 initiating unit and 3 target units used	P
	Additional representative test configuration based on test configuration.	No other representative test configuration.	---
	Separation distances between initiating and target units were representative of the installation.	Distances representative of installation	P
	Testing conducted outdoor for BESS intended for outdoor installation only. Following controls and environmental conditions were in place.	BESS intended for outdoor installation	P
	a) Wind screens were utilized with a maximum wind speed maintained at ≤ 12 mph	Winds below 12 mph and test space is surrounded by shipping containers	P
	b) Temperature range was within 10°C to 40°C	Outdoor temperatures were below 10°C, however, internal cell temperatures of the initiating unit were heated to above 10°C utilizing the unit HVAC system and considered acceptable for testing	P
	c) The humidity was < 90% RH	Humidity at the start of test was below 90%RH	P
	d) There was sufficient light to observe the testing;	Test performed during daylight, and flood lights turned on past sundown	P
	e) There was no precipitation during the testing;	No precipitation	P
	f) There was control of vegetation and combustibles in the test area to prevent any impact on the testing and to prevent inadvertent fire spread from the test area; and	Test area controlled	P
	g) There were protection mechanisms in place to prevent inadvertent access by unauthorized persons in the test area and to prevent exposure of persons to any hazards as a result of testing.	Protection mechanisms in place	P
9.1.2.1	For a container system BESS including those intended for outdoor installation only, the unit level test performed in accordance with the indoor floor mounted unit level test using the battery system racks as the test units and with the test	Not a container system	N/A

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Master Contract:	301546	Model:	GSP 5000 306	
Project / Network:	80229152	Description:	Gridstack Pro 5000 306Ah 2hr+ with CATL modules	

Clause	Requirement + Test	Result - Remark	Verdict
	installation set up in accordance with the installation layout within the container.		
9.1.3	Based on configuration and design of BESS, test conducted on:	☐ BESS ☒ Battery system	---
9.1.4	Initiating BESS unit contain components representative of a BESS unit in a complete installation.	All components in the battery system included with 48 live modules	P
	Combustible components that interconnect the initiating and target BESS units were included.	No combustible interconnecting components used in installation.	N/A
9.1.5	Target BESS units include the outer cabinet (if part of the design), racking, module enclosures, and components that retain cells components.	Target unit contains racking for module enclosures	P
	The target BESS unit module enclosures did not contain cells.	Target unit was partially filled with live modules	N/A
9.1.6	Initiating BESS unit was at the maximum operating state of charge (MOSOC).	Client BMS software did not record during top-off, but OCV from top-off was compared to OCV from initial charge to verify MOSOC and is considered acceptable.	P
	After charging and prior to testing, the initiating BESS was rested for a maximum period of 8 h at room ambient.	The initiating unit rested for more than 8 hours, however testing commenced within 24 hours and is considered acceptable for this testing	P
9.1.7	BESS unit test conducted as per following condition.	As per option b).	P
	a) Integral fire suppression system provided with the DUT.	Fire suppression system not used	N/A
	b) Without Integral fire suppression system.	Fire suppression system not used	P
9.1.8	Electronic and software control were not relied upon for this testing.	Electronic and software controls were not utilized during testing	P
	BESS unit test conducted with Integral fire suppression system meet UL 840 and considered reliable for this testing.	Fire suppression system not used	N/A
9.2	**Test method – Indoor floor mounted BESS units**	---	---
9.2.1	Test room environment was controlled to prevent drafts that may affect test results.	Test performed outside, per 9.1.2 exception	N/A
	At the start of the test, the room ambient temperature was not less than 10°C (50°F) nor more than 32°C (90°F).	See above	N/A
	Ambient temperature range during test, °C	See above	N/A

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Master Contract:	301546	Model:	GSP 5000 306	Page number 10 of 56
Project / Network:	80229152	Description:	Gridstack Pro 5000 306Ah 2hr+ with CATL modules	

Clause	Requirement + Test	Result - Remark	Verdict
9.2.2	Any access door(s) or panels were closed, latched and locked at the beginning and duration of the test.	All doors and panels closed prior to testing and remained closed	P
9.2.3	The initiating BESS unit was positioned adjacent to two instrumented wall sections.	Initiating Unit positioned between target units and targe walls	P
9.2.4	Instrumented wall sections were extended not less than 0.49 m (1.6 ft) horizontally beyond the exterior of the target BESS units.	Wall sections extended not less than 0.49m horizontally beyond exterior of Target Unit 1. Wall sections extend horizontally past Target Unit 2 but is less than 0.49m due to testing space limitations, however, this deviation is not expected to affect the results of the testing.	P
9.2.5	Instrumented wall sections were at least 0.61-m (2-ft) taller than the BESS unit height, but not less than 3.66 m (12 ft) in height above the bottom surface of the unit.	Wall sections were 12 ft in height and the units are 9.5 ft in height	P
9.2.6	The surface of the instrumented wall sections was covered with 16-mm (5/8-in) gypsum wall board and painted flat black.	Wall sections are ¾" plywood painted in black per 9.3.3	P
9.2.7	The initiating BESS unit was centered underneath an appropriately sized smoke collection hood of an oxygen consumption calorimeter.	N/A, outdoor only installation	N/A
9.2.8	The light transmission in the calorimeter's exhaust duct was measured.	N/A, outdoor only installation	N/A
	White light source and photo detector was used for the duration of the test.	N/A, outdoor only installation	N/A
	Smoke release rate was calculated as per following formula. $SRR = 2.303\left(\frac{V}{D}\right)Log_{10}\left(\frac{I_o}{I}\right)$	N/A, outdoor only installation	N/A
9.2.9	The chemical and convective heat release rates were measured for the duration of the test.	N/A, outdoor only installation	N/A
	Chemical heat release rate was calculated as per following formula. $HRR_t = \left[E \times \varphi - (E_{co} - E) \times \frac{1-\varphi}{2} \times \frac{X_{co}}{X_{O_2}}\right] \times \frac{\dot{m}_e}{1+\varphi \times (\alpha - 1)} \times \frac{M_{O_2}}{M_a} \times (1 - X^o_{H_2O}) \times X^o_{O_2}$	N/A, outdoor only installation	N/A

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Master Contract:	301546	Model:	GSP 5000 306	Page number 11 of 56
Project / Network:	80229152	Description:	Gridstack Pro 5000 306Ah 2hr+ with CATL modules	

Clause	Requirement + Test	Result - Remark	Verdict
9.2.10	The heat release rate measurement system shall be calibrated using an atomized heptane diffusion burner.	N/A, outdoor only installation	N/A
9.2.11	The convective heat release rate was measured during test.	N/A, outdoor only installation	N/A
	Thermopile, a velocity probe, and a Type K thermocouple, located in the exhaust system of the exhaust duct were used for measurement.	N/A, outdoor only installation	N/A
9.2.12	Convective heat release rate was calculated as per following formula. $HRR_c = V_e A \frac{353.22}{T_e} \int_{T_a}^{T} C_p dT$	N/A, outdoor only installation	N/A
9.2.13	Physical spacing between BESS units (both initiating and target) and adjacent walls were representative of the intended installation.	Physical spacing based on client provided installation manual	P
9.2.14	Separation distances was specified by the manufacturer for distance between:	--	--
	a) The BESS units and the instrumented wall sections.	See Attachment 3	P
	b) Adjacent BESS units.	See Attachment 3	P
9.2.15	Wall surface temperature measurements was collected for BESS intended for installation in locations with combustible construction.	Wall surface temperatures are collected	P
9.2.16	Wall surface temperatures was measured in vertical array(s) at 152-mm (6-in) intervals for the full height of the instrumented wall sections.	6" intervals used	P
	No. 24-gauge or smaller, Type-K exposed junction thermocouples were used for measurement.	No. 24 gauge or smaller Type K used	P
	The thermocouples were placed horizontally positioned in the wall locations anticipated to receive the greatest thermal exposure.	Thermocouple array centered on initiating unit.	P
9.2.17	Thermocouples were secured to gypsum surfaces by the use of staples placed over the insulated portion of the wires.	Thermocouples secured to plywood surfaces per 9.3.3	P
	The thermocouple tip was depressed into the gypsum so as to be flush with the	Thermocouple tip depressed into plywood per 9.3.3	P

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Clause	Requirement + Test	Result - Remark	Verdict
	gypsum surface at the point of measurement and held in thermal contact with the surface at that point by the use of pressure-sensitive paper tape.		
9.2.18	Heat flux was measured with the sensing element of at least two water-cooled Schmidt- Boelter or Gardon gauges at the surface of each instrumented wall.	Water cooled Schmidt-Boelter gauges used	P
	a) Both were collinear with the vertical thermocouple array.	Collinear with vertical array	P
	b) One was positioned at the elevation estimated to receive the greatest heat flux due to the thermal runaway of the initiating module	Positioned at 4.5 ft in height	P
	c) One was positioned at the elevation estimated to receive the greatest heat flux during potential propagation of thermal runaway within the initiating BESS unit.	Heat flux gauges were placed the height of the units	P
9.2.18.1	Heat flux measurements on walls were waived for residential units that are tested with the cheesecloth indicator.	Heat flux measurements were used	N/A
9.2.18.2	With reference to 9.2.18, if b) and c) were deemed to be at the same location, only one gauge was installed on the wall for the measurement.	Two gauges used	N/A
9.2.19	Heat flux was measured with the sensing element of at least two water-cooled Schmidt- Boelter or Gardon gauges at the surface of each adjacent target BESS unit that faces the initiating BESS unit:	Water cooled Schmidt-Boelter gauges used	P
	a) One was positioned at the elevation estimated to receive the greatest heat flux due to the thermal runaway of the initiating module within the initiating BESS	Positioned at 4.5 ft in height	P
	b) One was positioned at the elevation estimated to receive the greatest surface heat flux due to the thermal runaway of the initiating BESS.	Heat flux gauges were placed at the height of the units	P
9.2.19.1	Heat flux measurements on target units were waived for residential units that are tested with the cheesecloth indicator.	Heat flux measurements were used	N/A
9.2.19.2	With reference to 9.2.19, if a) and b) were deemed to be at the same location, only	Two gauges used	N/A

Clause	Requirement + Test	Result - Remark	Verdict
	one gauge was installed on the target unit for the measurement.		
9.2.20	For non-residential use BESS, heat flux was measured with the sensing element of at least one water-cooled Schmidt-Boelter or Gardon gauge positioned at one for the following location.	Water cooled Schmidt-Boelter gauges used	P
	a. At the mid height of the initiating unit in the center of the accessible means of egress.	Heat flux gauge positioned in egress at 4.5 ft height	P
	b. At the point where the majority of off-gas venting was expected from the initiating unit in the center of the accessible means of egress.	Heat flux gauges were placed the height of the units	P
9.2.21	No. 24-gauge or smaller, Type-K exposed junction thermocouples was installed to measure the temperature of the surface proximate to the cells and between the cells and exposed face of the initiating module.	See Attachment 3	P
	Each non-initiating module enclosure within the initiating BESS unit was instrumented with at least one No. 24-gauge or smaller Type-K thermocouple(s) to provide data to monitor the thermal conditions within non-initiating modules.	Thermocouples placed on target modules within Initiating Unit	P
	Additional thermocouples shall be placed to account for convoluted enclosure interior geometries.	N/A	N/A
9.2.22	For residential use BESS, the DUT was covered with a single layer of cheese cloth ignition indicator.	N/A, outdoor only installation	N/A
	The cheesecloth was untreated cotton cloth running 26 – 28 m^2/kg with a count of 28 – 32 threads in either direction within a 6.45 cm^2 (1 in^2) area.	N/A, outdoor only installation	N/A
9.2.23	An internal fire condition in accordance with the module level test was created within a single module in the initiating BESS unit.	Film heater method used	P
	a) The position of the module was selected to present the greatest thermal exposure to adjacent modules (e.g.	Positioned central within Initiating Unit	P

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Clause	Requirement + Test	Result - Remark	Verdict
	above, below, laterally), based on the results from the module level test;		
	b) The setup (i.e. type, quantity and positioning) of equipment for initiating thermal runaway in the module was same as that used to initiate and propagate thermal runaway within the module level test.	Film heater method utilized, similar instrumentation as the module level test	P
9.2.24	The composition, velocity and temperature of the initiating BESS unit vent gases was measured within the calorimeter's exhaust duct.	N/A, outdoor only installation	N/A
	The hydrocarbon content of the vent gas was measured using flame ionization detection.	N/A, outdoor only installation	N/A
	Hydrogen gas was measured with a palladium-nickel thin-film solid state sensor.	N/A, outdoor only installation	N/A
	Composition, velocity and temperature instrumentation were collocated with heat release rate calorimetry instrumentation.	N/A, outdoor only installation	N/A
9.2.25	The hydrocarbon content of the vent gas was additionally measured a Fourier-Transform Infrared Spectrometer with a minimum resolution of 1 cm^{-1} and a path length of at least 2.0 m (6.6 ft), or equivalent gas analyzer.	N/A, outdoor only installation	N/A
9.2.26	The test was terminated at:	As per option a).	P
	a) Temperatures measured inside each module within the initiating BESS unit return to ambient temperature;	As temperatures were cooling, test was terminated due to an anticipated precipitation approximately 45 hours after test start. One TC remained at 49°C when test was terminated, but all other temperatures were below 40°C, which is considered acceptable for this test.	P
	b) The fire propagates to adjacent units or to adjacent walls; or	See above	N/A
	c) A condition hazardous to test staff or the test facility requires mitigation.	See above	N/A
9.2.27	For residential use systems, the gas collection data gathered was compared to the smallest room installation specified by the manufacturer to determine if the	Non-residential system	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	flammable gas collected exceeds 25% LFL in air.		
9.3	**Test method – Outdoor ground mounted units**		
9.3.1	Test method described in Section 9.2 was used for non-residential use BESS testing.	See Clause 9.2 above	P
	Smoke release rate, convective and chemical heat release rate and content, velocity and temperature of the released vent gases were not measured for outdoor ground mounted installation only.	Smoke release rate, heat release rate, and vent gas information not included in this report. Outdoor ground mounted installation only.	P
9.3.2	Test method described in Section 9.2 except noted in 9.3.3 and 9.3.4 was used for residential use BESS testing.	See Clause 9.2 above	P
	Heat flux measurements for the accessible means of egress was measured in accordance with 9.2.20.	See Attachment 8	P
	The heat flux measurement for the accessible means of egress was waived for outdoor ground mounted residential use BESS because the BESS was draped with cheesecloth.	Cheesecloth not used	P
	Smoke release rate, convective and chemical heat release rate and content, velocity and temperature of the released vent gases were not measured for outdoor ground mounted installation only.	Smoke release rate, heat release rate, and vent gas information not included in this report. Outdoor ground mounted installation only.	P
9.3.3	Test samples was installed in proximity to an instrumented wall section that was 3.66-m (12-ft) tall with a 0.3-m (1-ft) wide horizontal soffit.	Wall is 12 ft in height (soffit not used for this testing)	P
	The sample was mounted on a support substrate and spaced from the wall in accordance with the minimum separation distances specified by the manufacturer.	Clearance distances used from installation manual	P
	The wall and soffit were constructed with 19.05-mm (3/4-in) plywood installed on wood studs and painted flat black.	¾" plywood used and painted black	P
	The instrumented wall was extended not less than 0.49-m (1.6-ft) horizontally beyond the exterior of the target BESS units.	Wall sections extended not less than 0.49m horizontally beyond exterior of Target Unit 1. Wall sections extend horizontally past Target Unit 2 but is	P

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Clause	Requirement + Test	Result - Remark	Verdict
		less than 0.49m due to testing space limitations, however, this deviation is not expected to affect the results of the testing.	
	The No. 24-gauge or smaller, Type-K exposed junction thermocouple array on the walls were extended to the surface of the soffit	No. 24 gauge or smaller Type K used	P
	Manufacturer requires installation against non-flammable material, the test setup included with manufacturer recommended backing material between the unit and plywood wall.	Manufacturer requires clearances from non-flammable material	N/A
9.3.4	Target BESS were installed on each side of the initiating BESS in accordance with the manufacturer's installation specifications.	Three target units used were spaced at minimum allowable separation distances per client installation manual	P
	The physical spacing between BESS units (both initiating and target) were the minimum separation distances specified by the manufacturer.	See above	P
9.4	**Test Method – Indoor wall mounted units**	N/A, outdoor/ground/non-residential only installation	N/A
9.5	**Test Method – Outdoor wall mounted units**	N/A, ground mounted system	N/A
9.6	**Rooftop and open garage installations**	N/A, outdoor ground mounted	N/A
9.7	**Unit level test report**		
9.7.1	Type of installation considered during unit level testing:	Outdoor ground mounted system	P
9.7.2	Additional installation represented by type of installation considered during unit level testing:	N/A	N/A
9.7.3	Unit level report include following information.	Confirmed	P
	a) Unit manufacturer name and model number (and whether UL 9540 compliant);	Fluence Energy, LLC Gridstack Pro 5000 2hr+ Enclosure	P
	b) Number of modules in the initiating BESS unit;	48	P
	c) The construction of the initiating BESS unit per 5.3;	See clause 5.3 in report	P
	d) Fire protection features / detection / suppression systems within unit;	See Unit Level Test Summary	P
	e) Module voltage(s) corresponding to the tested SOC;	See Attachment 1	P

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Clause	Requirement + Test	Result - Remark	Verdict
	f) The thermal runaway initiation method used;	Film heater method	P
	g) Location of the initiating module within the BESS unit;	See Attachment 3	P
	h) Diagram and dimensions of the test setup including mounting location of the initiating and target BESS units, and the locations of walls, ceilings, and soffits;	See Attachment 3	P
	i) Observation of any flaming outside the initiating BESS enclosure and the maximum flame extension;	See Table 5	P
	j) Chemical and convective heat release rate versus time data;	N/A for outdoor installation	N/A
	k) Separation distances from the initiating BESS unit to target walls;	See Attachment 3	P
	l) Separation distances from the initiating BESS unit to target BESS units;	See Attachment 3	P
	m) The maximum wall surface and target BESS temperatures achieved during the test and the location of the measuring thermocouple;	Maximum wall surface temperature: 2.5°C (located 138" from ground) Maximum target BESS temperature: 13.0°C (located Target Unit 3, Rack 3 Module 1)	P
	n) The maximum ceiling or soffit surface temperatures achieved during the indoor or outdoor wall mounted test and the location of the measuring thermocouple;	N/A, outdoor ground mounted	N/A
	o) The maximum incident heat flux on target wall surfaces and target BESS units;	Maximum heat flux on target wall: 0.0 kW/m^2 Maximum heat flux on target BESS: 0.0 kW/m^2	P
	p) The maximum incident heat flux on target ceiling or soffit surfaces achieved during the indoor or outdoor wall mounted test;	N/A, outdoor ground mounted	N/A
	q) Gas generation and composition data;	N/A, outdoor ground mounted	N/A
	r) Peak smoke release rate and total smoke release data;	N/A, outdoor ground mounted	N/A
	s) Indication of the activation of integral fire protection systems and if activated the time into the test at which activation occurred;	Fire alarms activated, louvers were opened 48 min after test start	P
	t) Observation of flying debris or explosive discharge of gases;	See Table 5	P

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Clause	Requirement + Test	Result - Remark	Verdict
	u) Observation of re-ignition(s) from thermal runaway events;	See Table 5	P
	v) Observation(s) of sparks, electrical arcs, or other electrical events;	See Table 5	P
	w) Observations of the damage to: 1) The initiating BESS unit; 2) Target BESS units; 3) Adjacent walls, ceilings, or soffits	See Table 5	P
	x) Photos and video of the test.	See Attachment 2, videos provided to client	P

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Table 1 – Unit charge specification	
Charging method	CC
Charge current, (Adc)	350
Charge voltage, (Vdc)	1497.6 V per rack
Manufacturer recommended charge temperature, (°C)	20 to 35
Maximum Operating State of Charge Condition	When any cell voltage reaches 3.6 V per rack as determined by BMS
Additional comments	For this test, the initiating BESS was charged individually by racks with 80 Adc at 1497.6 Vdc until the MOSOC condition was met. MOSOC condition was verified with individual cell voltage reading (cell reaches 3.6V). OCV of racks were compared during final charge on 2025-01-07 and previous charge between 2024-12-30 and 2025-01-03 to further confirm SOC.

Table 2 – Unit rest duration				
Sample Number	Final charge end time		Test start time	
	Date (YYYY-MM-DD)	Time (HH:MM AM/PM)	Date (YYYY-MM-DD)	Time (HH:MM AM/PM)
Gridstack Pro 5000 1	2025-01-07	10:21 PM	2025-01-09	5:14 PM
Ambient temperature during unit conditioning				
Ambient Temperature, (°C)		Relative Humidity, (%RH)		
-5.6 to 17.8		27 to 100		
Note: Initiating Unit was charged outside at the test site. While outdoor temperatures are low, unit was covered and external heaters were used during charging, and unit chiller/HVAC was used to raise the internal temperatures of the Initiating Unit to >10°C. This is considered acceptable for this test.				

Table 3 – Unit level test	
Sample Number:	Gridstack Pro 5000 1
Ambient temperature at start of test, (°C)	35.2 °F (1.78 °C), see note in Table 2
Ambient temperature range during test, (°C)	20.1 °F to 35.2 °F (-6.6°C to 1.78°C), see note in Table 2
Relative humidity, (%RH)	33% to 90%
Number of cells used for initiating thermal runaway:	1
Open circuit voltage before test, (Vdc)	Rack 1: 1404 Rack 2: 1444 Rack 3: 1441 Rack 4: 1387 Rack 5: 1438 Rack 6: 1440
External film heater ramp rate, (°C/min)	4.5

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Table 3 – Unit level test	
Other method used to initiate thermal runaway:	N/A
Location of cell and module for initiating thermal runaway:	See Attachment 3
Number of cells exhibited thermal runaway within initiating module:	4, cell 20-2 (initiating), cell 21-1, cell 21-2, and cell 20-1. See Attachment 2.
Number of modules exhibited thermal runaway within initiating BESS:	1, initiating only
Location of cell and module exhibited thermal runaway within initiating BESS:	See Attachment 3
Cell to cell propagation condition:	Propagation occurred
Peak chemical heat release rate, (kW)	N/A, outdoor installation
Peak convective heat release rate, (kW)	N/A, outdoor installation
Flammable gas generation, (Liter)	N/A, outdoor installation
Total gas generation, (Liter)	N/A, outdoor installation
Peak smoke release rate, (m^2/sec)	N/A, outdoor installation
Total smoke release rate, (m^2)	N/A, outdoor installation

Table 4 – Gas composition
N/A, outdoor installation

Table 5 – Critical observation	
Condition	**Comment**
Any flaming outside the initiating BESS enclosure and the maximum flame extension:	No flaming observed
Flying debris	No flying debris
Explosive discharge of gases	No explosive discharge of gases
Re-ignition(s) from thermal runaway events	No re-ignition
Sparks	No sparks
Electrical arcs	No electrical arcs
Other electrical events	N/A
Damage to the initiating BESS unit	Initiating module had 4 cells go into thermal runaway. The top of the module case was partially melted and charred from heat. Thermal runaway did not propagate outside of initiating module.
Damage to target BESS units;	No damage to target units observed.
Damage to adjacent walls	No damage to target wall observed.
Damage to ceilings	N/A, outdoor installation
Damage to soffits	N/A, outdoor installation

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Attachments

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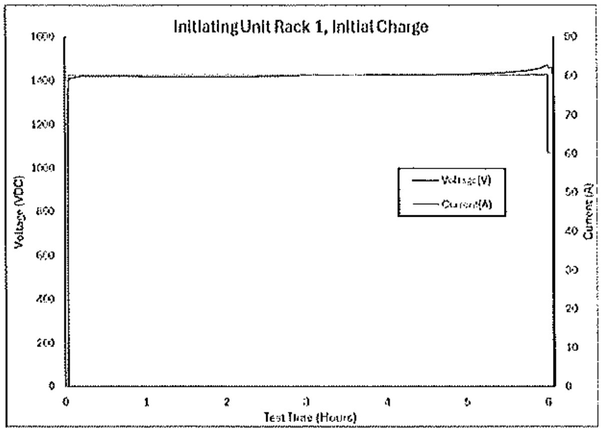
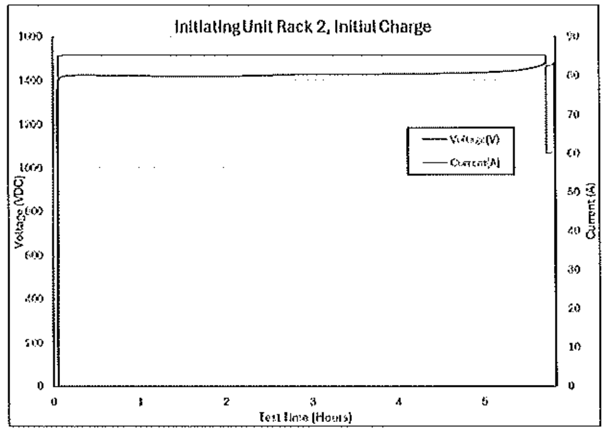
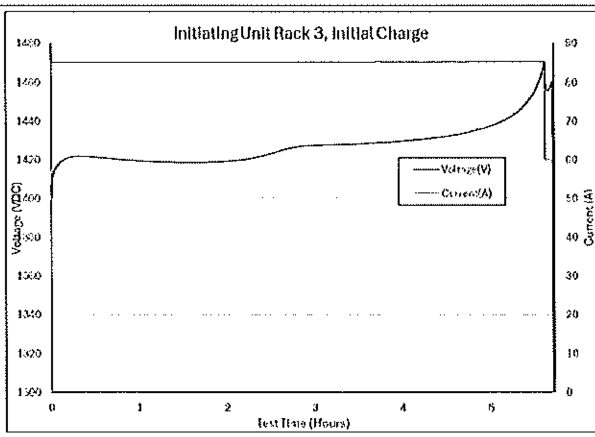
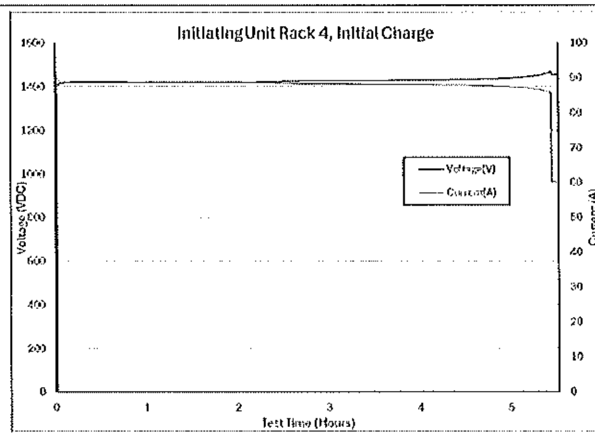
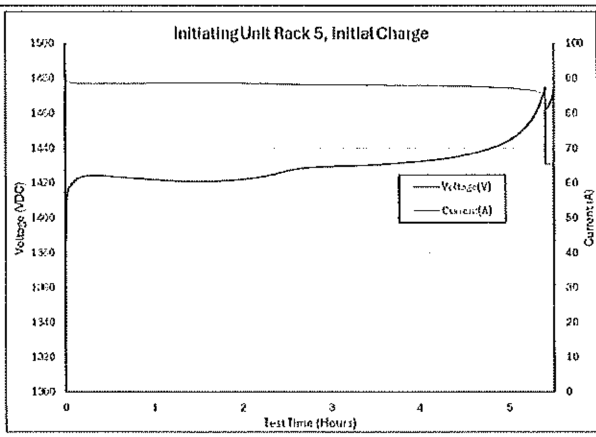
Attachment 1 - Unit charge conditioning graphs

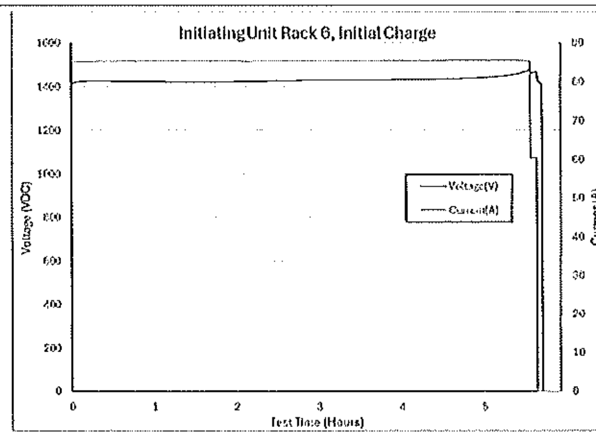












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Attachment 2 – Photos

General sample photos

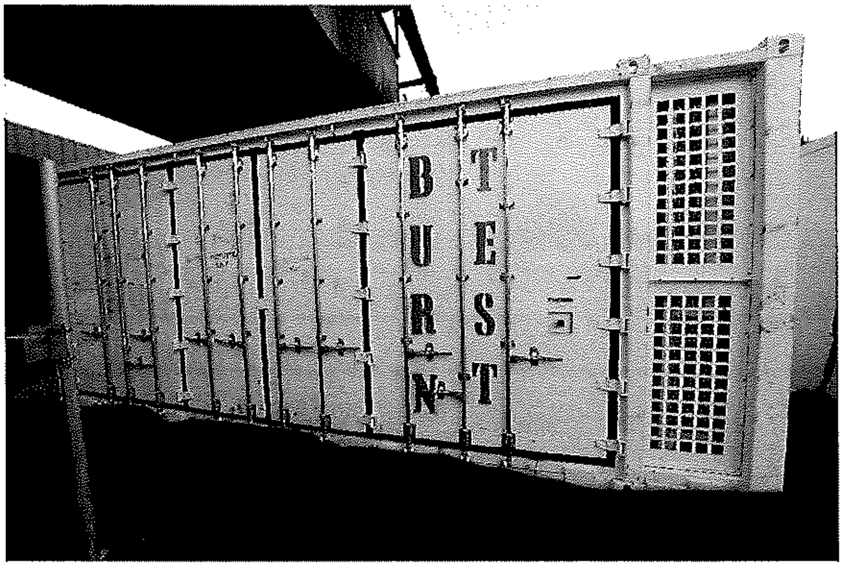

Figure 2.1: Initiating Unit

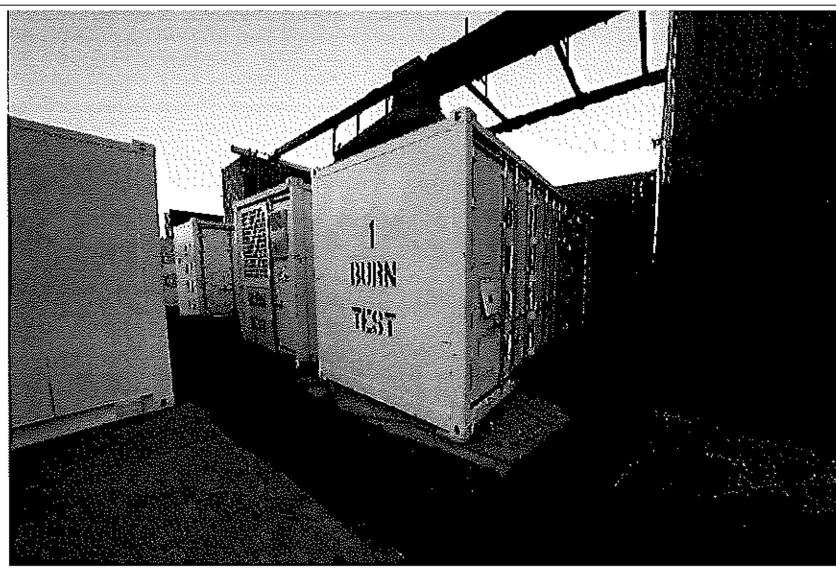

Figure 2.2: Overall test setup

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Figure 2.1: Test setup view from wall – from left to right: Target Unit 1, Initiating Unit, and Target Unit 3

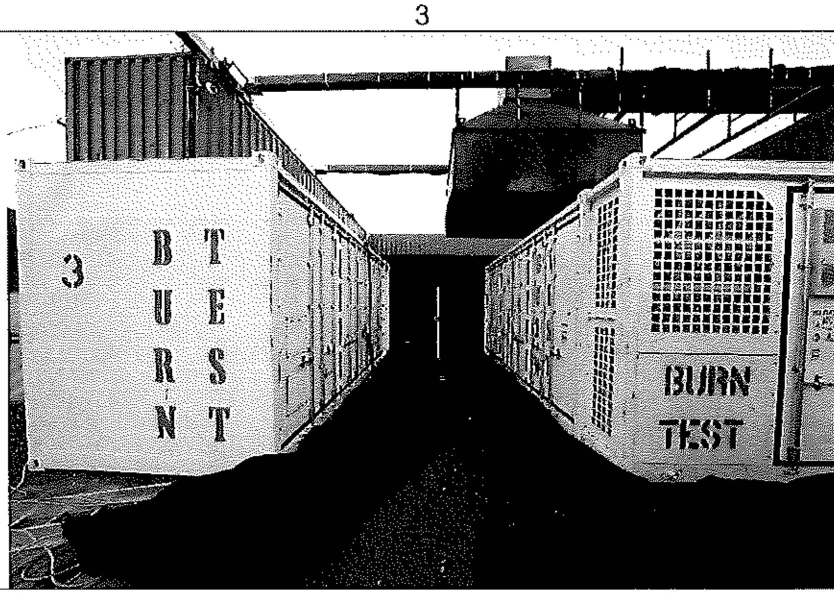

Figure 2.2: Test setup cont., aisle between Target Unit 3 and Initiating Unit

Attachment 2 – Photos

Photos with heater and thermocouple installation

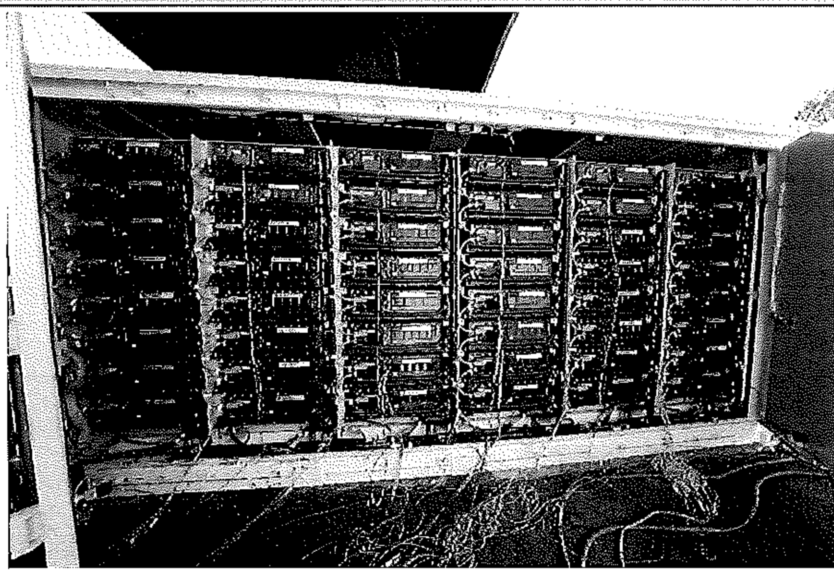

Figure 2.3: Fully populated Initiating Unit

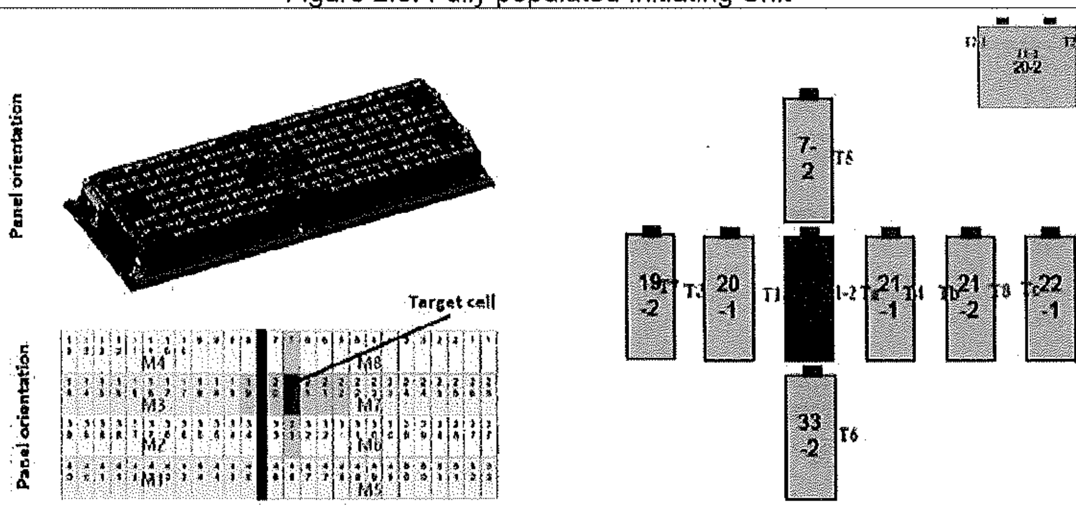

Figure 2.4: Initiating Module Instrumentation

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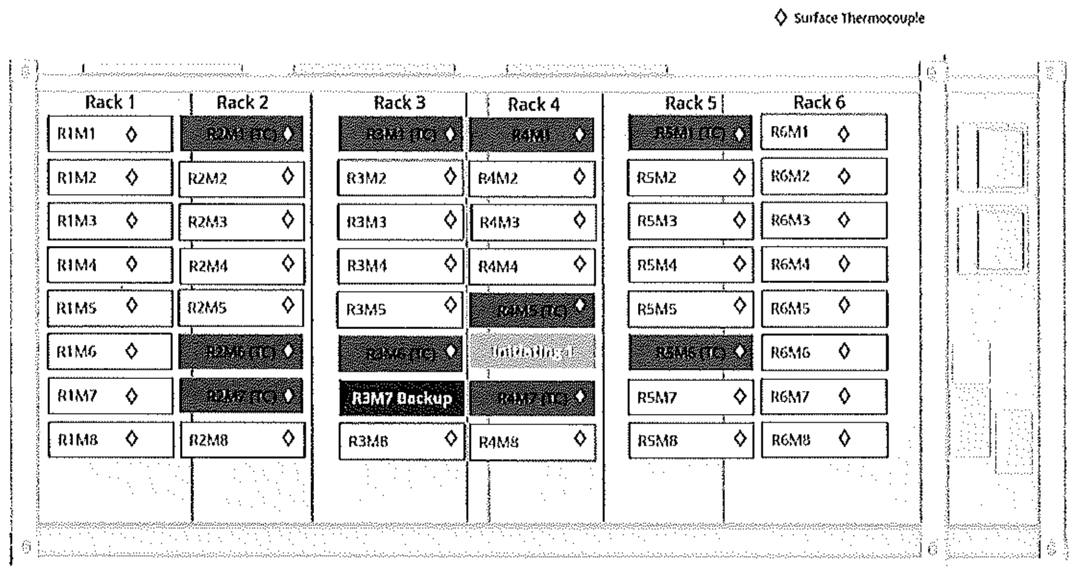

Figure 2.7: Initiating Unit Instrumentation

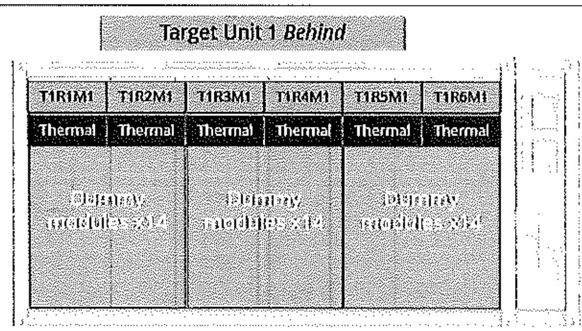

Figure 2.8: Target Unit 1 live module placement

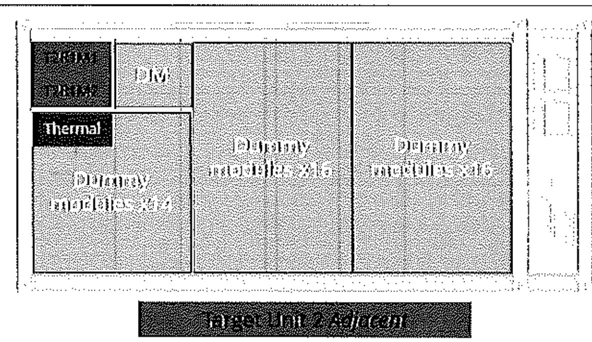

Figure 2.9: Target Unit 2 live module placement

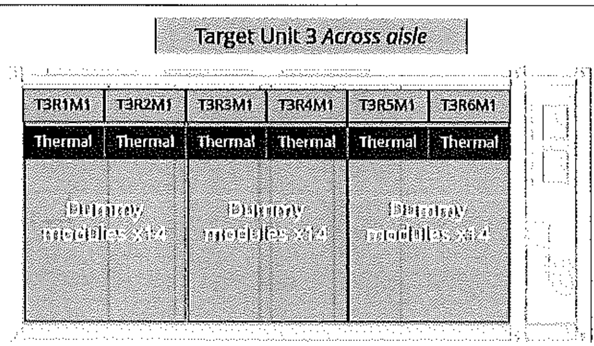

Figure 2.10: Target Unit 3 live module placement

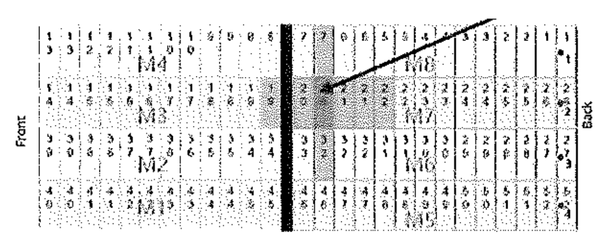

Figure 2.11: Target Unit 1 TC Module Instrumentation

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Attachment 2 – Photos

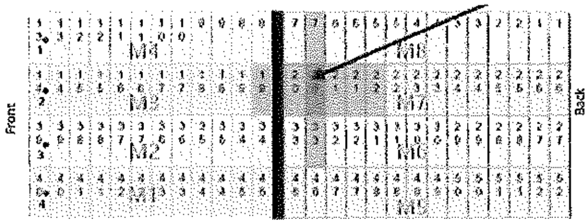	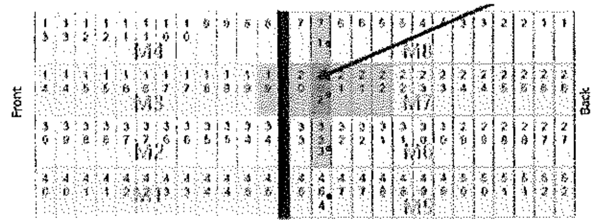
Figure 2.12: Target Unit 3 TC Module Instrumentation	Figure 2.13: Initiating Unit & Target Unit 2 TC Module Instrumentation

Photos during test in progress

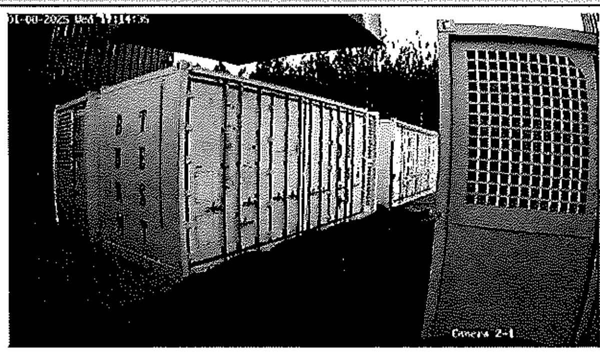	
Figure 2.14: At test start (00:00:00)	Figure 2.15: Gas visible on camera (00:47:29)
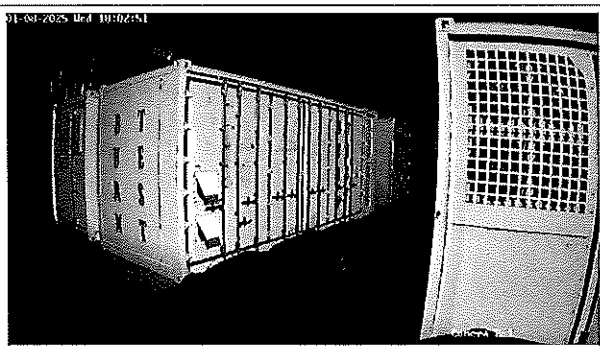	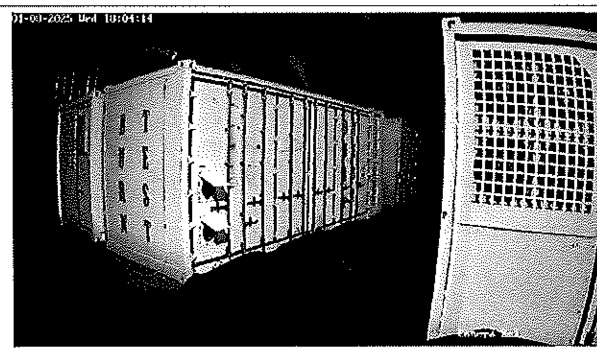
Figure 2.16: Gas detection system operates, ventilation system activates and louvers open (00:48:16)	Figure 2.17: Gas escaping continuously from top vent (00:49:39)

Attachment 2 – Photos

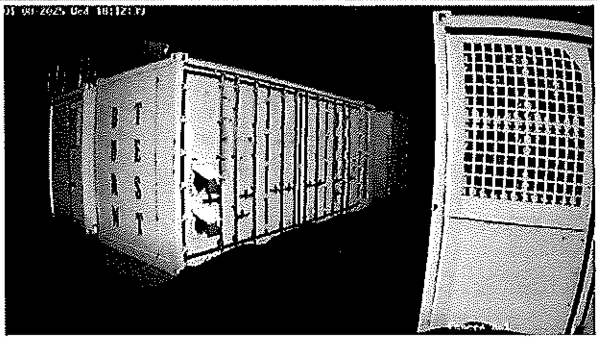

Figure 2.18: Gas production stopped (00:58:04)

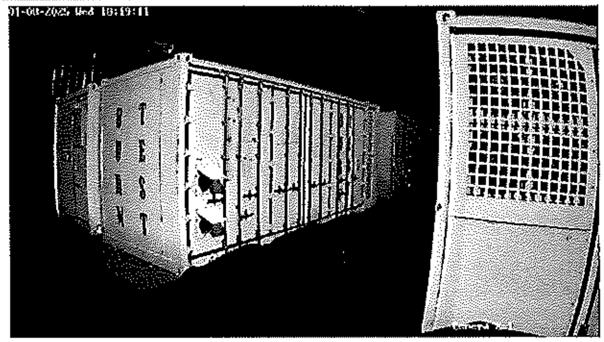

Figure 2.19: Increased smoking after additional venting event (01:04:36)

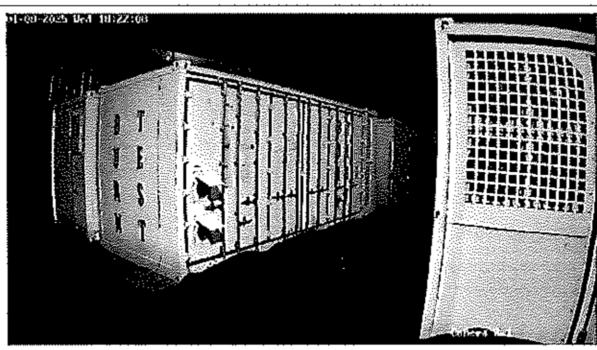

Figure 2.20: Continuous smoke release from ventilation outlet (01:07:33)

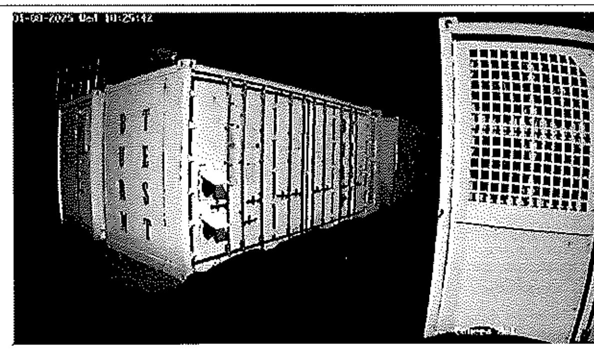

Figure 2.21: Smoke production stopped, no further activity from the DUT for the remainder of test (01:11:07)

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Attachment 2 – Photos

Photos after test

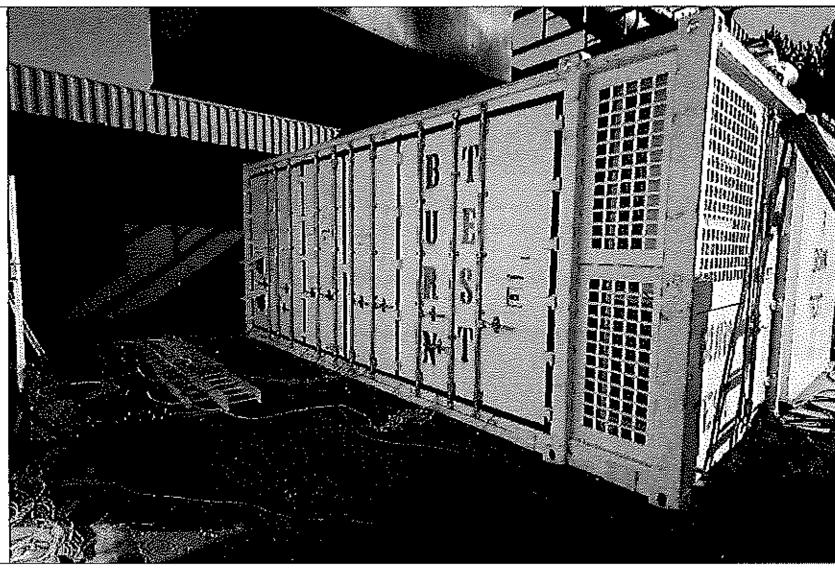

Figure 2.22: Initiating Unit post-test with no visible external damage

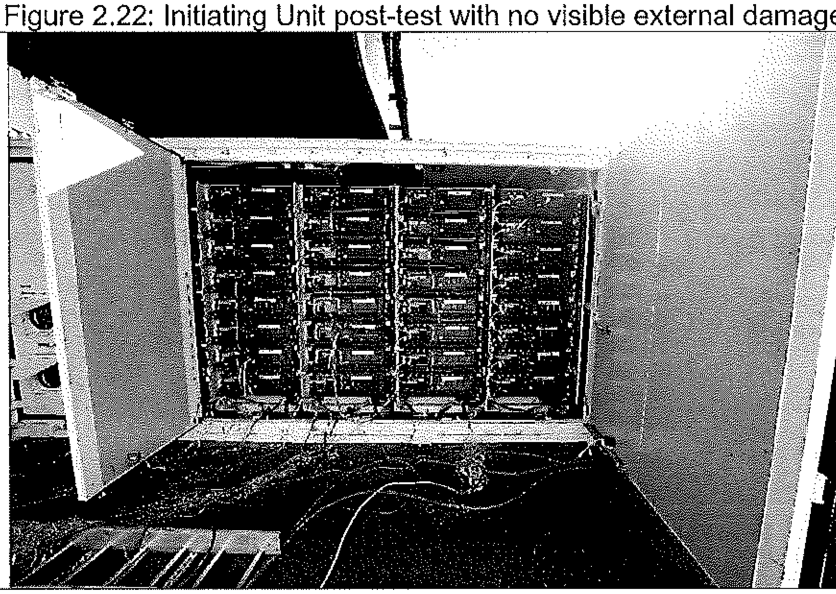

Figure 2.23: Initiating Unit door open

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Attachment 2 – Photos

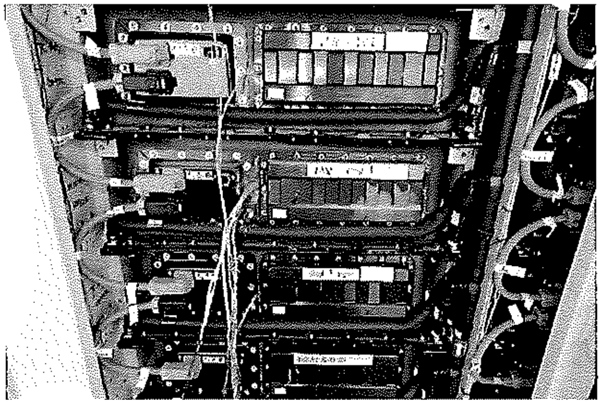

Figure 2.24: Close up of initiating module

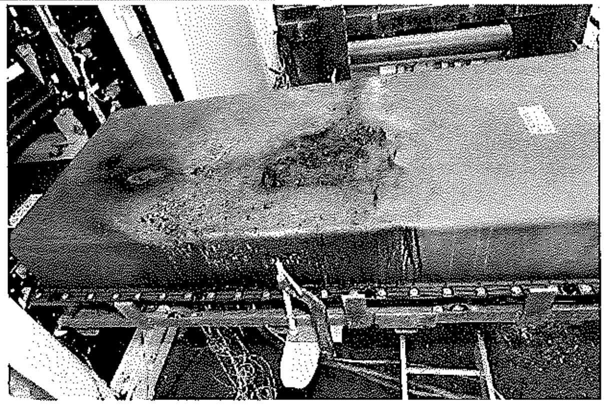

Figure 2.25: Initiating module removed from Initiating Unit

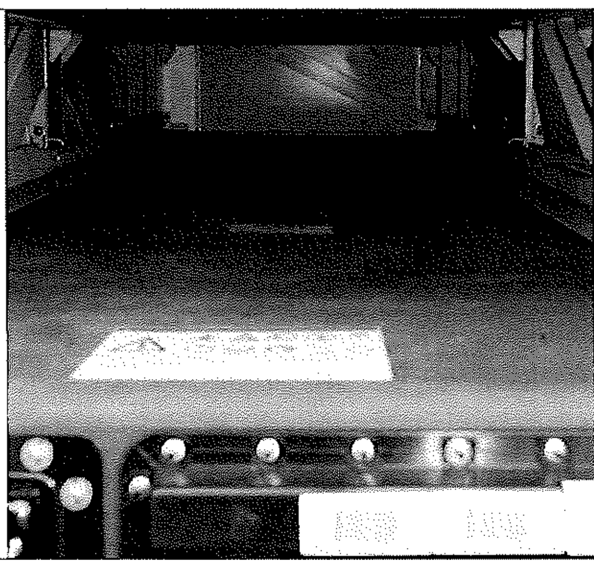

Figure 2.26: Condition of module below initiating module (R4M7) post-test

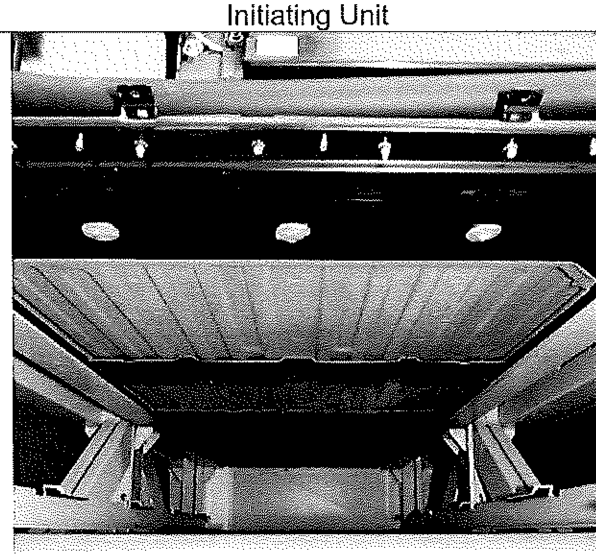

Figure 2.27: Condition of module above initiating module (R4M5) post-test

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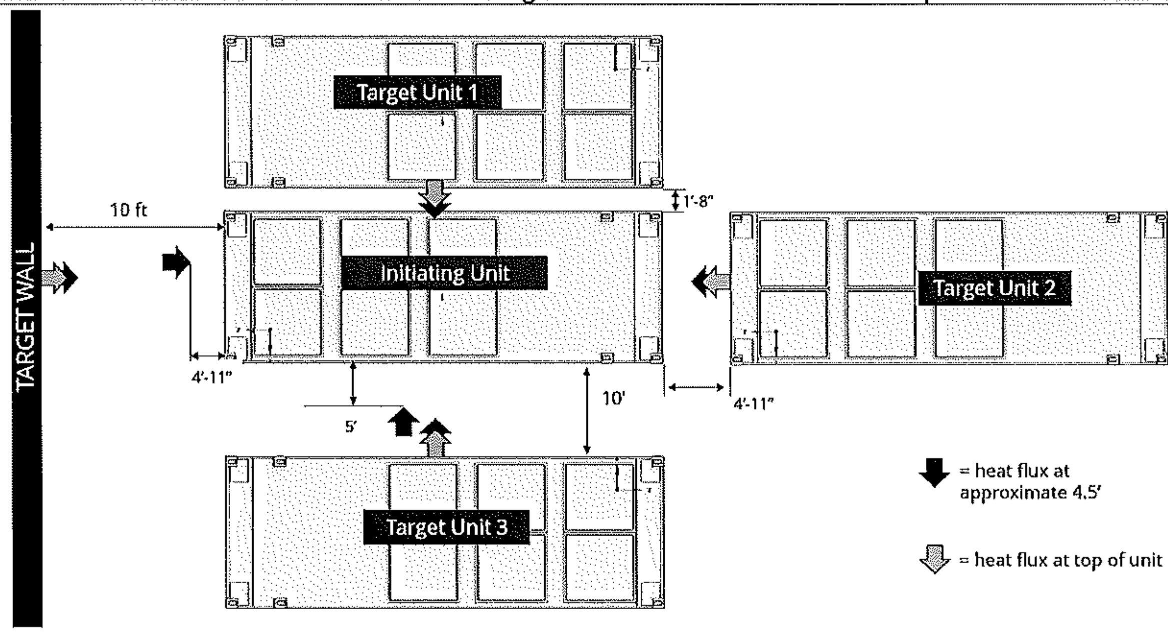
Attachment 3 - Diagram and dimension of test setup



Separation distance and other critical dimension detail		
Location	**Required by manufacturer (FT)**	**Measured (FT)**
Between Initiating Unit and Target Unit 1	1.67 (1'8")	1.64 (1'7.7")
Between Initiating Unit and Target Unit 2	4.92 (4'11")	4.92
Between Initiating Unit and Target Unit 3	10	10
Between Initiating Unit and Target Wall	10	10
Egress heat flux gauge to initiating unit	5	5
Egress heat flux gauge height	4.5 (4'6")	4.5

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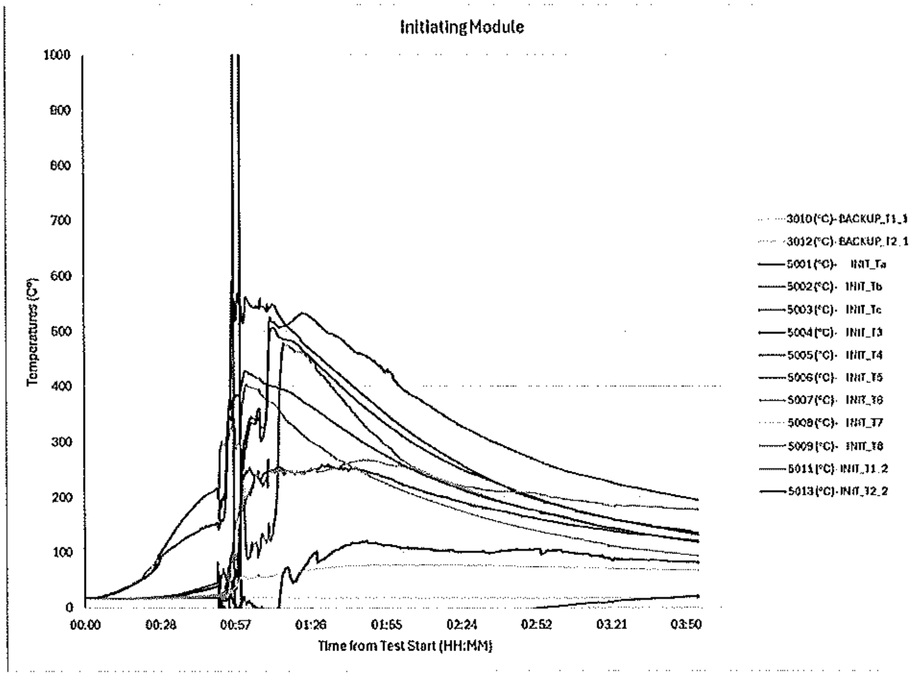
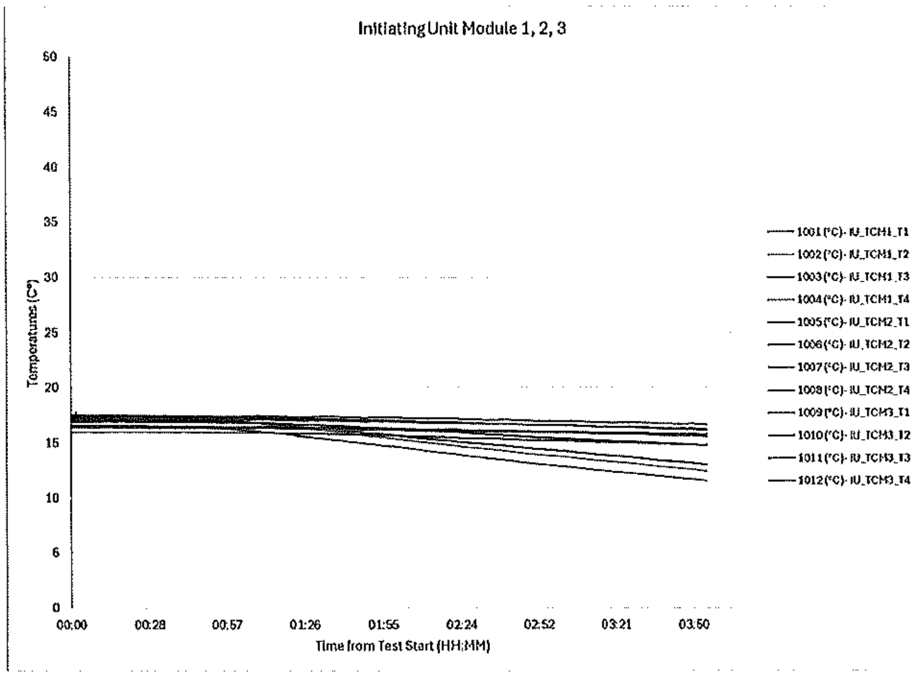
Attachment 4 - Temperature graph during testing (first 3.5 hrs)

For all temperature graphs, the first 3.5 hours of the test is plotted to show the critical events. No major events observed other than cooldown. The total test time is 45.4 hours





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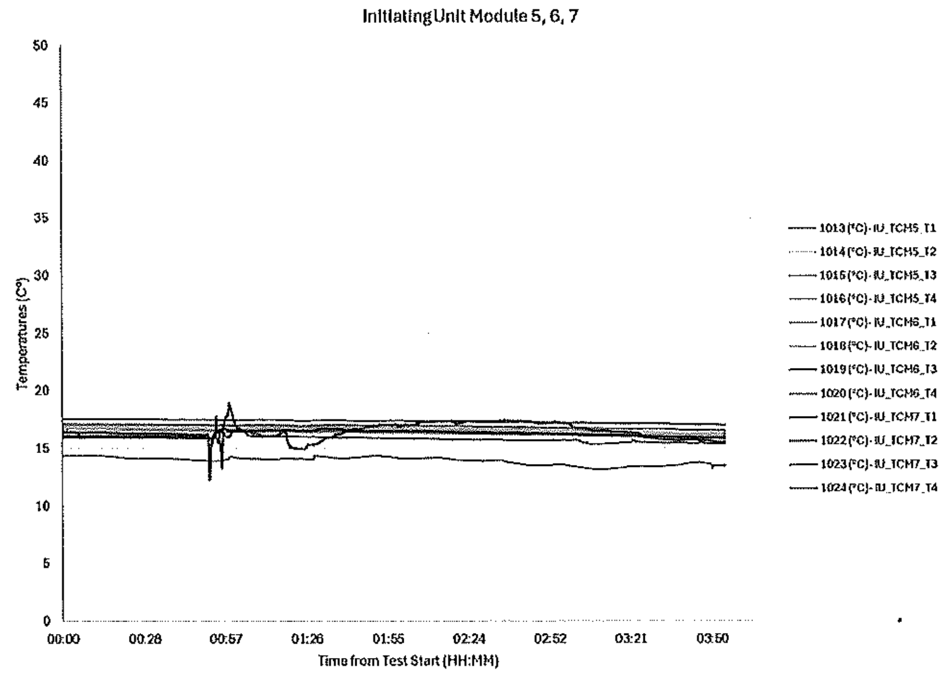
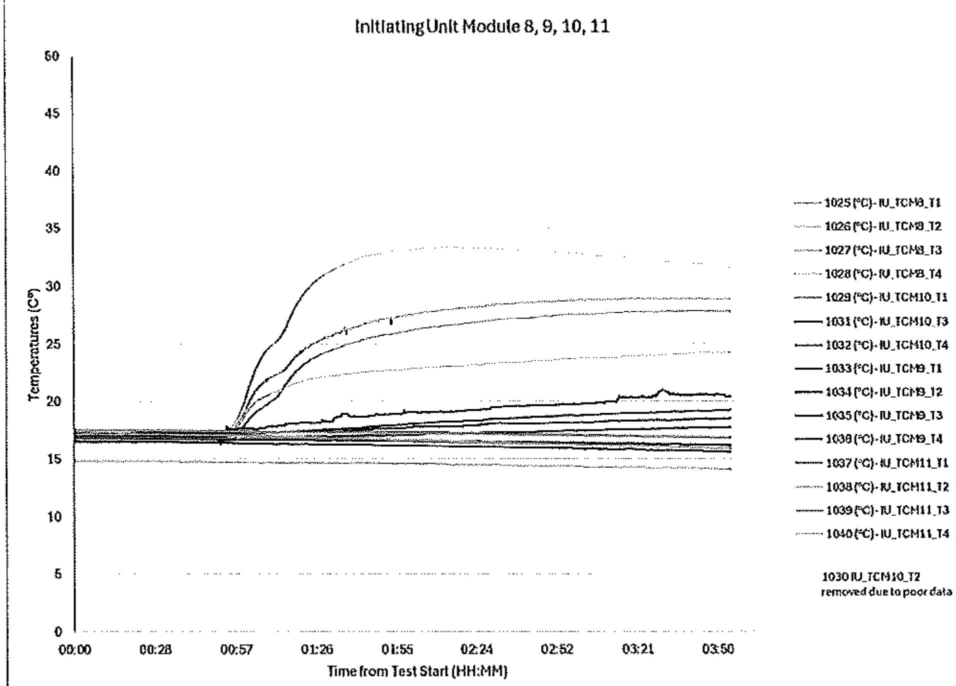
Attachment 4 - Temperature graph during testing (first 3.5 hrs)





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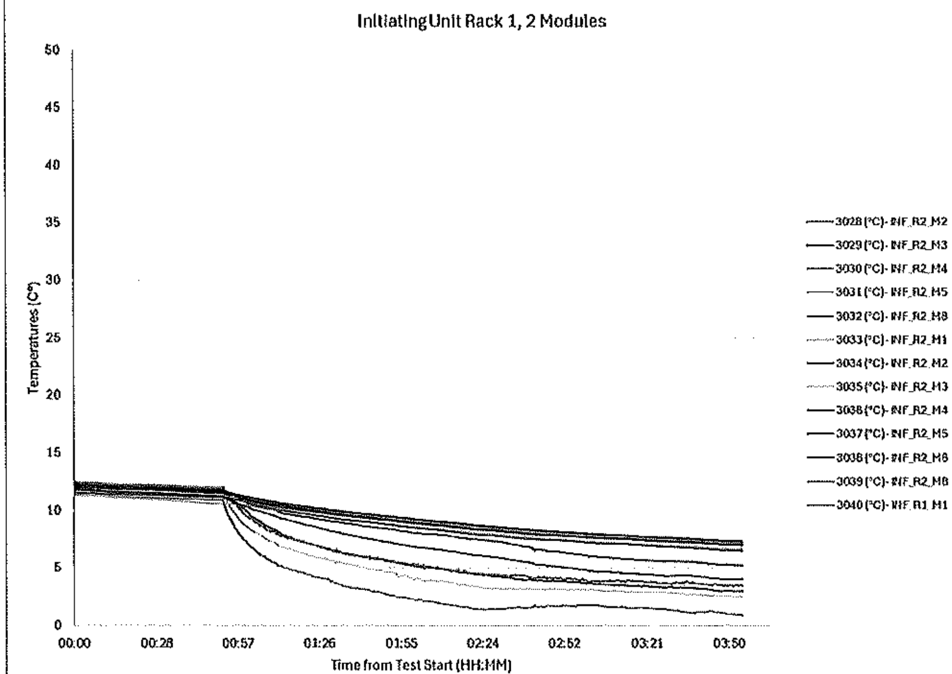
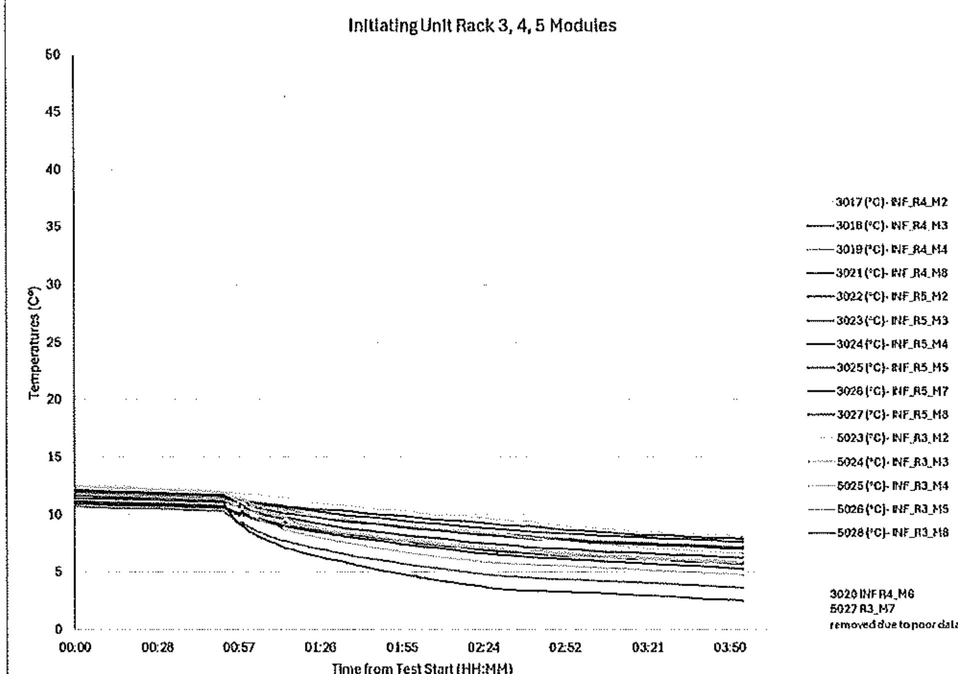
Attachment 4 - Temperature graph during testing (first 3.5 hrs)





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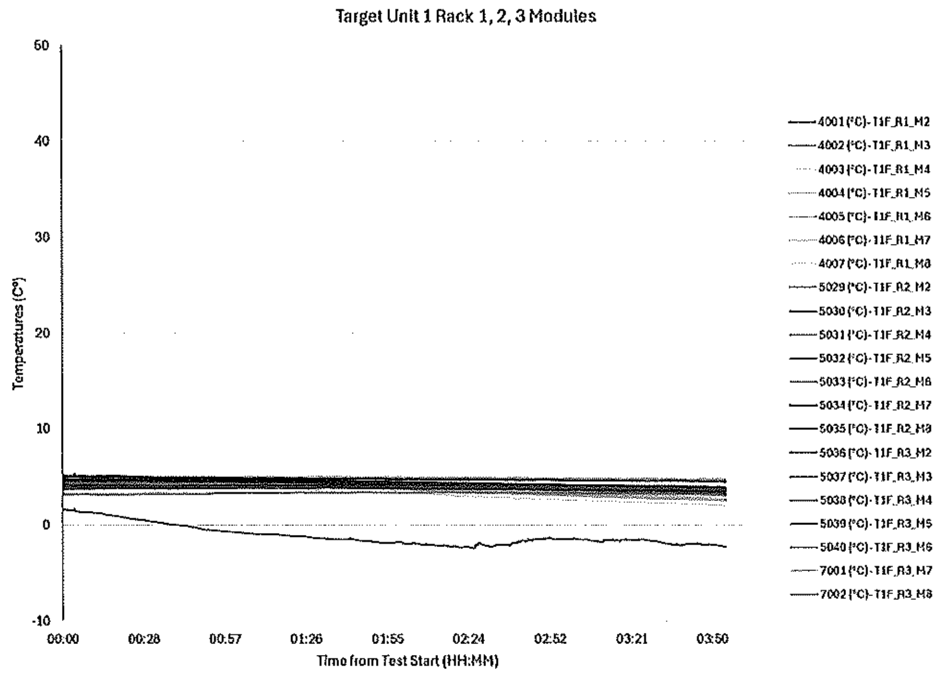

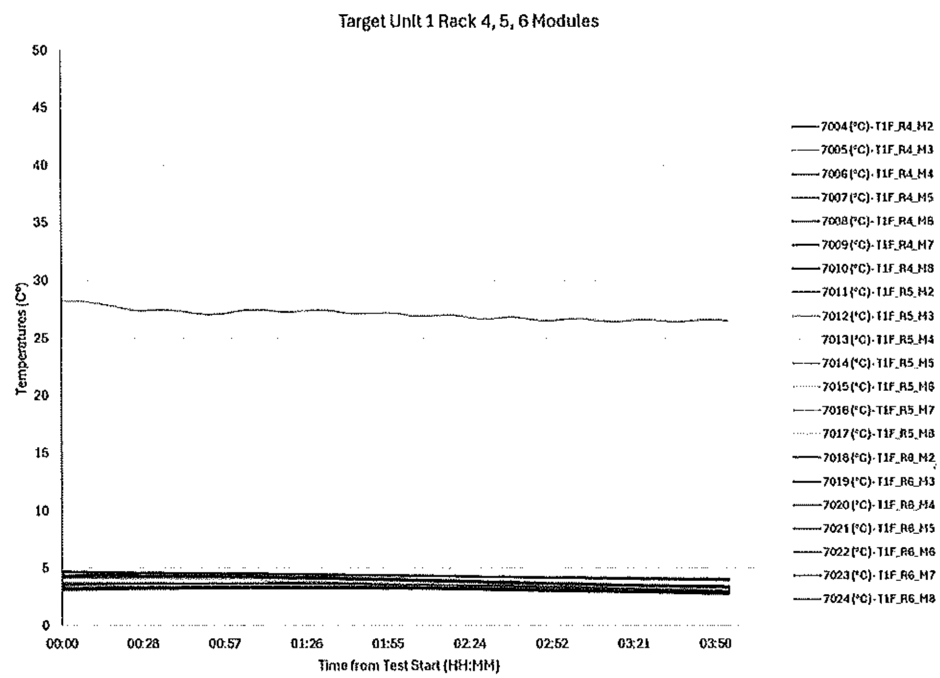

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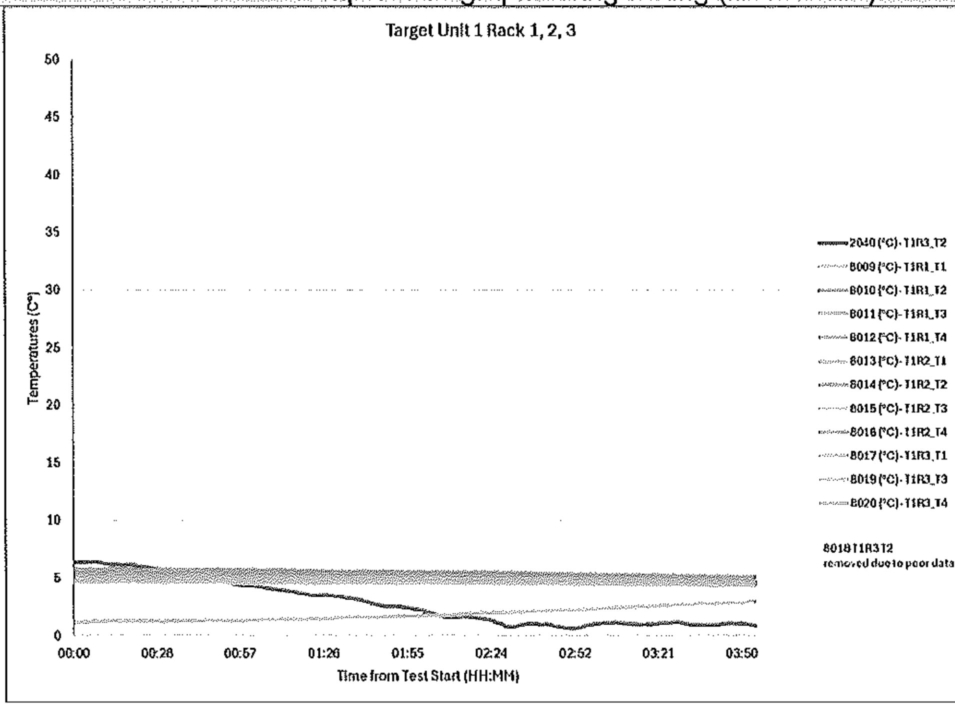
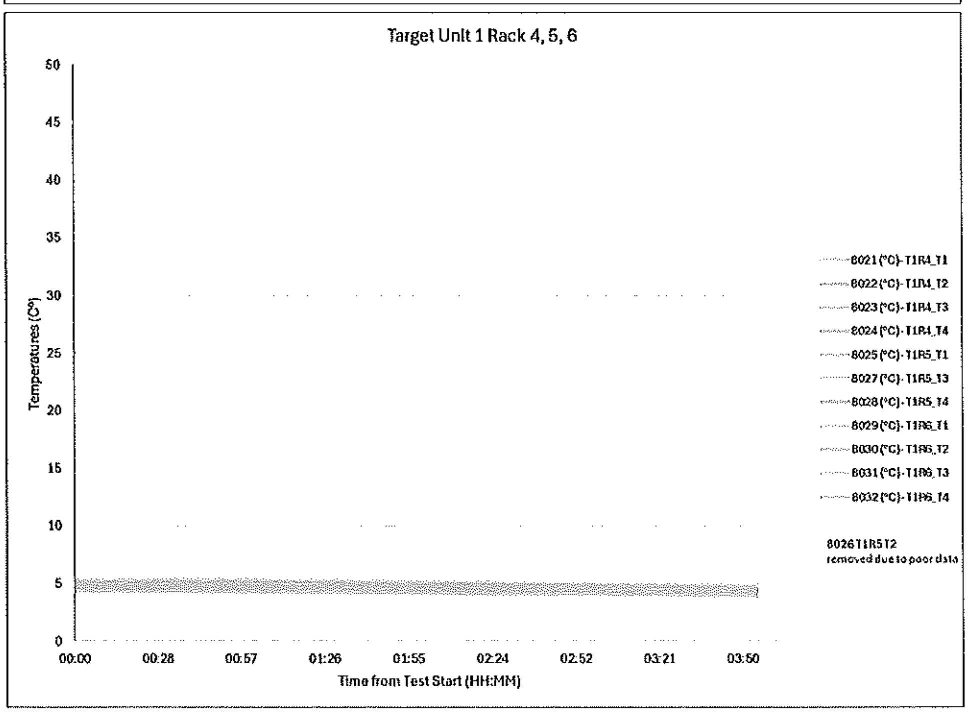
Attachment 4 - Temperature graph during testing (first 3.5 hrs)





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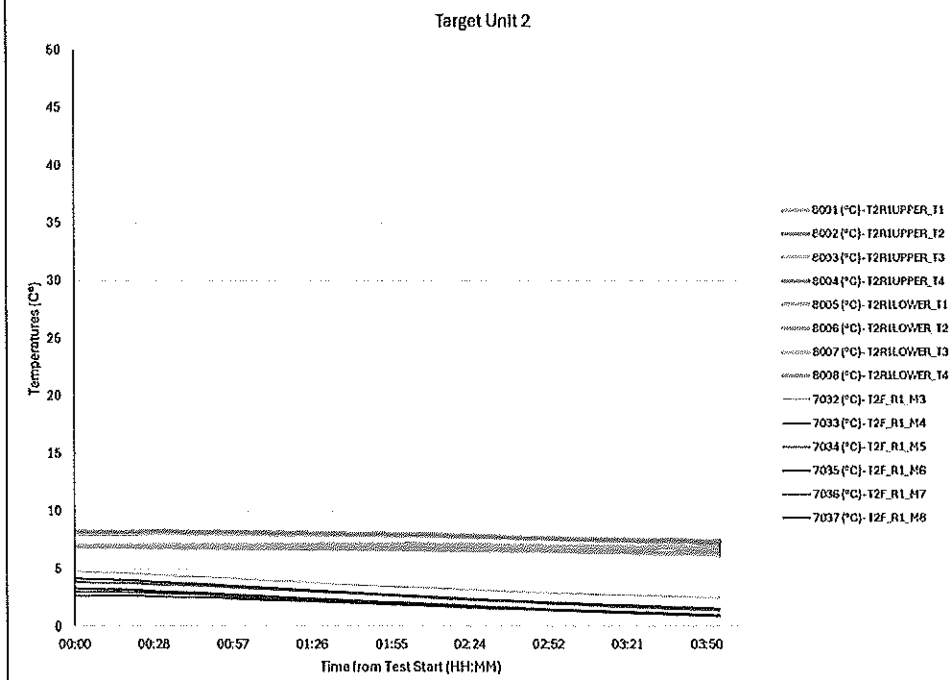
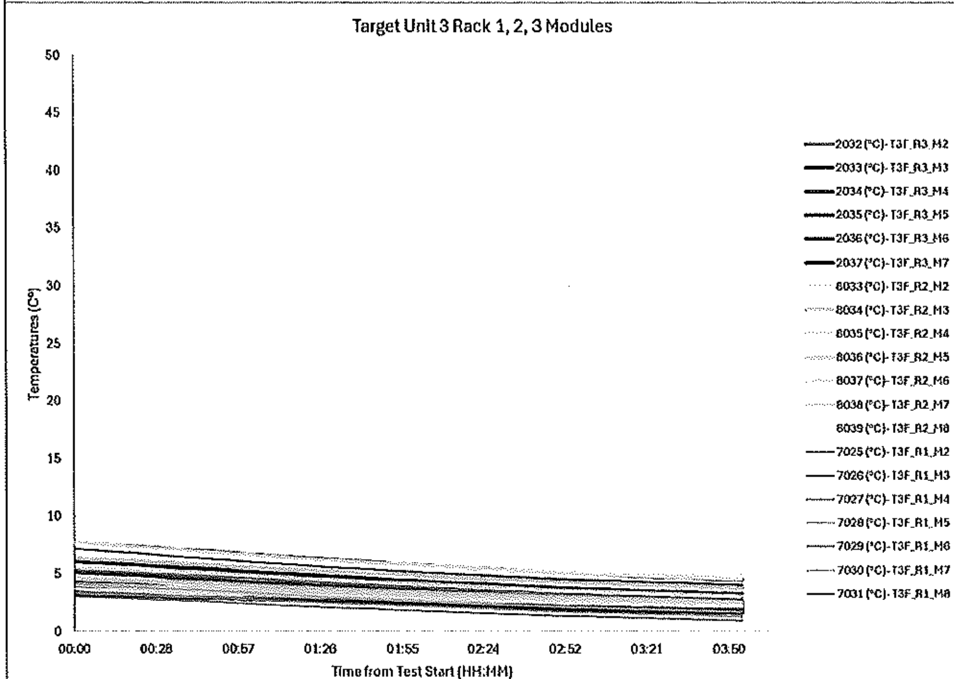
Attachment 4 - Temperature graph during testing (first 3.5 hrs)





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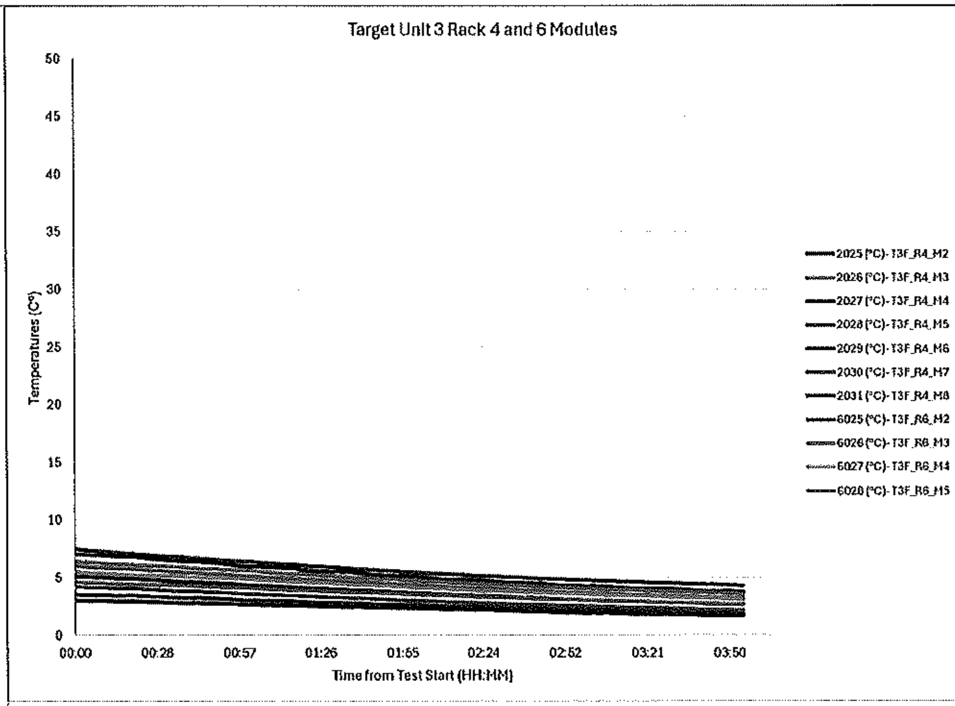

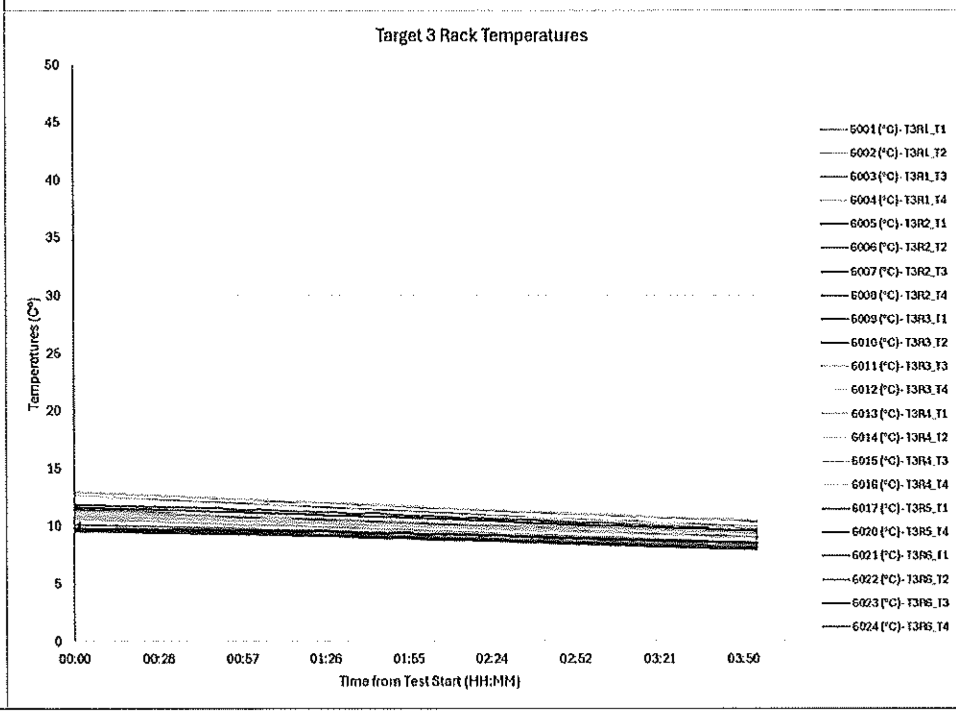

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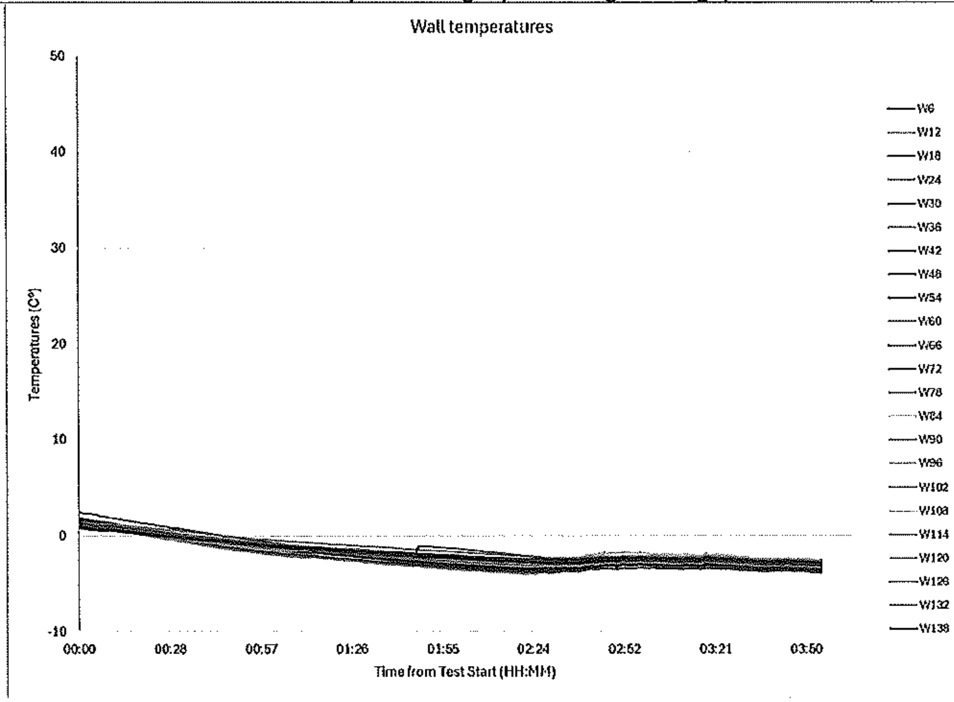
Master Contract:	301546	Model:	GSP 5000 306	
Project / Network:	80229152	Description:	Gridstack Pro 5000 306Ah 2hr+ with CATL modules	

Attachment 4 - Temperature graph during testing (first 3.5 hrs)



Maximum temperature measurement			
TC	**Location**	**Temperature limit (°C)**	**Measured maximum temperature (°C)**
Initiating Module			
5001 (°C)- INIT_Ta	Cell 21-1, left side	N/A	591.4
5002 (°C)- INIT_Tb	Cell 21-2, left side	N/A	533.2
5003 (°C)- INIT_Tc	Cell 22-1, left side	N/A	121.1
5004 (°C)- INIT_T3	Cell 20-1	N/A	262.8
5005 (°C)- INIT_T4	Cell 21-1, right side	N/A	506.9
5006 (°C)- INIT_T5	Cell 7-2	N/A	--*
5007 (°C)- INIT_T6	Cell 33-2	N/A	269.0
5008 (°C)- INIT_T7	Cell 19-2	N/A	77.2
5009 (°C)- INIT_T8	Cell 21-2, right side	N/A	478.5
5010 (°C)- INIT_T1_1	Initiating cell 20-2, left side	N/A	--*
5011 (°C)- INIT_T1_2	Initiating cell 20-2, right side, heater control	N/A	404.4
5012 (°C)- INIT_T2_1	Initiating cell 20-2 left edge	N/A	--*
5013 (°C)- INIT_T2_2	Initiating cell 20-2, right edge	N/A	427.8
Initiating Unit			
3040 (°C)- INF_R1_M1	Rack 1, module 1	N/A	11.9

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Attachment 4 - Temperature graph during testing (first 3.5 hrs)

5017 (°C)- INF_R1_M2	Rack 1, module 2	N/A	12.7
5018 (°C)- INF_R1_M3	Rack 1, module 3	N/A	12.4
5019 (°C)- INF_R1_M4	Rack 1, module 4	N/A	12.6
1001 (°C)- IU_TCM1_T1	TC Module 1, rack 1 module 5, cell 7-2 surface	N/A	16.4
1002 (°C)- IU_TCM1_T2	TC Module 1, rack 1 module 5, cell 20-2 surface	N/A	17.1
1003 (°C)- IU_TCM1_T3	TC Module 1, rack 1 module 5, cell 33-2 surface	N/A	17.2
1004 (°C)- IU_TCM1_T4	TC Module 1, rack 1 module 5, cell 46-2 surface	N/A	17.1
5020 (°C)- INF_R1_M6	Rack 1, module 6	N/A	11.2
5021 (°C)- INF_R1_M7	Rack 1, module 7	N/A	11.0
5022 (°C)- INF_R1_M8	Rack 1, module 8	N/A	10.4
1005 (°C)- IU_TCM2_T1	TC Module 2, rack 2 module 1, cell 7-2 surface	N/A	16.0
1006 (°C)- IU_TCM2_T2	TC Module 2, rack 2 module 1, cell 20-2 surface	N/A	16.4
1007 (°C)- IU_TCM2_T3	TC Module 2, rack 2 module 1, cell 33-2 surface	N/A	16.5
1008 (°C)- IU_TCM2_T4	TC Module 2, rack 2 module 1, cell 46-2 surface	N/A	16.6
3033 (°C)- INF_R2_M1	Rack 2, module 1	N/A	11.4
3034 (°C)- INF_R2_M2	Rack 2, module 2	N/A	12.1
3035 (°C)- INF_R2_M3	Rack 2, module 3	N/A	11.8
3036 (°C)- INF_R2_M4	Rack 2, module 4	N/A	12.3
3037 (°C)- INF_R2_M5	Rack 2, module 5	N/A	11.8
1009 (°C)- IU_TCM3_T1	TC Module 3, rack 2 module 6, cell 7-2 surface	N/A	17.0
1010 (°C)- IU_TCM3_T2	TC Module 3, rack 2 module 6, cell 20-2 surface	N/A	17.5
1011 (°C)- IU_TCM3_T3	TC Module 3, rack 2 module 6, cell 33-2 surface	N/A	17.7
1012 (°C)- IU_TCM3_T4	TC Module 3, rack 2 module 6, cell 46-2 surface	N/A	17.4
3038 (°C)- INF_R2_M6	Rack 2, module 6	N/A	12.1
3039 (°C)- INF_R2_M8	Rack 2, module 8	N/A	11.6
1013 (°C)- IU_TCM5_T1	TC Module 5, rack 3 module 1, cell 7-2 surface	N/A	16.8
1014 (°C)- IU_TCM5_T2	TC Module 5, rack 3 module 1, cell 20-2 surface	N/A	16.6
1015 (°C)- IU_TCM5_T3	TC Module 5, rack 3 module 1, cell 33-2 surface	N/A	16.8

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Attachment 4 - Temperature graph during testing (first 3.5 hrs)

1016 (°C)- IU_TCM5_T4	TC Module 5, rack 3 module 1, cell 46-2 surface	N/A	16.8
5023 (°C)- INF_R3_M2	Rack 3, module 2	N/A	12.5
5024 (°C)- INF_R3_M3	Rack 3, module 3	N/A	12.5
5025 (°C)- INF_R3_M4	Rack 3, module 4	N/A	12.4
5026 (°C)- INF_R3_M5	Rack 3, module 5	N/A	11.8
1017 (°C)- IU_TCM6_T1	TC Module 6, rack 3 module 6, cell 7-2 surface	N/A	17.1
1018 (°C)- IU_TCM6_T2	TC Module 6, rack 3 module 6, cell 20-2 surface	N/A	17.1
1019 (°C)- IU_TCM6_T3	TC Module 6, rack 3 module 6, cell 33-2 surface	N/A	17.6
1020 (°C)- IU_TCM6_T4	TC Module 6, rack 3 module 6, cell 46-2 surface	N/A	17.2
5027 (°C)- INF_R3_M7	Rack 3, module 7	N/A	--*
5028 (°C)- INF_R3_M8	Rack 3, module 8	N/A	11.5
1021 (°C)- IU_TCM7_T1	TC Module 7, rack 4 module 1, cell 7-2 surface	N/A	16.8
1022 (°C)- IU_TCM7_T2	TC Module 7, rack 4 module 1, cell 20-2 surface	N/A	18.9
1023 (°C)- IU_TCM7_T3	TC Module 7, rack 4 module 1, cell 33-2 surface	N/A	17.8
1024 (°C)- IU_TCM7_T4	TC Module 7, rack 4 module 1, cell 46-2 surface	N/A	14.4
3017 (°C)- INF_R4_M2	Rack 4, module 2	N/A	12.7
3018 (°C)- INF_R4_M3	Rack 4, module 3	N/A	12.2
3019 (°C)- INF_R4_M4	Rack 4, module 4	N/A	12.3
1025 (°C)- IU_TCM8_T1	TC Module 8, rack 4 module 5, cell 7-2 surface	N/A	27.9
1026 (°C)- IU_TCM8_T2	TC Module 8, rack 4 module 5, cell 20-2 surface	N/A	33.3
1027 (°C)- IU_TCM8_T3	TC Module 8, rack 4 module 5, cell 33-2 surface	N/A	29.0
1028 (°C)- IU_TCM8_T4	TC Module 8, rack 4 module 5, cell 46-2 surface	N/A	24.2
1033 (°C)- IU_TCM9_T1	TC Module 9, rack 4 module 7, cell 7-2 surface	N/A	18.5
1034 (°C)- IU_TCM9_T2	TC Module 9, rack 4 module 7, cell 20-2 surface	N/A	21.0
1035 (°C)- IU_TCM9_T3	TC Module 9, rack 4 module 7, cell 33-2 surface	N/A	19.2
1036 (°C)- IU_TCM9_T4	TC Module 9, rack 4 module 7, cell 46-2 surface	N/A	17.8
3021 (°C)- INF_R4_M8	Rack 4, module 8	N/A	10.8

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Attachment 4 - Temperature graph during testing (first 3.5 hrs)

1029 (°C)- IU_TCM10_T1	TC Module 10, rack 5 module 1, cell 7-2 surface	N/A	14.8
1030 (°C)- IU_TCM10_T2	TC Module 10, rack 5 module 1, cell 20-2 surface	N/A	--*
1031 (°C)- IU_TCM10_T3	TC Module 10, rack 5 module 1, cell 33-2 surface	N/A	16.9
1032 (°C)- IU_TCM10_T4	TC Module 10, rack 5 module 1, cell 46-2 surface	N/A	16.6
3022 (°C)- INF_R5_M2	Rack 5, module 2	N/A	12.2
3023 (°C)- INF_R5_M3	Rack 5, module 3	N/A	12.0
3024 (°C)- INF_R5_M4	Rack 5, module 4	N/A	12.2
3025 (°C)- INF_R5_M5	Rack 5, module 5	N/A	11.7
1037 (°C)- IU_TCM11_T1	TC Module 11, rack 5 module 6, cell 7-2 surface	N/A	16.9
1038 (°C)- IU_TCM11_T2	TC Module 11, rack 5 module 6, cell 20-2 surface	N/A	17.5
1039 (°C)- IU_TCM11_T3	TC Module 11, rack 5 module 6, cell 33-2 surface	N/A	17.6
1040 (°C)- IU_TCM11_T4	TC Module 11, rack 5 module 6, cell 46-2 surface	N/A	17.2
3026 (°C)- INF_R5_M7	Rack 5, module 7	N/A	11.2
3027 (°C)- INF_R5_M8	Rack 5, module 8	N/A	11.0
3033 (°C)- INF_R6_M1	Rack 6, module 1	N/A	11.4
3034 (°C)- INF_R6_M2	Rack 6, module 2	N/A	12.1
3035 (°C)- INF_R6_M3	Rack 6, module 3	N/A	11.8
3036 (°C)- INF_R6_M4	Rack 6, module 4	N/A	12.3
3037 (°C)- INF_R6_M5	Rack 6, module 5	N/A	11.8
3038 (°C)- INF_R6_M6	Rack 6, module 6	N/A	12.1
3039 (°C)- INF_R6_M8	Rack 6, module 8	N/A	11.6
Target Unit 1			
4001 (°C)- T1F_R1_M2	Rack 1, module 2	154	4.9
4002 (°C)- T1F_R1_M3	Rack 1, module 3	154	4.6
4003 (°C)- T1F_R1_M4	Rack 1, module 4	154	4.5
4004 (°C)- T1F_R1_M5	Rack 1, module 5	154	5.1
4005 (°C)- T1F_R1_M6	Rack 1, module 6	154	4.7
4006 (°C)- T1F_R1_M7	Rack 1, module 7	154	4.7
4007 (°C)- T1F_R1_M8	Rack 1, module 8	154	4.5
5029 (°C)- T1F_R2_M2	Rack 2, module 2	154	5.3
5030 (°C)- T1F_R2_M3	Rack 2, module 3	154	5.4
5031 (°C)- T1F_R2_M4	Rack 2, module 4	154	4.7
5032 (°C)- T1F_R2_M5	Rack 2, module 5	154	1.7
5033 (°C)- T1F_R2_M6	Rack 2, module 6	154	4.5
5034 (°C)- T1F_R2_M7	Rack 2, module 7	154	4.2

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Attachment 4 - Temperature graph during testing (first 3.5 hrs)

5035 (°C)- T1F_R2_M8	Rack 2, module 8	154	4.0
5036 (°C)- T1F_R3_M2	Rack 3, module 2	154	5.1
5037 (°C)- T1F_R3_M3	Rack 3, module 3	154	4.7
5038 (°C)- T1F_R3_M4	Rack 3, module 4	154	4.8
5039 (°C)- T1F_R3_M5	Rack 3, module 5	154	4.3
5040 (°C)- T1F_R3_M6	Rack 3, module 6	154	4.1
7001 (°C)- T1F_R3_M7	Rack 3, module 7	154	3.5
7002 (°C)- T1F_R3_M8	Rack 3, module 8	154	3.5
7004 (°C)- T1F_R4_M2	Rack 4, module 2	154	4.7
7005 (°C)- T1F_R4_M3	Rack 4, module 3	154	4.3
7006 (°C)- T1F_R4_M4	Rack 4, module 4	154	4.2
7007 (°C)- T1F_R4_M5	Rack 4, module 5	154	3.8
7008 (°C)- T1F_R4_M6	Rack 4, module 6	154	3.5
7009 (°C)- T1F_R4_M7	Rack 4, module 7	154	3.4
7010 (°C)- T1F_R4_M8	Rack 4, module 8	154	3.4
7011 (°C)- T1F_R5_M2	Rack 5, module 2	154	4.8
7012 (°C)- T1F_R5_M3	Rack 5, module 3	154	4.4
7013 (°C)- T1F_R5_M4	Rack 5, module 4	154	4.1
7014 (°C)- T1F_R5_M5	Rack 5, module 5	154	3.7
7015 (°C)- T1F_R5_M6	Rack 5, module 6	154	3.5
7016 (°C)- T1F_R5_M7	Rack 5, module 7	154	3.6
7017 (°C)- T1F_R5_M8	Rack 5, module 8	154	3.4
7018 (°C)- T1F_R6_M2	Rack 6, module 2	154	4.7
7019 (°C)- T1F_R6_M3	Rack 6, module 3	154	4.4
7020 (°C)- T1F_R6_M4	Rack 6, module 4	154	4.4
7021 (°C)- T1F_R6_M5	Rack 6, module 5	154	3.7
7022 (°C)- T1F_R6_M6	Rack 6, module 6	154	3.4
7023 (°C)- T1F_R6_M7	Rack 6, module 7	154	3.3
7024 (°C)- T1F_R6_M8	Rack 6, module 8	154	--*
8009 (°C)- T1R1_T1	TC module, rack 1 module 1, cell 1-2	154	5.3
8010 (°C)- T1R1_T2	TC module, rack 1 module 1, cell 26-2	154	5.9
8011 (°C)- T1R1_T3	TC module, rack 1 module 1, cell 27-2	154	5.7
8012 (°C)- T1R1_T4	TC module, rack 1 module 1, cell 52-2	154	5.6
8013 (°C)- T1R2_T1	TC module, rack 2 module 1, cell 1-2	154	3.0
8014 (°C)- T1R2_T2	TC module, rack 2 module 1, cell 26-2	154	5.0
8015 (°C)- T1R2_T3	TC module, rack 2 module 1, cell 27-2	154	5.4

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Attachment 4 - Temperature graph during testing (first 3.5 hrs)

8016 (°C)- T1R2_T4	TC module, rack 2 module 1, cell 52-2	154	5.4
8017 (°C)- T1R3_T1	TC module, rack 3 module 1, cell 1-2	154	4.7
8018 (°C)- T1R3_T2	TC module, rack 3 module 1, cell 26-2	154	--*
8019 (°C)- T1R3_T3	TC module, rack 3 module 1, cell 27-2	154	5.1
8020 (°C)- T1R3_T4	TC module, rack 3 module 1, cell 52-2	154	5.2
8021 (°C)- T1R4_T1	TC module, rack 4 module 1, cell 1-2	154	4.7
8022 (°C)- T1R4_T2	TC module, rack 4 module 1, cell 26-2	154	5.2
8023 (°C)- T1R4_T3	TC module, rack 4 module 1, cell 27-2	154	5.3
8024 (°C)- T1R4_T4	TC module, rack 4 module 1, cell 52-2	154	5.1
8025 (°C)- T1R5_T1	TC module, rack 5 module 1, cell 1-2	154	4.6
8026 (°C)- T1R5_T2	TC module, rack 5 module 1, cell 26-2	154	--*
8027 (°C)- T1R5_T3	TC module, rack 5 module 1, cell 27-2	154	5.4
8028 (°C)- T1R5_T4	TC module, rack 5 module 1, cell 52-2	154	5.2
8029 (°C)- T1R6_T1	TC module, rack 6 module 1, cell 1-2	154	4.3
8030 (°C)- T1R6_T2	TC module, rack 6 module 1, cell 26-2	154	4.9
8031 (°C)- T1R6_T3	TC module, rack 6 module 1, cell 27-2	154	5.0
8032 (°C)- T1R6_T4	TC module, rack 6 module 1, cell 52-2	154	4.9
Target Unit 2			
8001 (°C)- T2R1UPPER_T1	TC Module, rack 1 module 1, cell 7-2 surface	154	8.2
8002 (°C)- T2R1UPPER_T2	TC Module, rack 1 module 1, cell 20-2 surface	154	8.2
8003 (°C)- T2R1UPPER_T3	TC Module, rack 1 module 1, cell 33-2 surface	154	8.2
8004 (°C)- T2R1UPPER_T4	TC Module, rack 1 module 1, cell 46-2 surface	154	8.4

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Attachment 4 - Temperature graph during testing (first 3.5 hrs)

8005 (°C)-T2R1LOWER_T1	TC Module, rack 1 module 2, cell 7-2 surface	154	7.0
8006 (°C)-T2R1LOWER_T2	TC Module, rack 1 module 2, cell 20-2 surface	154	7.1
8007 (°C)-T2R1LOWER_T3	TC Module, rack 1 module 2, cell 33-2 surface	154	7.2
8008 (°C)-T2R1LOWER_T4	TC Module, rack 1 module 2, cell 46-2 surface	154	7.0
7032 (°C)- T2F_R1_M3	Rack 1, module 3	154	4.8
7033 (°C)- T2F_R1_M4	Rack 1, module 4	154	4.2
7034 (°C)- T2F_R1_M5	Rack 1, module 5	154	3.9
7035 (°C)- T2F_R1_M6	Rack 1, module 6	154	3.3
7036 (°C)- T2F_R1_M7	Rack 1, module 7	154	3.0
7037 (°C)- T2F_R1_M8	Rack 1, module 8	154	2.7
Target Unit 3			
6001 (°C)- T3R1_T1	TC module, rack 1 module 1, cell 1-2	154	10.7
6002 (°C)- T3R1_T2	TC module, rack 1 module 1, cell 26-2	154	11.0
6003 (°C)- T3R1_T3	TC module, rack 1 module 1, cell 27-2	154	10.9
6004 (°C)- T3R1_T4	TC module, rack 1 module 1, cell 52-2	154	10.6
6005 (°C)- T3R2_T1	TC module, rack 2 module 1, cell 1-2	154	11.5
6006 (°C)- T3R2_T2	TC module, rack 2 module 1, cell 26-2	154	11.9
6007 (°C)- T3R2_T3	TC module, rack 2 module 1, cell 27-2	154	11.7
6008 (°C)- T3R2_T4	TC module, rack 2 module 1, cell 52-2	154	11.4
6009 (°C)- T3R3_T1	TC module, rack 3 module 1, cell 1-2	154	12.7
6010 (°C)- T3R3_T2	TC module, rack 3 module 1, cell 26-2	154	13.0
6011 (°C)- T3R3_T3	TC module, rack 3 module 1, cell 27-2	154	13.0
6012 (°C)- T3R3_T4	TC module, rack 3 module 1, cell 52-2	154	12.6
6013 (°C)- T3R4_T1	TC module, rack 4 module 1, cell 1-2	154	10.9
6014 (°C)- T3R4_T2	TC module, rack 4 module 1, cell 26-2	154	11.1

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Attachment 4 - Temperature graph during testing (first 3.5 hrs)

6015 (°C)- T3R4_T3	TC module, rack 4 module 1, cell 27-2	154	11.4
6016 (°C)- T3R4_T4	TC module, rack 4 module 1, cell 52-2	154	11.2
6017 (°C)- T3R5_T1	TC module, rack 5 module 1, cell 1-2	154	9.8
6018 (°C)- T3R5_T2	TC module, rack 5 module 1, cell 26-2	154	--*
6019 (°C)- T3R5_T3	TC module, rack 5 module 1, cell 27-2	154	--*
6020 (°C)- T3R5_T4	TC module, rack 5 module 1, cell 52-2	154	10.3
6021 (°C)- T3R6_T1	TC module, rack 6 module 1, cell 1-2	154	9.9
6022 (°C)- T3R6_T2	TC module, rack 6 module 1, cell 26-2	154	9.7
6023 (°C)- T3R6_T3	TC module, rack 6 module 1, cell 27-2	154	10.2
6024 (°C)- T3R6_T4	TC module, rack 6 module 1, cell 52-2	154	9.7
7025 (°C)- T3F_R1_M2	Rack 1, module 2	154	7.2
7026 (°C)- T3F_R1_M3	Rack 1, module 3	154	6.1
7027 (°C)- T3F_R1_M4	Rack 1, module 4	154	5.4
7028 (°C)- T3F_R1_M5	Rack 1, module 5	154	4.1
7029 (°C)- T3F_R1_M6	Rack 1, module 6	154	3.5
7030 (°C)- T3F_R1_M7	Rack 1, module 7	154	3.4
7031 (°C)- T3F_R1_M8	Rack 1, module 8	154	3.0
8033 (°C)- T3F_R2_M2	Rack 2, module 2	154	7.8
8034 (°C)- T3F_R2_M3	Rack 2, module 3	154	6.4
8035 (°C)- T3F_R2_M4	Rack 2, module 4	154	5.5
8036 (°C)- T3F_R2_M5	Rack 2, module 5	154	4.7
8037 (°C)- T3F_R2_M6	Rack 2, module 6	154	4.1
8038 (°C)- T3F_R2_M7	Rack 2, module 7	154	3.7
8039 (°C)- T3F_R2_M8	Rack 2, module 8	154	3.7
2032 (°C)- T3F_R3_M2	Rack 3, module 2	154	7.8
2033 (°C)- T3F_R3_M3	Rack 3, module 3	154	6.1
2034 (°C)- T3F_R3_M4	Rack 3, module 4	154	5.2
2035 (°C)- T3F_R3_M5	Rack 3, module 5	154	4.3
2036 (°C)- T3F_R3_M6	Rack 3, module 6	154	3.8
2037 (°C)- T3F_R3_M7	Rack 3, module 7	154	3.3
2025 (°C)- T3F_R4_M2	Rack 4, module 2	154	7.1
2026 (°C)- T3F_R4_M3	Rack 4, module 3	154	6.1
2027 (°C)- T3F_R4_M4	Rack 4, module 4	154	5.2
2028 (°C)- T3F_R4_M5	Rack 4, module 5	154	4.3

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Attachment 4 - Temperature graph during testing (first 3.5 hrs)

2029 (°C)- T3F_R4_M6	Rack 4, module 6	154	3.6
2030 (°C)- T3F_R4_M7	Rack 4, module 7	154	3.1
2031 (°C)- T3F_R4_M8	Rack 4, module 8	154	3.0
6032 (°C)- T3_R5_M2	Rack 5, module 2	154	7.7
6033 (°C)- T3_R5_M3	Rack 5, module 3	154	6.5
6034 (°C)- T3_R5_M4	Rack 5, module 4	154	5.7
6035 (°C)- T3_R5_M5	Rack 5, module 5	154	4.9
6036 (°C)- T3_R5_M6	Rack 5, module 6	154	4.2
6037 (°C)- T3_R5_M7	Rack 5, module 7	154	3.7
6038 (°C)- T3_R5_M8	Rack 5, module 8	154	3.7
6025 (°C)- T3F_R6_M2	Rack 6, module 2	154	7.5
6026 (°C)- T3F_R6_M3	Rack 6, module 3	154	6.4
6027 (°C)- T3F_R6_M4	Rack 6, module 4	154	5.5
6028 (°C)- T3F_R6_M5	Rack 6, module 5	154	4.7
6029 (°C)- T3_R6_M6	Rack 6, module 6	154	4.1
6030 (°C)- T3_R6_M7	Rack 6, module 7	154	4.5
6031 (°C)- T3_R6_M8	Rack 6 module 8	154	3.5
Target Wall			
2001 (°C)- W1_1	Wall surface, 138" from ground	98.8	2.5
2002 (°C)- W1_2	Wall surface, 132" from ground	98.8	1.7
2003 (°C)- W1_3	Wall surface, 126" from ground	98.8	1.4
2004 (°C)- W1_4	Wall surface, 120" from ground	98.8	1.3
2005 (°C)- W1_5	Wall surface, 114" from ground	98.8	1.9
2006 (°C)- W1_6	Wall surface, 108" from ground	98.8	1.4
2007 (°C)- W1_7	Wall surface, 102" from ground	98.8	1.9
2008 (°C)- W1_8	Wall surface, 96" from ground	98.8	1.8
2009 (°C)- W2_1	Wall surface, 90" from ground	98.8	1.8
2010 (°C)- W2_2	Wall surface, 84" from ground	98.8	1.8
2011 (°C)- W2_3	Wall surface, 78" from ground	98.8	1.8
2012 (°C)- W2_4	Wall surface, 72" from ground	98.8	1.7
2013 (°C)- W2_5	Wall surface, 66" from ground	98.8	1.6
2014 (°C)- W2_6	Wall surface, 60" from ground	98.8	1.3
2015 (°C)- W2_7	Wall surface, 54" from ground	98.8	1.2
2016 (°C)- W2_8	Wall surface, 48" from ground	98.8	1.3
2017 (°C)- W3_1	Wall surface, 36" from ground	98.8	1.6
2018 (°C)- W3_2	Wall surface, 30" from ground	98.8	1.4
2019 (°C)- W3_3	Wall surface, 24" from ground	98.8	1.4
2020 (°C)- W3_4	Wall surface, 18" from ground	98.8	1.2
2021 (°C)- W3_5	Wall surface, 12" from ground	98.8	1.0
2022 (°C)- W3_6	Wall surface, 6" from ground	98.8	0.8

*Note: TC damaged or not reading correctly during the test.

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Attachment 5 - Heat flux graph

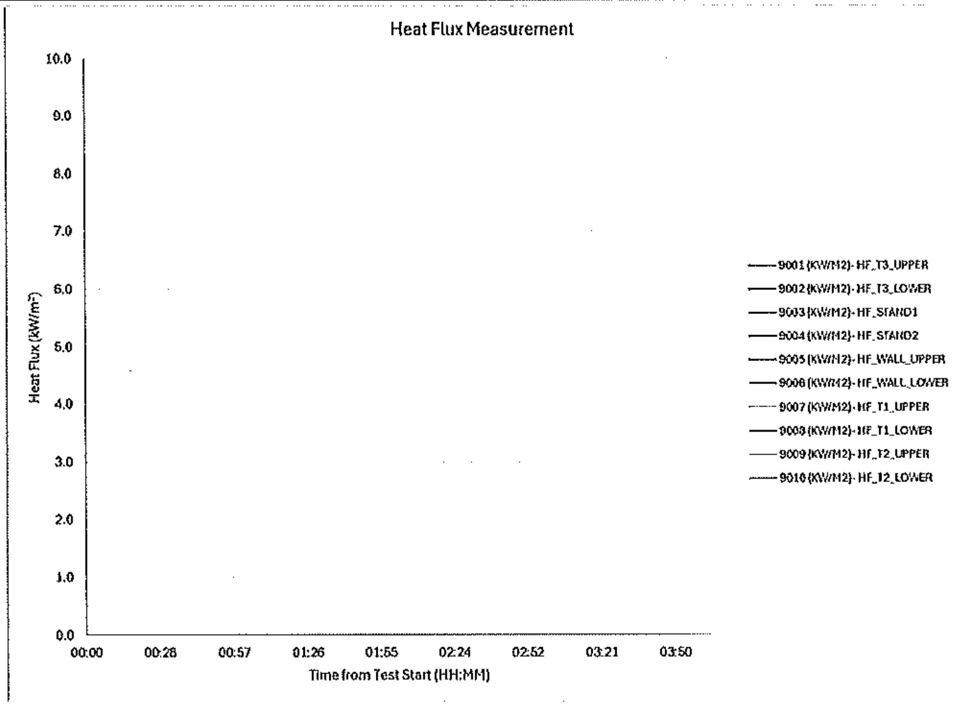

Table 6 – Maximum Heatflux measurement		
Location	**Heatflux limit (kW/m^2)**	**Measured maximum Heatflux (kW/m^2)**
HF_Wall_Lower: Main wall, elevation (4.5') estimated to receive greatest heat flux due to thermal runaway of the initiating module	N/A	0.0
HF_Wall_Upper: Main wall, elevation (top estimated to receive greatest heat flux during potential propagation of thermal runaway within initiating BESS unit	N/A	0.0
HF_Stand 1: Front of BESS, mid height of initiating unit in center of the accessible means of egress	1.3	0.0
HF_Stand 2: Back of BESS, mid height of initiating unit in center of the accessible means of egress	1.3	0.0
HF_T1_Lower: On Target 1, elevation estimated to receive greatest heat flux due to thermal runaway of the initiating module	N/A	0.0
HF_T1_Upper: On Target 1 elevation estimated to receive greatest heat flux during potential propagation of thermal runaway within initiating BESS unit	N/A	0.0
HF_T2_Lower: On Target 2, elevation estimated to receive greatest heat flux due to thermal runaway of the initiating module	N/A	0.0

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Attachment 5 - Heat flux graph

HF_T2_Upper: On Target 2 elevation estimated to receive greatest heat flux during potential propagation of thermal runaway within initiating BESS unit	N/A	0.0
HF_T3_Lower: On Target 3, elevation estimated to receive greatest heat flux due to thermal runaway of the initiating module	N/A	0.0
HF_T3_Upper: On Target 3 elevation estimated to receive greatest heat flux during potential propagation of thermal runaway within initiating BESS unit	N/A	0.0

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Attachment 6 - Notable observation during test

Observation	Time from test start (HH:MM:SS)	Comment
Test start	00:00:00	Data acquisition started, power applied to heaters. Test started
Venting	00:46:45	Initiating cell 20-2 vents, confirmed by interior camera audio
Visible gas	00:47:29	Vent gas visible on interior camera
Thermal runaway	00:47:35	Initiating cell 20-2 goes into thermal runaway
Ventilation system activates	00:48:16	Gas detection system activates, intake louvers and exhaust hatch open and exhaust fan activates, triggered by fire panel.
Gas escaping from top of unit	00:49:39	Gas extracted by ventilation system visible in a continuous stream from top of initiating unit
Propagation	00:50:45	Thermal runaway propagates to adjacent cell 33-2
Propagation	00:54:25	Thermal runaway propagates to cell 20-1
Propagation	00:54:52	Thermal runaway propagates to cell 21-1
Gas production stopped	00:58:04	Vent gas that was observed continuously stopped, no visible release of gas from DUT
Venting	01:03:08	Audible vent captured by interior camera audio
Gas escaping from top of unit	01:04:36	Gas visible escaping from top of initiating unit after additional venting events
Venting	01:06:20	Audible vent captured by interior camera audio
Gas release	01:07:33	Continuous smoke release from top of the initiating unit
Propagation	01:08:52	Thermal runaway propagates to cell 21-2
Gas production stops, no further activity	01:11:07	Visible smoke release stops, no further activity witnessed from DUT for the remainder of the test.
Active ventilation deactivates	03:51:13	Active ventilation system fan shuts off, audibly confirmed on interior camera.
Test End	45:21:25	All temperatures had returned to under 50°C, test called to approaching inclement weather that could potentially damage the DUT.

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Attachment 7 – Critical Components List

Object/Part No.	Manufacturer /trademark	Type/model	Technical Data	Standard	Mark(s) of conformity or certificate
Enclosure	Fluence (manufactured at ACE)	GSP503066PL-FLCC2U-200125C3060-AJ - UL	GSP5000 Enclosure 2Hr - 48 Modules UL Fully populated Enclosure	--	--
F Stop Button	ABB	MPET4-10R	Modular Emergency Stop, Twist release, Mushroom 40mm, Red - Non-illuminated, No contact block. Product ID - 1SFA611523R1001	UL 508	cULus E76003
Multi-criteria Detector	Siemens	OOHC941 (UL)	Multi-Criteria Fire and CO Detector for battery compartment, 13-32Vdc, 0° to 49°C.	UL 2075	S2378
Multi-criteria Detector	Siemens	OOH941(UL)	Multi-Criteria Fire Detector for BCP compartment, 13-32Vdc, 0° to 49°C.	UL 2075	S2379
GSP 5000 DCPM	SFO technologies	95-665-0001	GSP5000 DCPM for battery rack, Current rating 306A, 1500VDC.	--	--
DC Cable	VIMA CO., LTD	UL 3817 Wire	Conductor: Tinned annealed stranded copper & Bare copper Temp: Flexing -5℃ ~ +125℃ / Fixed -20℃ ~ +125℃	UL 758	E346083
306Ah Battery Long Module	CATL	M02306P05L01	52S2P Module with CATL PCB	--	--
Cells	CATL	CBDD0	Nominal voltage：3.2Vdc Rated capacity：306Ah	UL 1973 IEC 62619：2022	UL MH62898 JPTUV-146897
Metal enclosure	CATL	--	Material: Al6063.T6 Thickness: ≥2mm Size: L*W*H(mm) (2235±3.5)*(830±3)*(31±3)	--	--
Plastic enclosure	0000013277	NHPP-FR NHPP-FR-2	Fire rating：V-0 Material: PP RTI: 65°C	UL 746	E171666
Connector	0000007975	REA4	Voltage：1500VDC Current：350A for TUV, 300A for UL Fire rating：V-0	UL4818 EN 61984	UL E526230 J 50586193

Connecting wire for HV	0000009966	3932	Voltage: 2000V Current-carrying capability: 75°C 350A Maximum ambient temperature:-40°C~+125°C	UL 758 EN 50525 IEC 60227 IEC 60228:2004	E214184 M.2021.206. C63716
Wire for LV	0000009966	3666	Voltage: 600V Wire diameter: (0.5~4mm2) Maximum ambient temperature: -40°C~+105°C	UL 758 EN 50525 IEC 60227 IEC 60228:200 0	E214184 0B160705.D NTDS30
Plastic material (Harness isolation plate)	0000015262	PP C6540R-G20HF	Fire rating: V-0 Maximum ambient temperature: 90±2°C	UL 94	SHMR2208 00424401
Plastic material (Output pole base)	0000007541	46GF30	Fire rating: V-0 Maximum ambient temperature: 180°C	UL 94	UL E225348
Plastic material (Buffer pad)	0000007929	MPP	Fire rating: V-0 Maximum ambient temperature: 100°C	UL 94	UL E509966
Plastic material (PC Insulating sheet)	0000007929	U42B-1(PC)	Fire rating: VTM-0 Maximum ambient temperature: -40°C ~+85°C	UL 94	A22300754 98101C
Plastic material (Fuse base)	0000027338	PBT-GF30	Fire rating: V-0 Maximum ambient temperature: 120±2°C	UL 94	UL E225348
Plastic material (Wire harness bracket)	0000027338	PBT-GF30	Fire rating: V-0 Maximum ambient temperature: 120±2°C	UL 94	UL E225348
Plastic material (Injection-molded slide rail)	0000027338	POM	Fire rating: HB Maximum ambient temperature: 90±2°C	UL 94	UL E171666
Plastic material (Fuse Protective Cover)	0000027338	P2G(X)	Fire rating: V-0 Maximum ambient temperature: 120±2°C	UL 94	E204321
Plastic material (Gasket)	0000011532	SecA	Fire rating： ≥V-0 Maximum ambient temperature: -50~200°C	UL 94	UL E529227

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Mica paper	0000014138	--	Fire rating: V-0 Maximum ambient temperature: 1000±200°C	GB/T 2408-2008 UL 94	MS2207120 40C-04 E302583
Door Sensor	Amseco	AMS-39	Door Limit switch 200V 1A 1C, Mag	UL 634	BP2128
H2 Sensor	Honeywell	SPLCG1BMRC XNZZ	SENSEPOINT XCL TRANSMITTER, SAFE AREA, IP65, H2, MODBUS, RELAY, CHARCOAL24Vdc, 850mA, −20 to 50°C	--	--
HVAC	Envicool	EC20HDNC1E	230Vac, Cooling capacity is 2100W/2.1KW, Heating capacity 850/950, IP X5, Working Temperature Range: Cooling: -15~+55, Heating: -30~+55	UL 1995	SA45606
Fluence Edge Controller	Advantech	ECU-150FL	Compact High-Performance IoT Gateway, 24VDC, 2-pin screw terminal, IP30, -30C to 70C operating temp	UL 62368-1	E180881
Power Supply 24V DIN Rail	Mean Well	SDR-960-24	AC-DC Industrial DIN rail power supply; Output 24Vdc at 40A; Metal casing; Ultra slim width 110mm; Parallel function. Output: 24Vdc, 40A, 960W Input: 180-264Vac, 47-63 Hz, 6A @230Vac	UL 508	E215312
Input Output Module Relay	Siemens	FDCIO422	4-Input / 4-Output Interface Module 12-32Vdc, 1mA, -40°C to +55	UL 864	S25095
Terminal Block	WAGO	2002-1201	2 CONDUCTOR RL MTD TERM BLK-TJS GREY. 690V, 24A	UL 1059 IEC 60079	E45172
Terminal block End/intermediate plate	WAGO	2002-1294	End/intermediate plate; for 2002-12xx series terminal blocks; 2.0 mm wide	--	--
Chiller 60kW	Envicool	EMW600HCNC 3R	400Vac, 3ph, 50/60Hz, Cooling capacity 60kW@W15/L35	--	--
DC Fuse	Littelfuse	PSX3XLUB125 0	Battery Protection Fuse, 1500Vdc, 1250A, Operating temperature: -55° to +125°C	UL 248-1	E71611
DC Disconnect Switch	Socomec	27ES4200	1500Vdc, 2000A, 4P, 1 circuit	UL 98A UL 98B	E346418

Master Contract:	301546	Model:	GSP 5000 306	Page number 54 of 56
Project / Network:	80229152	Description:	Gridstack Pro 5000 306Ah 2hr+ with CATL modules	

Eaton 9PX UPS	EATON	9PX1000IRT2U	Eaton 9PX UPS, 1000 VA, 1000 W, Input: C14, Outputs: (8) C13, Rack/tower, 2U	UL 1778	E321205
Eaton 9PX UPS extended battery module (EBM)	EATON	9PXEBM48RT2U	Eaton 9PX extended battery module (EBM), 48V, Rack/tower, 2U	UL 1778	E321205
UPS - Power Cable (UPS to EBM)	EATON	EBMCBL48	Eaton 9PX and 9SX Accessories, EBM Cable, 2 m, for Extended Battery Module 48 V	--	--
AC Circuit breaker	SHANGHAI LIANGXIN ELECTRICAL CO LTD	NDB1-125C100/3	415/400VDC, 100A	--	--
AC Circuit breaker	SHANGHAI LIANGXIN ELECTRICAL CO LTD	NDB2T-63C30/2PL	240V, 30A	UL 489	E342099
AC Circuit breaker	SHANGHAI LIANGXIN ELECTRICAL CO LTD	NDB2T-63C03/2PL	240V, 03A	UL 489	E342099
AC Circuit breaker	SHANGHAI LIANGXIN ELECTRICAL CO LTD	NDB2T-63C06/2PL	240V, 06A	UL 489	E342099
AC Circuit breaker	SHANGHAI LIANGXIN ELECTRICAL CO LTD	NDB2T-63C08/2PL	240V, 08A	UL 489	E342099
AC Circuit breaker	SHANGHAI LIANGXIN ELECTRICAL CO LTD	NDB2T-63C10/2PL	240V, 10A	UL 489	E342099
AC Cable	VIMA CO., LTD.	UL 1015	Conductor: Tinned annealed stranded copper Temp: Flexing -5°C ~ +105°C / Fixed -40°C ~ +105	UL 758	E346083
AC Cable	VIMA CO., LTD.	UL 1284	Conductor: Tinned annealed stranded copper Temp: Flexing -5°C ~ +105°C / Fixed -20°C ~ +105	UL 758	E346083
AC Cable	Myungbo Cable Co., LTD	UL 2919	Conductor: Tinned Copper Wire Rated Temperature: 80	--	--

The results relate only to the items tested.
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Master Contract:	301546	Model:	GSP 5000 306	Page number 55 of 56
Project / Network:	80229152	Description:	Gridstack Pro 5000 306Ah 2hr+ with CATL modules	

Distribution box	Wago	249-116	Screwless end stop; 6 mm wide; for DIN-rail 35 x 15 and 35 x 7.5; gray	UL 1059	E45172
Distribution box	Wago	285-1175	Power tap; for 185 mm² high-current terminal blocks; gray	UL 1059	E45172
Distribution box	Wago	285-1185	POWER CAGE CLAMP feedthrough terminal block; DIN 35 x 15 rail mount; 2-conductor; 350 kcMil; 32 mm wide; gray	UL 1059	E45172
Fire Cable	VIMA CO., LTD.	FPL, UL1424	Conductor: Stranded Tinned Copper Temp: Flexing -5℃ ~ +105℃ / Fixed -30℃ ~ +105℃	UL 1424	E525280
Gasket	Sand Profile	CFLGP53-82-001	EPDM Rubber Seals D4533-UL, D4534-UL	--	--
Gasket	Sand Profile	CFLGP53-82-002	EPDM Rubber Seals D4533-UL, D4534-UL	--	--
Gasket	Sand Profile	CFLGP53-82-003	EPDM Rubber Seals D4533-UL, D4534-UL	--	---
Gasket	Sand Profile	CFLGP53-82-004	EPDM Rubber Seals D4533-UL, D4534-UL	--	--
Gasket	Sand Profile	CFLGP53-82-005	EPDM Rubber Seals D4533-UL, D4534-UL	--	--
Relay for fan and F-stop	Koino	KH-103-4CLD	Relay coil. Rated Load: 110 Vac Contact Resistance: 30mΩ	UL 508	E117960
Relay for fan and F-stop	ABB	CT-MFD-21	Input voltage: 24 Vdc/Vac to 240Vdc/Vac Ambient Temperature: -20~+60℃	UL 508	E140448
Relays for vent system	Kacom	HR710-4PLD-24VDC	Voltage: 12Vdc to 24Vdc, 12Vac to 220Vac. Socket: KLY4	UL 508	E168231
Network Switch	Advantech	EKI7720E4FIA2401-T	Managed Network Switch	--	--
Electronic Circuit Breaker	Phoenix Contact	CAPAROC E4	Rated Voltage: 12Vdc/24Vdc, Rated current: 4A, No. of slots: 4	UL 508	E123528
Electronic Circuit Breaker	Phoenix Contact	CAPAROC PM S-R	Rated Voltage: 12Vdc/24Vdc, Rated current: 45A, No. of slots: 2	UL 508	E123528
Electronic Circuit Breaker	Phoenix Contact	CAPAROC CR 8	Rated Voltage: 12Vdc/24Vdc, Rated current: 45A, No. of slots: 8	UL 508	E123528
Ground Bar	ACE	CFLGP53-50-009	Material: Copper Tin platedDimensions:355*50*5mm	--	--

The results relate only to the items tested.
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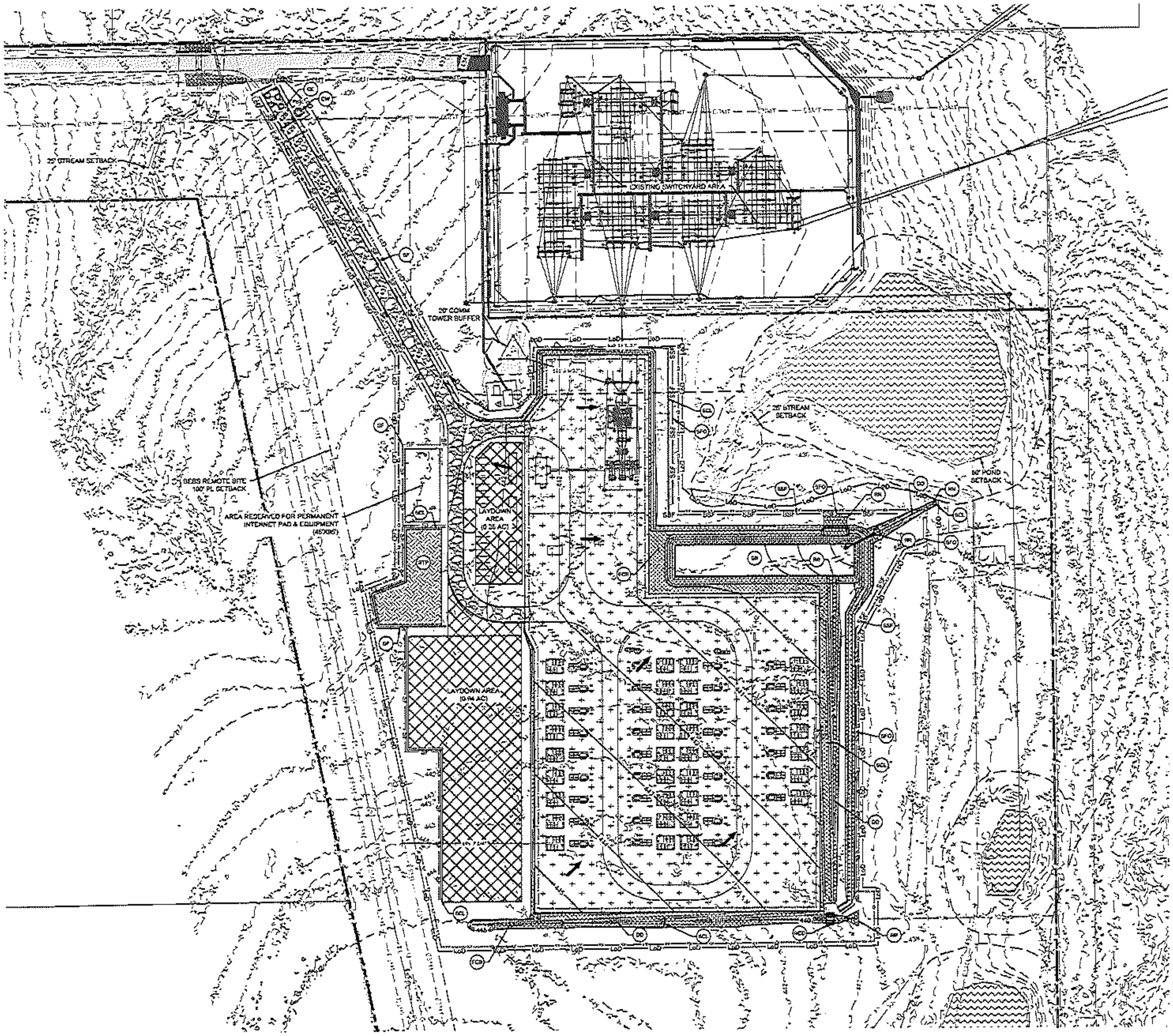
Master Contract:	301546	Model:	GSP 5000 306	Page number 56 of 56
Project / Network:	80229152	Description:	Gridstack Pro 5000 306Ah 2hr+ with CATL modules	

Internal Busbar	ACE	CFLGP53-50-000	Material: Copper Tin plated Dimensions: (612*100*15mm) X 2	--	--
Air Temperature sensor	Maxim interated	DS18B20	-55 Deg C to +125 DegC	UL 61010-031	E537810
Air temp&Humidity sensor	ICP DAS	DL10	-25 DegC to 75 DegC, 0 -95% RH	--	--
AVS Inlet Louvers	Heben	VL01-50	Material: Powder coated carbon steel External dimension (mm): 450*400*55 Operating temperature: - 20 deg C - +60 deg C Humidity: less than or equal to 85% RH, non- condensing	--	--
AVS Exhaust Fan	Heben	HB-T25G	Frame material: Aluminum (ADC-12) CFM- 820+/-15%	--	--
DVS Panel	STIFF	ARC-VENT INS-50B 1013x1013 SPE57VA0EJ9 101N-050_Clt	Pstat standard: 50 mbar +/- 25% @ 22 deg C	--	--
DCPM Connector	Amphenol	AT06-2S	CONNECTOR	UL 1977	E336860
DCPM Connector	Amphenol	AW2S-B	WEDGELOCK	--	--
DCPM Connector	Amphenol	AT62-16-0822	CONTACT, SOCKET, AWG 20-22	--	--
DCPM Connector	Molex	33472-0606	Connector	--	--
DCPM Connector	Molex	330122001	Female Terminal	--	--
DCPM Connector	Molex	343450001	BLADE CAV PLG	--	--

End of Report….



LEGEND

EXISTING
- PROPERTY LINE
- POND
- STREAM DELINEATION - NON-JURISDICTIONAL
- WETLAND DELINEATION - NON-JURISDICTIONAL
- EASEMENT
- OVERHEAD POWER
- CHAIN LINK FENCE
- BARBED WIRE FENCE
- GRAVEL ROAD

PROPOSED
- CONSTRUCTION LAYDOWN AREA
- FLOWLINE
- LIMIT OF DISTURBANCE
- PROJECT AREA BOUNDARY
- SETBACK LINE
- ACCESS ROAD
- FENCE - BARBED WIRE
- FENCE - CHAIN LINK
- BAFFLES
- BASIN OUTLET STRUCTURE W/ SKIMMER

EROSION CONTROL
- (CE) CONSTRUCTION ENTRANCE DTL 1 / SHT ES.C06.02
- (ECB) EROSION CONTROL BLANKET DTL 5 / SHT ES.C06.00
- (DD) DIVERSION DITCH DTL 7 / SHT ES.C06.00
- (LOD) LIMITS OF DISTURBANCE
- (SF) SILT FENCE DTL 1 / SHT ES.C06.01
- (SSF) SUPER SILT FENCE DTL 2 / SHT ES.C06.01
- (CW) CONCRETE WASHOUT DTL 3 / SHT ES.C06.01
- (SFO) SILT FENCE OUTLET DTL 4 / SHT ES.C06.01
- (SB) SEDIMENT BASIN
- (RCD) ROCK CHECK DAM DTL 10 / SHT ES.C06.00
- (RR) RIP RAP
- (SCL) SEDIMENT CONTROL LOG DTL 1 / SHT ES.C06.03
- (STP) TEMPORARY SOIL STOCKPILE DTL 6 / SHT ES.C06.00

NOTES

1. SEE SHEET C01-01 FOR MORE INFORMATION ON THE PROJECT LEGEND, ABBREVIATIONS, AND SYMBOLOGY.
2. SEE SHEET C01-02 FOR GENERAL AND CONSTRUCTION SEQUENCE NOTES.

N

60' 30' 0 60' 120' 180'

SCALE: 1"=60'

NEI ELECTRIC POWER ENGINEERING, INC.
TEXAS REGISTERED ENGINEERING FIRM
F-17716

ISSUED FOR CONSTRUCTION

NO	DATE	DRN	CHK	REVISIONS
0	11/25/2024	ECL	KB	ISSUED FOR CONSTRUCTION
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-

AMADOR BESS & SUBSTATION

VAN ZANDT COUNTY, TX

CIVIL DESIGN
EROSION CONTROL PLAN

res nei

ELECTRIC POWER ENGINEERING, INC.
[illegible] COLFAX AVE, STE. C500
LAKEWOOD, CO 80215
(303) 431-7895

STATE OF TEXAS
RYAN D. BRICK
100[illegible]
PROFESSIONAL ENGINEER

11/25/2024

Digitally signed by Ryan D Brick

DATE: 11/25/2024 SCALE: 1" = 60'

JOB NO: 4384.001

ES.C05.00

H:\Project\4384\4384.001 Amador BESS\HV_BESS\RES 4_DAGs\2_NEI\BESS\BESS Civil Drawings\ES.C05.00 - EROSION CONTROL PLANS.dwg

RES Group
Amador Energy Storage Project
Balance of Plant
Preliminary Hazard Mitigation Analysis

PRELIMINARY DRAFT

20250124-ARM-AW0715-BOP-PHMA-R0A

Issued: 7 April 2025

<u>*AHJ Revision Note:*</u>

This Preliminary Hazard Mitigation Analysis (PHMA) is based on the requirements of NFPA 855:2023 and outlines the industry's best practices that will be implemented for the Taaleri/RES Amador Project in Van Zandy County Texas. This PHMA is not intended for Permitting, Construction, or Operational purposes and should be considered as information only.

This PHMA is not intended to be used as a final Hazard Mitigation Analysis (HMA) for the Amador Project but rather outlines the typical standard industry best practices that will be included in the final HMA when all of the normative requirements and analyses are completed.

Prepared for:

RES Group
1601 19th Street,
Denver, CO 80202

Issued by:

Hiller
2120 Capital Drive
Wilmington NC 28405

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Table of Contents

PRELIMINARY DRAFT

Revision History

Revision	Date	Description
0A	7 April 2025	Released to Client for Review/Comment

PRIMLINARY DRAFT

Executive Summary

Battery energy storage systems (BESS) are increasingly being integrated into various applications due to their ability to store and deliver energy efficiently. However, the deployment of these systems introduces potential fire and safety hazards that must be carefully managed. This Preliminary Hazard Mitigation Analysis (PHMA) is provided to the Amador Project stakeholders to outline the depth of the engineering rigor required by NFPA 1, NFPA 855, and applies recent industry lessons learned leading to integration of purposeful engineering and administrative controls. The overlapping layers of engineering and administrative controls provide the defense in depth strategy to mitigate the probability of the occurrence of a fire, electrical shock, explosion, or injury to personnel (event) and to mitigate the consequences thereof.

This PHMA builds upon the County of Van Zandt Texas normative requirements outlined in NFPA 1, Section 52, *Energy Storage Systems*, where all energy storage systems (ESSs) will be installed in accordance with NFPA 855 and integrates industry best practices and standard of care as outlined in the International Fire Code (IFC)[1]. This comprehensive approach will equip the Van Zandt Fire Authority Having Jurisdiction (AHJ) with the necessary information to assess the safety and compliance of BESS installations within the County.

This Preliminary Hazard Mitigation Analysis (PHMA) is intended to illustrate the depth of engineering rigor required by NFPA1, NFPA 855 and the International Fire Code. A final and fully compliant NFPA 855:2023 Hazard Mitigation Analysis will be provided to the Van Zandt AHJ as a function of the agreed upon approval schedule.

This PHMA identifies the intentional engineering and administrative controls to mitigate potential hazards and consequences associated with the Amador containerized battery energy storage systems (BESS) for the RES Amador Project is located in Van Zandt County Texas, 32021 FM 47, Canton Texas in Van Zandt County (32.47692313668966, -96.03048027117488).

The Amador Energy Storage Project contains up to 68 Fluence Gridstack Pro 5000 battery energy storage system arranged in 4 array rows to provide a combined total of 100 MW/200 MWhr of energy for grid support.

Due to the potential risks associated with energy storage systems and as a matter of best practices, this PHMA integrates and evaluates the Failure Modes of NFPA 855:2023, Section 4.4.2 and the Fault Conditions of the 2024 International Fire Code (IFC) Section 1207.1.6 ensuring a comprehensive mitigation analysis of the identified failure mechanisms [1, 2].

The PHMA results indicate that the hazard mitigation systems and strategies that will be implemented throughout the Amador Project design development, construction, and commissioning process are presently based on well executed multi-layered engineering analyses demonstrating a design that exceeds the requisite safety standards. Upon finalization there will be sufficient documentation that indicates

[1] Amador Project documentation is presently under development and will be provided as part of the final series of analyses as required by NFPA 1:2024 or NFPA 855:2023 to support the finalization of the Hazard Mitigation Analysis is denoted by *"P"* within this PHMA.

engineering due diligence has been exercised to address the following failure modes:

1. A thermal runaway condition in a single electrochemical ESS unit.
2. A mechanical failure of a nonelectrochemical ESS unit.
3. Failure of any battery (energy) management system or fire protection system within the ESS equipment that is not covered by the product listing failure mode effects analysis (FMEA).
4. Failure of any required protection system external to the ESS, including but not limited to ventilation (HVAC), exhaust ventilation, smoke detection, fire detection, gas detection or fire suppression system.

This HMA is the culmination of numerous engineering analyses and presents the results in a multilayered, multivariable Bowtie Mitigation Analysis. This integrated solution is intended to provide relevant project stakeholders, such as the Authority Having Jurisdiction (AHJ), with the information necessary to make informed decisions regarding fire and explosion risk reduction and mitigation measures. When complete, the final HMA will provide the AHJ with information that demonstrates:

1. "Fires will be contained within unoccupied ESS rooms for the minimum duration of the fire resistance rating specified in 9.6.4 of NFPA 855:2023 [and IFC Section 1207.7.4].
2. Fires and products of combustion will not prevent occupants from evacuating to a safe location.
3. Deflagration hazards will be addressed by an explosion control or other system"[1, 2].

PRELIMINARY

Scope

This Preliminary Hazard Mitigation Analysis (PHMA) was developed for the Amador Battery Energy Storage System (ESS) Project system located in the proximity of State Highway 47, Canton TX 75103 (32.47692313668966, -96.03048027117488). The Amador Project consists multiple arrays of the Fluence Gridstack Pro 5000 Energy Storage enclosures as shown in Figure 1 and Figure 3.

The Amador Energy Storage Project consists of 45 initial and up to 68 final *Fluence Gridstack Pro 5000* ESS BESS for a total capacity of 100MW A.C./200MWh D.C.

The Fluence Gridstack Pro 5000 ESS is based on the safe implementation of the $LiFePO_4$ battery technology (Model Number CBDD0) developed by CATL[3-5]. The Fluence Gridstack Pro 5000 ESS will be fully compliant with the requirements of

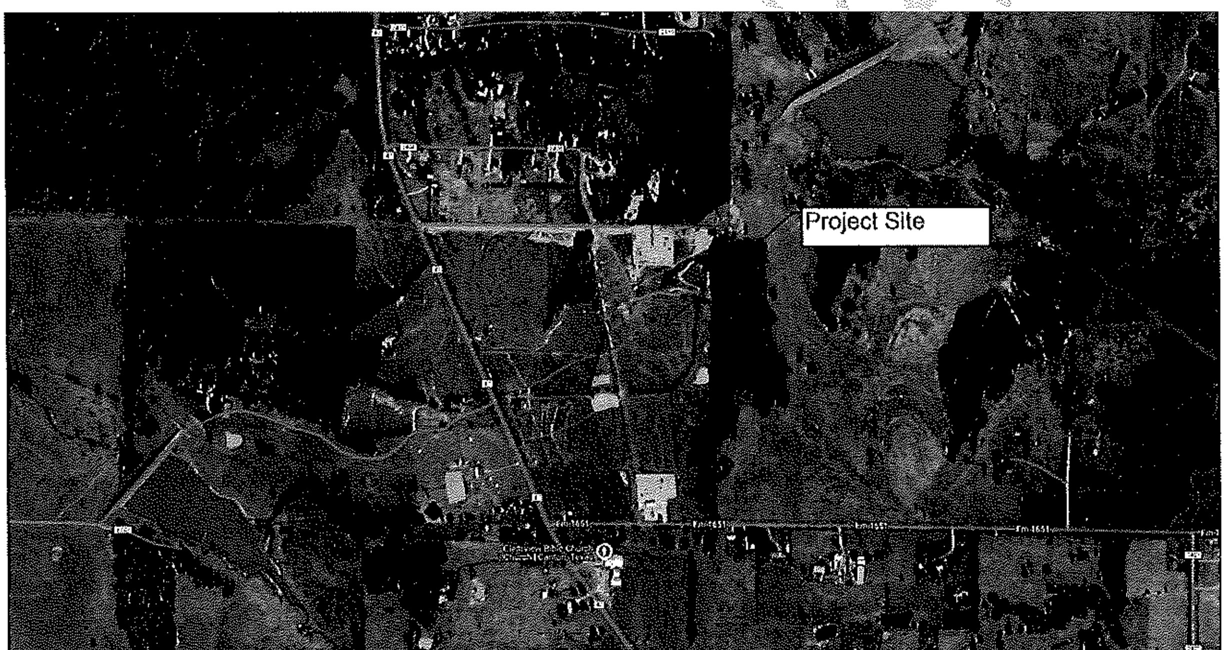


Figure 1: Amador Project Location

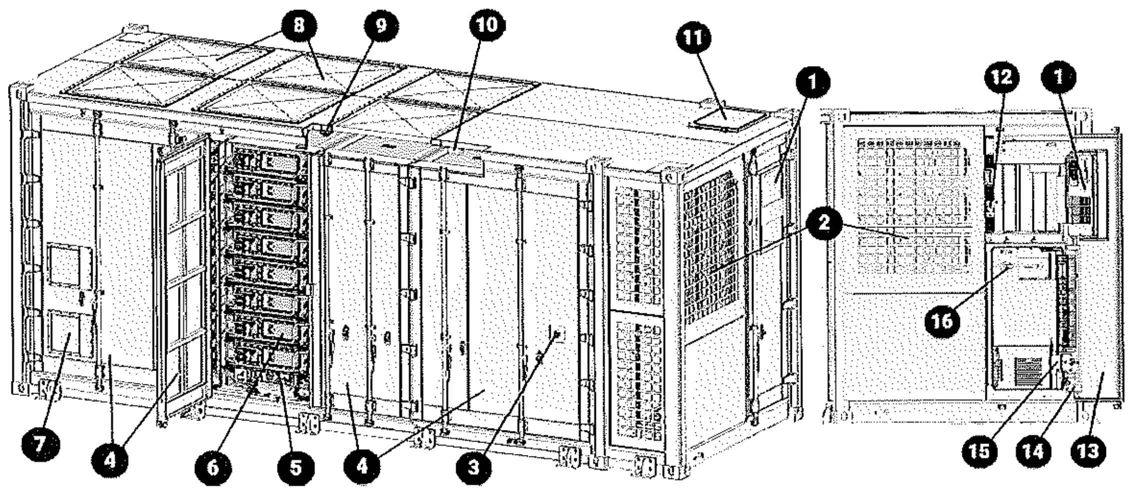
The Amador Fluence Gridstack Pro 5000 enclosures are divided into individually located BESS/PCS assemblies installed throughout the project site which feeds the nearby substation. The array of feeder structures is interconnected with an inverter which converts the direct current (DC) to supply power to 34.5kV three phase alternating current (AC) power source connected to the Bulk Electric System (BES).

The primary hazards associated with LFP batteries are overheating, generation of flammable gases during thermal or electrical abuse, and fire caused by thermal runaway. Thermal runaway is a temperature-triggered process that produces heat faster than the battery can cool, thus leading to temperature increases that can eventually lead to a fire. The release of flammable gases in the Amador battery packs is based on the UL9540A Module Level Test [6].

LFP batteries include a stable cathode chemistry that substantially reduces the possibility of thermal runaway and provides for a reduced reaction from any sort of abuse such as short-circuiting, overcharging, introduction of nails, or being crushed. In addition, the Amador battery storage system includes the following monitoring and safety components:

- Modular battery racks designed for monitoring and safety
- Integrated heat and fire detection and suppression system
- Explosive gas monitoring
- Exhaust/ventilation systems
- Integrated battery management system

The system in each BESS enclosure consists of flammable gas, smoke, and temperature detectors and one manual pull station as shown in Figure 3. The arrangement in each BESS enclosure is identical.



1. HVAC
2. Chiller Compartment
3. F-Stop
4. Enclosure Door
5. DCPM
6. Battery Module
7. Inlet Louver
8. Deflagration Panel x 6
9. Multi Detectors x 4
10. H2 Gas Detector x 2
11. Vent Panel
12. UPS
13. Enclosure Side Door
14. BCP Door
15. Enclosure Controller
16. DC Disconnect Switch

Figure 2: (typ.) Fluence Gridstack Pro 5000

The project would be served by the Van Zandt County Sheriff's Department. Fire support is assumed to be provided by the Whitton Rural Volunteer Fire Department (9972 Fm 1651, Canton, TX 75103, +1.803. 848.0260) ~2 miles to the Project Site, Mabank Fire Station #3 (17522 FM1836, Mabank, TX 75147, +1.903.887.4747) ~2 miles to the Project Site, or South Van Zandt Fire Station #3 (Co Rd 2301, Eustace, TX 75124, +1.903.479.3328) ~6.5 miles to the Project Site.

Law enforcement, due to the remote installation, could be provided from either one of the regional departments that includes

- Kemp Police Department,
- Van Zandt County Constable,
- Canton Police Department, 555 TX-243, Canton, TX 75103, +19035674991
- Mabank Police Department, 129 E Market St, Mabank, TX 75147, +19038878500

Primary site access via State Highway 47. The parcel is assumed to be under the responsibility of the Van Zandt Fire Department Local Area Responsibility. The proposed site layout is presented in in Figure 2.

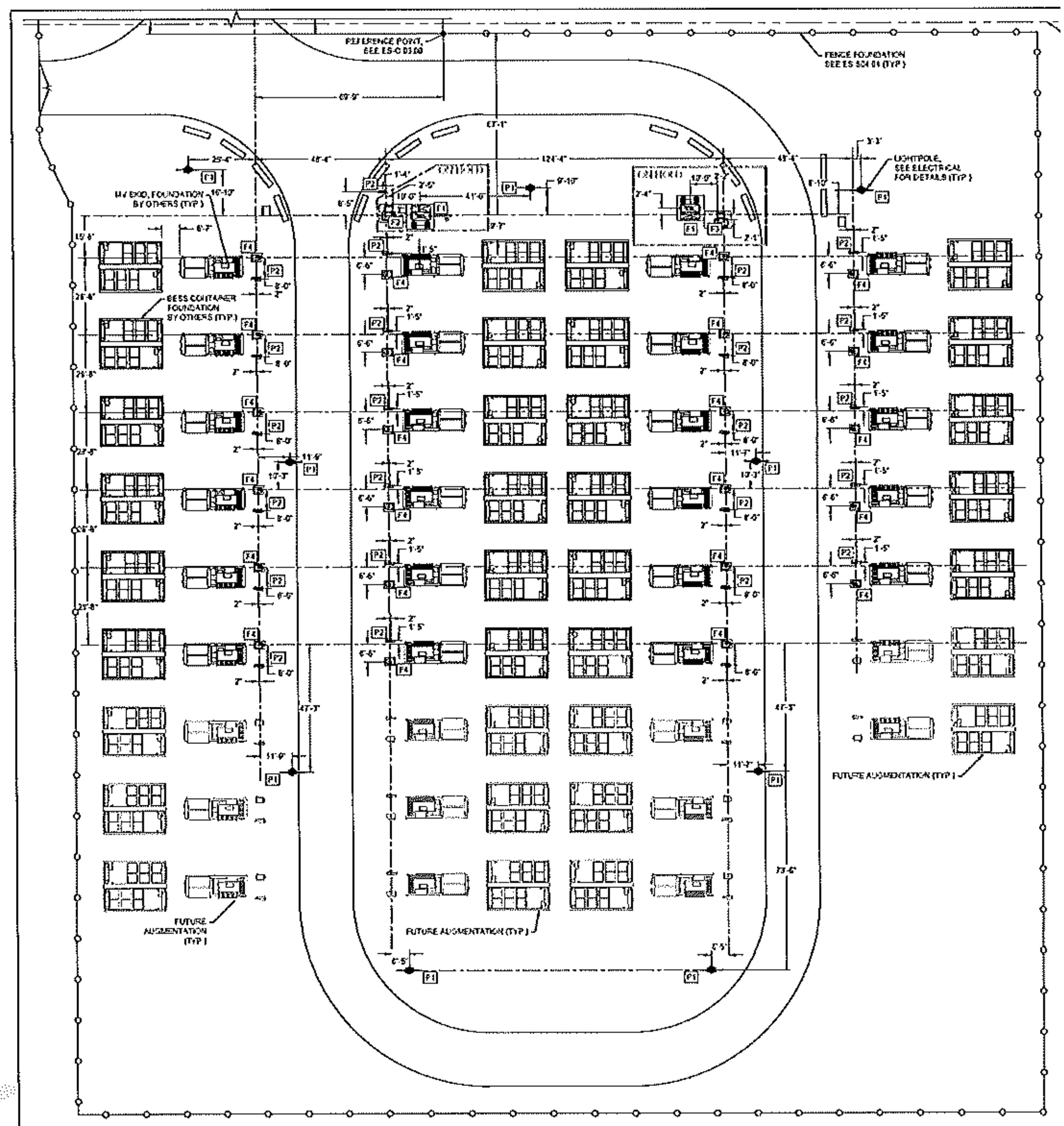


Figure 3: (typ.) Amador BESS Layout

Purpose and Objectives

The purpose of this PHMA is to provide a record of the decision-making process in determining the fire prevention, fire protection, and explosion prevention for appropriate hazards [2].

This PHMA demonstrates how the integrated Project Team will evaluate each risk contained in the numerous required engineering analyses required by NFPA 1, NFPA 855:2023, IFC and additional Van Zandt County requirements.

The design basis accident scenarios evaluated in this Hazard Mitigation Analysis include:

1. A thermal runaway condition in a single electrochemical ESS unit.
2. A mechanical failure of a nonelectrochemical ESS unit.
3. Failure of any battery (energy) management system or fire protection system within the ESS equipment that is not covered by the product listing failure mode effects analysis (FMEA).
4. Failure of any required protection system external to the ESS, including but not limited to ventilation (HVAC), exhaust ventilation, smoke detection, fire detection, gas detection or fire suppression system [1, 2].

When complete, the final HMA will provide the AHJ with information that demonstrates:

1. "Fires will be contained within unoccupied ESS rooms for the minimum duration of the fire resistance rating specified in 9.6.4 of NFPA 855:2023 [and IFC Section 1207.7.4].
2. Fires and products of combustion will not prevent occupants from evacuating to a safe location.
3. Deflagration hazards will be addressed by an explosion control or other system"[1, 2].

It is understood that NFPA 855:2023 and 2024 IFC require single failure criteria (common cause and common mode, mechanical, process, hardware, software and firmware, material, human) are assumed for any non-safety critical systems.

Safety Critical System Functional Safety Analyses will be presented in the OEM, Project, or Hiller developed IEC 60812 Failure Modes and Effects Analysis that addresses all applicable failure modes [2, 7-12].

Hazard Mitigation Analysis Methodology

Recognizing the limitations of the requirements presented in NFPA 1:2024, Section 52, *Energy Storage Systems*, this PHMA builds upon the minimum requirements of NFPA 855:2023 and integrates the energy storage market sector lessons learned through Hiller management and engineering personnel in numerous industry technical committees including the International Fire Code, NFPA 855, UL 9540/A, and Texas Fire Marshals Association (TXFMA).

The safe operation of long-term battery energy storage system safety depends on the range of identified engineering and administrative controls to address the complex hazards and the operational situations where intentional hazard mitigations result in decreased risk. Recent developments within the energy storage market sector emphasize the importance of the articulation of risks and the associated range of mitigation measures facilitating regulatory compliance and third-party certification. Hence, energy storage systems are required to be equipped with verified control mechanisms capable of reliably identifying and mitigating hazards in credited operational and design basis accident scenarios [1, 2]. To this end, available methods for the design and verification of active and passive controls have to be supported by models for risk hazard analysis and mitigation.

Central to project teams' safety culture is the integration of risk-based decision making into the organization's governance, planning, management, reporting, policies, values and culture. The integrated project team relies upon an open and transparent, principles and standards-based system that enables the interdependent organizations to apply the principles of risk management throughout the organizational context. Specifically, the risk management principles of the ISO/IEC 31000:2018 are applied as a graded approach in the project level Risk Management Framework (RMF) [13]. The Project RMF is a structured process used to identify potential threats associated with the implementation of the Fluence Gridstack Pro 5000 containerized battery energy storage system, evaluates the engineered and administrative control and recovery barriers to preclude the threats, and to define the strategy for eliminating or minimizing the impact (consequences) of the risks. This risk-based and compensatory measures (mitigation) analysis will result in the harmonizing integration of numerous third-party engineering studies including NFPA 68, NFPA 69 Explosion and Deflagration analyses, IEC 60812: 2018 Failure Mode and Effects Analysis, NFPA 551:2022 Fire Risk Assessments, and others as depicted in Figure 4.

Hiller utilizes international consensus standards to establish technical rigor throughout the engineering process. For ease of understanding and the standardized presentation of the information, Hiller presents the results of this qualitative analysis in both a Bow-Tie form (Attachment 1: Amador Project Bow-Tie Analysis Results).

The information presented throughout this HMA is based on accepted industry Process Safety Management practices and uses a Bowtie Risk Analysis to correlate the proposed mitigation strategies (i.e., barriers and controls) decrease the probability of the event happening. This HMA adopts a graded approach and leverages the analysis methodologies commonly used within the OSHA recognized High Hazard Process Safety Management (PSM), the Electric Power Research Institute (EPRI) and the Energy Storage Integration Council (ESIC) to present a comprehensive evaluation of the Amador BOP hazards. The results of this HMA are presented in Attachment 1: Amador Project Bow-Tie Analysis Results, follows the PSM and ESIC guidance for Bow-Tie Risk Analysis which relies upon significant HILLER industry market sector experience [14].

A summary of the numerous analyses and procedures required to complete the Amador HMA is presented in Figure 4.

PRELIMINARY

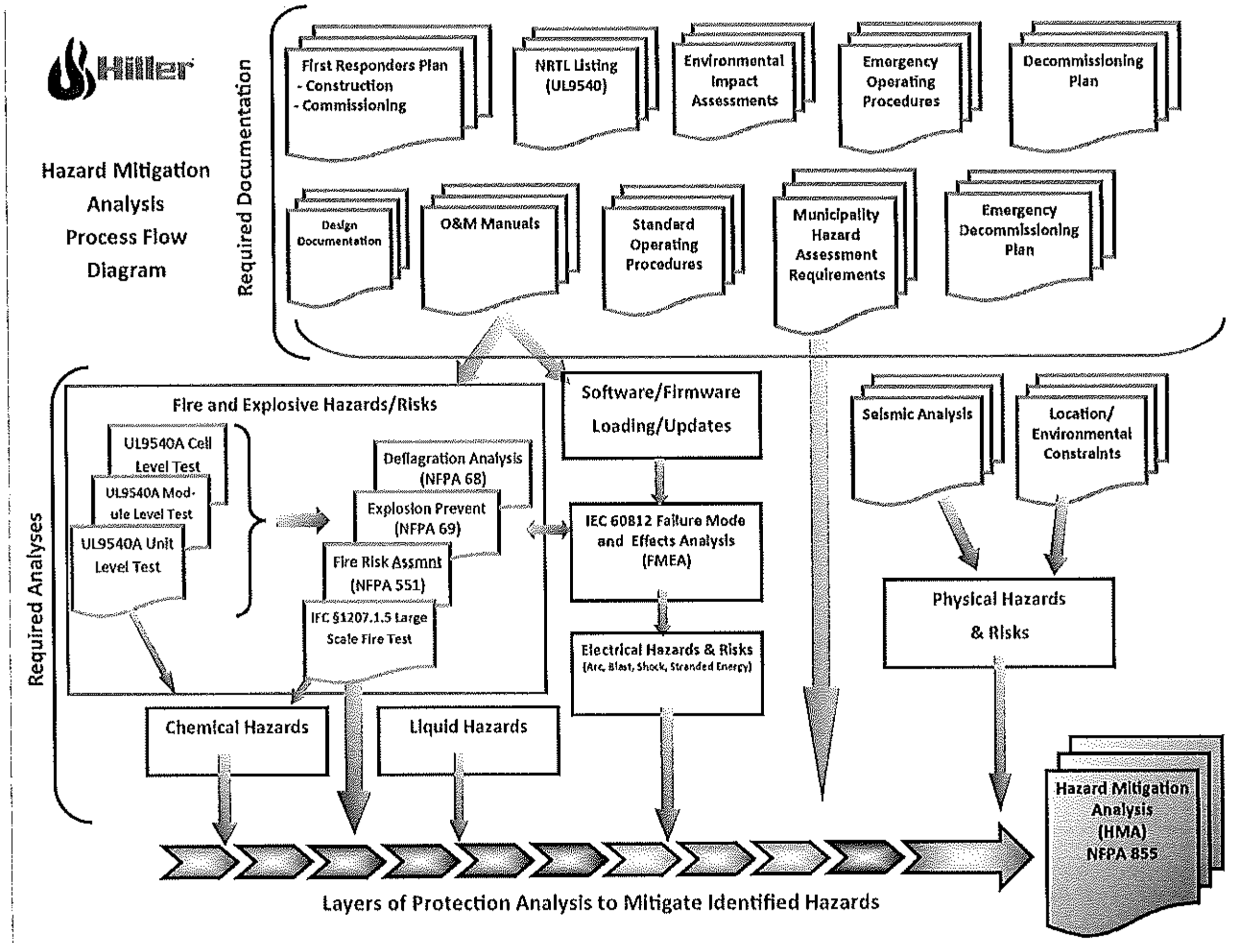


Figure 4: Hazard Mitigation Analysis Process [2]

Neither NFPA 855:2023, the 2024 International Fire Code nor the energy storage market sector does not designate any consensus standard to be used for either FMEA or HMA. Rather the guidance within NFPA 85 Annex G.2 and G.3 will be used in support of the Amador project. Additionally, the final HMA will include applicable international and third-party analyses techniques based on a consensus standards-based approach in accordance with the following standards and documents:

Risk Management and Analysis

- ISO/IEC 31000 – *Risk Management* [13]
- IEC 61511 - *Functional safety – Safety instrumented systems for the process industry sector – Part 3: Guidance for the determination of the required safety integrity levels* [15]

Failure Mode and Effects Analysis (FMEA)

- IEC 60812:2018 - Failure Modes And Effects Analysis (FMEA And FMECA) [16]

Fire Risk Assessment (FRA)

- NFPA 551, *Guide for the Evaluation of Fire Risk Assessments* [17]
- SFPE G.04:2006 – *Engineering Guide: Fire Risk Assessment*; [18]
- ISO 16732-1: 2012 – *Fire Safety Engineering – Fire Risk Assessment, Part 1: General*[19]
- ISO 16732-3: 2012 – *Fire Safety Engineering – Fire Risk Assessment, Part 3: Example of an Industrial Property* [20]

Short Circuit and Arc Flash Risk Assessments

- IEEE Std. 141-1993: *IEEE Recommended Practice for Electric Power Distribution for Industrial Plants* [21]
- IEEE Std. 242-2001: *IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems (IEEE Buff Book)* [22]
- IEEE Std. 399-1997: *IEEE Recommended Practice for Industrial and Commercial Power Systems Analysis (Brown Book)* [10]
- IEEE Std 1584:2018 - *IEEE Guide for Performing Arc Flash Hazard Calculations* [23]
- NFPA 70E:2018 - *Standard for Electrical Safety in the Workplace* [24].

Explosion and Deflagration Analysis:

- NFPA 68: 2019, *Standard on Explosion Protection by Deflagration Venting* [25]
- NFPA 69-2019, *Standard on Explosion Prevention Systems* [26]

Hiller strives to uniformly apply international consensus standards to all numerical and computational analysis when available. In instances where no applicable international consensus standard exists, recognized and generally accepted good engineering practices are applied that are either peer-reviewed and/or standards-based, where best available information is used to establish technically defendable analysis. In the absence of specific standards for Hazard Mitigation analysis, the fundamental principles of the Risk Management Framework outlined in ISO 31000, and the IEC 61511, Layers of Protection Analysis (LOPA) are applied to govern this Bowtie Risk Analysis [13, 15].

Although the IEC-61511 Layers of Protection Analysis (LOPA) techniques are typically applied to determine or allocate the Safety Integrity Level (SIL) of a Safety Instrumented Function (SIF) within a Safety Instrumented System (SIS). The graded approach to these analysis principles directly applies to determining the effectiveness of protection and mitigative measures for hazardous energy storage systems. The LOPA technique is based on the principle of Independent Protection Layers (i.e., barriers and controls) designed to prevent a threat or scenario, must fail for an event to occur. In order for the hazardous consequences of the scenario to manifest several Conditional Modifiers (an action or event that can reduce the probability of an undesirable event) might also have to coincide with the failure of all barriers and controls. This is the principle applied to calculate the demand rate on the credited system functions (before CMs) and the probability of occurrence (considering CMs).

Fundamentally, the Hiller HMA process is the integration of the Amador Balance of Plant Failure Modes and Effects Analysis (FMEA) and numerous supporting third-party engineering studies that are integrated into this HMA/Bow-Tie Analysis. The HMA/Bow-Tie Analysis is intended to reveal potential gaps in the design where changes to engineering controls or administrative process are developed to address potential identified gaps in mitigation strategies. This process is depicted in Figure 5.

This analysis focuses on the requirements of the 2024 International Fire Code, NFPA 855:2023, and the Van Zandt County BESS requirements to objectively demonstrate how each of the required accident scenarios are mitigated. The results of this mitigation are presented in the following six bowtie models:

- Cell internal failure (Attachment Figure A-1)
- Controls (Attachment Figure A-2)
- Non-cell thermal issues (Ventilation) (Attachment Figure A-3)
- Electrical risks (Attachment Figure A-4)
- Complete System failure (Attachment Figure A-5)
- External and environmental risks (Attachment Figure A-6)

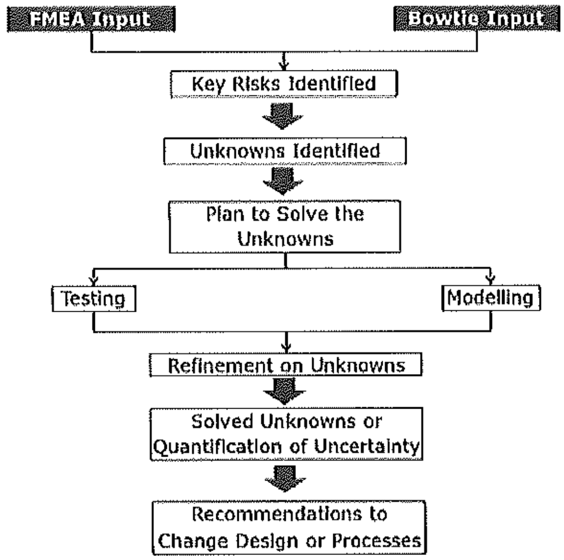


Figure 5: Risk Management Framework Integrating FMEA and Bowtie Risk Assessments

For the purpose of assessing ESS identified risks, four of the six mitigation analysis models focus on the propagation of external Balance of Plant hazards that could result in cell/module/stack/container failure that may result in very mild to very extreme consequences depending on the credited engineered or administrative controls (barriers) and subsequent compensatory measures (controls). The barriers are categorized and color-coded as Engineering Controls/Design Criteria, active hardware, continuous hardware, system property, and human factors.

Bowtie Risk Analysis Elements

Bowties are globally recognized as a useful tool to assist in the risk and hazard analysis of process and non-process industry risks. The general focus of bow ties in the process industry is towards the evaluation of Major Accident Events (MAE) where engineering or administrative controls or barriers are identified and credited to preclude occurrence. Bowtie Risk Analysis modeling is an emerging analysis tool within the energy storage market sector to assist in the delineation of energy storage hazards in traditionally difficult markets. The strength of the bowtie approach comes from its visual nature, which complements compliments complex tabular analysis.

Regarding the presentation of Bowtie information, the left side of the model are the threats, which are failures, events, or other actions which all result in a single, common hazard event in the center. For our model, many of these threats are the requirements of the IFC and are assumed to result in an unexpected thermal runaway.

The construction of a bowtie model begins with the identification of a specific hazard event for which mitigation measures are desired. For the purposes of this BOP HMA, the basis of the different analysis is rooted in the requirements of the International Fire Code (IFC) Chapter 12, Section 1207.1.4 for lithium-ion systems resulting in cell failure and potentially thermal runaway (Fault Condition). Once the hazard is determined the threats that can lead to the hazard and the consequences that can follow the hazard must be identified.

Credited Prevention/Mitigation Barriers are those engineering and administrative controls to preclude the realization of a consequence as depicted in Figure 6: Generic Bowtie Illustration.

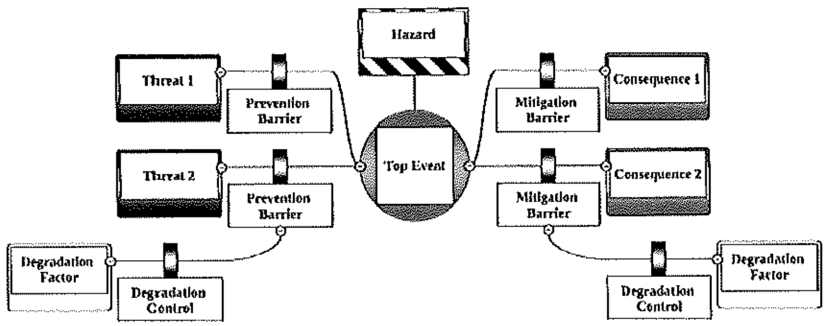


Figure 6: Generic Bowtie Illustration

A majority of failure conditions required by IFC are represented as threats on the left side of the bowtie model. These threat conditions, if uninhibited, may lead to thermal runaway, and then subsequently to the fire or deflagration events discussed as presented in Figure 8.

To mitigate this progression of failures (**Error! Reference source not found.**), barriers are put in place, displayed in approximate chronological order in which they may become relevant. Each barrier – many times present in the form of a physical protection system (such as a fire suppression system, smoke detector, or HVAC system) – is assessed in terms of its *Criticality* (a qualitative designation of how critical a barrier is to prevent further propagation of the threat resulting an analyzed consequence. When interpreting the information presented in a Bowtie as presented in Figure 7 and Figure 8, it should be reviewed from left-to-right where the progression of the threats may be mitigated by the credited engineering controls (Barriers) to mitigate the probability of the (central) event of occurring. In the unlikely scenario where the design basis event is realized, the consequence pathways outline the numerous administrative controls that mitigate the consequences of the design basis event.

Threats

By definition, BESS threats may not necessarily address a fully involved system fire or severe explosion, but rather smaller, precursor events that could lead to these catastrophic consequences. It is generally understood some threats occur without any intervention, such as defect propagation or act-of-God weather-related events, while others represent operational errors (either human or system induced). The identified threats may also be consequences of even earlier stage threats, spawning a new bowtie model that includes the threat at the center point or right side of the new bowtie. The information provided in Attachments 1 through 6 include diagrams that follow include careful selection and placement of each of the elements to best capture the perspective of system owners/operators responsible for safe construction and operation [27].

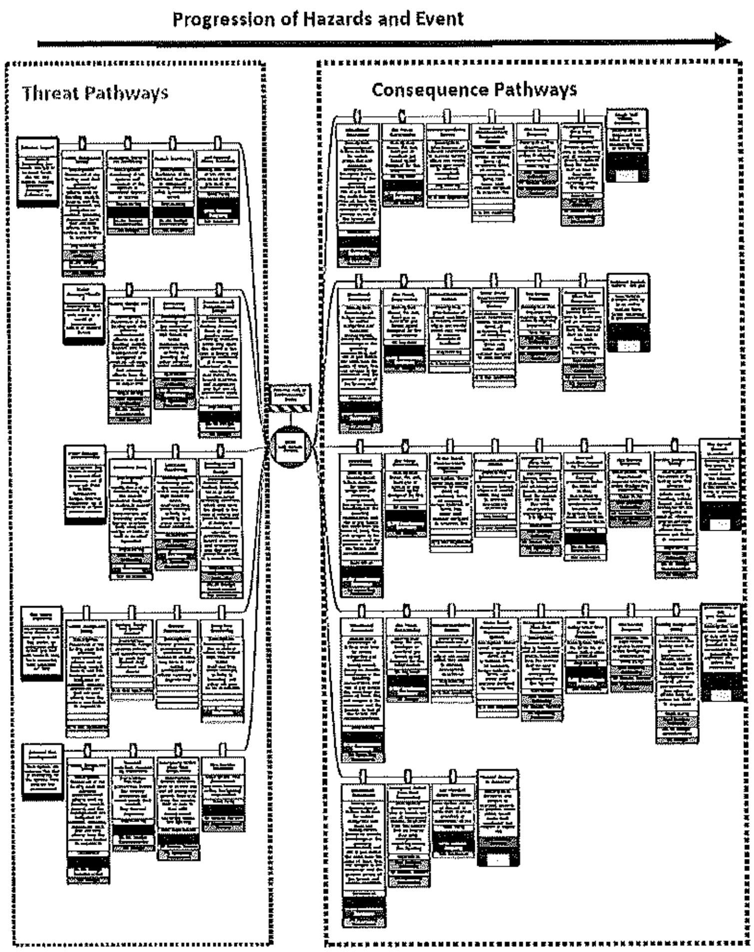


Figure 7: Bowtie Illustration

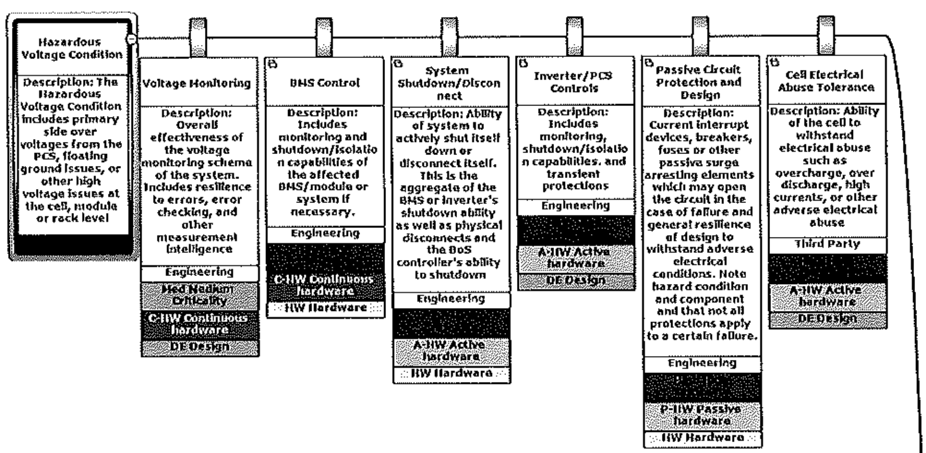


Figure 8: Threat Example

As it pertains to the Amador energy storage systems, many of these barriers include identified engineering controls that include active electrical monitoring and controls, passive electrical safety, and redundant failure detection if included in the design. In the unlikely event of the engineering controls detection and activation, system shutdown, or otherwise prevent thermal runaway from occurring, there are physical design elements which may prevent that fire from spreading. If the other associated protection measures fail the central risk hazard event (e.g., fire propagation) probability could increase unless additional mitigation barriers are initiated.

Barriers

As the International Fire Code chapter 1207 requires, only seven failure modes relative to the dozens of modes could be analyzed in more comprehensive analysis. The identified barriers that are intended to mitigate these failures are aggregated and explained quickly in a manageable document without the need for dozens of pages of documentation.

Each associated barrier in the Amador models is indicative of a concept that may include a single approach or consist of a complex series of combined layers of protection to mitigate the identified hazard. Similarly, the analysis may not include barriers required to prevent the threats at the far left of the diagram (which would be placed even farther left) to ensure that the models do not extend infinitely—though the incorporation of these variables into site-specific safety evaluations may provide additional benefit. This list does not contain all possible solutions; in some designs, these barriers may not exist at all. Many of the same barriers apply to several threats [27].

Barriers may offer benefits in a variety of ways. For example, common barriers to thermal runaway include active electrical monitoring and controls, interdependent system failure detection, and even passive electrical safety (such as over-current protection devices and inherent impedances). Should these systems fail to detect the threat, shut down the system, or otherwise prevent thermal runaway from occurring, the hazard may persist [27].

Consequences

Consequences are the events that are reasonably expected to occur once the central hazard event has occurred (thermal runway with cell-to-cell propagation). Consequence pathways include layers of protection as barriers that may help to manage or prevent the consequence of an event. Threat pathways are often consequence pathways from a separate hazard assessment, as is the case with thermal runaway. In other words, thermal runaway may result from many different threats at the end of a separate hazard pathway (if not properly mitigated) and may also be the threat that could result in several other consequences. The task force identified a set of common consequences representing areas of key concern to utilities, energy storage system (ESS) operators, and first responders [27].

Consequence Risk Categorization

Establishing an understanding of the associated risks is a vital element of the Bow-Tie mitigation analysis to determine if the mitigation strategies presented reduce the significance or magnitude of the consequence. Using the information presented in Figure 9 and Figure 11 the following qualitative analysis can be used to assess the risk associated with People (Column 1), Assets (Column 2) and Environment (Column 3). Reputational Risk is presented in Column 4 and was not assessed as part of this HMA. The following discussion and figures should be used when reading the Bow-Tie Analysis output.

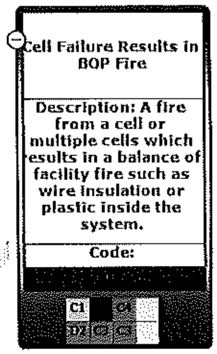


Figure 9: Risk Ranking Example

Given an example threat scenario where the identified barriers failed to stop a Thermal Management failure from creating the scenario resulting in BESS Cell/Module failure resulting in a BOP Fire, the risk to personnel was determined as class C1 where there is a "possible" chance of a "slight injury" to personnel responding to the event given the RES Emergency Response Procedures. If unmitigated there is residual chance the risk could degrade to where there is an increased hazard to personnel where "minor injury" is "likely" (Category D2).

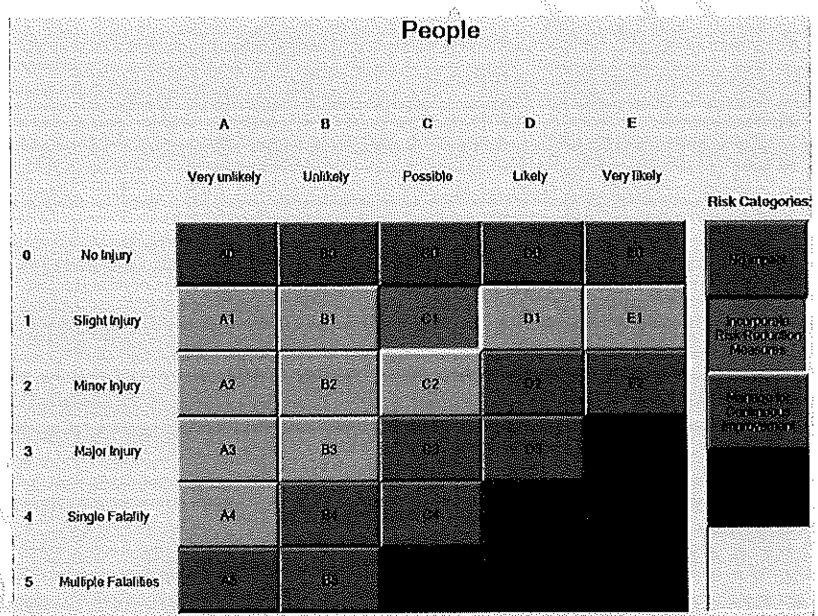


Figure 10: Bow-Tie Risk Categorization for Personnel

Asset Risk was classified is presented in Figure 11 as C5 where there is a possible risk of extensive damage to the BESS.

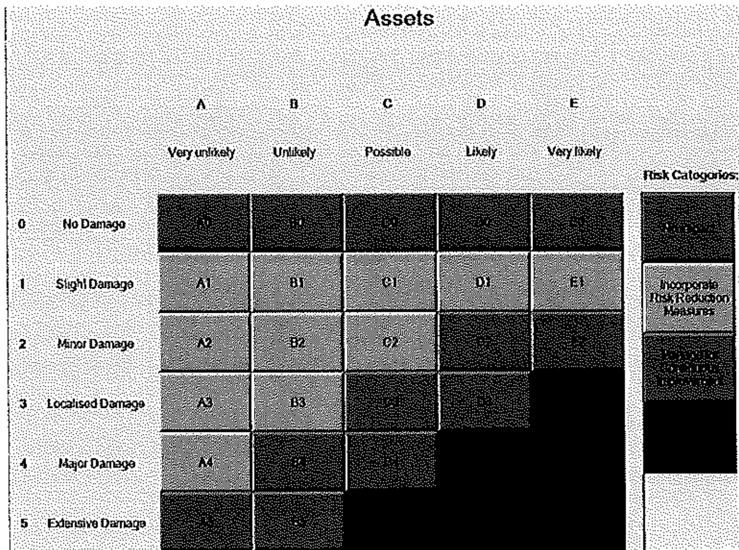


Figure 11: Bow-Tie Assets Risk Categorization Matrix

Environmental Risk was classified as "possible major effect" where the release of toxic plumes and entrained effluents could have an adverse impact on the environment as presented in Figure 12.

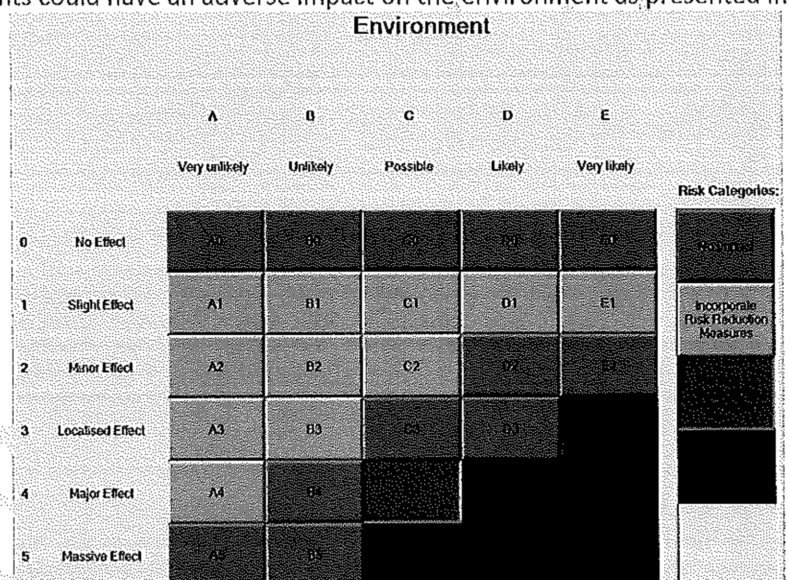


Figure 12: Bow-Tie Environmental Risk Categorization

NFPA 855:2023, Section 4.4 - Amador ESS Preliminary Hazard Mitigation Analysis Results

Table 1 presents the typical summary level HMA results that will be provided as a quick AHJ reference of how each of the requirements will be satisfied as part of the NFPA 855:2023, Section 4.4 and 2024 IFC §1207.1.6.

Table 1: NFPA 855:2023, § 4.4, §Annex G.2 & G.3, and 2024 IFC §1207.1.6 Compliance Summary

IFC 1207.1.4.1 Requirement	Complies (Yes/No)?	Summary Observation/Explanation
Fault condition. The hazard mitigation analysis shall evaluate the consequences of the following failure modes.		Hiller, OEM and third-party partners have performed a series of required analysis in accordance with the governing normative requirements as noted below and referenced herein.
A thermal runaway condition in a single ESS rack, module or unit [Fire and Explosion Risks].		UL 9540A Module Level test reports indicate that cell failure does propagate to adjacent battery cells within the module. Rack to rack propagation has been assumed and has been modeled to establish a bounding theoretical fire and heat flux event. The volume of flammable gas generated could be ignited as analyzed by Hiller or BESS OEM reports 20250124-ARM-AW0715-BESS-FRA-R0A[P], 20250124-ARM-AW0715-BESS-FMEA-R0A[P], 20250124-ARM-AW0715-BOP-FRA-R0A[P], and 20250124-ARM-AW0715-BOP-FMEA-R0A[P] demonstrating the potential that failure could result in a container fire. Localized fire tanks[P] will be permanently installed to be available in the event of a fire for supplemental evaporative cooling of adjacent containers. Refer to Figure A-1: Battery Technology Internal Failure Bowtie Analysis.
Failure of any battery (energy) management system not covered by the product listing failure mode and effects analysis (FMEA).		The Fluence Gridstack Pro 5000 design includes a series of engineering controls to act as Preventive and Mitigative barriers such as ESMS control, UL1973 Certified BMS control, UL9540[P] Certified system shutdown / disconnect, and NFPA 70[P] and 855 requisite active and passive circuit protection and design are in place to prevent cell failure from being reached. Requisite failure modes and effects analysis may be available in the Hiller BESS Level 20250124-ARM-AW0715-BESS-FMEA-R0A[P], or OEM equivalent and the Hiller Project/Balance of Plant Level 20250124-ARM-AW0715-BOP-FMEA-R0A[P] documents several different credited failures (Common Cause and Common Mode) and evaluates the efficacy of the engineering and administrative controls. Additionally, should cell

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		failure occur, numerous controls and barriers are in place to prevent further failure leading to fire or deflagration events. Refer to Figure A-2: Energy Storage Management System (Controls) Bowtie Analysis Results.
Failure of any required ventilation or exhaust system Failure of a required protection system including but not limited to ventilation (HVAC), exhaust ventilation….		The Fluence Gridstack Pro 5000 includes engineering controls that monitors and control the internal Thermal Management System to ensure safe operation within prescribed limits to preclude inadvertent thermal runaway events. Fluence's overall thermal management engineering topology utilizes multilayered protection, with overlapping zones. Sufficient controls/barriers are inherent in the Grid Stack design to decrease the probability of the failure of the Thermal Management system resulting in a fire as will be documented in either Hiller BESS Level FMEA (20250124-ARM-AW0715-BESS-FMEA-R0A[P], or OEM provided. Additionally, from a Project/Site Level impact analysis external failure mechanism will be documented in 20250124-ARM-AW0715-BOP-FMEA-R0A[P]. Refer to Figure A-3: Thermal Management/Ventilation Bowtie Analysis Results.
….Failure of the smoke detection, fire detection, fire suppression, or gas detection system		The Fluence Gridstack Pro 5000 design may be designed to include a fire suppression system. However, subsequent analysis will determine if suppression impacts explosion prevention measures[P]. Flammable gas and smoke detectors are relied upon for detecting and exhausting the accumulation of flammable gases in the unlikely event Fluence Modules module fails and enters TRA. 20250124-ARM-AW0715-BESS-FMEA-R0A[P], and 20250124-ARM-AW0715-BOP-FMEA-R0A[P] documents several different credited failures including failure of the Fluence thermal management system. Reasonable protection provided by subsequent barriers including situational awareness, flammable gas detection and emergency ventilation capability, emergency response planning, etc. Refer to Figure A-5: Total System Failure Bowtie Analysis Results.
The following hazards are scope of this PHMA as outlined in the guidance of presented in NFPA 855:2023 Annex G.2 and G.3[2]		
Electrical Hazards		
Voltage surges on the primary electric supply.		Numerous overlapping and effective barriers exist in the form of both AC and DC voltage
Short circuits on the load side of the ESS.		

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		monitoring, PCS control, BMS control, passive circuit protection, and system shutdown / disconnect. Additionally, many barriers are in place to mitigate propagation of failure in the unlikely case that propagating thermal runaway is reached. Refer to the Amador TOV analysis. Strong electrical protections and subsequent barriers to prevent further propagation of failure due to load side short circuits. Refer to the Amador Project Level AC and DC Arc Flash Risk Assessments[P]. Engineering due diligence will be objectively demonsrated. Refer to RES calculations[P]. Refer to Figure A-4: Electrical System Failure Bowtie Analysis Results.
Liquid/Chemical/Environmental Hazards		
Required spill neutralization is not provided or failure of a required secondary containment system.		While the Amador Grid Stack ESS is inclusive of liquid thermal management system for maintaining cell/module/stack temperatures, compliance with ASME B31.3 will be assured as required by UL9540, §19.2[P]. The container level environmental Thermal Management System relies on the coolant of the HVAC and for the Fluence thermal management system. The Air-Cooling system uses the Fluence Engine Ethylene Glycol Coolant. The credited BOP failures resulting inadvertent environmental impacts are presented Figure A-6: Environmental Controls Bowtie Analysis Results, and documented in 20250124-ARM-AW0715-BESS-FMEA-R0A[P], and 20250124-ARM-AW0715-BOP-FMEA-R0A[P]. Refer to the Amador Environmental Reports[P]. Refer to Amador Spill Response Procedure[P].

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The following discussion presents additional information about the HMA leading to the requirement compliance determination.

Thermal Runaway Analysis in an ESS rack, module or unit	**Complies?**	**Yes ☐**	**No ☐**

As per the requirements of NFPA 855:2023, § 4.4, and the guidance of §Annex G.2 & G.3, internal BESS failures leading to an exothermic reaction and thermal runaway analysis resulting to an enclosure level fire will be quantified in the combination of Hiller's Battery Energy Storage System Level NFPA 551 Fire Risk Assessment and Heat Flux Analysis or as provided by the OEM (BESS, 20250124-ARM-AW0715-BESS-FRA-R0A[P]). The BESS Level NFPA 551 Fire Risk Assessment and Heat Flux Analysis is intended to quantify the localized fire and heat flux risk and to evaluate if the potential exists for cascading fire propagation to any adjacent structures.

Additionally, external influences and failure leading to the failure and fire of a BESS will be evaluated as part of the Hiller Balance of Plant Fire Risk Assessment (BOP FRA) (20250124-ARM-AW0715-BOP-FRA-R0A^P). BOP FRA provides the technical basis for the Fire Risk Assessment with the objective of identifying and quantifying the potential external fire hazards (acts-of-God, environmental, wildfire, etc.) associated with containerized battery energy storage systems. The external influences of the interconnected and interdependent systems that could contribute a BESS Level failure will be presented in the Balance of Plant Level IEC 60812 Failure Mode and Effects Analysis (20250124-ARM-AW0715-BOP-FMEA-R0A^P.

Exothermic reactions and subsequent thermal runaway present unique fire challenges associated with the bulk storage of Li-ion batteries. These challenges are exceptional given the presence of a flammable organic electrolyte within the Li-ion battery as compared to the aqueous electrolytes typically found in other widely used battery types. When exposed to an external fire, it is well documented that Li-ion batteries can experience thermal runaway reactions resulting in the combustion of the flammable organics and the potential rupture of the battery [28-39]. The Amador Project uses the Fluence Gridstack Pro 5000 system which includes the LFP cells and modules [3-5]. The requisite UL9540A test has been performed and demonstrate how the lithium-ion battery technology responds to thermal abuse and was tested in compliance with the normative requirements [3-5].

UL 9540A Cell/Module Level Tests objectively indicate that cell failure did not result in propagation to adjacent battery cells within the modules [5]. However, since the BESS does not include any Safety Instrumented System (SIS), with Safety Instrumented Functions (SIF), or Safety Integrity Level (SIL) components, all assumed controls are assumed to fail resulting in the NFPA 855 bounded scenario of failure of a single rack/unit. It is conservatively assumed the volume of flammable gas generated (204 Liters per cell [5]) in an N+2 scenario could be ignited resulting in an enclosure level fire will be analyzed by Hiller report 20250124-ARM-AW0715-BESS-FRA-R0A^P or by the BESS OEM.

Refer to **Error! Reference source not found.**. Figure A-1 is provided as an example of a typical Process Safety Management (PSM) applied multivariable analysis and is not to be considered as the final HMA analyses.

Applicable administrative control and procedures required by NFPA 1:2024, §52., 855:2023, §4.2, and as required by the Van Zandt County AHJ, including the Site Level Standard Operating Procedure^P, Emergency Operating Procedure^P, Operations and Maintenance Manual^P and the Amadro Project Level Emergency Responders Plan^P will be provided as agreed upon with the AHJ.

Refer to the RES Procedures Index^P for the list of applicable procedures.

Energy Management (Controls) System Failure **Complies? Yes ☐ No ☐**

The Energy Storage Management System (ESMS), the Fluence Energy Management Control Unit (EMCU), and the Fluence Battery Management System (BMS) are the central functions for assuring safety within each battery module and within each Fluence Gridstack Pro 5000.

To be compliant with Nationally Recognized Testing Laboratory Safety Standards, BESS's are required to utilize a UL 1973 certified battery management system (BMS) to monitor and maintain safe, optimal operation of each battery pack and a system supervisory control (SSC) to monitor the full system. Lithium-ion batteries are inherently dynamic in nature, whereby they are constantly operating outside the equilibrium state during cycling. Additionally, this dynamic performance can worsen in certain cases where intercalation-based storage systems (e.g., Li chemistry) operate as a closed system with very few measurable state variables, making it difficult to properly monitor the states of the battery and maintain safe operation. Furthermore, even under normal operation the battery packs of a BESS will degrade during cycling [38, 40]. This degradation can be accelerated by extreme charging patterns, increased temperature (both ambient and operating), overcharging, or undercharging. Therefore, basic BMS utilizes engineered controls so the battery packs can satisfy the power demand without overall system performance degradation.

The Fluence Gridstack Pro 5000 will be evaluated and listed to be fully compliant with UL9540[P] as required by NFPA 855:2023, §.

The Fluence Gridstack Pro 5000 UL 1973 compliant BMS collects data at the cell and module levels and communicates to external systems via Modbus protocol (RTU or TCP/IP) to the ESMS[P] [41]. Properties monitored include temperature, voltage, current, state of charge (SOC), state of health (SOH), etc. If monitored system parameters exceed permissive setpoint, automatic shutdown is initiated.

Refer to the RES System Operations Document and the Fluence design details.

The characterization of the failure mechanisms of the ESMS and BMS utilized in the Fluence Gridstack Pro 5000 is documented in the BESS and BOP Failure Modes and Effects Analysis and the associated mitigation strategies are provided herein. Additional administrative controls are presented in the Standard Operating Procedure[P], Emergency Operating Procedure[P], Operations and Maintenance Manual[P] and the Emergency Responders Plan[P].

Refer to the Project Procedures Index[P] for the list of applicable procedures.

Attachment 1 provides the engineering and administrative carriers and controls to mitigate the cascading effects resulting from the failure of the BMS.

Failure of any Exhaust or Ventilation System **Complies? Yes ☐ No ☐**

Fluence's overall thermal management engineering topology utilizes multilayered protection, with overlapping zones. The Fluence Gridstack Pro 5000 will be UL 9540[P] compliant BESS safety features and a UL 1973 Certified Battery Management Systems [42] when integrated with the ESMS will work together to help protect against the cascading impacts of common industrial battery failure modes due to abuse, damage or other external factors. These protections are evaluated with a comprehensive Safety Risk Assessment for the equipment based on ISO 12100 (recommendations for Safety Risk Assessments) [43] and ISO 13849 (Functional Safety) [44] and designed to meet applicable UL, NEC, NFPA and IEC Standards.

The Fluence Gridstack Pro 5000 design uses other Fluence divisions as part of the supply chain with products that have an international track record of utilizing technology and components that render the likelihood of a safety event low. Such an event could be isolated by the module enclosures, rack assemblies and steel shell of the storage unit.

A key aspect in battery safety is adhering to the recommended operating practices. If safe operating limits are exceeded, the Fluence Battery Management Systems (BMS) are designed to isolate the affected batteries and racks from the system. The BMS continues to monitor operating conditions and will return the battery to service when conditions warrant availability.

Refer to the Amador Standard Operating Procedure[P], Emergency Operating Procedure[P], Operations and Maintenance Manual[P] and the Emergency Responders Plan[P].

Refer to the Amador Procedures Index[P] for the list of applicable procedures.

The Fluence Gridstack Pro 5000 utilizes an integrated Air-Cooling and pressurized liquid Thermal Management System design in accordance with ASME B31.3[P] as required by UL9540:2020[P] to maintain the operating temperatures within the Fluence Modules. Hiller or the BESS OEM, in support of the Amador Project [Pending], will be providing has developed a detailed Amador Grid Stack Failure Mode and Effects Analysis (FMEA)[P] that supports this analysis conclusion.

In the unlikely event of a design basis fire the combination of the maximum theoretical fire as determined in the Hiller or BESS OEM Fire Risk Assessment[P] and as measured in the fire and explosion testing establishes a maximum theoretical momentary heat flux calculation. Fire and explosion testing is outlined in NFPA 855:2023, § 4.2.1.3(1) and §9.1.5 [2] will be provide by the BESS OEM[P].

Figure **Error! Reference source not found.** contains the representation of the Ventilation System failure mechanisms and delineates the design measures considered to mitigate the consequences of the identified threats.

Refer to the Amador Project/Site Emergency Response Plan.

Voltage Surges on Electric Supply and Short Circuit on the Load Side of the ESS	**Complies?**	**Yes ☒**	**No ☐**

The Amador Battery Energy Storage System utilizes the Fluence Gridstack Pro 5000 coupled with the power conversion system (PCS, Inverter) to form an IEEE 1547 and UL 9540 compliant grid connected energy storage system. The PCS complies with UL 1741[P] performance standards and IEEE 1547-2021 [45]. The three-phase output currents are sinusoidal with total harmonic distortion to meet or exceed IEEE 519 and IEEE 1547 requirements.

Although certified as being compliant with Nationally Recognized Testing Laboratory Safety Standards, there is the extremely unlikely possibility of cascading transient voltage surges that could result in challenging PCS performance. The PCS has internal protection measures (IGBTs) to clamp and shutdown in less than 100 ms to protect both the PCS and the interconnected ESS system.

Refer to Amador AC Transient Overvoltage (TOV) Report [46] and the AC and DC Arc Flash Risk Assessment Reports [47] that demonstrates adequate protection exists to minimize the likelihood of the event occurring.

Refer to the Amador Standard Operating Procedure[P], Emergency Operating Procedure[P], Operations and Maintenance Manual[P] and the Emergency Responders Plan[P].

Refer to the Amador Procedures Index[P] for the list of applicable procedures.

BESS Short Circuit Analysis

Numerous engineering analyses have been performed by the RES engineering partners that demonstrate engineering due diligence has been performed to analyze the likelihood of short circuit currents.

Refer to RES calculations [46-48].

Refer to **Error! Reference source not found.** and Attachment 2 for HMA results.

Failure of the smoke detection, fire detection, fire suppression, or gas detection system	**Complies?**	**Yes ☒**	**No ☐**

The Fluence Gridstack Pro 5000 design includes an integrated Fire Detection and Fire Suppression Systems (FD/FSS) that includes the Stat-X suppression system. The Amador BESS relies upon the integrated Smoke Detection, Mutli-Sensor Monitoring, and Flammable Gas detection connected to an external NFPA 72 Fire Alarm Control Panel (FACP) as shown in Figure 2 and Figure 13.

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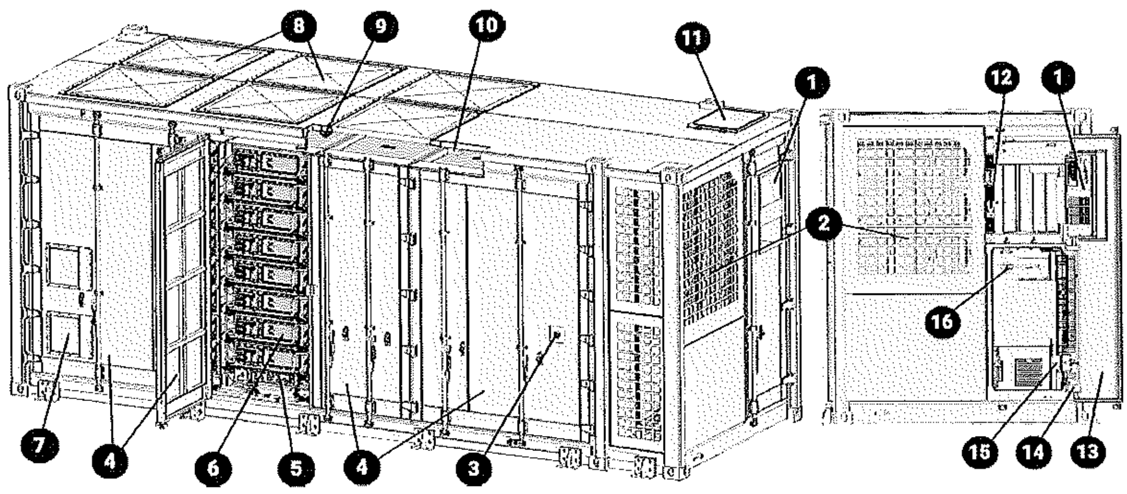

1. HVAC
2. Chiller Compartment
3. F-Stop
4. Enclosure Door
5. DCPM
6. Battery Module
7. Inlet Louver
8. Deflagration Panel x 6
9. Multi Detectors x 4
10. H2 Gas Detector x 2
11. Vent Panel
12. UPS
13. Enclosure Side Door
14. BCP Door
15. Enclosure Controller
16. DC Disconnect Switch

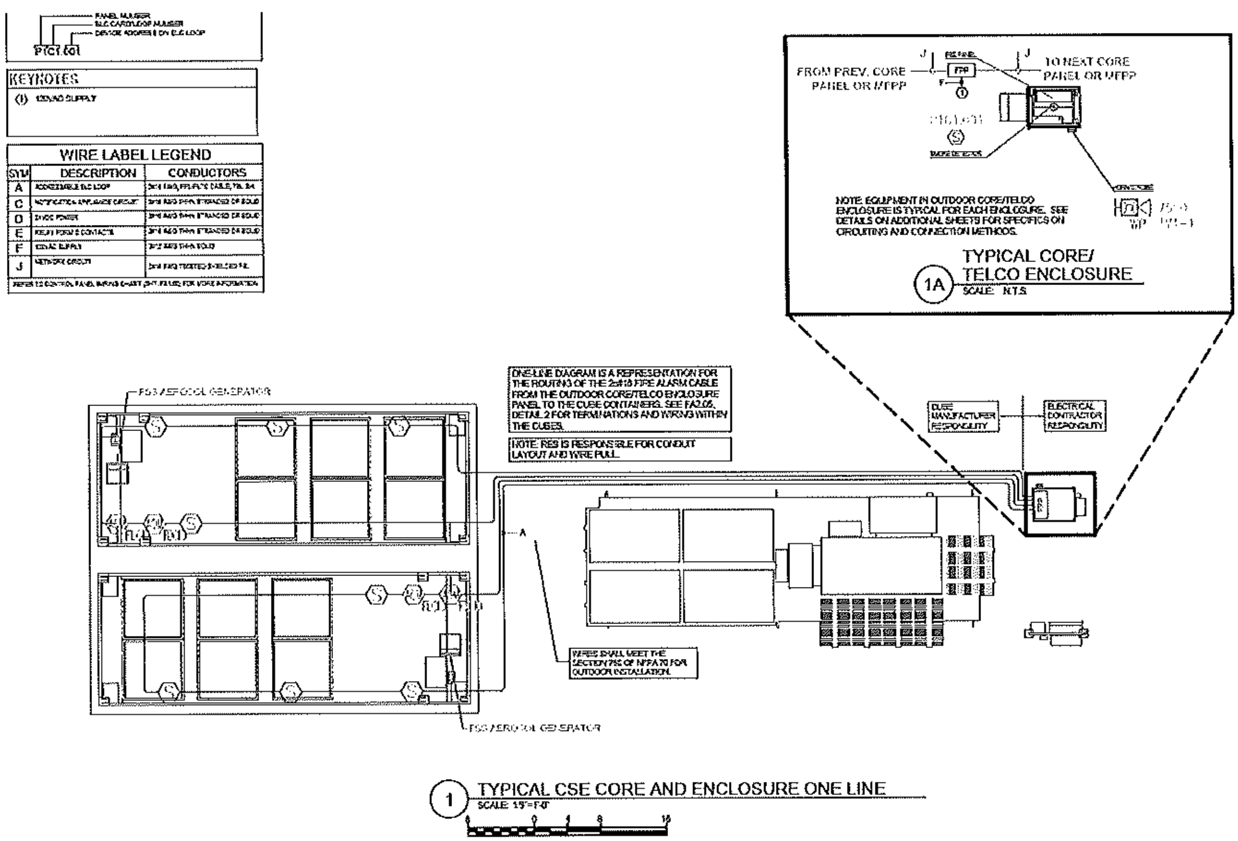

Figure 13: Fluence Gridstack Pro 5000 and ORR Fire Protection Scheme

The system was designed by Fluence and is documented in the Fluence Gridstack Pro 5000 drawing set. Orr designed the external site level alarm system as shown in AW0528FC-1-1 Drawing Set.

The Fluence Gridstack Pro 5000 ESS contains a series of interdependent Flammable Gas Detection, Temperature Monitoring subsystems to monitor if a thermal runaway event occurs (ref: Figure 3). The detection of potential thermal runaway events among the cells of the unit is achieved through a combination of electrical measurements and temperature readings. If thermal runaway occurs, containment of the failure is achieved primarily through passive design considerations and use of the cooling system. Should these measures fail and the runaway event progress into a module, rack, or full system fire, there exists the possibility of fire within the ESS as shown in Figure 14.

SEQUENCE OF OPERATIONS																					
		Enclosure			Core Support Enclosure								Fire Command Centre								
	Sequence of Operation (Cause and Effect)	Control Function			Control Panel				Notification	Control Function			Control Panel				Notification				Control Function
	System Input / Output	Activate Relays for HVAC / Chiller interface to shut down	Activate Relays for Opening in Air vents	Activate Relays for Closing in Air Vents	Activate Control Panel ALARM Buzzer & LED	Activate Control Panel SUPERVISORY Buzzer & LED	Activate Control Panel TROUBLE Buzzer & LED	Activate Control Panel STATUS Buzzer and LED	Activate Exterior AUDIBLE / VISUAL Devices (different sound for VISUAL)	Activate Relay for E-Stop Interface	Activate relay for Trouble Interface Common Exterior audible Device	Block either Air Vents from opening (in the same Core) (GAP)	Activate Control Panel ALARM Buzzer & LED	Activate Control Panel SUPERVISORY Buzzer & LED	Activate Control Panel TROUBLE Buzzer & LED	Activate Control Panel STATUS Buzzer and LED	Activate Exterior AUDIBLE / VISUAL Devices	Transmit ALARM signal to Central station via DAS (24h Attended Location)	Transmit SUPERVISORY signal to Central station via DAS (24h Attended Location)	Transmit TROUBLE signal to Central station via DAS (24h Attended Location)	Activate Dialer module (Ind. + Master via Relay) for Fire Brigade Interface
ENCLOSURE	Automatic Fire Detector (Multi sensor) at fire originating Enclosure	•	•		•				•	•			•				•	•			•
ENCLOSURE	Carbon Monoxide Detector (CO) in the Compartment of anyone of the Enclosure in the same Core (GAP)	•	•			•			•	•				•			•		•		•
ENCLOSURE	Contact from the aerosol canister indicating that the agent has been released in one of the Enclosure in the same Core	•			•				•	•			•				•	•			•
ENCLOSURE	Link Switch Air Vents (GAP)							•				•				•					
Core Support Enclosure	Automatic Fire Detector (Multi sensor)				•				•	•			•				•	•			•
Core Support Enclosure	FACP 240 VAC Power failure						•				•				•					•	
Core Support Enclosure	System Device wiring Trouble / Fault						•				•				•					•	
Core Support Enclosure	Open Circuit / Ground Fault						•				•				•					•	
Core Support Enclosure	Push Button Opening Air vents		•																		
Core Support Enclosure	Push Button Closing Air vents			•																	
Fire Command Centre	Manual Fire Alarm - Pull Station												•				•	•			•
Fire Command Centre	Automatic Fire Detector (Multi sensor)												•				•	•			•
Fire Command Centre	FACP 240 VAC Power failure														•	•				•	
Fire Command Centre	System Device wiring Trouble / Fault														•	•				•	
Fire Command Centre	Open Circuit / Ground Fault														•	•				•	

Figure 14: Orr Protection FD Sequence of Operation

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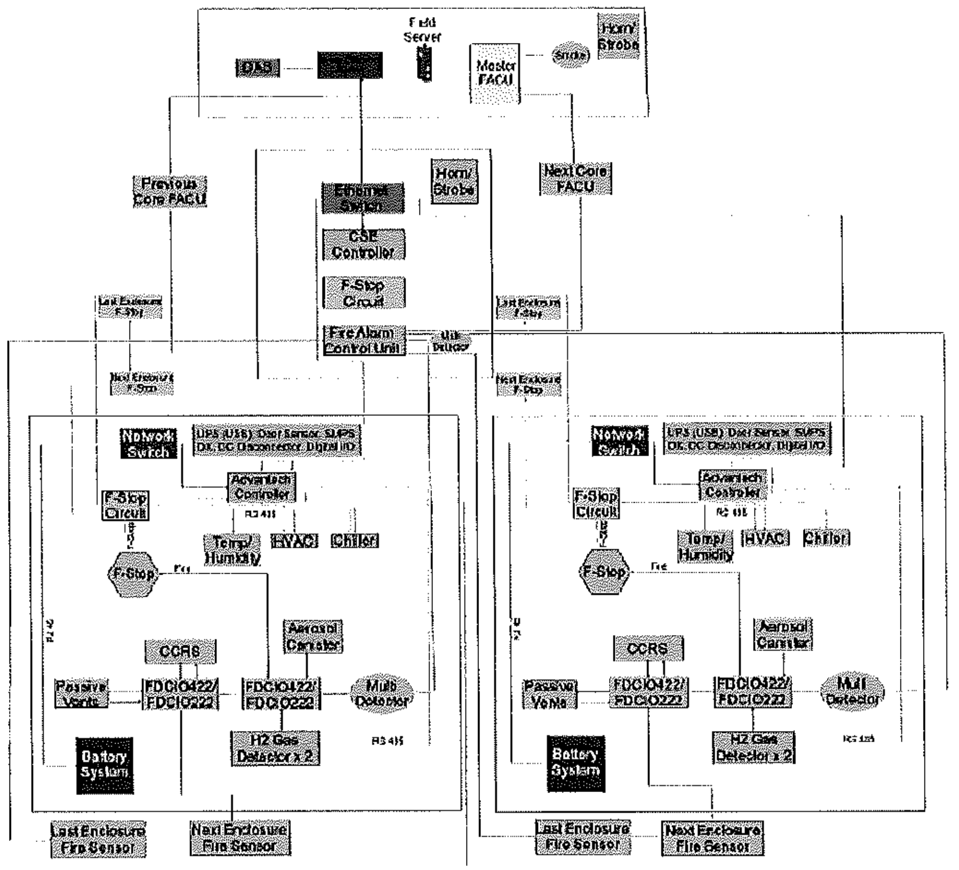

Figure 15: (example) Amador Communications and Core Safety Topology Diagram

As stated, the Fluence Gridstack Pro 5000 design includes and options a fire suppressant as an effective mitigation tool for electrical fires. Locally installed fire water tanks will be included within the Amador Project that could be used for evaporative cooling of adjacent containers or structures.

Refer to the Amador Standard Operating Procedure^P^, Emergency Operating Procedure^P^, Operations and Maintenance Manual^P^ and the Emergency Responders Plan^P^.

Refer to the Amador Procedures Index^P^ for the list of applicable procedures.

Refer to Figure A-5: Total System Failure Bowtie Analysis Results.

Required spill neutralization not being provided or failure of a required secondary containment system	**Complies? Yes ☐ No ☐**

The Amador Grid Stack Project contains a Fluence pressurized process Liquid Cooling Thermal Management System to ensure the cells and modules remain within the designed operating temperature limits. This Thermal Management System will be evaluated as being complaint to the requirements of UL9540 Section 19.2^P^.

The credited BOP failures resulting inadvertent environmental impacts are presented Figure A-6: Environmental Controls Bowtie Analysis Results and reports to be provided by either the BESS OEM or Hiller's BESS Level FMEA[P] (20250124-ARM-AW0715-BESS-FMEA-R0A), and Balance of Plant Level FMEA[P] (20250124-ARM-AW0715-BOP-FMEA-R0A).

Refer to Amador Spill Response Procedure [49].

6. ACCIDENTAL RELEASE MEASURES IN CASE OF SPILL OR OTHER RELEASE: In case of the release: Block the release or use a container to hold the antifreeze coolant and keep well-ventilated. Wear the respirator and personal protective clothes during the operation. The leaked antifreeze coolant can be treated with the inert absorbent such as covered with sand and soil. In order to prevent the pollution of surface water and groundwater, it is necessary to treat the contaminated area with detergent, water and a hard broom, and put the collected Air into a container.

Refer to the Amador Standard Operating Procedure[P], Emergency Operating Procedure[P], Operations and Maintenance Manual[P] and the Emergency Responders Plan[P].

Refer to the Amador Procedures Index[P] for the list of applicable procedures.

PRELIMINARY DRAFT

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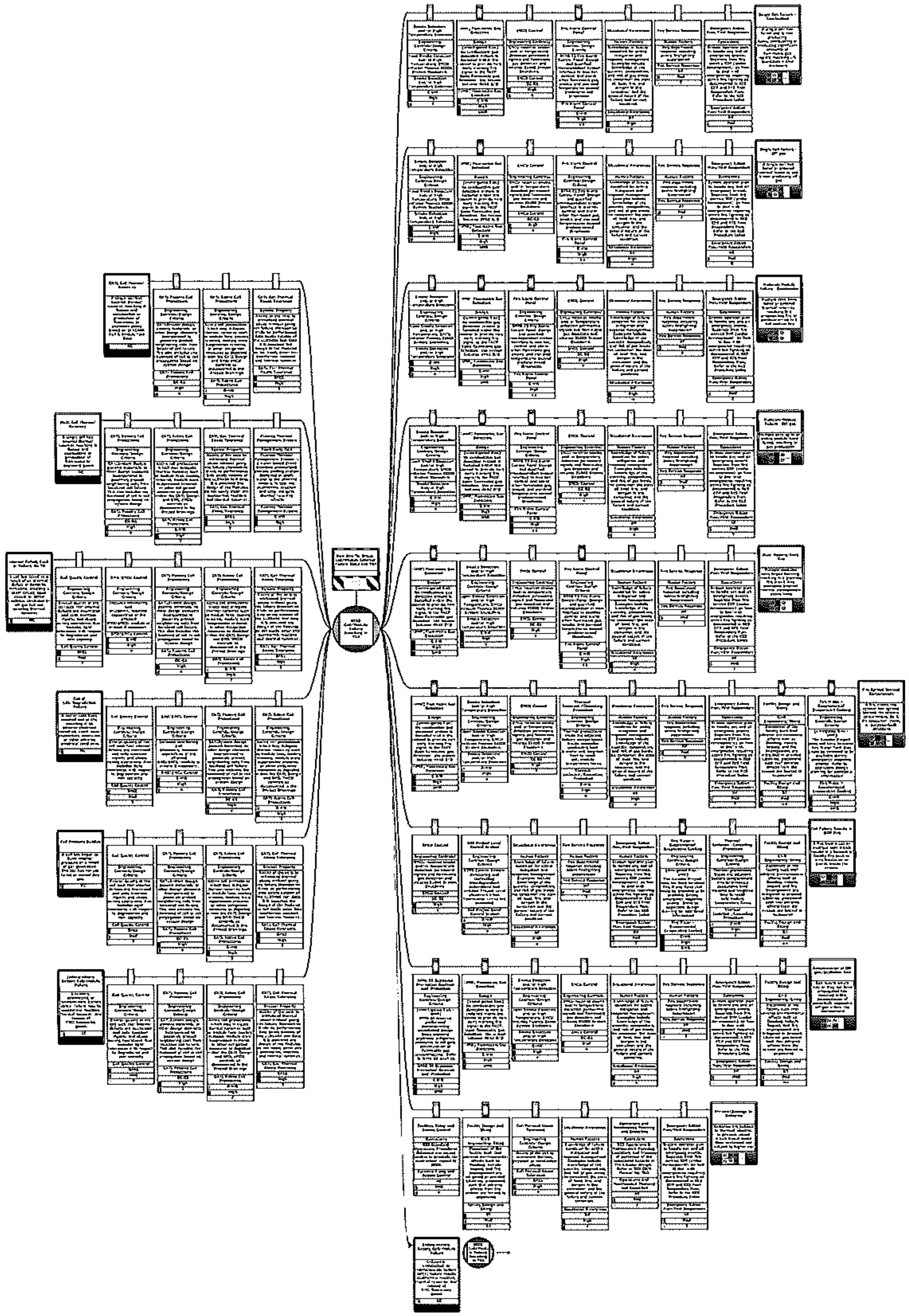
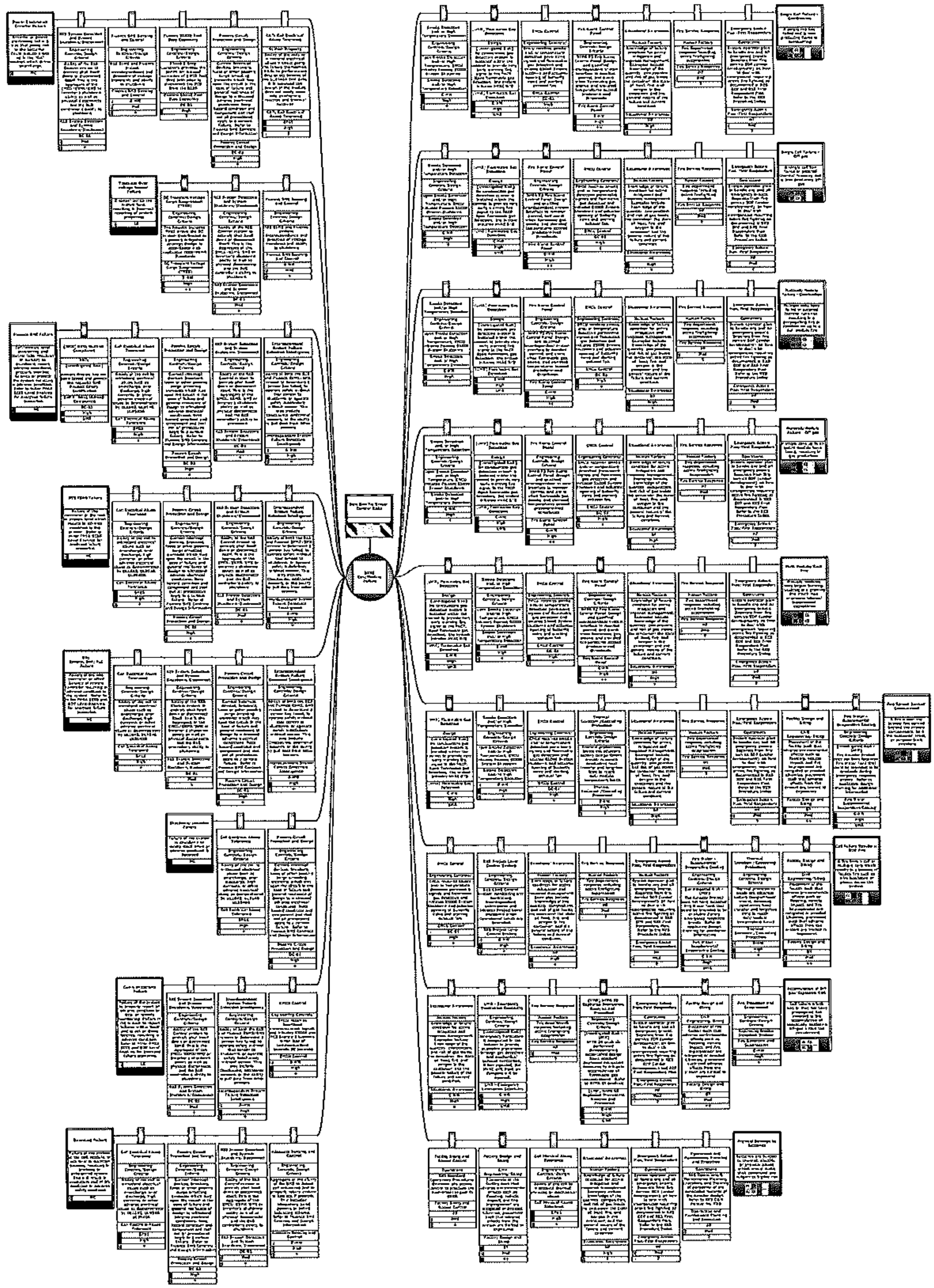
PRELIMINARY DRAFT

Attachment 1: Amador Project Bow-Tie Analysis Results

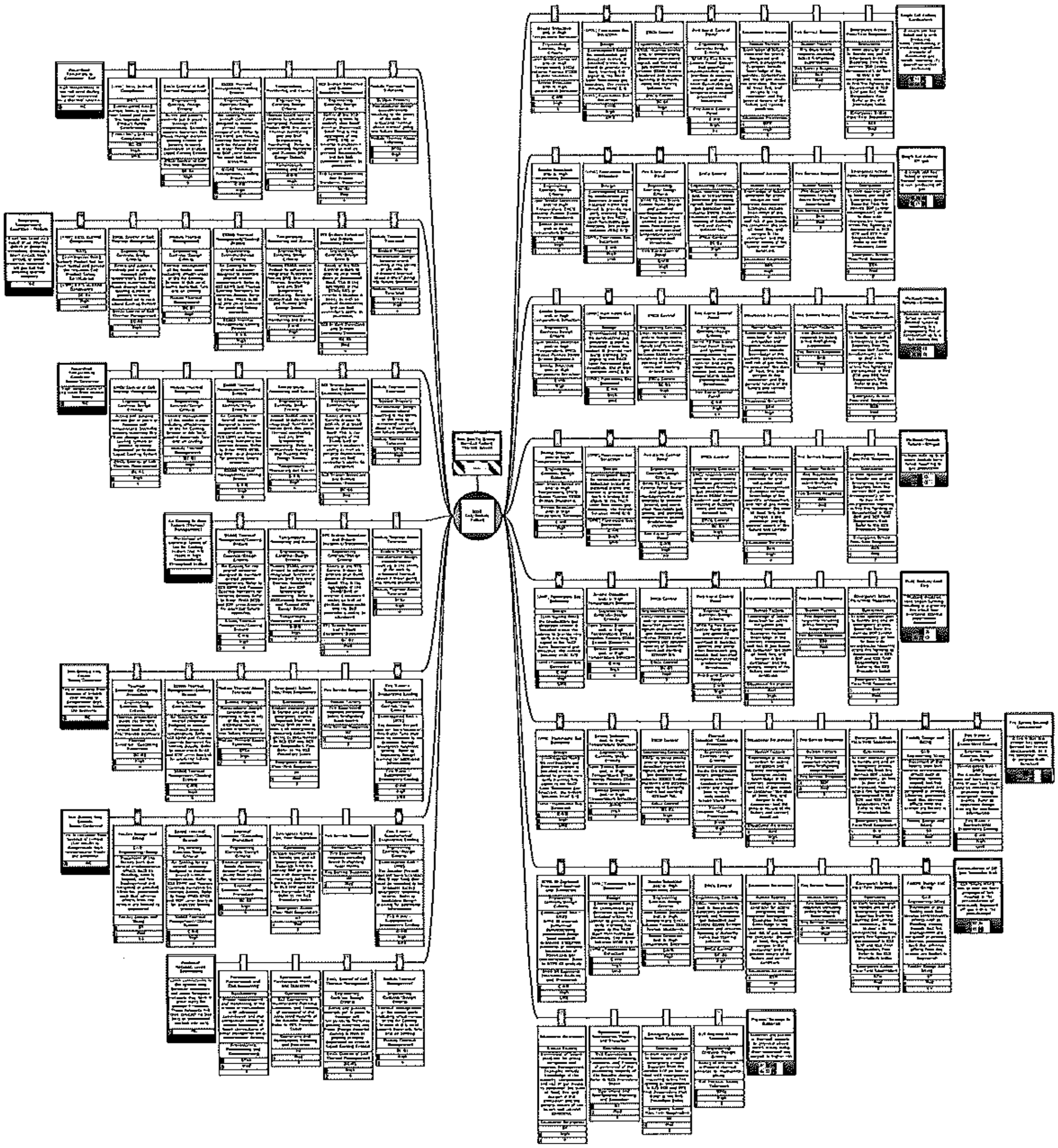
PRELIMINARY DRAFT



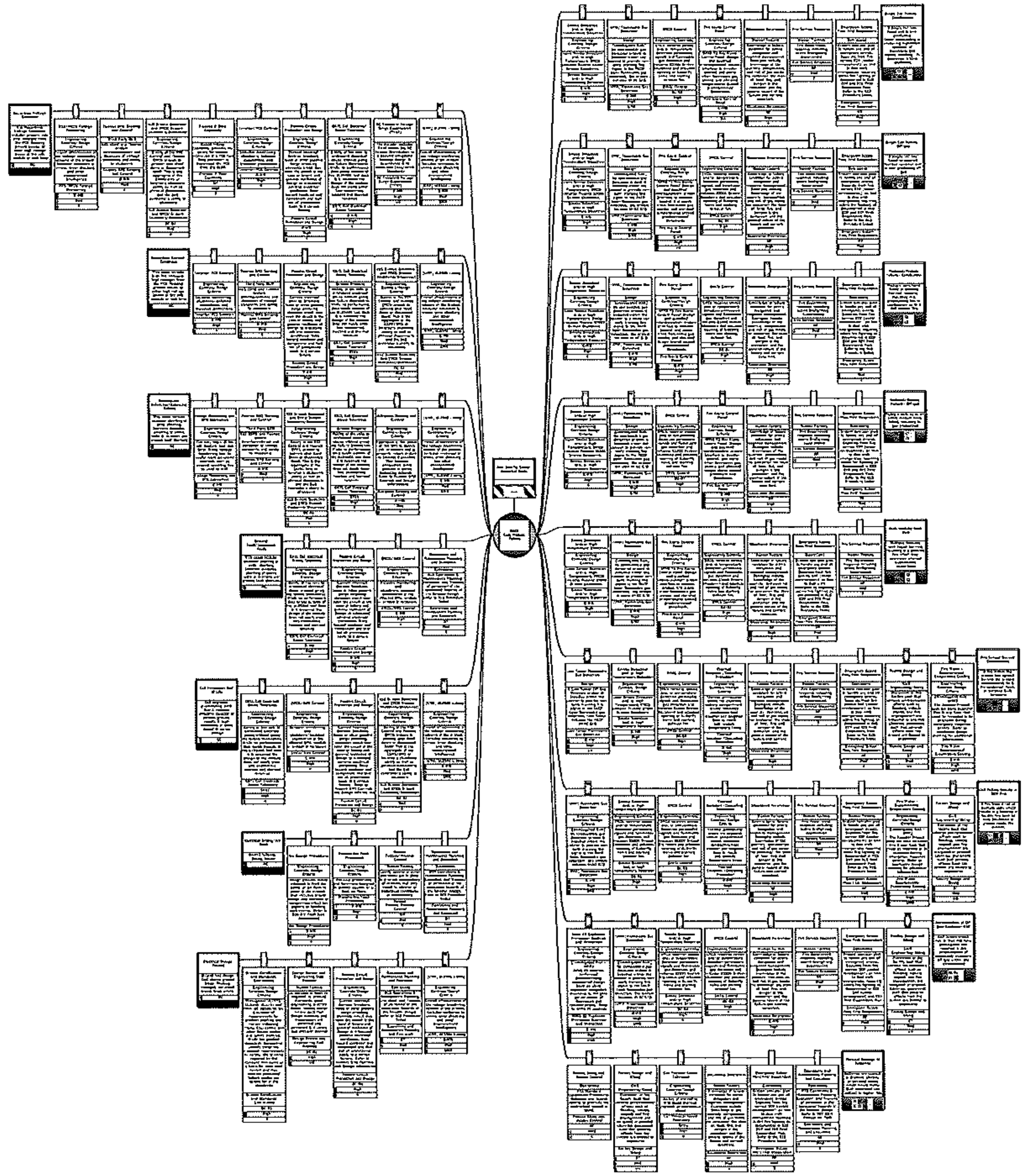
A- 1: Cell Internal Failure Bow-Tie Analysis Results



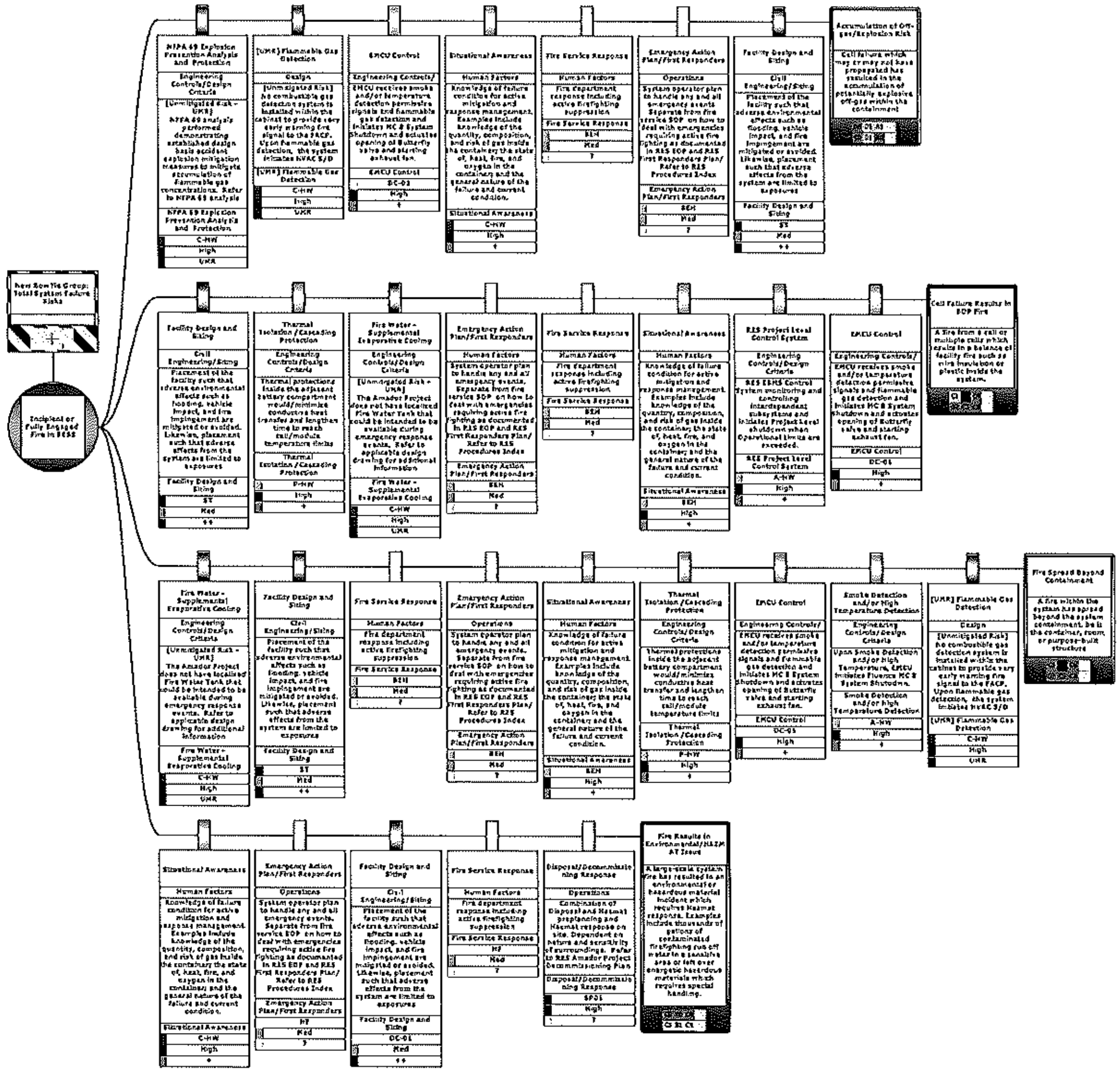
A- 2: Energy Storage Management System (Controls) Bow-Tie Analysis Results



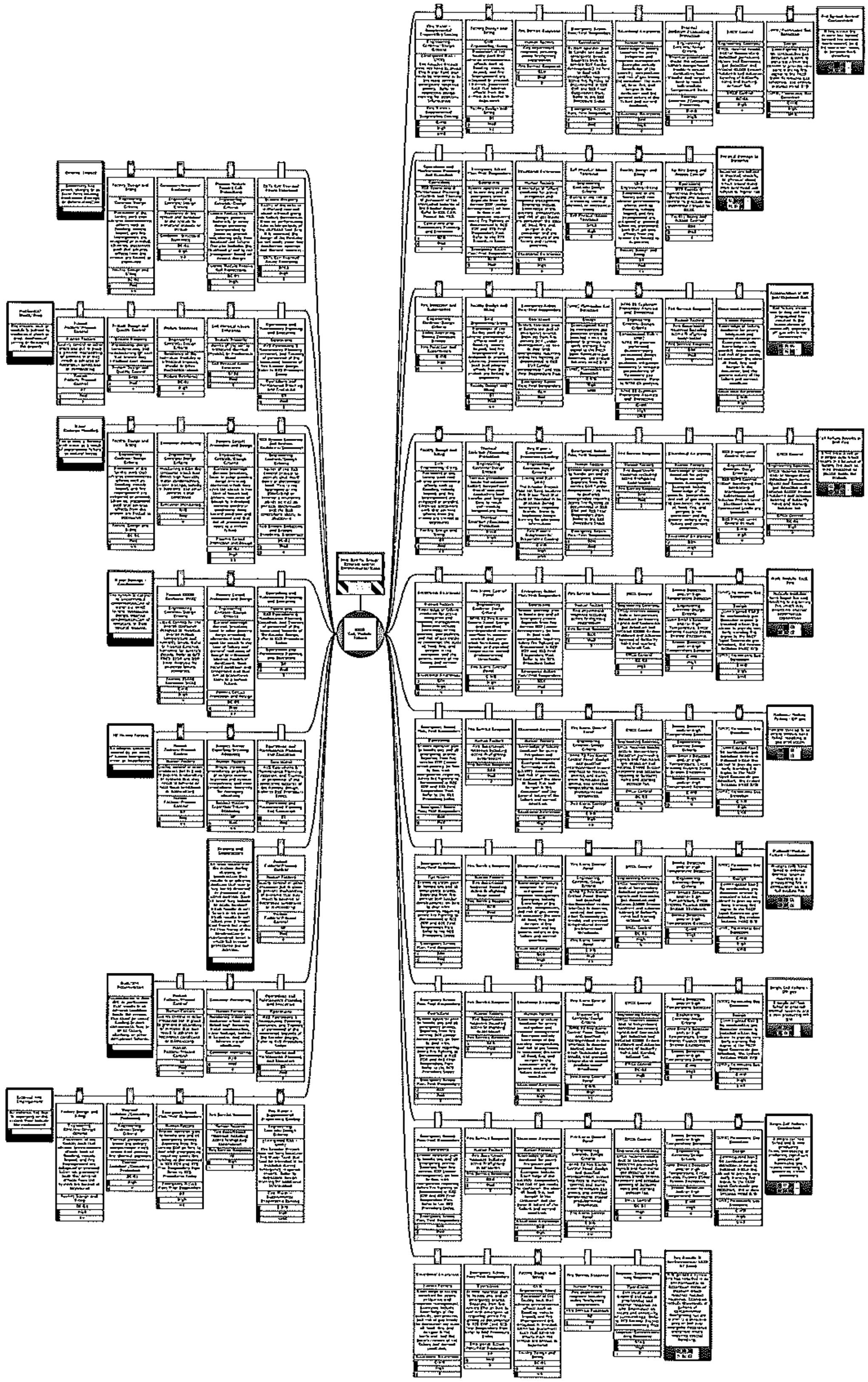
A- 3: Thermal Management/Ventilation Bow-Tie Analysis Results



A- 4: Electrical System Risks Bow-Tie Analysis Results



A- 5: Total System Failure Bow-Tie Analysis Results



A- 6: environmental Bow-Tie Analysis Results

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Amador BESS & Substation Project

Taaleria Energia

Emergency Response Plan

Date	7 April 2025
Ref	1

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Document No: BMS01-5331133

Table of Contents

1. Project Description

The Amador BESS & Substation Project will be a BESS consisting of a 100 MW / 200 MWh AC energy storage project utilizing Fluence Gridstack Pro 5000 306Ah BESS Units to include 45 battery containers and 23 EPC Power 46-100209-6530 Conversion System (PCS) skids.
The BESS will connect to the grid via a new 138kV/34.5kV site substation containing 1 138kV /34.5kV 72/96/120 MVA main power transformer, and a 138kV transmission line from the site substation.

Location: 32021 FM 47, Canton, Texas 75103
Latitude: 32°28'34.67"N Longitude: 96° 1'49.27"W

2. Emergency Response Procedures

2.1 Emergency Services

EMERGENCY SERVICE	ADDRESS	PHONE NUMBER
CHRISTUS Emergency Care Center - Canton	18780 I-20, Canton, TX 75103	(903) 567-7748
Fire: Canton Fire Dept.	1390 S Trade Days Blvd Canton, Texas 75103	(903) 567-6477
Police: Canton Police Department	555 Hwy 243 West Canton, Texas 75103	(903) 567-4991
Primary Occupational Health Clinic: UT Health East Texas Urgent Care - Canton, TX Hours: Hours: Mon - Sun 7:00 am - 7:00 pm	301 TX-243 #121, Canton, TX 75103	(903) 567-4692
Local Emergency Planning Commission (LEPC)	Office of Emergency Management - Houston 5320 N. Shepherd Dr. Houston, TX 77091	(713) 884-4500
State Emergency Response Commission (SERC)	Office of the Texas Governor P.O. Box 12428 Austin Texas 78711	(512) 463-2000
Fluence Support Services	11740 Katy Freeway Suite 1400, Houston Texas 77079	(703) 635-7631
RES Project Contact	Will Hammond	(315) 489-1412

2.2 Emergency Notification Procedure

2.2.1 Assess the emergency

2.2.2 Notify emergency services and site safety

A. If there is a potentially life-threatening injury or scenario, the first step is to call 911 directly.

B. Then contact the RES Safety Supervisor by radio or cell phone

C. If the injury or scenario is not life threatening, contact the nearest Supervisor by radio or cell phone as well as Site Safety.

2.2.3 Identify location

A. Provide the location of the emergency, by referring to the nearest structure or road junction.

2.2.4 Describe the emergency scenario. Typically, the categories below can be used:

A. Incident type (e.g. fall, crush, vehicular accident, fire, electrical shock)

B. Potential fatality

C. Major illness (e.g., heart attack, not breathing, unconsciousness)

D. Major injury (e.g., broken bone, loss of limb, severe cuts/bleeding)

E. Bite/sting (e.g., snake, scorpion, wasp)

F. Weather effect (e.g., heat or cold stress, lightning strike)

2.2.5 Determine appropriate response

A. Unless the injury is a life-threatening injury, the Supervisor, RES Safety Supervisor will determine the appropriate response, which may be:

1. Arrange for a site First Responder to respond to the location of the injured.
2. Arrange for stop work.
3. Arrange for clearance of roads.
4. Arrange for transport of the injured to the site safety trailer for first aid administration, and further evaluation.
5. Arrange for 911 services to respond directly to the injured employee.
6. Arrange for site transport to take the injured to a hospital or local medical clinic.

2.2.6 Coordinate

A. Send an employee to the nearest site access point to meet emergency services and escort them to the location of the emergency.

B. If offsite emergency services are notified, the RES Safety Supervisor will coordinate in directing emergency services to the scene of the incident.

2.2.7 Accompany

A. The First Responder, Supervisor and RES Safety Supervisor will continue to assist with the emergency scenario.

B. If the decision is made to transport the employee directly to an offsite hospital or medical clinic (either by site transport or by EMS), the employees' Supervisor and the RES Safety Supervisor (or designee) shall:

1. Accompany the injured employee to the hospital.
2. Stay with the injured employee until examination (including a drug and alcohol test) is complete, and the diagnosis is completed (so that a full report including the extent of the potential injuries can be made).
3. Supervisors shall make known to the treating medical practitioners the employee's typical work duties, the availability of oversight for the employee's return to duty, and alternate duties available to the employee.

2.3 Suppression of Fires During Construction

2.3.1 Employees should attempt to extinguish a fire if possible, but never at risk to their personal safety or the safety of fellow employees.

2.3.2 Portable Fire Extinguishers - Each site vehicle shall be equipped with an ABC rated fire extinguisher that has been properly inspected and tagged.

2.3.3 Each piece of construction equipment (yellow iron or similar) shall be equipped with, or have available during operation, an ABC rated fire extinguisher, if it doesn't affect the safe operation of the equipment.

2.3.4 Any fire not immediately contained and/or suppressed shall require notification to the local fire department for support.

2.3.5 Water availability - Water will be provided on site via water truck that can be utilized in a fire emergency.

2.4 Site Evacuation Procedure

2.4.1 Site-wide evacuations can be ordered by:

A. The RES Project Manager/Senior Responsible Person.

B. The Owner.

C. Site Safety Supervisor

2.4.2 Evacuation of local work areas can be ordered by the Supervisor of the work, following notification to RES Safety consistent with the reporting process above.

2.4.3 Notification of a site-wide evacuation shall be by radio communication or cell phone communication.

2.4.4 When instructed to evacuate, all employees shall proceed to the Muster Point. **Muster Point / Laydown Yard / Office: 32021 FM 47 Canton, TX 75103**

2.4.5 The RES Senior Responsible Person, Site Safety Supervisor (or designee) will arrange a head count of all personnel. This will be completed by the supervisors from each contractor.

2.4.6 Employees that remain after an evacuation to shut down or maintain critical operations shall perform the necessary operations and evacuate as soon as possible.

2.5 Lightning Action Levels

2.5.1 Warning/Shutdown Action Levels

A. 50 Mile/80 Km Weather Advisory- Advise project that lightning has been reported within 50 miles/80 Km of the project.

B. 30 Mile/50 Km Weather Caution - Advise project that lightning has been reported within 30 miles/50 Km of the project.

C. 10 Mile/15 Km Weather Caution - Advise project that lightning has been reported within 10 miles/15 Km of the project. All site personnel must immediately cease their operations and seek shelter in any rubber-tired vehicle/piece of equipment or the nearest safe building (e.g., O&M building, Substation Control Building, site office trailers)

2.5.2 Return to Work Action Levels

A. 10 Mile/15 Km All Clear, but lightning still within 30 Miles/50 Km. Ground operation crews may return to work but must observe 100' clearance from towers if applicable.

B. 30 Mile/50Km All Clear, but lightning still within 50 Miles/80 Km. All site crews may return to work but maintain awareness because lightning is still within 50 Miles/80 Km of the site.

C. 50 Mile/80 Km All Clear. There has been no lightning within 50 miles/80 Km in the last 30 minutes. All crews may return to their normal work duties.

2.5.3 Severe Weather - Lightning Communication Flyer (See Appendix 10)

2.6 Emergency Response Drill

2.6.1 Emergency Response Drill - Project Wide

A. At least one emergency response drill shall be completed within sixty (60) days of mobilizing to project that engages the local emergency service providers in the community.

2.6.2 Emergency Response Drill - Drilled Excavation

A. At least one drilled excavation rescue drill, based on RASWP 018 shall be completed after the start of drilled excavations but before the last drilled excavation is completed.

2.6.3 Lessons learned shall be communicated across the project at the Plan of the Day (POD) Meetings, All Hands Safety Meetings, and Staff Meetings. Needed improvement areas shall be incorporated into the next revision of the plan.

2.7 RASWP 018 Excavation Emergency Response and Rescue

2.7.1 Trained and qualified staff shall be in place to perform drilled excavations during drilled foundation, drilled embed and pole structure activities. Rescue at Height activities shall be conducted in accordance with RASWP 018 - Excavation Emergency Response and Rescue.(See Appendix 11)

3. Specific Procedures for Known Site Hazards

See **RASWP 014** Hazardous Flora and Fauna Guidance for Poisonous or Noxious Flora and See Poisonous Snake Guidelines for Texas.

3.1 Energy Storage System (ESS) Fire Related Emergencies

3.1.1 This section provides instruction, guidance, and direction in the event of a thermal event where an increase in temperature changes the conditions in a way that causes a further increase in temperature, often leading to a destructive result at an Energy Storage System Facility. Hazards include Explosion, Fire, and Toxic Gases released. Emergency Response Guidance specific to the Fluence GSP 5000 is included as Appendix 12.

3.1.2 General

A. Battery Types

1. Lead Acid Batteries

a. Hydrogen is released and will need to be vented. If allowed to collect explosion is likely.

2. Lithium Ion
   a. Potential for explosion. Pressure builds up in an enclosed area. If using water, ensure you are containing it with spill prevention material.

B. Safety Data Sheets
   1. SDS applicable to the facility can be found strategically placed in the site offices for reference.

C. Eye Wash Stations
   1. In the event eyes are affected by smoke or gas, eye wash stations are strategically placed inside the container or building, or at eye wash stations.

3.1.3 Coordination with local Emergency Response

A. In case of Emergency
   1. Acknowledge a fire alarm for the Fire Monitoring Center.
   2. Validate alarm conditions and make notifications as necessary.
   3. Attempt a remote shut down of the ESS.
   4. Dispatch a facility representative capable of de-energizing the ESS.

B. Local emergency services should secure the perimeter so that first responders, workers, civilians, etc. do not access the facility.

C. Refer to section 2.1 - Emergency Services for Emergency Services contact information.

3.1.4 Site Specific Blast Radius

A. In the event of a fire, all personnel included emergency personnel are to remain outside of the blast radius while event specific information is gathered.

B. Facility Specific Blast Radius: 150 ft.

3.1.5 Extinguishing

A. Fire Suppression System
   1. Stat-X Aerosolized fire suppression system BESS Auxiliary System only.

B. Fire Extinguishers
   1. Fire Extinguishers may not be used in a thermal run away event.

3.1.6 Hazardous Gasses

A. Battery technology is reliant on chemical reactions. Under the event of thermal runaway hazardous gases will be released.

1. Understand what gases are present before engaging in corrective actions. Ensure SDS material is reviewed, understood and readily accessible.
2. Ensure Proper PPE is Used
3. Atmosphere test: Inspect hazardous gasses prior to entry
   a. Check Oxygen first. Low levels in Oxygen can be due to the Inert Gas System (if applicable) and therefore increases the Carbon Monoxide levels and could be an identifier of Hydrogen.
4. Ensure person(s) are upwind from the event.
5. Depending on the structure of the facility (buildings), the HVAC system may have to be shut down due to contamination.

B. Clean Agent Fire Suppression (Stat-X)

1. Special Protective Actions for Fire-Fighters: Wear full protective clothing and self-contained breathing apparatus as appropriate for specific fire conditions.

3.1.7 Ventilation

A. Do not open doors in the event of a fire. Let the fire suppression system do its job or the fire to run its course.

B. After the event is done and there are no signs of heat/smoke, treat like an energized component.

C. Prior to opening the door(s), monitor the area with a 4-gas meter. If a hazardous atmosphere is present, immediate evacuate the area.

D. Wear fire rated PPE, open corner door to vent with your back to the enclosure. Repeat in opposite corner and allow to vent.

E. After the doors are opened and the container/building is vented, monitor the area and container/building with a 4-gas meter. If a hazardous atmosphere is present, immediate evacuate the area.

F. Once complete and there is no hazardous atmosphere present, proceed with visual inspections of enclosure.

3.1.8 Battery OEM Response Guidance

A. Refer to Appendix 12 for Fluence Emergency Response Guidance.

3.2 Snake Bite Procedures

3.2.1 Facilities with Antivenom

FACILITY NAME	ADDRESS	PHONE NUMBER
CHRISTUS Emergency Care Center - Canton	18780 I-20, Canton, TX 75103	(903) 567-7748

3.2.2 What to do if bitten by a venomous snake.

A. Allow the bite to bleed freely for 15-30 seconds.

B. Cleanse and rapidly disinfect the area with an iodine solution (if not allergic to iodine, fish, or shellfish), and remove clothing and jewelry from the body extremity where the bite occurred (pant legs, shirt sleeves, rings, etc.)

C. If bite is on the hand, finger, foot, or toe - wrap the leg/arm rapidly with 3" to 6" of ACE or crepe bandage past the knee or elbow joint immobilizing it. Over-wrap bite marks. If possible, apply hard and direct pressure over bite using a 4" x 4" gauze pad folded in half twice to 1" x 1". Tape in place with adhesive tape. Soak gauze pad in Betadine™ solution if available and victim is not allergic to iodine, fish or shellfish.

D. Strap gauze pad tightly in place with adhesive tape.

E. Over-wrap dressing above, over, and below bite area with ACE or crepe bandage, but not too tight. Wrap ACE bandage as tight as one would for a sprain. Not too tight. Check for pulse above and below elastic wrap; if absent, the wrap is too tight. Unpin and loosen. If pulses are strong (normal), it may be too loose.

F. Immobilize bitten extremity use splinting if available.

G. If possible, try and keep bitten extremity at heart level or in a gravity-neutral position. Raising it above heart level can cause venom to travel into the body; below heart level can increase swelling.

H. Evacuate to nearest hospital or medical facility as soon as possible.

I. Try to identify the snake (ONLY if safe to do so). This is the least important thing you should do. Visual identification/description usually suffices, especially in the U.S. and in regions where the local fauna is known. Symptoms will alert doctors to whether the bite is venomous.

J. Bites to face, torso, or buttocks are more of a problem. ACE or crepe bandaging cannot in these areas. A pressure dressing made of a gauze pad may help to contain venom.

3.2.3 What to Communicate at the Hospital.

A. Ask the staff to immediately contact their designated Poison Control Center.

B. Ask the hospital staff to use physician consultants available through the nationwide Poison Control Network if necessary.

3.2.4 What **NOT** to do if bitten by a venomous snake.

A. Contrary to advice given elsewhere, do not permit removal of pressure dressings or ACE bandages until you are at the treatment facility and the physician is ready and able to administer anti-venom. When the dressings are released, the venom will spread causing the usual expected problems associated with a venomous snakebite.

B. Do **not** eat or drink anything.

C. Do **not** engage in strenuous physical activity.

D. Do **not** apply oral/mouth suction to the bite.

E. Do **not** cut into or incise bite marks with a blade.

F. Do **not** drink any alcohol or use any medication.

G. Do **not** apply hot or cold packs.

H. Do **not** apply a narrow, constrictive tourniquet such as a belt, necktie, or cord.

I. Do **not** use a stun gun or electric shock of any kind.

J. Do **not** remove dressings/wraps until arrival at hospital and anti-venom is readily available.

3.3 Bear Encounters

3.3.1 Counter Assault Bear Deterrent Spray.

A. Bear spray shall be kept with every work crew if working in known bear areas.

3.3.2 What to Do If You Encounter a Bear.

A. Scenario #1 - Bear has not detected your presence and is more than 100 m (350 ft.) away:

1. Do not announce your presence if the bear has not seen you. If possible, retreat slowly and give the bear plenty of space. If you have the opportunity, you should retreat and leave the trail to the bear. If you must continue, back off a short distance, and give the bear time to leave the area. You should also do a wide detour quietly and quickly downwind to avoid problems.

B. Scenario #2 - Bear has detected your presence, but is more than 100 m (350 ft.) away:

1. Your goal here is to act in a way that will allow the bear to identify you, but also to let the bear know that you are not a threat. Speak calmly so that it knows you are a human - their eyesight is quite poor. They will often quickly give ground to you once they identify you as human. If the situation permits, back away slowly, keeping a close eye on the bear. Otherwise, you may wish to detour around the bear, but in this case, detour upwind so that the bear can get your scent. Keep talking calmly. Waving your arms may help it identify you as a human.

C. Scenario #3 - Bear has detected you and shows signs of aggression:

1. If you have followed the advice listed above, hopefully you have a bit of distance between the bear and yourself. You'll need to assess the situation. Are you dealing with a black bear or a grizzly? Are there cubs involved? Are there climbable trees nearby - and do you have sufficient time to climb them?

2. Do Not Run. You can't outrun a bear so don't even try. Black and grizzly bears can outrun a human on ANY terrain, uphill or down. People will tell you that you should run downhill when chased by a grizzly. This is simply a myth - don't try it!

3. Try to retreat slowly. Back up slowly and try to put more space between you and the bear. Talk calmly so that it can identify you as human, and slowly back up. Keep your backpack on as it can provide protection if necessary. Don't make direct eye contact, but keep a close look at the bear as you back away.

4. Climb a tree if available. If you have enough time, and the bear continues to move closer, take advantage of a tall tree to climb. Remember, black bears are strong climbers as well. Grizzlies have also climbed short distances up trees after people. You want to get at least 10 m (33 feet) high to reduce the chance of being pulled out of the tree. Even though some bears can come up the tree after you, the hope is that they will feel less threatened, and thus less likely to chase you up the tree.
5. Bears will often bluff charge before attacking. This is designed to allow enemies to back down before the bear needs to make contact. It evolved to prevent encounters with enemies, and it may provide you with an opportunity to back away.
6. Use your pepper spray. Pepper spray is only good at very close range (5 m or 15 ft.). Wind will reduce this effective range even farther - and may blow the spray back into your face. If the bear approaches within this range, point the spray at its eyes and discharge the contents. Hopefully, this will either disorient the bear to allow you to escape, or at the very least deter it from attacking. Once you have partially discharged a canister of bear spray it should be discarded. While the spray may deter attacks, the smell of pepper can act as an attractor.
7. If the attack escalates and a black bear or any bear that appears to have been stalking you physically contacts you, fight back with anything that is available to you. Black bears tend to be more timid than grizzlies and fighting back may scare the bear off. In addition, if a bear is stalking you than you are in a predatory situation and fighting back is your only option. This also applies to any attack at night as these may also be considered predatory in nature.
8. If a grizzly makes contact - as above, if you believe the bear to be stalking you, fight back with everything you have. In general though, playing dead in a daytime grizzly encounter tends to reduce the level of injury sustained by most attack victims. Many grizzly attacks are defensive in nature and playing dead may show the bear that you are not a threat. Keep your backpack on as it will provide added protection. The best position is to lie on your side in a fetal position. Bring your legs up to your chest and bury your head into your legs. Wrap your arms around your legs and hold on tight. You may also lie on your stomach, backpack on, and place your hands behind your neck to protect that vulnerable area. Do not play dead until the last moment. Staying on your feet may allow you to dodge or divert an attack.
9. Once the attack has ended, remain patient. After a few minutes, try to determine if the bear is still in the area. If the bear has moved on, you should make your way towards assistance as quickly as possible.

3.4 Tornadoes

3.4.1 Tornado Categories

A. (F0) Gale Tornado (40-75 mph) - Light damage: Some damage to chimneys, breaks branches off trees, pushes over shallow-rooted trees, and damages signboards.

B. (F1) Moderate Tornado (73-112 mph) - Moderate damage: The lower limit (73 mph) is the beginning of hurricane wind speed, peels surfaces of roofs, mobile homes pushed off foundations or overturned, and moving autos pushed off roads.

C. (F2) Significant Tornado (112-157) - Considerable Damage: Roofs torn off the frames of houses, mobile homes demolished, boxcars pushed over, large trees snapped, and heavy cars lifted off ground and thrown.

D. (F3) Severe Tornado (158-206 mph) - Severe Damage: Roofs and some walls torn off well-constructed houses, trains overturned, most trees in forest uprooted, and heavy cars lifted off ground and thrown.

E. (F4) Devastating Tornado (207-260) mph - Incredible damage: Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown, and large missiles generated.

F. (F5) Incredible Tornado (261-318) mph - Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile-sized missiles fly through the air in excess of 100 meters; trees debarked; steel reinforced concrete structures badly damaged.

G. (F6+) Inconceivable Tornado (319-379 mph) - These winds are very unlikely. The small area of damage they might produce would probably not be recognizable along with the mess produced by F4 and F5 wind that would surround the F6 winds. Missiles, such as cars and refrigerators would do serious secondary damage that could not be directly identified as F6 damage. If this level is ever achieved, evidence for it might only be found in some manner of ground swirl pattern, for it may never be identifiable through engineering studies.

3.4.2 Phase 1 - Preparation

A. When the National Weather Service issues a Tornado Watch, RES and subcontractors shall begin preparations for a shut-down of operations.

B. The SRP and Safety Supervisor will notify RES and subcontractor personnel and actively monitor storm progress.

C. Upon notification by the SRP, all Subcontractors will begin a general clean-up effort to eliminate, remove, or secure any loose objects around the project/site including tools, equipment, materials, trash cans, etc.

D. RES and subcontractor administrative support will prepare documents, for proper storage or removal, and secure paperwork and office equipment.

3.4.3 Phase 2 - Monitoring

A. After the National Weather Service issues Tornado Watch, SRP and Safety Supervisor will continue to monitor the storm activities and will advise site personnel of the appropriate actions to take in the event Phase 3 is implemented.

3.4.4 Phase 3 - Evacuation

A. When the National Weather Service issues a Tornado Warning, SRP and Safety Supervisor will ensure that all preparations for the storm and shutdown of operations have been completed.

B. The site will be immediately evacuated to the nearest Certified Tornado Shelter.

3.4.5 Phase 4 - Returning to Work

A. The SRP will begin the implementation of Phase 4 within 12 hours after the Tornado has passed and/or upon confirmed safe conditions of the project/site.

B. The SRP will notify each designated company contact.

C. Each subcontractor's designated company contact will alert their company's personnel that they shall return to work.

D. Damage reports and priority repairs will begin immediately and crews will be assigned accordingly.

3.5 Hurricanes

3.5.1 Hurricane Warning Categories

A. Category 1: Winds 74-95 mph, Storm surge 4-5 feet above normal

B. Category 2: Winds 96-110 mph, Storm surge 6-8 feet above normal

C. Category 3: Wind 111-130 mph, Storm surge 9-12 feet above normal

D. Category 4: Winds 131-155 mph, Storm surge 13-18 feet above normal

E. Category 5: Winds 156 mph and above, Storm surge greater than 18 feet above normal

3.5.2 Phase 1 - Preparation

A. When the National Weather Service issues a tropical storm watch or hurricane watch (48 hours prior to forecasted landfall), RES and subcontractors shall begin preparations for a shut-down of operations.

B. The SRP and Safety Supervisor will notify RES and subcontractor personnel and actively monitor storm progress.

C. Upon notification by RES PM, all Subcontractors will begin a general clean-up effort to eliminate, remove, or secure any loose objects around the project/site including tools, equipment, materials, trash cans, etc.

D. RES and subcontractor administrative support will prepare documents, for proper storage or removal, and secure paperwork, and office equipment.

3.5.3 Phase 2 - Monitoring

A. When the National Weather Service issues a tropical storm watch or hurricane watch (48 hours prior to forecasted landfall), SRP and Safety Supervisor will continue to monitor the storm activities and will advise site personnel of the appropriate actions to take in the event Phase 3 is implemented.

3.5.4 Phase 3 - Evacuation

A. When the National Weather Service issues a hurricane warning (24-36 hours prior to the forecasted landfall), SRP and Safety Supervisor will ensure that all preparations for the storm and shutdown of operations have been completed.

B. If that the National Weather Service issues a mandatory evacuation (typically due to a Category III Hurricane or greater), the RES SRP will comply with the mandatory evacuation for all site personnel.

C. The RES SRP and Safety Supervisor will require all site personnel to leave the impacted area.

D. Within 8 hours of the evacuation, each subcontractor shall ensure that their site personnel have evacuated safely, and the Designated Company Contacts shall inform the Safety Supervisor that they can account for and communicate with each employee.

3.5.5 Phase 4 - Returning to Work

A. The SRP will begin the implementation of Phase 4 within 12 hours after the National Weather Service issue an "all clear" and allow re-entry to the impacted area.

B. The SRP will notify each Designated Company Contact.

C. Each subcontractor's Designated Company Contact will alert their company's personnel that they shall return to work.

D. Damage reports and priority repairs will begin immediately, and crews will be assigned accordingly.

4. Appendices

4.1 Appendix 1 - Site Contact Information

4.2 Appendix 2 - FA/CPR/AED Trained Employees

4.3 Appendix 3 - Drilled Excavation Rescue Trained Employees

4.4 Appendix 4 - Site Map/Muster Points/Landing Zones

4.5 Appendix 5 - Hospital Map and Directions

4.6 Appendix 6 - Primary Occupational Health Clinic Map and Directions

4.7 Appendix 7 - Alternate Occupational Health Clinic Map and Directions

4.8 Appendix 8 - Utility Strike Emergency Response

4.9 Appendix 9 - Active Shooter Response

4.10 Appendix 10 - Lighting Communication Flyer

4.11 Appendix 11 - Excavation Emergency Response and Rescue

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Appendix 1 - Site Contact Information

COMPANY	TITLE	NAME	PHONE NUMBER
RES	Project Manager	Tim Finn	(916) 246-1463
RES	Asst. Project Manager	Pasquale Piccininni	(585) 953-8473
RES	Operations Manager - Substation	Ronny Beaver	(661) 406-9992
RES	General Superintendent - Substation	Matt McClean	(352) 251-8661
RES	Contractor Safety Representative	Steve Finkey	(816) 825-0879
RES	Safety Manager	Jonathan Cadd	(432) 258-1772
RES	Site Safety Supervisor	Prudencio Arriaga	(979) 282-1391
RES	Project Director	Mike Repholz	(518) 332-8379

[Site Contact Information is to be updated, distributed, displayed, and communicated ~every thirty (30) days if there are changes.]

Appendix 2 -

FA/CPR/AED Trained Employees / After Hours Contacts in Case of Emergency*

COMPANY	NAME	PHONE NUMBER
RES Sr. Safety Manager - T&D*	Steve Finkey	(816) 825-0879
RES Safety Manager - T&D*	Jonathan Cadd	(432) 258-1772
RES Safety Supervisor - T&D - Site Supervisor*	TBD	(000) 000-0000
RES Safety Supervisor - T&D - Traveler	Prudencio Arriaga	(979) 282-1391
RES Safety Supervisor - T&D - Traveler	Shane Summers	(918) 914-2717
RES Risk - Asst. Risk & Insurance Manager	Jonathan Hoffman	(720) 341-6885
RES Fleet & Equipment - Operations Manager	Jason Bolton	(916) 919-5705
Res Fleet & Equipment - DOT Manager	Bennett Evans	(603) 937-4224

- [Site Contact Information is to be updated, distributed, displayed, and communicated ~every thirty (30) days if there are changes.]

See Appendix 1 of this Emergency Response Plan for Site/Project Contact information and contact as needed.

Vehicle Accidents

In the case of an auto/vehicle accident find the QR Code Sticker on the Drivers Side Window and access the instructions/information on what to do and who to contact in the instructions using your cell phone.

AED Requirements

Minimum required AED requirement at RES projects/sites shall consist of: One (1) AED.

When staffing reaches 50 employees, there shall be a minimum of two (2) AED's.

One (1) AED shall be kept and maintained in the RES Site office, and one shall be kept and maintained in the Safety Supervisor's or SRP's Company Vehicle.

For Distribution projects/sites, one (1) AED shall be kept and maintained in all Supervisor's Company Vehicles, and one (1) shall be kept and maintained in all Bucket Trucks.

If the project footprint is large, the site may require more than two (2) AED's when there are less than 50 employees on site.

A First Aid Kit for each trailer/office and in every vehicle in use at the project/site. Each Subcontractor shall meet this requirement individually.

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Appendix 3 - Drilled Foundation Rescue Trained Employees

COMPANY	NAME	PHONE NUMBER
RES	Jonathan Cadd	(432) 258-1772
RES	Prudencio Arriaga	(979) 282-1391
RES	Shane Summers	(918) 914-2717
RES	Steve Finkey	(816) 825-0879

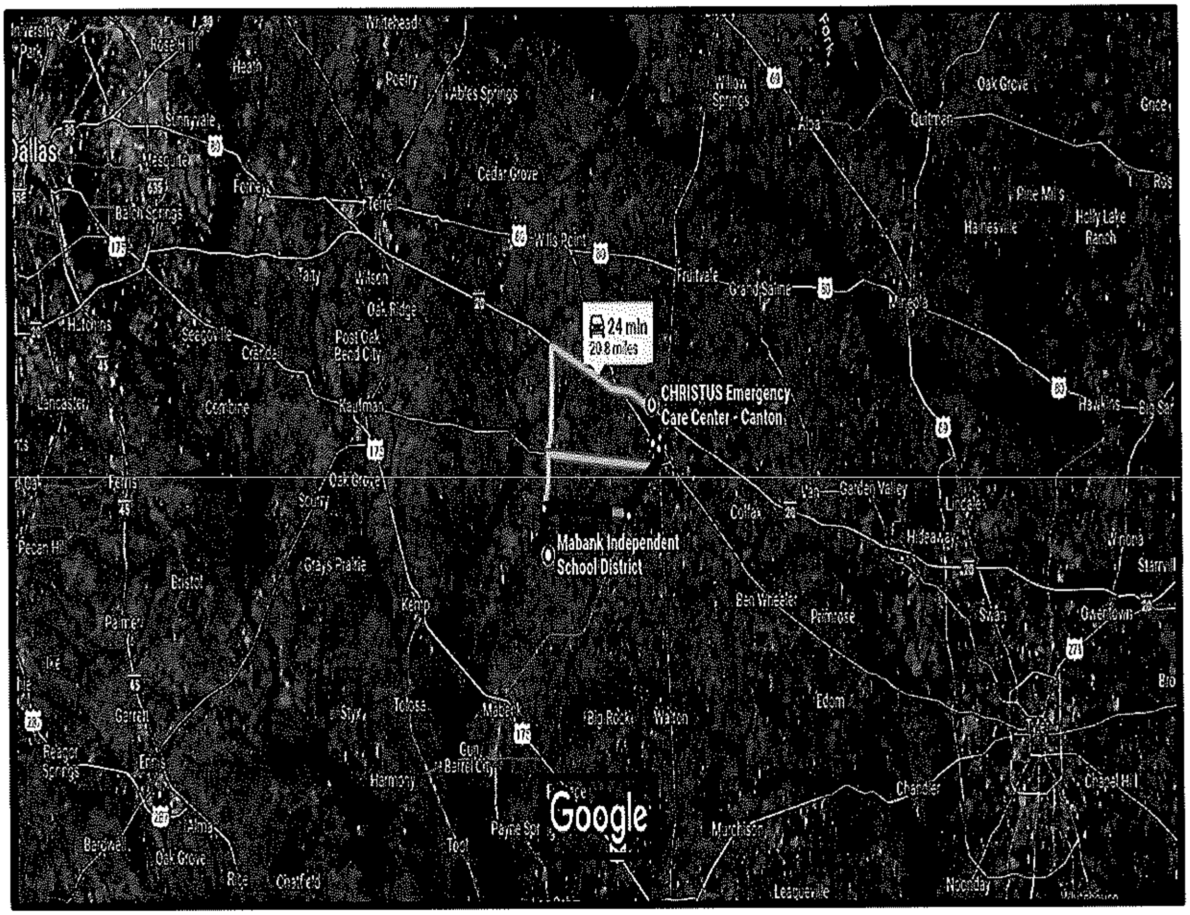
Appendix 4 - Site Map/Muster Points/Landing Zones

RES – Amador BESS & Substation Laydown Yard Site – Canton Texas, 75103

Latitude: 32°28'34.67"N Longitude: 96° 1'49.27"W

Appendix 5 - Hospital Map and Directions

CHRISTUS Emergency Care Center - Canton - 18780 I-20, Canton, TX 75103



Directions:

RES Laydown Yard - 32021 FM 47, Canton, TX 75103 Head

west toward FM 47 N - 1 min (0.4 mi)

Drive from FM3227 E and TX-198 N to Canton - 22 min (16.8 mi)

Drive to your destination - 1 min (0.1 mi)

CHRISTUS Emergency Care Center - Canton - 18780 I-20, Canton, TX 75103

Appendix 6 - Primary Occupational Health Clinic Map and Directions

UT Health East Texas Urgent Care - Canton, TX

301 TX-243 #121, Canton, TX 75103 - (903) 567-4692

Directions:

RES Laydown Yard - 32021 FM 47 - Canton, TX 75103

Head west toward FM 47 N - 0.4 mi - Turn right onto FM 47 N - 2.4 mi

Turn right onto FM3227 E - 7.4 mi - Turn left onto TX-198 N - 3.5 mi

Slight right onto W State Hwy 243/Veterans Memorial Pkwy - 0.3 mi

Turn right onto S Trade Days Blvd - 417 ft - Turn left - Destination will be on the right - 0.1 mi

UT Health East Texas Urgent Care - 301 TX-243 #121, Canton, TX 75103

Appendix 7 - Alternate Occupational Health Clinic

Map and Directions - See Primary Occupational Health Clinic Info.

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Appendix 8 - Utility Strike Emergency Response

General Requirements

1. If any services are damaged, the work shall immediately stop and inform RES, who shall contact the utility owner to advise them of the situation.

2. If there is a spill associated with the strike, follow Spill Response procedures outlined in the Spill Prevention, Control, and Countermeasure (SPCC) Plan.

3. In the event of a potential gas, natural gas, petroleum or propane utility strike:

   a) Check for the following signs of a leak:
      - Hissing, roaring, or explosive sound
      - Flames appearing from the ground or water.
      - Vapor cloud/fog/mist.
      - Dirt/debris/water blowing out of the ground.
      - Liquids bubbling up from the ground or bubbling in water.
      - Distinctive, unusually strong odor of rotten eggs, skunk, or Petroleum.
      - Discolored/dead vegetation or snow above a pipeline right-of way.
      - Oil slick or sheen on flowing/standing water.

   b) If there is a leak, stop work and evacuate the area to an upwind location and away from vapor clouds and flames.

   c) Abandon equipment used in/near area.

   d) Call RES Safety/Management on RES channel 1.

   e) RES office to notify 911 if applicable.

   f) Don't do anything that could create a spark.

   g) Keep employees, vehicles, and members of the public 1000' away from the area.

   Note: RES Safety, EMS, Security and Supervision to perform this function.

   h) Barricade the area if necessary.

   i) Stay upwind of blowing gas.

   j) Do not try to extinguisher a gas burning fire prior to shutting off supply unless there is a threat to life.

   k) Never attempt to operate pipeline valves, as this could prolong/worsen incident or cause another pipeline leak.

   l) Start 1000' out from the strike location, and while walking towards the strike, assess the air quality using a 4-gas meter.

   m) While walking towards the strike location, if the 4-gas meter alarms, evacuate the area. Do not return to the strike location or authorize employees to access the strike location until the utility owner verifies that it is safe to enter the area.

   n) If the 4-gas meter does not alarm, continue to walk towards the strike location assessing the air quality and document equipment readings on the JHA (Job Hazard Analysis).

4. In the event of an electrical utility strike:

    a) Stop work immediately and warn all persons in the vicinity, including emergency and rescue personnel, that the ground and objects near the excavator, and equipment around the point of contact, may be energized.
    b) Contact the electrical utility operator and fire department immediately if a radio or phone is at hand. Otherwise, the operator must remain still and signal for help to relay a call for utility and emergency assistance.
    c) The operator must remain on the excavator or equipment.
    d) Personnel on the ground near the equipment involved or point of contact should remain still with both feet together. Don't touch the excavator, nearby equipment, structures or material.
    e) Evacuate the excavator and the area near the point of contact only after an official of the electric utility deems it is safe to do.
    f) If immediate evacuation is required due to threat of serious injury from fire, explosion or other hazard, jump clear of the equipment and land with both feet together. Move a safe distance away (at least 25 to 30 feet) using short hops or shuffling steps to keep both feet together.
    g) Do not try to disentangle cables from excavator buckets.
    h) Do not resume work until an electric utility official confirms the site is safe.

5. In the event of a telecommunications strike:

    a) Stop excavation and secure the area.
    b) Notify facility owner of the potential damage to copper/fiber cable.
    c) Do not examine or stare into broken/severed/ disconnected fibers/fiber cable.
    d) Move a safe distance away from a damaged fiber system (always assume that a laser signal is present).
    e) Place barricades around the fiber damage location to protect others from exposure.
    f) Do not view broken fiber cables with any optical instruments.

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Appendix 9 - Active Shooter Response

General Requirements

1. In the event of an active shooter, affected employees shall immediately stop working.

2. Call 911 - (from an area of safety or concealment) and provide as much of the following information as possible:
   - Description of suspect(s) and possible location.
   - Number and the types of weapons.
   - Suspect's direction of travel.
   - Location and condition of any victims.

3. Evacuate - If there is an accessible escape path, attempt to evacuate the premises. Be sure to:
   - Have an escape route and plan in mind.
   - Evacuate regardless of whether others agree to follow.
   - Leave your belongings behind.
   - Help others escape, if possible;
   - Prevent individuals from entering the active shooter area;
   - Keep your hands visible;
   - Follow the instructions of any police officers;
   - DO NOT attempt to move wounded people;
   - Call 911 when you are safe.

4. Hide - If evacuation is not possible. Your hiding place should:
   - Be out of the shooter's view.
   - Provide protection from gunshots, such as behind a heavy desk.
   - If you trap you or restrict your options for movement (broom closet).
   - Lock the door.
   - Block the door.
   - Silence cell phones.
   - Remain Quiet.

5. Fight - If no other options exist, and there is imminent/immediate danger to yourself, take direct action against the shooter:
   - Remain calm.
   - If you have not already done so, call 911 and leave the line open.
   - Commit to your actions.
   - Act as aggressively as possible against the shooter.
   - Move with speed and force. Improvise weapons if time permits.
   - Continue to fight until the shooter is physically incapacitated.

6. Evacuate - Priority is always to evacuate. Once shooter is incapacitated leave the area immediately, taking as many people as possible with you.
   - Keep hands visible.
   - Do not group together once outside the building, in the event of a second shooter.
   - Follow all commands of law enforcement officials.

7. Regroup - When possible and safe to do so, account for all personnel and report this information through one person to law enforcement.

8. Report - As soon as possible and practical, report the incident.

Appendix 10 - Lightening Communications Flyer

Document No: IMS-2706562

Radio Communications for Severe Weather - Lightning

Items in red are information only and not to be read over radio. Update for miles vs km, site shutdown distance.

****50 Mile Weather Advisory****

Attention. We are currently under a condition YELLOW. Now preparations should be made to allow an immediate shut down of main crane and up tower operations should the lightning get within our 30-mile radius. Again, we are currently under a condition YELLOW for lightning within 50 miles. Repeat 3 times over a 2 or 3-minute period when lightening is within 50 miles of site. Work will continue during an advisory. Preparations should be made to stop work if storm continues towards site.

****30 Mile Weather Caution****

Attention. We are currently under a condition ORANGE for lightning within 30 miles of the site. Due to time constrains, all <u>main crane</u> lifting and tower climbing activities must cease and personnel should immediately evacuate the towers and main crane and shall maintain a 100' clearance from the towers. Repeat 3 times over a 2 or 3-minute period when lightning is within 30 miles of site. All Main Crane and Tower work is to cease immediately.

[redacted]

Attention. We are currently under a condition [redacted] for lightning within 10 miles of the site. All site personnel must IMMEDIATELY cease their operations and seek shelter in any vehicle, mobile equipment, or the nearest structure (e.g., O&M building, Substation Control Building, site office trailers). Again, we are under a condition [redacted] for lightning within 10 miles. Repeat 3 times over a 2 or 3-minute period when lightning is within 10 miles of site or if Thunder is heard. ALL site operations are to cease immediately, and personnel should seek shelter.

****Lightning All Clear****

Attention. We are currently under a condition (ORANGE or YELLOW or GREEN). No lightning has been observed within (10 or 30 or 50) miles of the site in the last 30 minutes.

<u>10 Mile All Clear</u>, but lightning still within 30 Miles. We are currently under a Condition ORANGE. Ground operation crews may return to work but must observe 100' clearance from the towers. Again, we are currently under condition ORANGE.

<u>30 Mile All Clear</u>, but lightning still within 50 Miles. We are currently under a condition YELLOW. All site crews may return to work but maintain awareness because lightning is still within 50 Miles of the site.

<u>50 Mile All Clear</u>, - We are currently under a condition GREEN. There has been no lightning within 50 miles in the last 30 minutes. All crews may return to their normal work duties.

Repeat the specific all clear announcement (10, 30, 50 mile) 3 times over a 2 or 3-minute period once the RES Project Office gets confirmation of all clear. An all clear will be announced once no strikes have been reported in the 10, 30, and 50-mile radius for 30 minutes.

Appendix 11 - Excavation Emergency Response and Rescue

RASWP 018 - Excavation Emergency Response and Rescue

Date	21 September 2022
Ref	IMS01-3105752
Department	HSQE

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Table of Contents

1. Purpose

This procedure provides guidance to RES staff and Contractors for Excavation Emergency Response and Rescue.

2. Scope

Unless specifically noted herein, this procedure shall apply to all Work conducted by/for Renewable Energy Systems Americas Inc. and/or Renewable Energy Systems Canada Inc. and any of their affiliates or subsidiary companies hereafter referred to in this procedure as "RES".

3. References

3.1 RASOP 006 - Emergency Response

3.2 RASWP 005 - Confined Space Entry

3.3 OSHA Standards for General Industry 29 CFR 1910

3.4 OSHA Standards for the Construction Industry 29 CFR 1926

4. Definitions

4.1 Refer to Glossary of Health and Safety Terms

5. Responsibilities

5.1 Authorized Attendant

5.1.1 Able to identify and assess the hazards that may be present during the entry of a confined space.

5.1.2 Maintain an accurate count of the number of authorized entrants in the confined space

5.1.3 Keep unauthorized employees from entering the confined space or interfering with the scope of work.

5.1.4 Monitor activities inside and outside the confined space, while an entry is occurring.

5.1.5 Perform no other activities which could interfere with monitoring the health and safety of Authorized Entrants inside the confined space.

5.1.6 Remains outside the space during entry operations until the scope is complete, or relieved by another authorized attendant.

5.1.7 Maintain communication with Authorized Entrants to monitor their work activities and to activate an evacuation.

A. Methods of communication include radios, hand or line signals; or verbal means if conditions allow.

5.1.8 The setup and operation of the rescue system.

5.1.9 The setup and operation of the hitch-mounted ascent/decent device used for access into a confined space.

5.1.10 Assessment of air quality for hazardous atmospheres.

5.1.11 Activate Emergency Response.

5.1.12 Initiate and perform rescue activities.

5.1.13 Authorized Attendants are prohibited from monitoring more than one confined space at the same time.

5.2 Authorized Entrant

5.2.1 Able to identify and assess the hazards that may be present during the entry of a confined space.

5.2.2 Maintain communication with Authorized Attendants to activate an evacuation.

A. Methods of communication include radios, hand or line signals; or verbal means if conditions allow.

5.2.3 The setup and operation of the rescue system.

5.2.4 The setup and operation of the hitch-mounted ascent/decent device used for access into a confined space.

5.2.5 Assessment of air quality for hazardous atmospheres.

5.2.6 Activate Emergency Response.

5.2.7 Initiate and perform rescue activities.

5.3 SRP

5.3.1 Provide the necessary means, materials, and methods to ensure compliance with this procedure during project activities.

5.4 PIC

5.4.1 Remains onsite until a rescue is complete, or duties are transferred to another PIC.

5.4.2 For Confined Space Entry:

A. Ensure all Authorized Attendants and Authorized Entrants have current training in the procedures and precautions for work to be performed.

B. Inform contractors of the RES Confined Space Entry Program requirements and of the potential hazards of each space to be entered.

C. Verify all entry equipment is maintained and/or calibrated according to the manufacturer's specifications and the company's preventive maintenance procedures; and knowing the hazards that may be faced during entry, including information in the mode, signs or symptoms, and consequences of the exposure.

D. Check the appropriate information is on the permit, that all tests specified by the permit have been conducted and that all procedures and equipment specified by the permit are in place before endorsing the permit and allowing entry to begin.

E. Terminate the entry and cancel the permit at the end of work or specified expiration time.

F. Verify rescue services are available and that communication devices are operable.

G. Remove unauthorized individuals who enter or who attempt to enter the permit space.

H. Determine that entry operations remain consistent with terms of the entry permit and that acceptable entry conditions are maintained.

5.5 Safety Supervisors

5.5.1 Assist SRP by providing appropriate training, technical assistance, and other applicable resource materials.

5.5.2 Periodically review this procedure to ensure that it complies with current legislation and is fulfilling Company requirements.

6. Procedure

6.1 General Requirements

6.1.1 When an emergency involving a drilled hole/excavation occurs, the PIC or their designee will be engaged to support a rescue, if needed.

6.1.2 The PIC will determine next steps regarding emergency response and make the request for emergency assistance.

6.1.3 Call EMS/911 if required.

A. Rendezvous and guide EMS to the incident location.

B. If EMS can perform a rescue, then the PIC will be the interface.

C. All other persons not involved in the rescue will be kept a minimum of 50 feet back from drilled hole/excavation.

D. If EMS is unable to perform the rescue, a rescue attempt from outside a drilled hole/excavation will occur.

6.2 Rescue from Outside a Drilled Hole/Excavation

6.2.1 The PIC will determine the most appropriate and lowest risk location for viewing into the drilled hole/excavation.

A. When necessary, plywood or similar material will be used to distribute any/all loads to minimize loose debris from falling into drilled hole/excavation.

B. A designated person will approach the drilled hole/excavation (personal fall arrest or fall limiting systems will be utilized by the designated person) to determine the current condition of the employee and any other hazards present.

C. Depending on the depth of the drilled hole/excavation, additional illumination may be required.

D. After reviewing the findings with the PIC and if deemed safe to proceed, and the employee in the drilled hole/excavation can assist in the rescue, then proceed as follows:

1. The appropriate anchor point for the rescue system will be selected by the PIC.
2. Appropriate anchor points may include augers on drill rigs and the boom or bucket of an excavator.
3. The rope/carabiner will be setup with the rescue system on the anchor point and above the braking system.
4. The Rescue Kit/System contents include:

a. LED headlamp.

b. LED flashlight.

c. Personal fall arrest harness and connecting device.
d. First aid kit.
e. LOTO kit with steering wheel cover.
f. Hoist/rope apparatus.
g. Rescue pole with carabiner clip.
h. Forced air system/blower w/50' flexible ductwork.
i. 4-gas monitor w/50 feet of hose.

5. When mobile equipment is used as the anchor point, the equipment must be locked out prior to use (keys to equipment will be given to PIC).
6. All debris that could affect the rescue attempt in the hole/excavation must be removed prior to the rescue attempt.
7. The rescue system will then be positioned to hoist the employee (centered and directly above is preferred).
8. The rope/carabiner will be lowered to the employee utilizing the rescue remote connection pole.
9. If possible, the employee operating the rescue remote connection pole, will attach the carabiner to one of the D-rings on the employee's harness (preferably the dorsal D-ring).
10. Or, the employee in the drilled hole/excavation will attach the carabiner to one of the D-rings on their harness (preferably the dorsal D-ring).
11. If the employee is not wearing a harness, the employee will secure a connecting device around their chest twice for attaching the carabiner.
12. The employee will then be extracted/hoisted from the drilled hole/excavation.

E. If the employee in a drilled hole is not responsive or unable to assist in the rescue, proceed as follows:

1. The appropriate anchor point for the rescue system will be selected by the PIC.
2. A designated person will approach the drilled hole/excavation with a rescue pole and rope/carabiner (personal fall arrest or fall limiting systems will be utilized by the designated person).
3. If the depth of a drilled hole is greater than 25 feet, proceed to Section 6.3.
4. The rescue system will then be positioned to hoist the employee (centered and directly above is preferred).
5. The rope/carabiner will be lowered to the employee utilizing the rescue remote connection pole.
6. If possible, the employee operating the rescue remote connection pole, will attach the carabiner to one of the D-rings on the employee's harness (preferably the dorsal D-ring).

7. If the employee is not wearing a harness, proceed to Section 6.3.
8. When determined safe to proceed, the employee will be hoisted to the surface using the rescue system.
9. If FA/CPR/AED is needed, it should be provided immediately and until EMS is available.

6.3 Rescue from Within a Drilled Hole/Excavation or Confined Space

6.3.1 Implement when the employee is not wearing a harness, >25' below grade, and/or entry is required.

6.3.2 Confined Space Entry

A. The PIC shall evaluate the condition of the drilled hole/excavation to determine if it is safe for entry.

B. RASWP 005 - Confined Space Entry Program will be implemented when entry is required.

1. Forced air may be used to remove atmospheric hazards.
2. The intake for forced air shall not be placed near operating machinery.
3. Conditions inside the drilled hole/excavation shall be observed.
4. If conditions deteriorate, the rescue attempt will be stopped.

C. Additional PPE and equipment needed for Authorized Entrants of a confined space:

1. Hard hat with headlamp.
2. Harness and lanyard or connecting device.
3. Nitrile gloves under the cut resistant gloves if the injured worker is bleeding.
4. 4-gas monitor.
5. Radio.
6. First aid kit.
7. Respiratory protection if/when:
   a. There are unknown airborne contaminants in the space.
   b. The level of airborne contaminants cannot be determined.
   c. The potential for IDLH exists.
   d. The potential exists to contaminate the atmosphere while in the space.
8. BAPPS Board and/or SPEC Pack.
9. Other equipment, as required.

D. The appropriate anchor point for the rescue system will be selected by the PIC.

E. The rescue system will then be positioned to hoist the worker (centered and directly above is preferred).

F. Authorized Entrants will use an ascent/descent device for access into the drilled hole/excavation and/or Confined Space.

1. The Authorized Entrant will descend into the drilled hole/excavation and/or Confined Space using the ascent/descent device.
2. If the employee is wearing a harness, the carabiner hook will be attached to one of the D-rings on the injured person's harness (preferably the dorsal D-ring).
3. If the employee is not wearing a harness, a connecting device will be secured around the worker's chest twice and secured.
4. If the employee has injuries that are affecting his/her movement or it is determined that extraction/hoisting will exacerbate their injuries, the Authorized Entrant will attempt to secure the employee to the BAPPS Board and/or SPEC Pack.

G. The employee will then be extracted/hoisted from the drilled hole/excavation with help from the Authorized Entrant on the ascent.

H. If FA/CPR/AED is needed, it should be provided immediately and until EMS is available.

I. The Authorized Entrant will then be extracted/hoisted from the drilled hole/excavation and/or Confined Space, with the ascent/descent device (preferably the sternum D-ring), if they cannot exit on their own.

6.3.3 If injuries to the employee were fatal, the Authorized Entrant may be extracted/hoisted to the surface before the worker that was fatally injured.

6.4 Trench Rescue

6.4.1 Due to the inherent dangers associated with trench rescue, the risk to personnel, and the potential complexity of the tasks, the rescue attempt shall be continuously monitored by the PIC. A phased approach to trench rescue shall include: Arrival, Pre-entry, Entry, and Termination.

6.4.2 Arrival

A. Upon arrival to a trench collapse where a worker is engulfed or trapped, employees responding should begin by identifying hazards and critical factors associated with the incident and begin planning the rescue attempt. Information to obtain and document includes:

1. Exact time of event.
2. Number and location of workers.
3. Location of tools and equipment (leave in place).
4. Removal of employees (not engulfed or trapped) from trench.
5. Assess the immediate and potential hazards to the rescuers.
6. Isolate the immediate hazard area, secure the scene, and deny entry for all non-rescue personnel.
7. Assess current capabilities and determine the need for additional resources.
8. Secure a witness or responsible party to assist in gathering information to determine what happened and why.

6.4.3 Pre-Entry

A. Determine if a Trench Rescue is feasible, or if Recovery is more appropriate. This will be based on the potential survivability of the affected employee(s) and includes:

1. Location and condition of the affected employee(s).
2. Elapsed time since the incident occurred.

B. Make the General Area Safe.

1. Establish a hazard zone perimeter 50 feet from the collapsed area.
2. Keep all non-essential rescue employees out of the hazard zone.
3. Establish a staging area to control rescue employees while entering/exiting the hazard zone.
4. Monitor the time of day and ensure sufficient lighting is available if the rescue or recovery extends into the night.

C. Traffic Control Movement.

1. If collapse area is near roadway, shut down roadway traffic.
2. Re-route all non-essential traffic at least 300 feet from the collapse area.
3. Shut down all heavy equipment operating within 300 feet of the collapse area.

D. Make the Rescue Area Safe.

1. Approach the trench from the ends where possible.
2. Look for unidentified hazards such as fissures or an unstable spoil pile.
3. Assess the spoil pile for improper angle of response and general raveling.
4. Remove any tripping hazards from around the trench.
5. Place ground pads around the lip of the trench.
6. If feasible, secure all utilities in the area: electric, gas, water, etc.
7. De-water the trench where necessary.
8. Monitor the atmosphere in the trench when needed.
9. Ventilate the trench when needed.

6.4.4 Entry

A. Make the Trench Safe.

1. Place ingress and egress ladders into the trench. There should be at least two (2) ladders placed into the trench no more than 50 feet apart.
2. Determine the shoring system to be used (hydraulic, pneumatic, or timber). Timber shoring should consist of several sheets of ¾" plywood, 4" x 2", and 4" x 4" lumber cut to various lengths to accommodate differences in the width of the trench.
3. Create a safe zone in the non-collapsed area of the trench from both ends where possible, by installing the shoring system.
4. Secure all utilities, pipe, or other obstructions in the trench.

5. Remove dirt from the collapsed zone while remaining in the safe zone.

6. **DO NOT USE MOBILE EQUIPMENT TO REMOVE SOIL NEAR AFFECTED EMPLOYEES.**

B. Affected employee Removal/Incident **WITHOUT** Collapse.

1. Create safe zone around the affected employee.
2. Remove object trapping affected employee.
3. Assess affected employee's condition.
4. Properly package the affected employee (if needed) and remove them from the trench.

C. Affected employee Removal/Incident WITH Collapse.

1. Begin dirt removal while operating from the safe zone.
2. Continue extending safe zone into collapsed zone.
3. Create safe zone around the affected employee(s).
4. Remove dirt from around affected employee to a depth below the diaphragm (mid-section) utilizing small shovels, buckets, or by hand and assess the affected employee's condition.
5. Completely uncover the affected employee, properly package the affected employee (if needed) and remove them from the trench.

D. Treatment

1. Consider removing the affected employee from danger zone prior to assessment and treatment.
2. If FA/CPR/AED is needed, it should be provided immediately and until EMS is available.

6.4.5 Termination

A. Maintain situational awareness by identifying hazards and critical factors that could still affect the area.

B. Account for all employees involved in the rescue or recovery.

C. Remove tools, equipment, and shoring system (last-in/first-out) from the trench.

D. If an employee was fatally injured, consider leaving everything in place until the investigation has been completed.

E. A trench collapse could attract the news or media. The PIC shall be the on-site interface and requests for information shall be forwarded to the RES Crisis Management Team.

6.5 Training

6.5.1 The following training is required for employees involved in Excavation Emergency Response and Rescue:

A. Emergency Response.

B. First Aid/CPR/AED.

C. The setup and operation of the rescue system.

D. The setup and operation of the ascent/descent device used for access into a drilled hole/excavation and/or Confined Space.

E. Tools and equipment utilized for trench rescue or recovery.

F. Fall protection.

G. Confined Space Entry.

H. Assessment of air quality for hazardous atmospheres.

I. Mock drill for drilled hole/excavation rescue.

J. Mock drill for trench rescue or recovery.

7. Appendices

7.1 Confined Space Entry Hand Signals

7.2 Confined Space Entry Log and Forms

7.3 Confined Space Entry Permit Template

7.4 Visual Aids and Pictures of Rescue Scenarios

Appendix 7.4 - Visual Aids and Pictures of Rescue Scenarios

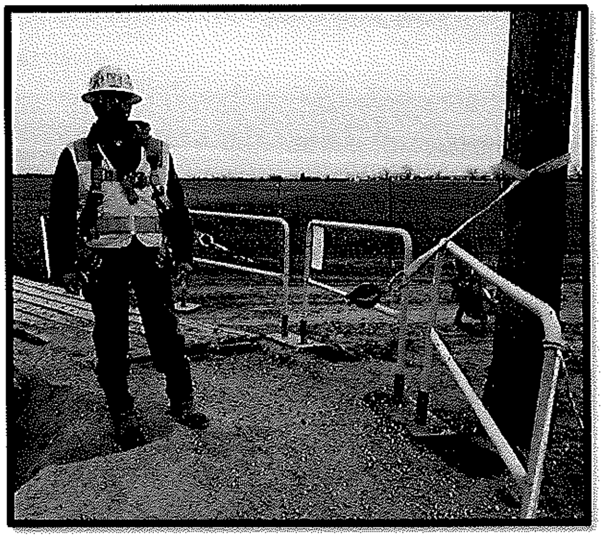


Figure 1. A designated person will approach the drilled hole/excavation while donning Personal Fall Arrest or Fall Limiting Systems to determine the current condition of the employee and any other hazards present.

Figure 2. The rope/carabiner will be setup with the rescue system on the anchor point and above the braking system. Rope is positioned above hoist.

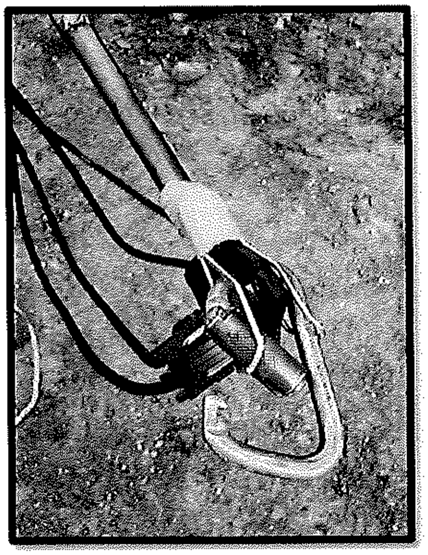
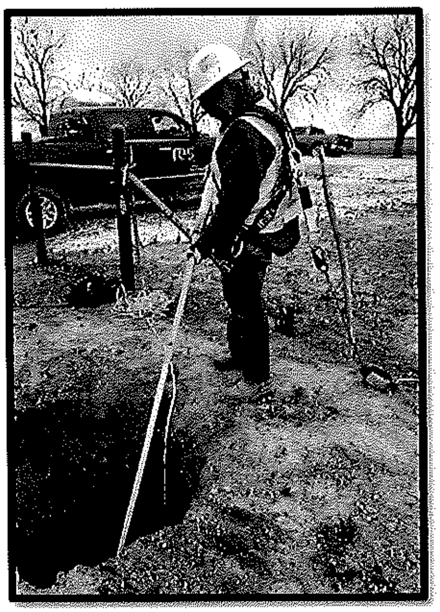


Figure 3. The rope/carabiner will be lowered to the employee utilizing the rescue remote connection pole.



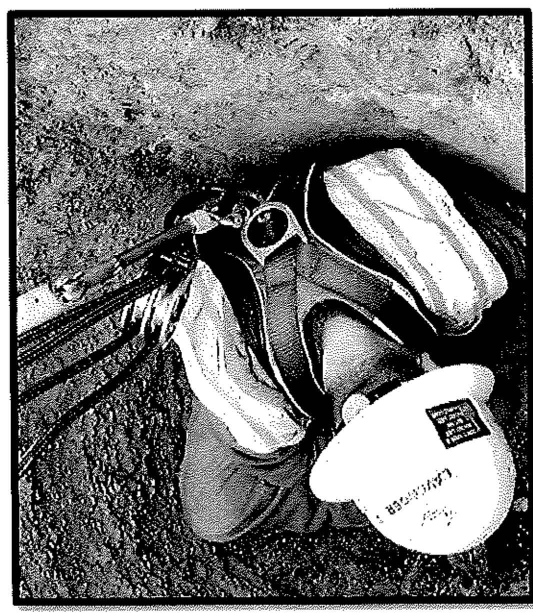


Figure 4. The employee operating the rescue remote connection pole will attach the carabiner to one of the D-rings on the employee's harness (preferably the dorsal D-ring).

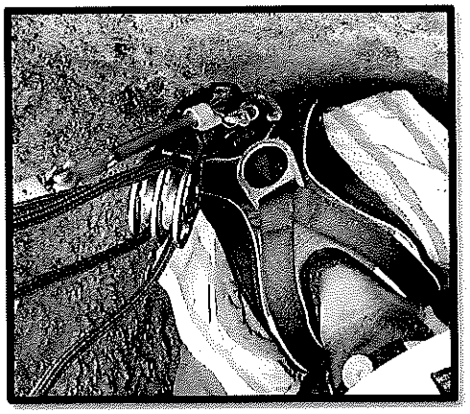


Figure 5. When the carabiner has engaged the D-ring, the pole shall be pulled away from the D-ring (quickly), and the rescue device will be secured.

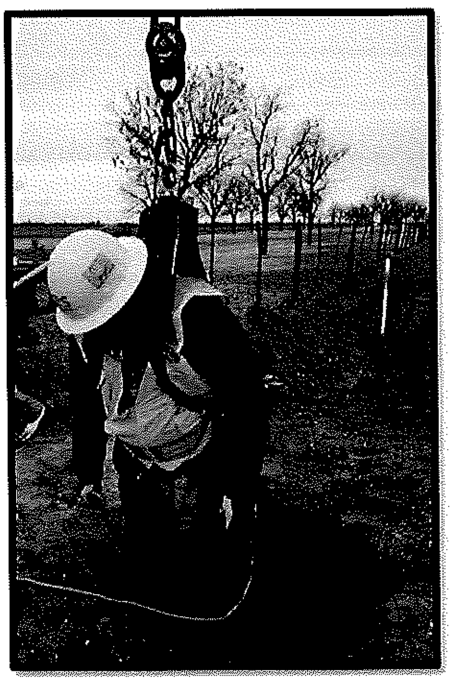


Figure 6. When determined safe to proceed, the employee will be hoisted to the surface using the rescue system.

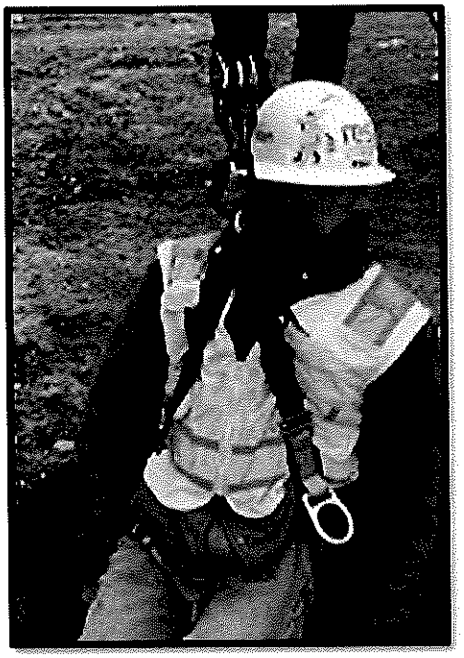


Figure 7 - If/when entry is required to a drilled hole/excavation and/or Confined Space: The Authorized Entrant will be extracted/hoisted from the drilled hole/excavation and/or Confined Space, with the ascent/decent device (preferably from the sternum D-ring), if he/she cannot exit on their own.

Revision History

Issue	Date	Latest changes
01	06/18/2021	Document first created.
02	08/26/2021	Procedure updated to match the current template and new document number.
03	09/21/2022	Procedure updated to match the current template.

The following is extracted from Fluence Document 00SQ-PLN-SYS-90-001 GSP 5000 Site Emergency Response Plan

4. Battery Energy Storage System Overview

4.1 Energy Storage System

The Energy Storage system is comprised of multiple interconnected Fluence Battery Enclosures. The Enclosures are comprised of multiple lithium-ion battery modules in Packs and associated climate control and monitoring equipment. The modules within Half-Packs are connected in series and multiple Packs within an Enclosure are connected in parallel to a DC busbar. Multiple Enclosures are connected in parallel to the DC side of inverters. The AC side of the inverters are connected to step-up transformers before being connected to the grid.

A Node is the smallest dispatchable part of the system. It comprises one or two rows of Enclosures connected to a single DC bus on the Power Conversion System (PCS).

A Core is made up of one or more nodes. In addition to the PCS, the core also includes:

- Isolation transformer between low voltage and medium voltage.
- One Core Support Enclosure (CSE), containing the main Core-level ethernet switch, the Core-level fire panel, and the F-Stop system at Node / Core level.

The main system components are the following:

#	Site Level Equipment	Specs, Rating or Details	Qty on Site
1	Isolation Transformer	5300 kVA, 690 V / 34.5 kV, Oil based	23
2	Aux Transformer	2500 kVA, 400 V / 34.5 kV, Oil based	2
3	DC/AC Inverters	5378 kVA, 690 V AC	22
4	DC/DC Converters	N/A	N/A
5	Fluence Enclosure consists of six (6) Packs of modules	Length / Depth / Height – Battery Enclosure 6820 x 2438 x 2896 mm (22.38 x 8.0 x 9.5 ft) Each rated to 4888 kWh of DC energy, max DC voltage of 1498 VDC	45
6	Each Core Support Enclosure	NA	23

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#	Equipment Associated with a Battery Enclosure	Specs, Rating or Details	Qty per Enclosure
1	Battery Packs	814.69 kWh per Pack, 4888 kWh per enclosure Max DC voltage 1498 / Pack	6
2	LFP Lithium-ion battery modules	101.8 kWh	8 per Pack, 48 per Enclosure
3	Stat-X Aerosolized fire suppression system (Optional)	It is independently deployed if it detects 95C and discharges an ultra-fine cloud of condensed extinguishing agent that acts on non-battery components within the enclosure. It is not designed to extinguish a battery fire. Even if the canister is discharged during a thermal runaway event, batteries continue to produce flammable gas	1 (Optional component)
4	Deflagration panels	(NFPA 68 compliant) The battery enclosure contains built-in deflagration panels in the roof of the container that are intended to direct the force resulting from deflagration upward to prevent explosion.	4
5	Actuated vents	(NFPA 69 compliant) mechanical off gas exhaust system.	2
6	Triple-criteria Smoke/Heat & CO Detectors	If smoke or temperature within the battery compartments of the Enclosure exceeds 203 °F (95 °C), the detection systems automatically trigger a site alarm. They also activate a strobe, and horn on the applicable Enclosure and Core. A CO detection at 100 PPM will trigger a site alarm, shutdown the core and activate a strobe and horn on the applicable Core Support Enclosure (CSE).	3
7	Dual Smoke/Heat Detector	If smoke or temperature within the isolated telco compartment of the Battery Enclosure exceeds 203 °F (95 °C), the detection systems automatically trigger a site alarm.	1
8	Strobe	The strobe is mounted at the top of Core Support Enclosures. After a fire alarm event, if a red strobe flashes, wait for a company representative to authorize you to enter the site. If the horn and/or red strobe stop, it does not indicate that the equipment and enclosures are safe to approach or enter.	1

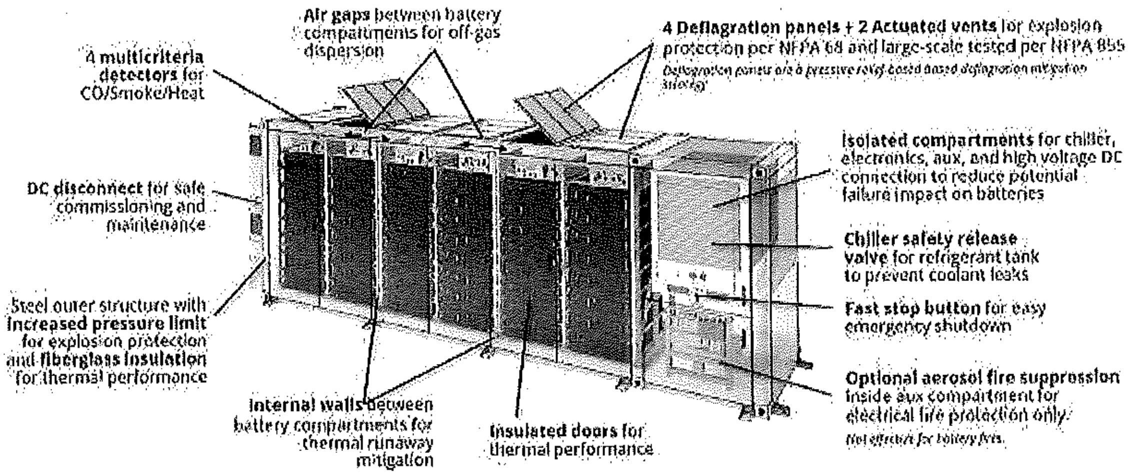


Figure 4-1: Component Identification

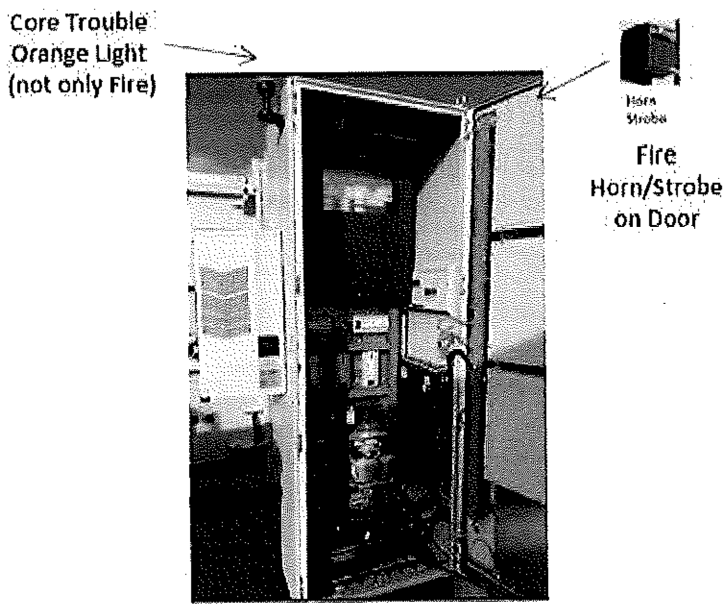


Figure 4-2: Core Fire Panel in CSE

4.2 Fluence 24/7 System Monitoring

The energy storage site is monitored 24x7 by the Fluence Support Team and the Customer Operational Center.

4.3 Before Entering the Site

Do not disconnect the auxiliary power supply. Multiple systems of the energy storage site rely on the site auxiliary power supply. Site auxiliary power supply also enables data collection from inside the affected Battery Enclosure.

Information on what the fire alarm is related to and where onsite it occurred should be available.

4.4 Initial Communication & Scene Evaluation

For a BESS Fire alarm, the system owner should contact the Fluence team in addition to contacting emergency responders. Fluence monitors the equipment 24/7 and should, in parallel, have already escalated internally any fire alarm incidents. Fluence will assign a subject matter expert to function as the Fluence Emergency Focal who can be different from the support provided day to day.

The initial site assessment should include the following and include the Project Owner and Fluence SME.

- Where the incident is located within the Project – address of alarmed asset on site confirmed by Fire Panel
- What alarm was triggered (heat/smoke, CO, aerosol canister discharge)
- What has occurred since the alarm onsite
- Current situation as noted from safe distance – visible smoke, flames, strobes, alarms, if deflagration vents are open or closed
- Current situation based on data available from affected enclosure – ie. Temperatures of modules
- Take note of what work was being done onsite at the time of the incident and ensure all personnel are at muster points
- Injuries or unaccounted individuals
- Is there any danger/risk to adjacent exposure. Water can be used to protect exposures but is **NOT RECOMMENDED** on any enclosure/battery specific fire.
- The system should protect itself and turn off the related core – note if anyone took other action to turnoff anything else. Aux power is recommended to remain on.

It is critical to secure and barricade off the area around the alarmed asset, to ensure people are at the minimum recommended distance (150 feet) and not allowed to open any equipment doors.

4.5 Equipment and PPE

Fluence minimum PPE: Category 2 PPE including arc rated clothing with min arc rating of 8 call/cm2, arc rated long sleeve shirt/pants, face shield, jacket, hard hat, safety glasses, hearing protection, heavy duty leather gloves or arc rated gloves or rubber insulating gloves with protectors, leather footwear, and balaclava.

First Responders would use Cat 4 PPE plus self-contained breathing apparatus (SCBA) as required if high module temperatures observed or anomalies in BMS faults, cell voltages. Thermal imaging and explosive gas detection analyzation of equipment is required prior to entry into any enclosure during or after an event.

4.6 Emergency Shut Offs

The Battery Storage System automatically shuts down/isolates the Core that signaled a fire alarm but the rest of the project will continue to operate under Fluence controls.

4.7 Fire Detection Components and Location

- Detection equipment within a Enclosure or Core Support Enclosure monitors carbon monoxide, smoke, and temperature. If it detects smoke or high levels of carbon monoxide, or if the temperature within a Enclosure or CSE exceeds 203 °F (95 °C), the detection systems automatically trigger a site alarm. They also activate a strobe, and horn on the applicable Core.
- All fire alarms will be associated with a specific part of the system including a specific Core, its applicable Node, and either a specific Enclosure or CSE cabinet. For example, "Smoke detected in Core 1, Node 1, Enclosure 3." Refer to the site physical and software architectural drawing.
- The strobe is mounted on the top of CSE enclosures. if a red strobe is flashing, wait for a company representative to authorize you to enter the site. If the horn and/or red strobe stop, it does not indicate that the equipment and enclosures are safe to approach or enter.
- The Battery Enclosure Support Compartment may optionally contain a canister with aerosol fire suppresant. It would be independently deployed if it detects 95C and would discharge an ultra-fine cloud of condensed extinguishing agent that acts on non-battery components within that section of the enclosure. It is not designed to extinguish a battery fire. Even if the canister is discharged during a thermal runaway event inside the Support Compartment, batteries continue to produce flammable gas.
- Fire alarms can be reset at the master fire protection panel to check for ongoing enclosure interior smoke, heat or carbon monoxide. Ensure all data is recorded prior to any resets.
- The Battery Enclosure contains built in deflagration panels (NFPA 68 compliant) in the roof that are intended to direct the force resulting from deflagration upward to prevent an explosion.
- The Battery Enclosure contains built in actuated vents (NFPA 69 compliant) which is a mechanical off gas exhaust system designed to proactively purge the enclosure as required.
- Fluence monitors the system 24/7 and reports on any fire alarm including location and has data available regarding current temperature inside the enclosure.

4.8 Fire Alarm Triggered Alarm Shutdowns

The BESS also automatically initiates a system fast-stop that cuts power throughout the applicable Core (not the entire system).

> Batteries retain energy even if the system is "shutdown."

Auxiliary power remains on and is used to run portions of the fire system, the Enclosure chiller, HVAC, data collection and battery rack control computer for the rest of the core.

Smoke, high temperature or an aerosol canister release will shut down the chiller and HVAC of the affected enclosure only. CO detection will not shut down these components.

The aerosol canister is not dependent on external power or control (thermally actuated).

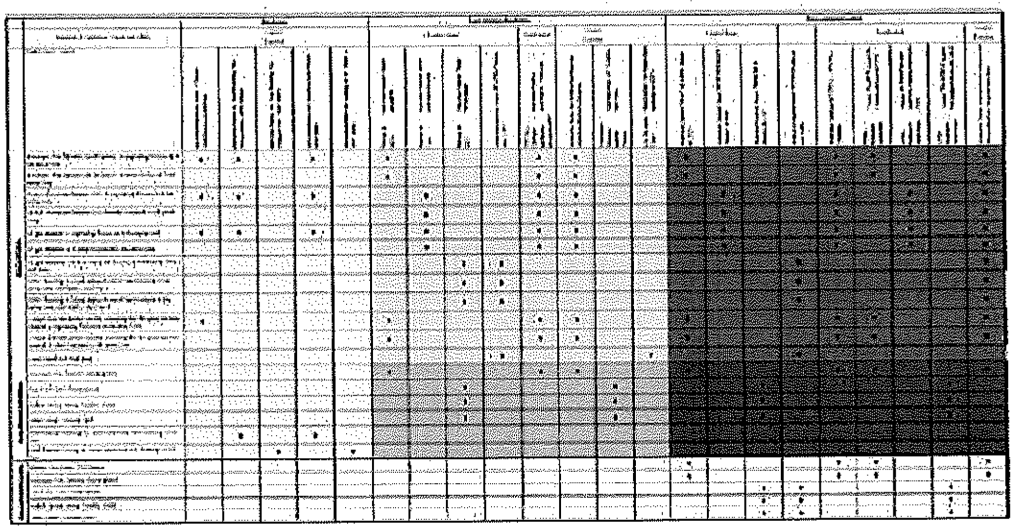


Figure 4-3: Core Fire Panel in CSE

> This table comes from the standard fire alarm systems design sequence of operations per NFPA 72.

4.9 Maintain Distance of 150 feet (45M)

Keep a minimum distance of 150 feet (45 m) from the affected battery enclosure. As a precaution, evacuate buildings within 150 feet (45 m) of the battery location. Immediately contact Fluence Support Services 24 hours a day, 7 days a week at +1 (703) 635-7631.

WARNING

FIRE AND GAS EXPLOSION RISK
Damaged batteries may discharge toxic, flammable gases leading to a thermal runaway event and explosion. Keep back at least 150 feet (45 m).

When site management authorizes you to enter the site, proceed with caution. Maintain a minimum distance of 150 feet (45 m). Do not approach the unit and do not attempt to vent the enclosure. The enclosure doors should remain shut during an incident. The actuated vents are the proactive mechanical mitigation system ensuring internal off-gas concentrations do not exceed 25% Lower Flammable Limit (LFL) per NFPA 855 requirements.

The battery enclosure contains built-in deflagration panels in the roof of the Enclosure that are intended to direct the force resulting from deflagration upward to prevent explosion. Take note of the status of the deflagration panels. If opened, any future risk of explosion/deflagration is reduced due to the venting.

With a battery module thermal runaway event, the system may emit flammable and/or toxic gases including but not limited to carbon dioxide, carbon monoxide, fluorine, ethane, and methane.

4.10 Minimum 24 Hours to Consider Entry into a Enclosure

Do not approach enclosure without thorough evaluation of available data.

Do not approach the enclosure at any time if there are external signs of heat, unusual interior module temperature data (available from operator), active heat, smoke/CO alarms or within the first 24 hours of a verifiable fire alarm, or if there is visible smoke or flames.

The minimum time to wait prior to considering entry into the Enclosure is 24 hours but it could be longer depending on the situation and thorough evaluation of available data.

Thermal imaging and gas detection are two devices that can be used to evaluate the situation and safety of approach and ultimate enclosure entry.

If the source of the fire alarm is a thermal event in a battery module, the cooldown and approach periods can extend to several days. Never assume a fire is extinguished based on visual observation. During cooldown, thermal events at cell or multi cell level may continue to occur causing hot spots or loud noises.

4.11 Fire Management Tactics

Under abnormal failure conditions, lithium-ion batteries can rapidly produce flammable and explosive gases, leading to a thermal runaway event. It is impossible to extinguish a thermal runaway event with water or foam.

There is no way to stop the discharge of energy stored inside lithium-ion batteries during a thermal runaway event. Unlike a typical electrical or gas utility, an energy storage system does not have a single point of disconnect. There are emergency disconnects that de-energize select parts of the system, but even if all the contactors, breakers, and switches are open, the battery remains energized.

4.11.1 Water Is Ineffective at Extinguishing a Battery Module in Thermal Runaway

Water is ineffective at extinguishing a thermal runaway fire. Water is electrically conductive and can cause short circuits. If water is applied to a lithium-ion fire, there is a risk that surrounding batteries that are not involved will be damaged. The application of water only serves to exacerbate the thermal runaway event (both in duration and severity).

Water may be used on adjacent exposure if deemed necessary. Fluence large scale tests have demonstrated that fire is not expected to propagate to adjacent enclosures on its own. Water runoff will require additional cleanup.

4.11.2 5.9.2 Do Not Open the Enclosure Door

Thermal runaway battery fires are preceded by a period of off-gas/smoke. Off-gas/smoke has the potential to be flammable and may ignite at any time.

Do not open any Enclosure door. Unvented gas may be present and could cause an explosion which would be deflected out of the deflagration panels on top of any affected unit.

4.11.3 Do Not Apply Inert Gaseous Suppressants

Gaseous agents such as CO2, Halon, or dry chemical suppressants may temporarily suppress fire on lithium-ion battery packs, but they do not cool lithium-ion batteries and do not limit thermal runaway reactions. Metal fire suppressants such as LITH-X, graphite powder, or copper powder are unlikely to be effective and are unsuitable agents for suppressing fires involving lithium-ion battery packs. A foam fire-extinguishing system typically is used in a flammable liquids fire are not effective against a thermal runaway fire.

4.11.4 Protect Exposures

We recommend you protect any adjacent exposures and allow the fire to run its course. In our tests supervised by NFPA personnel, the fire self-extinguished within approximately 16 hours. However, each site may behave differently.

4.12 Fire Decay

Never assume a fire is extinguished based on visual observation. Batteries can remain hot and pose a risk of gas generation leading to thermal runaway or other incidents. Reignition is possible for days or even weeks after the initial event. Collaborate with the on-site company management to determine when it is safe to enter the area.

Before approaching the ignition source, we recommend you confirm that temperatures are trending towards the ambient temperature. Do not touch the battery equipment during the event or during overhaul operations. The involved equipment is already damaged beyond repair. Use available tools like these to determine when it is safe to approach:

- Thermal cameras
- Infrared thermometers
- Explosive gas detectors
- Current measurements from the Fluence Data Acquisition System, if available:
  - Battery cell temperature
  - Enclosure ambient temperature
  - Presence of carbon monoxide and other gases
  - Suppression system state
  - State of charge

Keep the public and company personnel out of the area until the area is stable.

5. Hazards

5.1 Chemical and Toxicity Hazards

5.1.1 Lithium-Ion Batteries and Toxic Gases

Lithium-ion batteries pose chemical risks. Please read the Safety Data Sheet for more information. Batteries are sealed hermetically; however, if broken open or damaged, contents may be toxic or corrosive to skin.

Under abnormal conditions, lithium-ion batteries can produce toxic gases. However, from a toxicity perspective, the gases may be managed effectively through the appropriate Personal Protective Equipment (PPE), including Self Contained Breathing Apparatus (SCBA). The toxicity of gases released is similar to a plastics fire. However, they should not be approached without SCBA, as concentrations of gases which cause immediate danger to life and health without PPE may be reached.

5.1.2 Fire Suppression Agent

The Fire Suppression Agent used at this facility is Solid aerosol. When discharged in the event of a fire, the byproducts are known to cause eye and skin irritation and potential toxicity risks. Please read the Safety Data Sheet for more information.

5.1.3 Coolant and Refrigerant Hazards

The system can contain the following. See applicable SDS for full information, including first aid.

- **Chiller Coolant:** a mixture of water and ethylene glycol; toxic.
- **Chiller Refrigerant:** mildly toxic; can cause asphyxiation if excessively inhaled; liquid contact could cause frostbite.
- **HVAC Refrigerant:** can cause asphyxiation if excessively inhaled; liquid contact could cause frostbite.

5.1.4 Electrical Hazards

A Fluence Battery Energy Storage site contains electrical equipment with voltage ratings up to 33kV or above. Arc flash labels are present on all devices where arc flashes may occur. The battery equipment contains stored electrical energy, even when disconnected it remains energized at its current state of charge.

As such, exercise care to not directly come in contact with the battery equipment during the event or during post-incident operations. A subject matter expert should advise on how to handle stranded energy remaining in any of the damaged battery equipment after the event. Energy cannot be remotely discharged.

The balance of plant equipment (including the inverter, Core and auxiliary transformers, switchgear/breaker panels) should be approached utilizing the same firefighting techniques for other industrial/commercial electrical equipment under fire conditions.

5.1.5 Fire and Explosion Hazards

Lithium-ion batteries, under normal operating conditions, do not produce any gases. However, under abnormal failure conditions, such batteries can rapidly evolve flammable/explosive gases. In the event of a fire in the enclosure or other emergency where a battery failure in the enclosure is suspected, stay outside of the site.

While solid aerosols are proven highly effective at extinguishing non-battery fires, explosive conditions may still develop when fire is not present as batteries continue to off-gas until cool.

While an explosive atmosphere is unlikely, should one occur, deflagration panels will direct any pressure resulting from explosions upward. The panels are tethered to the enclosure.

5.1.6 Confined Space Hazards

The energy storage containers are not intended for occupancy.

The Enclosure is a discrete energy-storage unit that includes batteries, a battery management system, a data acquisition system, and other equipment and accessories necessary to maintain health and long-term operation in an outdoor environment.

Hiller

March 18, 2025

Van Zandt County Fire Marshal's Office
24634 State HWY 64
Canton, TX 75103
Attn: Mr. Kevin D. Palmer

Re: Amador NFPA 1142 Minimum Fire Water Supply Calculation

Dear Mr. Palmer,

This letter documents Hiller's professional opinion and recommended action for a minimum water supply at the Amador BESS site located in Van Zandt County, TX. The basis of this letter is Hiller's understanding of the state fire and building codes, the model codes, specifically NFPA 1142 (2022 Edition) and Hiller's experience in the BESS industry.

The impetus for this evaluation is as directed from RES and after review of the Site Plan General Arrangment drawings (ES.E.01.02, dated 4/19/2024).

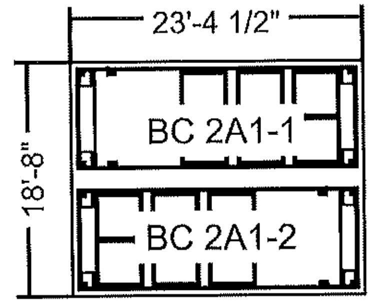
To determine the minimum water supply per NFPA 1142, four inputs must be understood.

1. Occupancy Hazard
2. Type of Construction
3. Structure Dimensions
4. Exposures, if any

Occupancy Hazard is based upon the building contents. The site does not include a building, but an array of battery energy storage systems (BESS), the Fluence Gridstack Pro 5000. The guidance provided under NFPA 1142 does not include specific direction for batteries. For the purposes of this evaluation and for conservatism, the most stringent occupancy hazard number 3 per NFPA 1142 Chapter 5 has been assumed.

Type of Construction is meant to describe building construction, which is not readily applicable to a BESS unit. For the purposes of this evaluation, type of construction is based on the Fluence Gridstack Pro 5000 datasheet and is evaluated to be Type II (non-combustible construction with no fire rating). Per §6.2.1, the Construction Classification Number is 0.75. However, for conservatism, this calculation will assume the most stringent type of construction coefficient, which is 1.5.

Structural dimensions are taken from the general arrangement of one set of side-by-side BESS units. The measurements are 23.3' x 18.7' x 9.25' (L x W x H), or 4,031 ft^3. For conservatism, the evaluation will round up to 5,000 ft^3.



In reference to exposures, per the NFPA 1142 §3.3.12 and §4.1.5, the BESS units are considered to be without exposure hazard.

The minimum water supply is determined by NFPA 1142 §4.2.1:

$$WS_{min} = \frac{VS_{tot}}{OHC}(CC)$$

Where:
- WS_{min} = minimum water supply in gallons
- VS_{tot} = total volume of structure in ft^3
- OHC = Occupancy Hazard Classification Number
- CC = Construction Classification Number

$$WS_{min} = \frac{5{,}000}{3}(1.5)$$

$$WS_{min} = 2{,}500\ gal$$

NFPA 1142 is titled the Standard on Water Supplies for Suburban and Rural Firefighting, and is referenced by NFPA 855 §4.9.4.2. Hiller appreciates this reference but also recognizes that NFPA 1142 does not directly reference battery energy storage applications. Per §4.2, the user of NFPA 1142 must describe the occupancy hazard classification and type of construction, both of which are problematic for BESS application. The standard defines a "building" and a "structure" separately and while it is clear that an outside BESS enclosure is not a building (and therefore considered a structure for the purposes of NFPA 1142), Chapter 5 provides no reasonable comparable example for a BESS application to determine an occupancy hazard classification. Similarly, the construction type classification number is based on construction types from NFPA 220 and NFPA 5000, Chapter 7 and not written for enclosed and non-occupied equipment.

The purpose of NFPA 1142, as described in §1.2, is to "establish the minimum water supply necessary for structural firefighting purposes". Another definition provided for the standard is a "recognized water supply", which requires 250gpm for 2 hours, or 30,000 gallons of usable water (§3.3.23). However, for the application of outdoor battery energy storage, Hiller's practice is to use NFPA 1142 more to establish a minimum water supply necessary for predetermined mitigation strategies. The overall strategy is to allow the fire to consume itself while mitigating the growth to adjacent targets, including other BESS enclosures. Direct suppression has not been demonstrated as effective or practical (consider the Chandler, AZ event and the more recent San Diego, CA event in which millions of gallons were used without extinguishment). Therefore, one accepted practice, especially in areas without established fire water infrastructure, has been to provide intermittent exposure protection on adjacent units. The benefit to this approach is that it allows the water to be utilized most efficiently.

Hiller recommends intermittent exposure protection for up to 12 hours. For the purposes of this recommendation, intermittent exposure protection is 5 minutes of water spray on adjacent units every 30 minutes. This equates to 30,000 gallons. This water supply is significantly greater than the minimum permissible by NFPA 1142 but provides a more tailored solution for the hazard due to the longevity of BESS-involved fire.

Sincerely,

Joseph R Whitt

Joseph Whitt, PE
Fire Protection Engineer

April 7, 2025

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Energia

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April 7, 2025

Kevin D. Palmer
Fire Marshal
Van Zandt County Fire Marshal's Office
24634 State HWY 64
Canton, TX 75103
kpalmer@vanzandtcounty.org
(903) 910-8602

Subject: Response to Fire Marshal Order

We respectfully disagree with the assertion that our project is currently in violation of NFPA codes. However, we remain committed to full compliance with the requirements of the NFPA and working together to move the project forward towards installation and commissioning.

As per the recommendation in your letter dated February 11, 2025, we attempted to visit the Van Zandt County Fire Marshal's Office on February 13, 2025. During our visit, we found that no one was aware of a "new construction permit" for battery energy storage projects or any related application fees. Additionally, we were unable to locate information regarding the "new construction permit" on the Fire Marshal's Office website. Your order was the first document to provide us with guidance regarding the application process and associated fees. We appreciate you providing this information.

To date, only civil, piling, and substation work has been conducted at the project site. The installation of the Battery Energy Storage System, which falls under the scope of NFPA 855 and related documentation, is scheduled to commence only at the end of April 2025.

Responses to Your Requests Under the Fire Marshal Order

1. **Permit Application:** We have submitted the new construction permit application and have paid the associated application fee. This application was submitted on April 4, 2025 and is Appendix 1 to this letter. The associated application fee of $ 50,840.00 was paid on April 7, 2025.

2. **Fire Testing:** A unit-level large-scale fire test in accordance with UL 9540A has been conducted and successfully passed by an independent laboratory in the United States. This testing complies with NFPA 855 (2020 edition) section 4.1.5, as detailed in Appendix 2. The UL 9540A test process follows a sequential approach, progressing from cell to module, module to unit, until pass is achieved. Consequently, it was anticipated that the cell and module tests might not fully pass, whereas the unit-level test successfully met the requirements. If you have any questions regarding this approach, we would appreciate the opportunity to better explain the battery testing process.

3. **Site Location Compliance:** As per NFPA 855 (2020 edition) section 4.4.3.1, *Remote outdoor locations include ESS located more than 100 ft (30.5 m) from buildings, lot lines that can be built upon, public ways, stored combustible*

materials, hazardous materials, high-piled stock, and other exposure hazards not associated with electrical grid infrastructure. Appendix 3 provides evidence that the project site complies with this requirement, being over 100 feet from any of the listed exposure hazards.

4. **Hazard Mitigation and Emergency Response:** The site-specific Hazard Mitigation Analysis (HMA) is included in Appendix 4. Additionally, the Emergency Response Plan (ERP) for the project is attached as Appendix 5.

5. **Water Supply Compliance:** NFPA 855 (2020 edition) section 4.13.2 states that, *where no permanent adequate and reliable water supply exists for fire-fighting purposes, the requirements of NFPA 1142 shall apply.* NFPA 1142 section 1.1.1 outlines methods for *determining the minimum requirements for alternative water supplies for structural firefighting purposes in areas where the authority having jurisdiction (AHJ) determines that adequate and reliable water supply systems for firefighting purposes do not otherwise exist.* An independent fire protection engineer has calculated the minimum water supply requirements under NFPA 1142 section 4, concluding—with all safety margins accounted for—that a 30,000-gallon water tank is appropriate and typical for similar projects in Texas. Details are provided in Appendix 6. Currently, the project site has two 20,000-gallon frac tanks, which exceed the 30,000-gallon requirement. These tanks, or equivalent frac tanks, will remain onsite during the operational period. Additionally, the project company will contract a water supplier with a source located nearby Dallas to ensure a continuous water supply, even in the event of a prolonged fire, in compliance with NFPA 1142 requirements.

We are fully committed to ensuring the highest level of safety for this project and maintaining close cooperation with Van Zandt County Fire Marshal's Office. We recommend scheduling a call to discuss this response in further detail and address any questions you may have. Should you require additional information or clarification, please do not hesitate to contact us.

Sincerely,

DocuSigned by:
Ville Rimali
30FC3AF8DD26466...

Ville Rimali
Investment Director, Energy Storage
Taaleri Energia

Appendices:

- Appendix 1: Van Zandt County New Construction Permit Application
- Appendix 2: Fluence Gridstack Pro 5000 UL9540A Unit Level Test Report
- Appendix 3: Project Amador Layout
- Appendix 4: Project Amador Preliminary Hazard Mitigation Plan (HMA)
- Appendix 5: Project Amador Preliminary Emergency Response Plan (ERP)
- Appendix 6: Project Amador NFPA 1142 Minimum Fire Water Supply Calculation