

April 16, 2024

City Council
City of League City, TX
300 W Walker St,
League City, TX 77573

Re: ESS Safety from a Planning and Zoning Viewpoint

Background; Stella Energy Storage System Site

Code Concepts Group, LLC has been engaged by the City of League City, Texas as third-party experts specific to the installation of the Stella Energy Storage System (ESS). We have attached our company profile to this report providing our code and standards background, inclusive of ESS-related code development work.

Currently, national, and international zoning codes do not provide guidance regarding the treatment of ESS from the standpoint of planning and zoning, leaving this topic to individual communities to address on a case-by-case basis. Ongoing is an International Code Council GAP analysis project that holds some promise in alleviating this issue.

A difficulty in handling the topic from the zoning perspective is that energy storage is necessary for sustainability and is targeted for industrial, commercial, utility scale, health care, business, and residential occupancies, including one and two-family dwellings.

Communities have addressed this in various ways; in some cases looking at ESS as an appliance, an inherently beneficial use, or as an industrial use.

At this point in the process, the issue is safety. Can the Stella ESS units be installed, operated, and maintained in a manner that does not present an unusual risk to the community at large?

The answer is yes, if we step back and look at the issue from the standpoint that any permitted use, in any zone, can suffer a fire event that must be responded to and mitigated in a manner that protects the public. All fire events produce potentially harmful products of combustion. All fire events also hold the potential for contaminated runoff.

The key is to effectively mitigate the chances of an event occurring by applying the current standard of care for the installation of ESS, whether of a commercial nature or associated with a detached one and two-family home. Doing so involves application of the 2021 or 2024 International Fire Code and the 2023 Edition of the National Fire Protection Association (NFPA) 855 Energy Storage Systems Standard.

Standard of Care

The current standard of care, under International Fire Codes and the 2023 Edition of NFPA 855, requires system level listings designed to eliminate a major event from a thermal runaway due to a component or cell failing and propagating to additional cells. At the same time, both documents recognize a catastrophic event may occur and provide additional protection requirements should that event occur.

The second level of required protection addresses early detection, protection against deflagration, fire service water supplies, location of remote fire command centers to assess the various detection signals, fire service access roads, site emergency access plans, and response of technically trained responsible parties to relieve the fire service from standing by the site.

Coupling the preventative design listing requirements with the second safety level response requirements should a system failure occur, energy storage systems can be safely installed anywhere in a community; with no difference to any other system, appliance, or other relatively safe installation that nonetheless carries an event potential.

The key is having a process in place to ensure ESS units being installed in the jurisdiction meet the current standard of care for code compliance, including listing.

Toxicity issues

An issue that has been focused on is the toxic and environmental impact of a thermal runaway/fire event involving an ESS. This issue is the focus of several research activities. Currently, actual events indicate that this is not an off-site impact. The basis of the current codes and standards is that an ESS unit can be consumed in fire and will not propagate to the next closest unit. This is an important requirement since they cannot be extinguished. The quickest and most effective method is for the fire service to stand back and let the unit consume itself. This method provides for faster conclusion and ensures that the stranded energy in the modules is eliminated as well, thus providing for a safer cleanup.

If the fire service is not flowing water on the unit there is no environmental runoff impact; and current data indicates that even if water flows the runoff issues are minimal to non-existent.

Available information indicates toxic levels of smoke exposure does not exceed several meters from an involved unit; however, any exposure needs to be avoided, whether from a conventional fueled vehicle fire or a single-family house fire. The products of combustion always carry toxic elements, regardless of what is burning.

As with any fire event, the fire service assesses what is occurring, identifies the proper mitigation strategy, and determines the appropriate methods of protecting the public. The key is ensuring your fire service members obtain training to prepare them for ESS incident response.

A recent report from the State of New York addressing the environmental impacts of commercial ESS unit failures is attached for reference.

Planning & Zoning Commission Concepts

The following recommendations are related to the fire/safety comments that were provided to the Planning and Zoning Commission by League City Fire Department Staff.

MAP-23-0007 (Stella B.E.S.S.)

Recommendation Based on the criteria listed above, staff recommends rezoning the approximate 1.7 acres and the SUP subject the following conditions:

4. The site shall comply with all applicable fire codes and actions, but not limited, to the following:

a. 2021 IFC, Chapter 12 and the listed NFPA references with Chapter 12.

This should be the 2024 edition of the IFC to apply the current standard of care.

b. NFPA 855

This would be the 2023 edition of NFPA 855 while additionally assessing topics and decisions in the current updating of that document.

c. An Environmental site plan shall be provided to include firefighting water runoff retention.

The current standard of care is not to use firefighting water unless such pertains to a fire that presents an exposure threat to the ESS.

d. There shall be some form of air monitoring system for vapor detection.

This is a concept that does not work for real time monitoring. The products of combustion are a mix of chemicals that cause cross-contamination issues for typical gas detection sensors and devices, rendering them unreliable. This has been validated by research.

e. A Water fire flow analysis shall be provided at the permitting phase to ensure the existing water infrastructure can support the firefighting demands.

Firefighting demands would be based upon confronting fires that expose the ESS.

f. There shall be 24/7 site monitoring with the ability to detect and prevent thermal runaway.

This is currently required by the 2021 IFC and the 2023 Edition of NFPA 855

g. A technician shall respond within 1 hour of being notified by the Fire Department in the event of an emergency incident at the site.

This is a current requirement of the 2021 IFC and the 2023 Edition of NFPA 855. The AHJ 1-hour response time is appropriate.

h. The company shall provide the Fire Department with the equipment needed to monitor and test the air and the water for any hazards at these sites during emergencies.

Active air monitoring by the fire service is not technically effective, and the recommendation is not to flow water on the involved ESS.

- i. Provide the Fire Department with a Plume model on a satellite image of the area they plan on doing the installation.

Plume modeling is ineffective. The available models are based upon single gas parameters, the products produced are best described as a soup mixture. In addition, to make an effective plume model, one is required to know the weather impacts at the time of the event.

- j. Provide annual training to the fire department for hazards and responses.

This is a valid parameter.

- k. Provide an emergency procedure guide and emergency contacts that shall be updated annually or when significant changes are made whichever is earlier.

This is required by the 2021 IFC and the 2023 NFPA 855.

5. Prior to the City's authorization to operate the facility, the Applicant shall:

- a. Provide and receive approval from The Office of Emergency Management, a finalized Emergency Action Plan (EAP) for the site. Any future updates to the EAP shall be provided within 60 days of the update.

An EAP is required by the 2021 IFC and the 2023 NFPA 855. A construction activities plan prior to commissioning and an operations plan are necessary.

- b. Provide a Decommissioning Plan of the facility to the Planning Department. Any additional updates shall be provided within 60 days of the update.

The 2021 IFC and 2023 NFPA 855 require decommissioning plans. A "cradle to grave" concept was built into the ESS batteries standard of care.

Key items to consider for the Stella ESS application.

- The Stella Energy storage system can be safely deployed in League City if the current Standards of Care and applicable codes are stringently enforced.
- Like all utilities and appliances, there remains a chance for a fire incident. Again, adherence to current Standards of Care and applicable codes minimizes the chances of a fire incident.
- The operator should be required to adhere to the 2024 Edition of the IFC and the 2023 edition of NFPA 855.
- In the event of a fire, suppression best practices include allowing the fire to consume the unit without the application of water.
- Research does not support the deployment of air monitoring by the fire service during and following an incident.
- Constant site monitoring is not only prudent but also required by the IFC and NFPA 855.

- Deployment of a technician within 1 hour is required by NFPA 855, and the IFC and NFPA 855 provide for the response of trained fire mitigation personnel to relieve the fire department.
- Plume modeling is ineffective based on currently available models and the nature of the products released during a thermal runaway.
- The standards require that the operator provide League City Fire Department with initial site orientation hazard and response training, which should be required to be renewed annually as a condition of renewal of the required operating permit.
- An updated emergency procedure guide and contacts are required by NFPA 855.
- Require not only an operations emergency action plan but also a construction activities plan prior to commissioning the Stella ESS.
- Provide a full decommissioning plan as per NFPA 855.
- The sites are required to be secured against entry and the equipment electronically supervised per the IFC and NFPA 855.
- Sites with multiple ESS units are configured based upon distances unit to unit which is determined by a Hazard Mitigation Analysis applying large-scale burn test data.
- A fire service water supply is needed to address exposure fires.
- Fire detection and gas detection system signals are required to be transmitted to a fire command center on site where approved by the fire department.
- It is recommended that the fire service water supply and the fire command center be located 300 feet from the Stella ESS location or fire service exposure be otherwise mitigated where sites do not have that available distance.

Summary

In summary, the current codes and standards provide for the safe deployment of the Stella energy storage systems for utility scale, commercial and residential settings. The primary level of safety is the proper listing, approvals and installation of the systems and their components, a secondary level of protection built into the current Standard of Care and the Codes provides for early detection of events, fire department alerting, site resources providing the fire scene commander with intelligence as to the severity of the event, and technical assistance provided by the operator.

The safety of citizens can be provided for by stringently enforcing the current Standard of Care and codes addressing the listing and installation of ESS.

Respectfully,



Robert J Davidson
Code Consultant

Documents Reviewed for this report:

- MAP-23-0007 (Stella B.E.S.S.)
- Hidden Lakes - Emergency Response Plan Draft 17Nov2023
- League City_Hidden Lakes Presentation_Feb2024
- SES-Hidden Lakes BESS Site Safety[5]

- Hidden Lakes BESS_Dec27
- Hidden Lakes Feb 2024
- 4A. - MAP-23-0007 - Stella B.E.S.S. Staff Report and Attachments
- 2021 International Fire Code
- 2023 NFPA 855 Energy Storage Systems.



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Code Concepts Group, LLC is the combination of Davidson Code Concepts, LLC and Code Savvy Consultants, LLC where Mr. Davidson and Mr. O'Brian have brought their expertise together to tackle some of the largest building and fire code complexities found in the built environment today.

Code Concepts Group, LLC has experience working alongside building officials, fire code officials, design professionals, and communities as a whole. They work diligently in the application of fire and building codes and standards. Their experience in code development aids in providing safe, compliant projects by providing the concepts behind, and the intent of code requirements.

Mr. O'Brian and Mr. Davidson are well known for their efforts in code development, education and training programs, keynote lectures and much more.

Major Projects recently include:

- Multiple battery manufacturing, laboratory and storage facilities.
- Lab and storage facilities.
- Energy Storage System installations including navigating code requirements from design to permit review and commissioning.
- Transition to A2L refrigeration.
- Deployment of hydrogen fuel-cell and hydrogen motor fueling technology.
- Hazardous material compliance.
- General code navigation for various building and fire code projects.

Michael O'Brian, Managing Partner mobrian@concepts.codes

The owner/CEO of Code Savvy Consultants, LLC since 2001. Code Savvy Consultants, LLC specializes in third party plan review services with communities., Mr. O'Brian has more than thirty years of experience in both volunteer and career fire service as well as, emergency management and EMS experience with an emphasis in his career in public and private service. Mr. O'Brian has risen through the ranks serving as Fire Marshal and Fire Chief through his career service. Mr. O'Brian has a bachelor's degree from Eastern Michigan University and is a Graduate of the Eastern Michigan Fire Staff and Command Program.

Mr. O'Brian is known for his ability to navigate complex situations and his strong work ethic. This was truly demonstrated in his leadership of the International Code Council (ICC) Fire Code Action Committee for over 8 years. His actions as chair led to increased collaboration across the code community and navigated some of the most significant code changes in the last 10 years. He is the recipient of the IAFC/ICC Excellence in Fire Safety in 2021 and the Robert W. Gain Fire Prevention Leadership Award in 2021.

Mr. O'Brian currently serves on the following Boards and Committees:

- International Association of Fire Chiefs, Board Member IAFC, Fire and Life Safety Section, International Director
- Chair, IAFC Lithium Ion Battery Committee
- International Code Council, Building Code Committee
- National Fire Protection Association NFPA 1, Technical Correlating committee and Fundamentals Committee
- NFPA 855 Technical Committee (Energy Storage and Battery Storage)
- International Code Council, Codes and standards Committee
- International Code Council Code Correlating Committee
- National Fire Protection Association, Residential Sprinkler Committee
- Chair, Eastern Michigan Fire Staff and Command Advisory Board
- Underwriters Laboratory-Member of Fire Council

He previously served on the following:

- NFPA 101 Technical Coordinating Committee
- ICC Administration Committee
- ICC-Fire Code Action Committee
- Various ad-hoc committees and task groups
- Past President Michigan Association of Fire Chiefs Past President Michigan Fire Inspector's Society



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The Managing Partner of Davidson Code Concepts, LLC since 1990, Mr. Davidson has more than thirty-five years of experience in both volunteer and career fire service as well as law enforcement, emergency management and EMS experience. With over 25 years as a code enforcer, he retired as Fire Marshal in charge of the Fire Safety Division of the South Brunswick Township Code Enforcement Department with responsibilities including enforcement of the NJ Uniform Fire Code, managing the Office of Emergency Management, along with firefighting and technical rescue safety officer response. He has experience teaching a variety of subjects involving health, safety and code enforcement for the International Association of Fire Fighters, the International Code Council, Rutgers, The State University of New Jersey, The NJ University of Medicine and Dentistry, Middlesex County College, Middlesex County NJ Fire Academy, University of North Carolina School of Architecture, Charlotte Campus and University of Texas-Arlington Campus. He has been a speaker at numerous NFPA World Safety Conferences as well as at state and regional code official and SFPE conferences.

He gained national recognition as the Chair of the International Code Council's International Fire Code Development Committee. In September of 2006 he was the recipient of the International Code Council's annual 'ICC Fire Service Award' which is presented in recognition of untiring support of and dedication to professional code enforcement and the fire protection profession. In 2011 he was awarded an ICC Honorary Membership which is granted to an individual who has been recognized as having rendered outstanding service to the International Code Council. These were in addition to previous Middlesex County, NJ and State of New Jersey Fire Prevention inspector of the Year awards.

Mr. Davidson currently serves on the following Boards and Committees:

- Project Technical Panel Member, Fire Protection Research Foundation (FPRF) project on the "Development of Li-ion BESS Explosion Control and Prevention Guidance - Phase I
- ICC Ad Hoc Battery and Energy Storage
- ICC Fire Code Action Committee representing IAFC Fire & Life Safety Section
- NFPA 1 Fire Code Committee
- NFPA 401 Hazardous Waste Recommended Practice Committee
- NFPA 855 Energy Storage Systems & Lithium-ion and Lithium Metal Battery Storage
- IAFC Lithium-Ion Battery Committee
- New York City Fire Department's Fire Code Revision Project Advisory Committee
- NJ State Fire Safety Commission, Codes Advisory Council
- Construction Fire Safety Coalition
- UL 3741 STP - Standards Technical Panel for Photovoltaic Hazard Control
- Interstate Renewable Energy Council (IREC), Sustainable Energy Action Committee (SEAC) Assembly
- California Fire Chiefs Association SoCal FPO Code Committee
- CSA C800 Testing protocol for ESS Reliability and Quality Assurance Program
- CSA C22.2 350 Thermal Barrier Safety for Batteries

Mr. Davidson has also served on:

- ICC Fire Code Interpretations Committee
- NFPA Fire Research Foundation PV Stakeholder Group
- NFPA Task Group on Fire Fighter Safety and PV Systems
USDOE Biomass Industry Panel on Codes and Standards
- FCHEA/NREL Hydrogen Code Improvement Team
- ICC Building Code Action Committee
- ICC Fire Code Committee, including serving as Chair
- ICC IBC-Fire Safety Committee
- ICC IRC Building Committee
- ICC Northeast Regional Fire Code Committee
- ICC Joint Fire Service Review Committee
- ICC/NFPA/USDOE Hydrogen Industry Panel on Codes
- BOCA Building Code Interpretations Committee
- NFPA 232 Guide for Protection of Records

In addition, he serves on various workgroups for the ICC Fire Code Action Committee, and the ICC Building Code Action Committee. He has served in the past on workgroups for the ICC Tall Wood Buildings Ad hoc Committee, ICC Ad hoc Healthcare Committee, the ICC Code Technology Committee, and the ICC International Green Construction Code Committee.

Besides his heavy involvement in drafting, submitting, and testifying on the provisions in the International Code Council's series of codes and various NFPA Codes & Standards, Mr. Davidson has specialized in addressing renewable energy topics including energy storage systems, PV roof systems, the use of hydrogen as a fuel and flammable refrigerants. Mr. Davidson has presented lectures on a multitude of firefighter safety & code related topics in addition to conducting ESS, PV, hydrogen energy and biofuel workshops for building code and fire code officials throughout the United States.