CITY OF BLACK DIAMOND

August 14, 2025, Regular Work Session
Council Chambers, 25510 Lawson Street, Black Diamond, WA 98010

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https://zoom.us/j/4454477047?pwd=eGxRY3ZEeU14SVM2cGRBcUxCSjdmZz09
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Meeting ID: 445 447 7047
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Password:426953 (phone in only)

6:00 P.M. – CALL TO ORDER, FLAG SALUTE, ROLL CALL

1) Battery Energy Storage System (BESS) Discussion

ADJOURNMENT

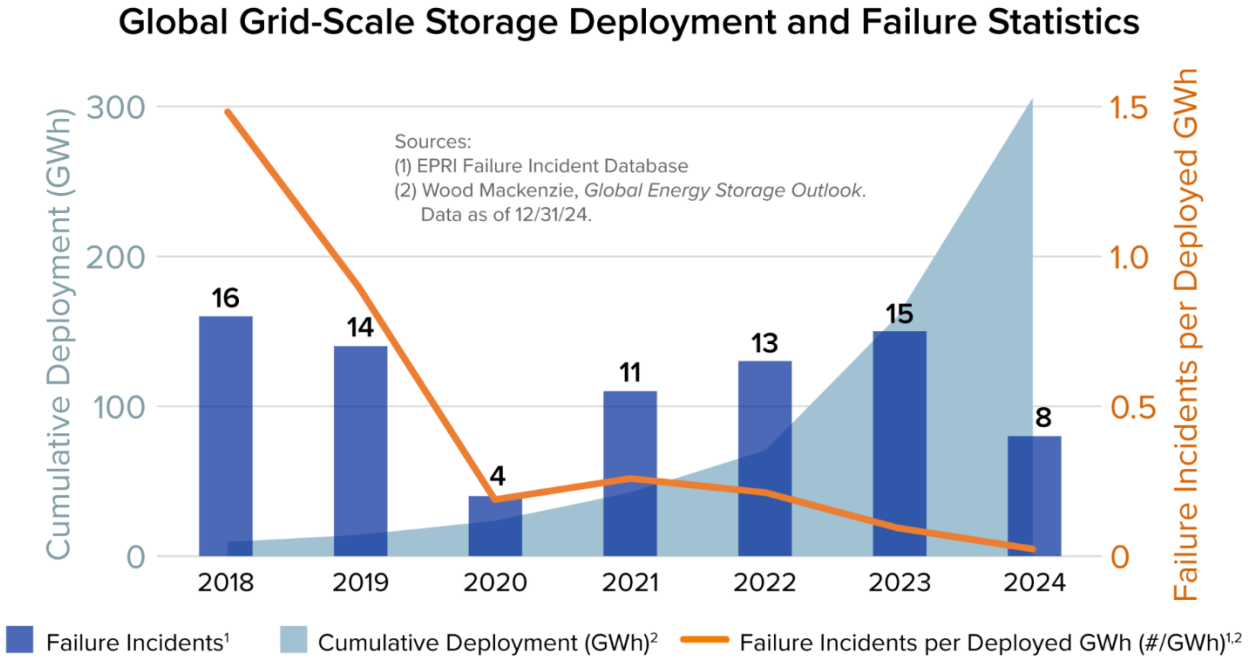
BESS Discussion with Black Diamond City Council – June 2025

June 10, 2025,

Honorable Mayor and Councilmembers,

Thank you for giving me the opportunity to prepare some additional information and resources related to BESS installations and why I believe they would benefit Black Diamond.

You will find a lot of BESS information following this cover page, but if I only had one thing to share with you, it would be this…



This chart is from the "BESS Failure Incident Database." (FYI, a GWh = 1 million kilowatt-hours or 1 billion watt-hours) The chart includes the following comment:

The global installed capacity of utility-scale BESS has dramatically increased over the last five years, and while failure incidents continue to occur, the overall rate of incidents has sharply decreased. The failure rate dropped by 98% from 2018 to 2024 as lessons learned from early failures have been incorporated into the latest designs and best practices. The battery industry continues to engage in R&D activities to improve risk reduction measures.

Additional Documents attached include:

1. Proposal for Hosting BESS in Black Diamond, 5 pages
2. What about Fire and Contamination Risks, 2 pages
3. Email with DJP's Questions & PSE's Answers with Julian Loh, PSE, 3 pages
4. MRSC Article, Jan 2025 "BESS – Coming soon to your community?" 9 pages
5. NFPA (National Fire Protection Association) Feb 2024 – BESS Fact Sheet, 3 pages
6. NYBES+ (NY BESS Technology Consortium) – BESS FAQ, 4 pages
7. American Clean Power – Utility Scale BESS model Ordinance, 16 pages

Proposal for Hosting a Battery Energy Storage System (BESS) in Black Diamond

Date: June 10, 2025
Prepared for: Black Diamond City Council

Executive Summary

Hosting a privately owned Battery Energy Storage System (BESS) in Black Diamond, a city of 6,000 in King County, Washington, offers a low-risk opportunity to boost economic growth and energy resilience. The BESS will generate sales and property taxes, potentially exceeding $104,000 annually, without city ownership costs. Modern BESS incorporates advanced safety features, and emerging technologies like solid-state batteries enhance safety further. Compliance with King County Ordinance 19824 ensures safe implementation. Real-world case studies, federal incentives, and precise financial projections demonstrate the project's feasibility, aligning with Black Diamond's 2044 vision for a sustainable, vibrant community.

Safety Considerations

Safety is critical for BESS due to potential fire risks from lithium-ion batteries. Modern systems mitigate these through:

- Battery Management Systems (BMS): Monitor temperature, voltage, and current to prevent hazards.
- Fire-Resistant Enclosures: Contain potential fires.
- Automatic Fire Suppression: Activate sprinklers or gas systems if needed.
- Thermal Management: Maintain safe operating temperatures.
- **NOTE**: Black Diamond has the option not to allow Lithium-ion batteries.

King County Ordinance 19824 Requirements: The King County Council approved Ordinance 19824 in September 2024, which would allow BESS installations in unincorporated King County. The ordinance includes:

- Compliance with NFPA 855 for fire safety standards.
- Siting restrictions, including 50-foot setbacks for large systems from property lines. (Black Diamond could have larger setbacks if desired.)
- Detailed permitting and regular inspections to ensure ongoing safety.
- Includes requirements for decommissioning, extensive emergency plans, regular reporting, financial stability requirements, and $1 million in liability insurance. (It is common to see liability insurance limits at $2 million.)

As Black Diamond will not own the BESS, the private operator handles compliance, minimizing city risk.

Emerging Battery Technologies

Emerging technologies enhance BESS safety and efficiency, supporting Black Diamond's sustainability goals. The following table summarizes key advancements:

Technology Name	Active Electrolyte	Pros	Cons	Estimated Time to Market
Solid-State Batteries	Solid electrolyte	Faster charging, higher voltage, longer cycle life, non-flammable, denser/lighter	High production cost, temperature/pressure sensitivity, dendrite formation	2027-2028 (Toyota)
Lithium-Sulfur Battery	Sulfur (solid state)	High specific energy, cost-effective, 4x energy density, long life	Limited life in liquid-based versions (mitigated by solid state)	Post-2028 (Saft)
Sodium-Ion Battery	Sodium sulfate	Long lifespan, low maintenance, non-toxic, cheaper, grid storage ready	Lower energy density, fewer charge cycles	Available now for grid; vehicles soon (Reuters)
Metal Hydrogen Battery	Hydrogen	85% efficiency, 20,000-30,000 cycles, environmentally friendly	Heat dispersion needed for overcharging	2025 (TopSpeed)
Silicon Anode Lithium-Ion	Lithium-ion	Larger specific capacity	Silicon reactivity, limited to 10% of anode	Progressing, no specific date (BloombergNEF)

Benefits of Hosting a BESS

Hosting a BESS provides Black Diamond with economic, environmental, and resilience benefits, supported by real-world examples and federal incentives.

1. **Economic Benefits through Tax Revenues**

- **Property Tax Revenue:** At Black Diamond's 1.04% property tax rate, a $10 million BESS would generate approximately $104,000 annually, funding schools, public safety, and infrastructure (Ownwell)1. (See footnote 1 for calculation of property tax rate)
- **Sales Tax Revenue:** Additional taxes on equipment and materials during construction and operation.
- **Federal Incentives:** The Clean Electricity Investment Credit (CEIC) offers up to 50% of project costs for commercial BESS, attracting developers and enhancing project feasibility (EnergySage).
- **Case Study:** Troy, Vermont
  A 3 MW/12 MWh BESS in Troy, Vermont (population ~1,000), owned by EVLO Energy Storage Inc., stores wind energy and enhances grid stability. Commissioned in 2023, it supports Vermont's renewable goals and generates tax revenue, mirroring Black Diamond's potential (VTDigger).

2. **Grid Stability and Reliability**

- Provides frequency regulation and voltage support, reducing blackout risks.
- Supports renewable energy integration, smoothing solar and wind intermittency.

3. **Environmental Benefits**

- Reduces fossil fuel reliance and greenhouse gas emissions.
- Enhances Black Diamond's reputation as a sustainable community.

4. **Community Resilience**

- Offers backup power during outages, critical for emergency services.
- **Case Study**: Rural Maryland
  A 1.75 MW/8.4 MWh BESS in Allegany and Washington counties, Maryland, provided 11 hours of backup power during a high-wind outage, serving over 600 customers. Given Washington's wildfire risks, this is vital for Black Diamond (ESS News).

5. **No Ownership Costs**

- Private ownership eliminates capital and maintenance costs for the city.

Policy Recommendations

To ensure safety and maximize benefits, Black Diamond should adopt policies compliant with King County Ordinance 19824:

General Policies for All BESS:

- **Safety Compliance**: Mandate NFPA 855 adherence, including fire detection and suppression.
- **Emergency Plans**: Require operator coordination with fire departments.
- **Grid Standards:** Enforce smart inverters for safe grid integration.
- **Public Education**: Launch programs to inform residents about BESS benefits and safety.

Scale-Specific Policies:

- **Small-Scale BESS (Residential, 5–20 kWh):** Streamline permitting, enforce basic fire safety, offer tax credits for renewable pairing.
- **Medium-Scale BESS (Business, 100 kWh–1 MWh):** Require fire suppression, inspections, tax breaks for peak demand reduction, commercial zoning.
- **Large-Scale BESS (Utility-Scale, 1 MWh+):** Mandate comprehensive safety plans, environmental assessments, partnerships, and 50-foot setbacks.

Benefit-Maximizing Policies:
These policies aim to enhance economic, environmental, and social benefits from the BESS:

- **Subsidize renewable-paired BESS:** Offer financial incentives to developers pairing BESS with renewable sources, promoting sustainability.
- **Negotiate revenue-sharing with operators:** Secure agreements to share BESS operational revenue, increasing city funds.
- **Integrate BESS into virtual power plants:** This will enable participation in grid services like demand response, generate revenue, and enhance grid stability. (A **virtual power plant (VPP)** is a network of distributed energy resources—such as solar panels, batteries, electric vehicles, and smart appliances—that are coordinated to function like a traditional power plant. Instead of relying on a single large facility, VPPs aggregate smaller energy sources to provide electricity to the grid efficiently and flexibly.)
- **Encourage local hiring:** Prioritize local labor for installation and maintenance, boosting the local economy.

Addressing Potential Concerns

- **Land Use:** Compact designs fit industrial lots, complying with Ordinance 19824. Black Diamond could identify industrial only or a combination of industrial and commercial zones for BESS installations.
- **Aesthetics and Noise:** Quiet, unobtrusive systems blend into surroundings.

- **Tax Revenue Stability:** 10–20-year operation ensures long-term income.
- **Community Impact:** Creates jobs and business opportunities.

Alignment with Black Diamond's 2044 Vision

The BESS supports Black Diamond's vision for a sustainable, vibrant community:

- **Economic Growth:** Tax revenues and reliable energy support retail and tourism.
- **Open Space Preservation:** Compact designs minimize land use.
- **Sustainability:** Renewable storage reduces emissions.
- **Community Engagement:** Educational programs foster participation.
- **Regional Cooperation:** Grid stability benefits neighboring areas.

Conclusion

Hosting a BESS with emerging technologies offers Black Diamond economic, environmental, and resilience benefits while complying with King County Ordinance 19824. Real-world case studies, federal incentives, and precise tax projections ($104,000 annually) demonstrate feasibility. This initiative aligns with Black Diamond's 2044 vision, positioning the city as a leader in sustainable innovation.

Footnotes:

1. The 1.04% property tax rate for Black Diamond was determined using data from Ownwell, which aggregates property tax information. The rate is calculated by dividing total property taxes collected ($16.1 million) by the total assessed value of 2,644 properties ($1.5 billion), yielding an average tax rate of 1.04%, slightly above King County's 0.97% average due to local taxing district needs.

Key Citations:

- Troy, Vermont BESS Case Study
- Rural Maryland BESS Case Study
- Federal Energy Storage Incentives Guide
- Black Diamond Property Tax Rate Information
- King County Ordinance 19824 on BESS Regulations

What about Fire and Contamination Risks

Over the past two years, Black Diamond citizens have made it clear that they are concerned that Battery Energy Storage Systems (BESS) that catch on fire might contaminate air, land, and water. Evaluating this concern in light of technology changes and up-to-date information is critical. This involves examining the potential risks, evidence from real-world incidents, and the role of safety measures in mitigating these risks.

Potential Risks of Contamination

BESS typically uses lithium-ion batteries, which, when they burn, can release hazardous substances:

- **Air Contamination**: Fires involving lithium-ion batteries can produce toxic gases like hydrogen fluoride, which is highly dangerous, and particulates containing heavy metals such as nickel, manganese, and cobalt. These emissions could degrade air quality, particularly near the fire site.
- **Land and Water Contamination**: Water or foam used to extinguish BESS fires can create runoff that might carry contaminants into the soil or nearby water bodies. Additionally, particulates from smoke could settle on land, potentially introducing heavy metals into the environment.

Theoretically, these factors suggest that contamination is possible, which validates the basis for citizens' concerns.

Evidence from Real Incidents

However, real-world data provides a more nuanced picture:

- **Air Quality**: In a notable fire at the Moss Landing BESS facility in California, the U.S. Environmental Protection Agency (EPA) monitored air quality and found no detectable levels of hydrogen fluoride or excessive particulate matter beyond the immediate area. This suggests that while toxic emissions occur, they often dissipate quickly and may not pose widespread or long-term risks to public health.
- **Land and Water**: The same Moss Landing incident revealed elevated levels of heavy metals in nearby marsh soils, indicating some localized soil contamination. However, broader water and soil testing after multiple BESS fires, as reviewed by the Fire & Risk Alliance, showed that firefighting runoff typically does not lead to hazardous contamination. This is partly because the byproducts of lithium-ion battery fires have low solubility in water, limiting their spread.

These findings indicate that while contamination can occur, it is generally confined to the immediate vicinity and does not result in widespread environmental damage.

Role of Safety Measures

Modern safety standards significantly reduce these risks:

- **Regulations**: Guidelines like NFPA 855 outline requirements for fire suppression systems, ventilation, and emergency response plans. Many past incidents involved older BESS designs built before these standards were widely adopted, whereas newer systems incorporate enhanced safety features.
- **Industry Perspective**: The American Clean Power Association (ACP) asserts that BESS are safe when properly designed and regulated, with fires being rare occurrences.

When these measures are in place, the likelihood and severity of contamination are minimized, suggesting that the risks are manageable.

Public Perception vs. Reality

Despite the evidence and safety improvements, some communities remain skeptical. For example, residents near Moss Landing reported health concerns after the fire, and opposition to BESS projects has emerged elsewhere, often citing environmental risks. This disconnect highlights that while the actual risk of contamination may be low and localized, the *perception* of danger persists and fuels citizen concerns.

Conclusion

So, is it accurate to say that BESS fires cause air, land, and water contamination? Yes, there is a potential for contamination—toxic gases and heavy metals can be released during a fire, and runoff or smoke particulates could affect soil or water locally. However, evidence shows that with proper safety protocols, the environmental impact is typically minimal and contained, not leading to widespread or severe contamination. Citizens' concerns are not unfounded, but the reality is less alarming than feared, especially as technology and regulations continue to improve. Ongoing efforts to address and communicate these risks effectively are key to bridging the gap between perception and evidence.

From: Loh, Julien <Julien.Loh@pse.com>
Sent: Friday, May 30, 2025 3:23 PM
To: Darcey Peterson <dpeterson@blackdiamondwa.gov>
Subject: RE: Follow-ups from yesterday

Hi, Councilmember Peterson. Thank you for your continued interest in BESS technology, which will help ensure the grid remains reliable during extreme temperatures and times of peak demand.

Here's some additional information based on your questions.

Do you have examples of successful BESS installations locally?

Please see these examples of BESS installations in PSE's territory. To understand the variety of applications for BESS please view the YouTube video at the bottom of the page where we installed a hybrid solar/battery project on Samish Island.

If yes, do you know how much tax revenue these generate for their respective cities?

Tax revenues will differ based on the project size and local jurisdiction. But for context I can share this. Last year, PSE announced a 200 MW BESS near Sumner. A breakdown of the potential direct tax benefit for the life of the project is below:

Potential Direct Tax Benefit

City of Sumner	$4.08M
Pierce County	$1.12M
Schools	$7.31M
Fire	$2.40M
Library	$0.48M
State, Transit, Housing, and other	$28.31
Total	$43.70

In addition, $5,000 will be invested to supply first responders with BESS industry training. $30,000 has been committed to supply first responders with specialized training. As I have indicated, PSE is prepared to discuss issues related to the city's fire impact fee and other thoughts as it weighs the future of fire service in the city.

Greenwater (Battery Energy Storage System) Project

PSE is investing in a battery storage system to better manage peak electricity demand, avoid the need for additional generation infrastructure and provide a more reliable and efficient energy supply to its customers. The Greenwater project will be located near Sumner and will make it possible for PSE to serve approximately 70,000 residential customers on cold winter days and 100,000 customers on hot summer days.

Battery storage systems are designed to store excess energy generated by wind and solar farms, and release it to the grid during periods of high demand.

"We're investing in technologies like battery storage that can support a continuous and reliable supply of clean energy to our customers," said Craig Pospisil, PSE Vice President of Business Development and M&A. "Battery storage projects like Greenwater help us harness the renewable energy we generate while ensuring the grid remains reliable during extreme temperatures and times of peak demand."

BrightNight will design and install the facility, using lithium-ion batteries, which are used in mobile phones and electric cars, and housed in secure, temperature-controlled enclosures. BrightNight worked with the city of Sumner and other local agencies for two years to secure the Conditional Use Permit and to satisfy requirements of Washington's State Environmental Policy Act (SEPA). Energy from the facility will be fed to the White River Substation and then distributed onto the grid as needed. The project is scheduled to be operational by mid-year 2027.

PSE plans to add approximately 1,500 MW of battery storage capacity by 2030. These systems are an important part of PSE's plans to effectively operate and manage peak demand and play an increasingly important role in how we meet our clean energy goals and comply with CETA.

Do you know if any BESS installations use technology other than Lithium-Ion?

Specific to PSE, I would like to call out our partnership with Form Energy to explore an iron-air battery pilot. Puget Sound Energy partners with Form Energy to evaluate multi-day energy storage solutions

The partnership will allow both companies to collaborate on the development of a 10 megawatt (MW), 100-hour iron-air battery pilot within PSE's service area. Through the partnership, PSE and Form Energy will evaluate the potential benefits of Form Energy's technology, as well as determine an initial project configuration that could be deployed by the end of 2026.

Multi-day energy storage is a battery that can provide power over several days as compared to most commercially available batteries that supply only about four hours of backup power. Energy storage systems are critical to offsetting the need for PSE to build additional generation resources that are used only at times of high demand.

"Our priority is ensuring the lights and heat are on when the sun isn't shining, the wind isn't blowing, or when customers need more energy, such as a cold winter day or during a summer heat wave," said Josh Jacobs, vice president of Clean Energy Strategy and Planning

at Puget Sound Energy. “Doing that in compliance with state law means that we must address a critical reliability gap with carbon free resources that can act as on-demand sources of energy.”

Washington’s Clean Energy Transformation Act requires electric utilities to be coal free by 2025, carbon neutral by 2030, and 100% served by renewable and non-emitting resources by 2045. As a result, utilities need to replace fossil fuel generation that is easily dispatched to meet reliability. At the same time, demand for electricity is expected to increase dramatically due to clean energy policies, such as the proliferation of electric vehicles and requirements for electrification of new buildings.

PSE is pursuing a multi-faceted approach to ensure reliability focused on understanding what is most effective for customers in terms of carbon reduction, cost and technical feasibility.

PSE is undergoing the most significant transformation in its 150-year history as it strives to meet Washington’s state’s clean energy laws—some of the most ambitious in the nation—and provide customers with energy that is safe, reliable and affordable. By 2030, the amount of new, non-emitting generating resources PSE will need to have is more than the utility has acquired in its existence to date.

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Battery Energy Storage Systems – Coming Soon to Your Community?

January 22, 2025 by Steve Butler
Category: Energy Resources and Conservation, Development Regulations and Zoning

Demand for electricity as an energy source is increasing in Washington State and throughout the U.S. This increased reliance on electrical power holds the promise of a more carbon-neutral future, but the demand for ever more electricity has had some unanticipated impacts — including the emergence of "battery energy storage systems" (often referred to as BESS)

BESS facilities are increasingly being used by energy companies to help store electricity and release it on demand. As BESS' popularity increases, there will be a corresponding increase in the need to find sites upon which to locate new BESS facilities. In fact, there have been several newspaper articles over the past few months about BESS facilities being proposed in different parts of Washington State

This is a relatively new type of land use that may not be adequately addressed in local zoning codes and associated regulations. As a result, local governments across the U.S. need to be prepared when a BESS application is submitted at their permit counter.

This blog is the first in a two-part series, with the second part highlighting examples of local BESS regulations.

Description of Battery Energy Storage Systems (BESS)

In simple terms, a BESS uses "large" batteries to store electrical energy generated at one point in time and then discharge it later when needed.

The City of Sumner defines BESS as:

[a] facility consisting of any combination of electrochemical storage batteries, battery chargers, controls, power conditioning systems and/or associated electrical equipment, including transmission lines, whether assembled together or separately, capable of storing at least 200 megawatt hours of electrical energy in order to supply energy at a future time to the electrical grid of a public utility provider(s).

The City of Arlington's BESS code provisions (see AMC 20.114.125) includes the following introductory description:

Batteries are a unique class of energy storage system infrastructure. Because the basic unit is a small cell or pouch, a BESS is modular in nature and can be configured in virtually any size. Additionally, a BESS has relatively limited infrastructure requirements, needing a concrete pad to sit on and a connection to the electric grid. These two factors - *modularity* and *limited infrastructure needs* - mean that a BESS can be built virtually anywhere, including in close proximity to existing commercial and residential uses. [*Emphasis added*]

Larger than batteries typically used in consumer goods and automobiles, as well as those used in individual charging stations for electric vehicles (EVs), the size of an individual BESS "unit" (which contains several individual battery "cells") is still fairly compact in size.

Several BESS units will typically be grouped together in a container (sometime referred to as a "Control Enclosure") that measures around 10 feet wide, 10 feet high, and 30 feet long. Only one or two BESS containers may be needed to store electricity created by a small energy generator.

Individual BESS containers are often combined together on a single site to provide more storage capacity. Large-scale BESS facilities are sometimes referred to as "battery farms" (see the photograph at the beginning of this blog), which are typically located near major producers of electricity, such as large solar farms or windmill installations.

Benefits and Potential Impacts

BESS is viewed as one component of the state's approach to clean energy, as these facilities have the ability to store electricity created intermittently by "clean energy" generators, such as solar panels and windmills. For example, while solar panels produce ample energy during the day, peak electricity demand often occurs in the evening and the surplus energy generated during daylight hours is wasted. Solar panels combined with BESS allows an operator to store this excess power for use during peak demand times.

Another benefit is that BESS can quickly provide backup power, with less noise and without the harmful greenhouse gas emissions caused by diesel emergency generators.

Regarding potential impacts, battery storage systems (particularly those using lithium-ion technology), can present potential safety risks, such as fire hazards and thermal runaway events. It should be noted, however, that national fire and electrical standards have been recently updated to address those risks. More information may be found in the National Fire Protection Agency's (NFPA) BESS Safety Fact Sheet.

Aesthetics and noise are also among the list of impacts caused by BESS. Local regulations can mandate safety standards for the design, installation, and operation of BESS and reference the appropriate national and state standards.

Where a BESS Facility Can Be Located

As mentioned earlier, the modular nature of BESS means they can be sited in a wide variety of locations, based both on the size and functionality of their associated primary use. For example, BESS that act as storage for solar panels or windmills will be located in close proximity to those uses, with a larger number of clean energy generators needing a corresponding higher number of associated BESS facilities.

Conversely, BESS that are used as back-up power sources (as an alternative to a diesel generator) for a single business operation will typically occupy a smaller site "footprint."

Larger BESS facilities will almost always not be located within a building, due in part to help address any heat build-up generated with larger clusters of BESS containers. There are examples of BESS sites in Washington that range from one BESS container to large BESS battery farms.

Local zoning maps and codes can also influence where BESS facilities are allowed to be located, as well as requiring compliance with applicable performance standards.

Conclusion and Additional Resources

Given the benefits of BESS to our state's energy future, it is very likely that Washington will see a growing number of these facilities being constructed in locations throughout our state. Local governments can play an important role by adopting proper standards and procedures to ensure that public safety, environmental protection, and other community concerns are adequately addressed.

A Local Government's Role in Regulating Battery Energy Storage Systems

January 29, 2025 by Steve Butler
Category: Energy Resources and Conservation, Development Regulations and Zoning

This is the second in a two-part blog series on battery energy storage systems (BESS), which are large, modular units composed of rechargeable batteries that can be used independently or in groups to store and later release electrical power generated by another source, maximizing energy efficiency and reducing costs associated with energy retention.

Part 1 of this series looked at what a BESS is, potential benefits and impacts of their use, and where such facilities can, and often are, located. This blog will focus on the approaches two Washington local governments have taken to regulate the introduction of BESS facilities into their communities.

Regulatory Considerations

Local regulations, such as fire codes, zoning requirements, and emergency response protocols can help protect public health and safety and address compatibility concerns. Below is a list of topics that are typically addressed in local BESS regulation:

- Fire and life safety

- Noise impacts
- Screening and security fencing

Part 1 covered those safety-related issues listed above and recommended additional resources for further review. Other issues likely to be addressed in local BESS regulations include facility size limits, location, facility decommissioning, and plans for facility operations and maintenance.

Maximum size limits

Regulatory size limits for BESS facilities can be based on physical size (i.e., the square footage or acreage of a medium or large-scale facility), and/or the amount of stored energy — For example, a threshold of 200 megawatt hours (MWh) or higher is often used to differentiate between a large-scale and medium-scale BESS facility.

Location

Agencies should identify where BESS facilities are to be permitted outright, allowed subject to the issuance of a conditional use permit (CUP), or prohibited. Compatibility with adjacent uses is a related factor, which might result in standards requiring a minimum separation between similar facilities.

Decommissioning of BESS facilities

It is farsighted to plan for a potential BESS closure by requiring preparation of a decommissioning plan and confirming the applicant's financial ability and willingness to do so in the future (Arlington's regulations contain this requirement for large-scale BESS). This type of requirement is often included when local governments develop franchises or lease agreements with other utility/service providers, such as telecommunications companies.

Operations and maintenance plan and schedule

During the project approval process, agencies should also get firm commitments and clear understanding from the BESS owner/operator on how their facility will be operated and maintained. This is another common provision in local telecommunication agreements.

When developing local BESS regulations, it is recommended that all relevant departments within a municipality be involved (such as planning, building, fire, and other emergency response staff) as well as other relevant county and state agencies. Puget Sound Energy (PSE) staff are also available to work with local governments to explain the need for additional energy and BESS facilities.

Case Studies from Two Washington Cities

Though there are benefits, proposed BESS facility development can also generate controversy. For example, the location of a proposed BESS facility near Sedro-Woolley on land zoned for agriculture and in close proximity to a salmon-bearing creek has generated local opposition. What follows, however, are short descriptions of how Sumner and Arlington successfully dealt with BESS projects proposed within their communities.

Sumner

The city received an application for a large BESS facility (200-800 MWh) in February 2024, before they developed regulations to address this type of development. At that point in time, the city made a determination that it was an outright permitted use in the M-1 Light Manufacturing zone as a "major utility facility," given its nature and association with the PSE grid/utility, but the city also required a CUP for the project, primarily because new power lines would need to be constructed within some residential zoning.

The BESS applicant participated in several public outreach opportunities (public open house and other community events) and held their own on-site informational event (with notice provided to the public). Because the city did not yet have specific BESS regulations in place, Sumner relied on the State Environmental Policy Act (SEPA) for conditions related to several issues, such as screening the public's view of the BESS facility and requiring the BESS operator to develop an emergency management plan. The city also closely

coordinated the permit application review of the proposed BESS with the local fire district. The permit was issued in November 2024.

Soon after the BESS application was received, city staff also went to work on creating new development standards to address future BESS facilities. These standards were recently adopted by the city council (see Sumner Municipal Code Section 18.18.60 (X)) and are focused on larger BESS facilities that generate greater than 200 MWh. The council will be working on regulations that address smaller BESS facilities in the near future.

Arlington

The Snohomish County Public Utility District (PUD) contacted Arlington in early 2024 about a proposal to construct a 100 megawatt-hours BESS facility. The city and PUD undertook a collaborative process, which resulted in the July 29, 3034, adoption of Chapter 20.144: Alternative Energy Systems and Technologies to the city's municipal code. Part II of this new chapter directly addresses BESS.

Arlington's BESS regulations create three different tiers. As a proposed BESS facility increases in size (and, correspondingly, potential impacts) permit applicants will encounter an increase in the number of requirements the facility must meet, and fewer zones in which the facility may be located. All BESS facilities, regardless of the tier they fall into, must be screened from view from adjacent property and the public right-of-way and must be securely fenced.

Under Arlington's BESS regulations, a "Tier 1" BESS is allowed in all zones (subject to compliance with a small number of applicable standards). Residential electric vehicle (EV) charging stations are one type of facility that would fall within the Tier 1 category.

A "Tier 2" (medium-scale/commercial) BESS are those facilities with an aggregate energy capacity greater than 40 kilowatt hours (kWh) up to 600 kWh, which are allowed in a small number of commercial and industrial zones, and for which, applicants must obtain an administratively issued special use permit prior.

In contrast, a "Tier 3" BESS (industrial-scale/utility facility) include facilities with an aggregate energy capacity greater than 600 kWh, up to, but not exceeding 200 MWh and are only allowed in the city's General Industrial zones and would need to receive a CUP (after a public hearing before Arlington's Hearing Examiner) from the city and be subject to a multitude of restrictions and requirements. For example, Tier 3 systems must be set back 500 feet from any residentially zoned property and are required to submit a hazard mitigation analysis and an emergency management plan for the facility.

Conclusion

The increased demand for new and alternative sources of electricity generation will result in a growing need for construction of more BESS facilities. As the scale of a BESS facility increases, however, so do its potential impacts.

This blog highlights the efforts of two Washington State cities to regulate BESS but there are other local governments that have adopted their own regulations, such as King County and Whatcom County. It is important that Washington's local governments are aware of BESS, so that they may proactively choose to consider their options for addressing possible BESS impacts.

The author wants to thank Ryan Windish, Community & Economic Development Director, City of Sumner; Marc Hayes, Director, and Amy Rusko, Deputy Director, Community & Economic Development, City of Arlington; Christine Nhan, Local Government Affairs & Public Policy Manager, Puget Sound Energy; and Abby Newbold, Public Policy Intern, MRSC.

NFPA® FACT SHEET

ENERGY STORAGE SYSTEMS SAFETY FACT SHEET

Growing concerns about the use of fossil fuels and greater demand for a cleaner, more efficient, and more resilient energy grid has led to the use of energy storage systems (ESS), and that use has increased substantially over the past decade. Renewable sources of energy such as solar and wind power are intermittent, so storage becomes a key factor in supplying reliable energy. ESS also help meet energy demands during peak times and can supply backup power during natural disasters and other emergencies. However, the rise in the number of ESS installations requires the need for a heightened understanding of the hazards involved and more extensive measures to reduce the risks.

What Is an ESS?

An ESS is a device or group of devices assembled together, capable of storing energy in order to supply electrical energy at a later time. Battery ESS are the most common type of new installation and are the focus of this fact sheet.

DID YOU KNOW?

Battery storage capacity in the United States is expected to more than double between 2022 and 2025 from 9.4 GW to 20.8 GW, according to the U.S. Energy Information Administration.

Some ESS Advantages

Supplement Renewables

Renewable energies such as solar panels or wind turbines only produce electricity when the sun is out or the wind is blowing. Supplementing these with ESS allows users to take advantage of the electricity that is generated when the renewable energy technologies are not producing electricity.

Peak Shaving

ESS allows a user to shift where their electricity comes from by drawing power from the batteries during the higher-cost daytime hours then recharging during the lower-cost nighttime hours. This practice is referred to as peak shaving.

Load Leveling

When power generation facilities ramp up and ramp down to keep up with the changing demand for electricity, it puts stress on the system. ESS can help flatten out the demand curve by charging when electrical demand is low and discharging when it is high.

Uninterruptible Power Supply

ESS can provide near instantaneous protection from power interruptions and are often used in hospitals, data centers, and homes.

Some ESS Hazards

Thermal Runaway

Thermal runaway is a term used for the rapid uncontrolled release of heat energy from a battery cell; it is a condition when a battery creates more heat than it can effectively dissipate. Thermal runaway in a single cell can result in a chain reaction that heats up neighboring cells. As this process continues, it can result in a battery fire or explosion. This can often be the ignition source for larger battery fires.

Stranded Energy

As with most electrical equipment there is a shock hazard present, but what is unique about ESS is that often, even after being involved in a fire, there is still energy within the ESS. This is difficult to discharge since the terminals are often damaged and presents a hazard to those performing overhaul after a fire. Stranded energy can also cause reignition of the fire hours, days, or even weeks later.

Toxic and Flammable Gases Generated

Most batteries create toxic and flammable gases when they undergo thermal runaway. If the gases do not ignite before the lower explosive limit is reached, it can lead to the creation of an explosive atmosphere inside of the ESS room or container.

Deep Seated Fires

ESS are usually comprised of batteries that are housed in a protective metal or plastic casing within larger cabinets. These layers of protection help prevent damage to the system but can also block water from accessing the seat of the fire. This means that it takes large amounts of water to effectively dissipate the heat generated from ESS fires since cooling the hottest part of the fire is often difficult.

ENERGY STORAGE SYSTEMS SAFETY FACT SHEET *CONTINUED*

Failure Modes

These are ways the batteries can fail, often leading to thermal runaway and subsequent fires or explosions.

Mechanical Abuse	Thermal Abuse	Electrical Abuse	Environmental Impacts
Can happen when a battery is physically compromised by either being dropped, crushed, or penetrated.	Can occur when a battery is exposed to external heat sources.	Can happen when the battery is overcharged, charged too rapidly or at high voltage, or discharged too rapidly.	Can lead to battery failure include seismic activity, rodent damage to wiring, extreme heat, and floods.

Tips to Help Keep People and Property Safe

For the Designer/Installer

Explosion Protection/Prevention

If there are enough batteries in a room to create an explosive atmosphere, then explosion prevention systems or deflagration venting should be installed per NFPA 68, *Standard on Explosion Protection by Deflagration Venting*, and NFPA 69, *Standard on Explosion Prevention Systems*.

Fire Suppression System

Testing has shown water to be the most effective medium for cooling an ESS fire. A sprinkler system that complies with NFPA 13, *Standard for the Installation of Sprinkler Systems,* should be installed in buildings where an ESS is installed.

Battery Management System (BMS)

A BMS is a critical system that should be used in an ESS to monitor, control, and optimize performance of an individual or multiple battery modules in an ESS. It can also control the disconnection of the module(s) from the system in the event of abnormal conditions.

Spacing

ESS units should be grouped into small segments limited to certain kilo-watt hours (kWh) and spaced from other segments and walls to prevent horizontal propagation. The table below, which summarizes information from a 2019 Fire Protection Research Foundation (FPRF) report, "Sprinkler Protection Guidance for Lithium-Ion Based Energy Storage Systems," demonstrates the recommended spacing for the testing for specific chemistries and arrangements.

Recommended Separation of Lithium-Ion Battery Energy Storage Systems

ESS Type & Capacity	Object Combustibility	Sprinklered ft (m)	Nonsprinklered ft (m)
LFP 31 kWh	Non Combustible	-	< 3 ft (< 0.9 m)
	Combustible	-	4 ft (1.2 m)
LFP 83kWh	Non Combustible	3 ft (0.9 m)	4 ft (1.2 m)
	Combustible	5 ft (1.5 m)	6 ft (1.8 m)
LNO/LMO 47 kWh	Non Combustible	-	4 ft (1.2 m)
	Combustible	-	6 ft (1.8 m)
LNO/LMO 125 kWh	Non Combustible	6 ft (1.8 m)	8 ft (2.4 m)
	Combustible	9 ft (2.7 m)	13 ft (4.0 m)

ENERGY STORAGE SYSTEMS SAFETY FACT SHEET *CONTINUED*

For the AHJ

Permitting Checklist

Permits should be issued by and in accordance with the procedures of all authorities having jurisdiction (AHJ) and should bear the name and signature of each AHJ or their designated representative(s). In addition, the permit should indicate the following:

1. Purpose of the ESS for which the permit is issued
2. Type of ESS, size, weight broken down by subcomponents or subsystems, type, and amount of any hazardous materials, general arrangement of the system, and extent of work to be performed
3. Address where the ESS is to be installed and operated
4. Name and address of the permittee
5. Permit number and date of issuance
6. Period of validity of the permit
7. Inspection requirements

For the Fire Service

Pre-Incident Planning

The fire department should develop a pre-incident plan for responding to fires, explosions, and other emergency conditions associated with the ESS installation, and the pre-incident plan should include the following elements:

1. Understanding the procedures included in the facility operation and emergency response plan described
2. Identifying the types of ESS technologies present, the potential hazards associated with the systems, and methods for responding to fires and incidents associated with the particular ESS
3. Identifying the location of all electrical disconnects in the building and understanding that electrical energy stored in ESS equipment cannot always be removed or isolated
4. Understanding the procedures for shutting down and de-energizing or isolating equipment to reduce the risk of fire, electric shock, and personal injury hazards
5. Understanding the procedures for dealing with damaged ESS equipment in a post-fire incident, including the following:
   a. Recognizing that stranded electrical energy in fire-damaged storage batteries and other ESS has the potential for reignition long after initial extinguishment
   b. Contacting personnel qualified to safely remove damaged ESS equipment from the facility (This contact information is included in the facility operation and emergency response plan.)

Emergency Operations Planning

An emergency operations plan should be created and contain elements such as procedures to safely shut down the system, procedures for the removal of damaged ESS, general emergency procedures, and annual staff training.

CASE STUDY

On April 19, 2019, a thermal runaway event followed by an explosion occurred at the McMicken Battery Energy Storage System in Surprise, Arizona. A fire captain, a fire engineer, and two firefighters sustained serious injuries. The walk-in structure housed a 2.16 MWh lithium-ion battery energy storage system. This event highlighted the hazard of a non-flaming thermal runaway event and the need for deflagration prevention and protection.

FAQs

Q: Which NFPA standard covers the installation of ESS?

A: If you are installing ESS for either new construction or a renovation, you should review the requirements of NFPA 855, *Standard for the Installation of Energy Storage Systems.*

Q: What is the best extinguishing agent for a fire in a battery ESS?

A: Testing has shown that water is the most effective agent for cooling for a battery ESS. For this reason, a sprinkler system designed in accordance with NFPA 13, *Standard for the Installation of Sprinkler Systems,* is required by NFPA 855, *Standard for the Installation of Energy Storage Systems.*

Learn More

- Visit nfpa.org/ess to access more FAQs and the latest ESS-related training, information, research, and reports.
- To view NFPA 855, visit nfpa.org/855, or to access the standard plus expert commentary, visit nfpa.org/LiNK.

IT'S A BIG WORLD.
LET'S PROTECT IT TOGETHER.®

Battery Energy Storage Safety

Frequently Asked Questions

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1. Why do we need battery energy storage systems?

Grid-scale battery energy storage systems are critical to modernizing our electric grid and reducing pollution from fossil fuels. They typically incorporate the same core lithium-ion technology as the batteries that power the phone in your pocket, but at a larger scale, and with their own unique and rigorous set of safety standards, certifications and regulations. These energy storage systems are necessary to achieve the mandates of the New York Climate Leadership and Community Protection Act (CLCPA), as they will:

- **support renewables** like wind and solar by storing excess energy for use when the sun isn't shining and the wind isn't blowing, helping New York meet its 70% renewable by 2030 target;
- **improve the environment** by directly reducing reliance on peaker plants, which means cleaner air and **improved health** outcomes;
- **save consumers money** by helping make the grid more efficient, which can drive down energy system costs and contribute to a more **affordable** energy transition;
- **stabilize the grid** by providing frequency and voltage regulation; and
- **reduce risk of power outages** by providing resilient **backup power** in the event of an emergency.

2. What are lithium-ion batteries?

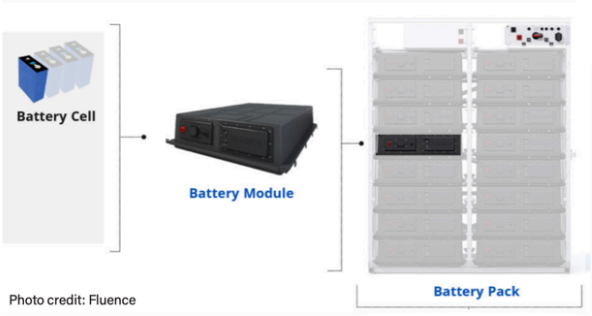
Any product that you own that you can recharge, chances are it uses lithium-ion batteries. The lithium-ion battery is a Nobel-prize winning technology first developed in the 1970s by SUNY Binghamton Professor M. Stanley Whittingham. Not only are lithium-ion batteries good at being recharged, but they are also energy dense, meaning they can hold a lot of energy in a small amount of space, making them lightweight, compact, and versatile.

Lithium-ion batteries have revolutionized modern technologies, enabling portable consumer electronics like laptops, cell phones, and electric toothbrushes; powering electric vehicles from passenger cars to buses, trucks, and helicopters; enabling medical devices like pacemakers, infusion pumps and mobile medical carts; and supplying defense systems, satellites, AI data centers, and the electricity grid itself with critical power supplies.

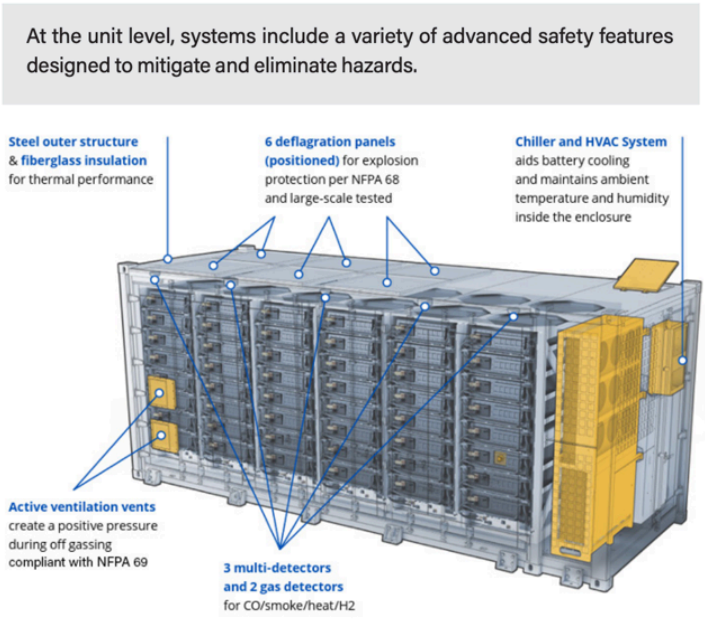
3. Is battery energy storage a safe and proven technology?

Yes! Stationary battery energy storage systems are rigorously tested, vetted, certified, and built to comply with extensive national and international safety standards. The risks posed by batteries, like all electrical infrastructure, can be mitigated or eliminated with rigorous testing and safety standards. That's why product certifications are so important. The most widely recognized battery energy storage safety standards include Underwriter Laboratories (UL) certification and compliance with National Fire Protection Association (NFPA) standards:

- **Underwriter Laboratories (UL) Certification or equivalent.** UL is a third-party certification company founded in 1894 that develops industry-wide safety standards for a wide range of electrical products and lays out severe testing protocols to demonstrate product safety. While other third-party companies also provide similar standards and certification services, UL is the gold standard and the most common in the U.S. You may have noticed a UL sticker on your toaster, refrigerator, or extension cord. Most consumer electrical products sold in the U.S. are required by law to be tested, listed, and labeled by a third-party certified laboratory such as UL to protect consumers from unsafe products. In New York State, all battery energy storage systems are required to meet the following standards:
    - UL 1642 & UL 1973: evaluate and certify the safety and performance of the battery cells (UL 1642) and modules (UL 1973), which together comprise the building blocks of battery energy storage systems. These certifications test their ability to withstand mechanical stress and electrical faults.



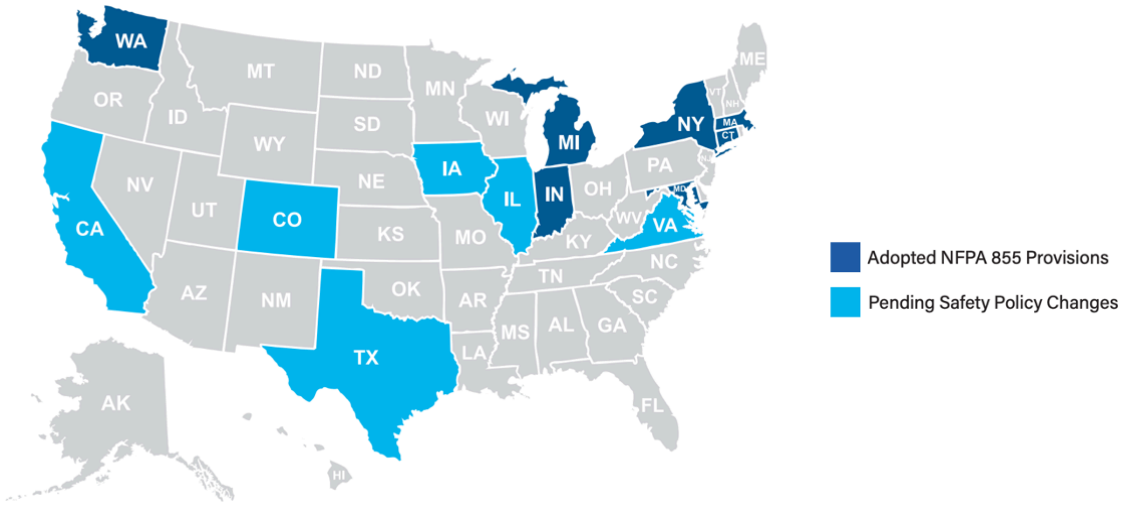
- UL 9540: builds on UL 1642 and UL 1973 by evaluating and certifying the entire battery energy storage system, verifying that it meets rigorous fire, electrical, and functional safety requirements.
- UL9540A: tests performance of the battery energy storage system under failure conditions, to ensure that in the rare case of a fire, the fire will be contained within a single unit located within the secure facility site and won't spread to other units. Data from the testing can inform product design, installation parameters, and code official decisions.



Graphics courtesy of Fluence

These standards take each product several years to obtain, providing a thorough testing framework to minimize risks, protect facilities and communities, and instill confidence in the safety of the technology.

- **National Fire Protection Association (NFPA) requirements.** NFPA is a U.S.-based nonprofit organization that develops and publishes standards relating to fire and building safety that are recognized and respected around the world. The national standard for battery energy storage safety, NFPA 855, provides requirements for the design, installation, commissioning, operation, maintenance, and decommissioning of battery energy storage facilities. It also outlines the necessary collaboration between the battery energy storage industry and local first responders to maximize the safe and reliable performance of battery energy storage as critical grid infrastructure. Adopting and enforcing the latest edition of NFPA 855 is the best approach to ensure safety at all future battery energy storage facilities. New York State has been a national leader in contributing to the development and early adoption of NFPA 855. NFPA 855 includes provisions that comprehensively address fire risks, including venting (NFPA 68), explosion prevention (NFPA 69), electric code (NFPA 70), and fire alarms and signalling (NFPA 72).



Graphics courtesy of American Clean Power

4. How does New York State's Fire Code regulate battery energy storage?

All battery energy storage systems in New York must be designed and installed in accordance with the New York State 2020 Fire Code. The 2020 Fire Code formally adopts NFPA 855, the national standard for battery energy storage safety, and incorporates additional expertise from bodies such as the New York City Fire Department, a national leader on safety standards for battery energy storage in dense urban environments. The 2020 Fire Code currently requires, among other specifications:

- All relevant **permits** to be obtained from the local Authority Having Jurisdiction (AHJ);
- Redundant safety features for **fire prevention and mitigation** (in accordance with NFPA 855);
- **Hazard Mitigation Analyses**, which evaluate the consequences of potential worst-case failure scenarios and prescribes mitigation measures to ensure any impacts are strictly contained;
- Rigorous **testing and certification** (UL1973, UL9540), including **large-scale fire testing** (UL9540A), which demonstrates that any worst-case failure scenario involving a fire in one unit will not spread to an adjacent unit;
- Advanced **monitoring and controls** to enhance system safety;
- **Fire mitigation personnel** to be immediately dispatched in the event of an emergency, at the system owner's expense; and
- A detailed **commissioning plan** that documents the people who are qualified to service, maintain, and decommission the system, and respond to any incidents.

Utility-Scale Battery Energy Storage Systems

MODEL ORDINANCE

MODEL ORDINANCE

ORDINANCE FRAMEWORK

American Clean Power Association

The American Clean Power Association (ACP) is the leading voice of today's multi-tech clean energy industry, representing over 800 energy storage, wind, utility-scale solar, clean hydrogen and transmission companies. ACP is committed to meeting America's national security, economic and climate goals with fast-growing, low-cost, and reliable domestic power.

About this Document

This document is intended to provide guidance to local governments considering developing an ordinance or rules related to the development of utility-scale battery energy storage systems. The recommendations and considerations included in this framework draw from a variety of sources including: national fire safety standards, guidance established by national energy laboratories, and existing state laws and local regulations.

The American Clean Power Association **supports the adoption of NFPA 855**, the national fire protection safety standard for grid-connected energy storage. This safety standard, developed by firefighters, fire protection professionals, and safety experts, provides comprehensive requirements and guidance on the design, installation, and operation of energy storage facilities for all site and community contexts.

Instructions for Use

This document is designed to inform the development of individual ordinances or state regulations to guide the development of utility-scale energy storage facilities. It may not be appropriate for the Model Ordinance to be adopted precisely as it is written. It is intended to be advisory, and users should not rely upon it as legal advice. Local government officials are urged to seek legal advice from their attorneys before enacting a battery energy storage system ordinance. Local governments must consider how the language in this Model Ordinance may or should be modified to suit local conditions, comprehensive plans, existing land use and zoning provisions.

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Section I: Definitions & Applicability

A. Definitions

"Energy Storage" means any technology that is capable of absorbing electricity, storing the electricity for a period of time, and redelivering the electricity.

"Battery Energy Storage System" (BESS) means electrochemical devices that charge, or collect, energy from the grid or a generation facility, store that energy, and then discharge that energy at a later time to provide electricity or other grid services.

"National Fire Protection Association" (NFPA) is a nonprofit organization dedicated to eliminating death, injury, property, and economic loss due to fire, electrical, and related hazards. Established in 1896, the NFPA develops and publishes over 300 consensus codes and standards intended to minimize the risk and effects of fire by establishing criteria for building, processing, design, service, and installation in the United States and internationally. The NFPA's mission extends beyond code development; it also focuses on research, training, education, and advocacy to promote safety and preparedness.

"National Electric Code" (NEC) also known as NFPA 70, is a set of standards for the safe installation of electrical wiring and equipment in the United States. Its primary purpose is to ensure the safety of electrical installations by setting forth requirements to protect people and property from electrical hazards. The NEC covers the installation of electrical conductors, equipment, and raceways; signaling and communications conductors and equipment; and fiber optics. It is updated every three years to incorporate new technologies and improve safety measures

"NFPA 855" the *Standard for the Installation of Stationary Energy Storage Systems*, provides comprehensive guidelines for the safe installation of stationary energy storage systems (ESS), including those using lithium batteries. This standard addresses various aspects of installation to mitigate fire and explosion risks associated with energy storage technologies. It covers topics such as system design, construction, operation, and maintenance to ensure safety and reliability.

"UL 9540" is a standard for Energy Storage Systems (ESS) and Equipment. It is designed to ensure the safety of these systems and covers their construction, performance, and testing requirements. UL 9540 certification is essential for verifying that energy storage systems, such as batteries and related equipment, meet rigorous safety standards to prevent hazards related to electrical, mechanical, and environmental conditions.

B. Applicability

The requirements of this ordinance shall apply to all battery energy storage systems with a rated nameplate capacity of equal to or greater than 1,000 kilowatts (1 megawatt).

The requirements of this ordinance shall apply to all battery energy storage systems permitted and installed in [County/Village/Town/City] after the effective date of this ordinance.

This ordinance does not extend to the general maintenance and repair of battery energy storage systems permitted, installed, or modified prior to the effective date of this ordinance.

C. Application Approval

Applications for permits shall be approved in accordance with Section [XXX] of [County/Village/Town/City] ordinances.

D. Timeline for Review and Approval

The [County/Village/Town/City] shall complete an initial review of the application to determine compliance with the requirements established within this ordinance and shall provide written approval or issue a notice of deficiency within 30 days of receipt of the application.

The notice of deficiency must include a list of each requirement included in this ordinance with which the applicant has not sufficiently demonstrated compliance and issue a recommendation for achieving sufficient compliance.

If no written approval or notice of deficiency is provided within 30 days of receipt of the application, the application shall be considered approved.

Section II: Land Use & Siting Standards

A. Land Use Zones

Battery energy storage systems that comply with the requirements established in this ordinance shall be permitted in all land use zones.[1]

Agricultural: Permitted-by-Right

[1] **Land Use Zoning** definitions differ between local jurisdictions, so it is important for each community to assess the right process for permitting energy storage across zones. Because battery energy storage technologies are uniquely flexible and modular, they can be safely sited within any land use context. In some contexts, battery energy storage systems, which serve as critical grid infrastructure and present minimal impacts to adjacent land, can be sited by right – this includes land use zones being utilized primarily for agricultural, industrial, and commercial functions. Energy infrastructure, like substations, are seamlessly integrated into these zones.

Other zones may present contextual considerations that local jurisdictions may wish to consider, thus battery energy storage facilities may be subject to discretionary permitting in public, mixed use, and residential zones. However, similar to transformers and distribution transmission lines, energy storage facilities can provide critical services while safely operating in these land use zones. Battery energy storage systems may also provide important services, such as lowering electricity costs, to residences as part of community energy infrastructure, or provide reliability-focused services to other critical infrastructure such as hospitals,

Industrial: Permitted-by-Right

Commercial: Permitted-by-Right

Public & Institutional: Discretionary Permit

Mixed Use: Discretionary Permit

Residential: Discretionary Permit

B. Setbacks

Battery energy storage systems shall comply with NFPA 855 requirements related to setbacks and buffers.[2]

An applicant may request a waiver of these requirements under circumstances that an engineered solution may satisfy setback requirements outlined in NFPA 855.

C. Lighting Requirements

Battery energy storage systems shall comply with NFPA 855 requirements related to lighting.[3]

Lighting requirements applicable to other infrastructure within the [County/Village/Town/City], or requirements specified in state statute or code for electrical infrastructure are appropriate to apply to BESS so long as they do not conflict with NFPA 855.

D. Security and Screening

Battery energy storage systems shall have a perimeter fence of at least 7 feet in height, consistent with requirements established in NFPA 70.[4]

Battery energy storage systems shall also comply with specifications established in NFPA 855 relating to barriers and buffering.[5]

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[2] **NFPA 855** includes specifications for setbacks and buffering between the energy storage system and property lines, buildings, and other potential exposures. These distances are determined based on type and size of the energy storage system, its energy capacity, and the surrounding environment.

[3] **NFPA 855** and **NFPA 70** identifies lighting requirements for energy storage systems. These requirements are designed to ensure adequate visibility for safe operation, maintenance, and emergency response. Lighting provisions typically cover areas such as access points, equipment locations, and signage. The specific lighting requirements may vary depending on factors such as the size and configuration of the energy storage system, as well as the surrounding environment.

[4] **NFPA 70** requires all large electrical installations, including utility-scale energy storage systems, to have a perimeter fence of at least 7 feet to prevent unauthorized access to the facility.

[5] **NFPA 855** and **NFPA 70** includes requirements for security and barriers to enhance the safety and protection of energy storage systems. These requirements are aimed at preventing unauthorized access, as well as containing and securing the site. Security barriers may involve measures such as fencing, gates, locks, access controls, and

E. Auditory Requirements

The average noise generated from the battery energy storage systems, components, and associated ancillary equipment, measured at the nearest building, lot line that can be built upon, or public way, shall not exceed any auditory limits established for each land use zone.[6]

Section III: Permitting & Environmental Compliance

A. Site Plan Applications

A site plan application shall include the following information:

1. Property lines and physical features, including roads, for the project site.
2. Proposed changes to the landscape of the site, grading, vegetation clearing and planting, exterior lighting, and screening vegetation or structures.
3. Zoning district designation for the parcel(s) of land comprising the project site.

B. Special / Conditional Use Permits

Applications for special use or conditional use permits shall be considered and approved in accordance with Section [XXX] of [County/Village/Town/City] ordinances.

C. Environmental Compliance

An applicant shall comply with, and receive the necessary permits for, relevant state environmental and wildlife laws prior to commencing construction and operation of the battery energy storage system.[7]

D. Review of Augmentation Plans

Battery energy storage system applicants may include a plan for periodic augmentation to maintain the capacity of the system or nominally increase the capacity of the system for approval as part of the site plan application.

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surveillance systems. Some barriers may be designed to compartmentalize and contain the energy storage system and in the rare case an incident occurs on site. The specific requirements for security and fire barriers outlined in NFPA 855 may vary depending on factors such as the size, type, and location of the energy storage system.

[6] BESS have demonstrated minimal or limited auditory impact on adjacent properties. At close distances, sound caused by BESS can range from 60 to 80 decibels, equivalent to the sound of a conversation (60db) and the sound of being inside a car (80db). Beyond property lines, and with the setbacks and screening specifications in **NFPA 855**, neighboring properties should experience minimal impact. For more information, consult the Pacific Northwest National Laboratory publication on Energy Storage in Local Zoning Ordinances.

[7] During normal operations, battery energy storage systems do not create any emissions or discharge any pollutants. During rare instances of an incident or operational errors, **NFPA 855** details requirements related to the containment of any potential hazards, including spill control measures. Historical investigations into the effects of fire-related incidents have determined there were no harmful levels of toxins detected at the site, adjacent properties, and there was no risk to the broader community.

The owner of an operating battery energy storage system shall provide notice to the [County/Village/Town/City] at least 90 days prior to the commencement of augmentation activities at the site of the battery energy storage system.

The owner shall also provide an updated site plan that identifies any changes resulting from augmentation of the battery energy storage system. Augmentation modifications that require the issuance of a building permit may be considered under the special / conditional use permitting process in accordance with Section [XXX] of [County/Village/Town/City] ordinances.

Section IV: Commissioning, Safety Standards & Certifications

A. Commissioning Plan

Prior to issuance of a building permit, battery energy storage system Applicants shall submit a commissioning plan that contains:

4. A electrical diagram detailing the battery energy storage system layout, associated components, and electrical interconnection methods, with all National Electrical Code compliant disconnects and over current devices.
5. A preliminary equipment specification sheet that documents the proposed battery energy storage system components, inverters and associated electrical equipment that are to be installed. A final equipment specification sheet shall be submitted prior to the issuance of the building permit.
6. Name, address, and contact information of proposed or potential system installer and the owner and/or operator of the battery energy storage system. Such information of the final system installer shall be submitted prior to the issuance of building permit.
7. A commissioning report meeting the requirements of NFPA 855 section 6.1.5 shall be submitted prior to final inspection.

B. Safety Requirements

Battery energy storage systems shall comply with the latest published version of the National Fire Protection Association (NFPA) 855, *Standard for Installation of Stationary Energy Storage Systems,* at the date of the submission of the application.[8]

Prior to issuance of a building permit, battery energy storage system Applicants are required to:

[8] **NFPA 855**: is the standard developed by the National Fire Protection Association (NFPA) that addresses the design, installation, and operation of energy storage systems (ESS). The purpose of NFPA 855 is to ensure the safety of ESS installations and provides prescriptive requirements including, but not limited to: site plans, equipment designs and specifications, fire protection, emergency response, training, maintenance, testing and certifications. Local jurisdictions can comprehensively address safety by simply requiring applicants to comply with the latest version of NFPA 855. The **International Fire Code** (IFC) is harmonized with NFPA 855.

i. Submit an emergency response plan as an appendix to the project application.
ii. Submit a plan as an appendix to the project application for offering site-specific training to the fire service and emergency personnel of jurisdiction prior to commencing operation.
iii. Conduct hazard mitigation analyses if specified by NFPA 855.

C. Equipment Certification

All batteries integrated within the battery energy storage system shall be listed under UL 1973. The battery energy storage system shall be listed in accordance with UL 9540, either from the manufacturer or by field evaluation.[9]

Section V: Decommissioning

A. Decommissioning Plan

A decommissioning plan that is consistent with agreements reached between the applicant and other landowners of participating properties and that ensures the return of all participating properties to a useful condition, including removal of above-surface facilities and infrastructure that have no ongoing purpose, shall be provided by the applicant.

The decommissioning plan shall include, but is not limited to, financial assurance in the form of a bond, a parent company guarantee, or an irrevocable letter of credit, but excluding cash, to be determined by applicant. The amount of the financial assurance shall not be less than the estimated cost of decommissioning the energy facility, after deducting salvage or recycling value, as calculated by a third party with expertise in decommissioning, hired by the applicant.

However, the financial assurance may be posted in increments as follows:

i. At least 25% by the start of full commercial operation.
ii. At least 50% by the start of the fifth year of commercial operation.
iii. 100% by the start of the tenth year of commercial operation. (s) Other information reasonably required by the commission.

[9] **UL 9540 Certification**: When a battery energy storage system is listed under UL 9540, it means that it has been tested and certified by a Nationally Recognized Testing Laboratory (NRTL) to meet the safety requirements outlined in UL 9540, which specifically covers energy storage systems and equipment. This certification indicates that the battery has undergone rigorous testing to ensure it meets safety requirements related to fire, electrical, and other potential hazards associated with energy storage systems. UL 9540 listing provides assurance to consumers, regulators, and insurers that the battery meets recognized safety standards for use in energy storage applications.

Section VI: Resources

As state and local jurisdictions consider the recommended framework for siting and permitting battery energy storage facilities outlined in this model ordinance, ACP seeks to provide communities with resources and technical guidance. ACP encourages the review of the following materials:

NFPA 855: Guiding Energy Storage System Safety: NFPA 855 (2023), the Standard for the Installation of Stationary Energy Storage Systems, provides mandatory requirements for, and explanations of, the safety strategies and features of energy storage systems (ESS). Applying to all energy storage technologies, the standard includes chapters for specific technology classes. The depth of this standard makes it a valuable resource for all Authorities Having Jurisdiction (AHJs). The focus of this fact sheet is on how the standard applies to electrochemical (battery) energy storage systems in Chapter 9 and specifically on lithium-ion (Li-ion) batteries.

U.S. Codes & Standards for Battery Energy Storage Systems: This document provides an overview of current codes and standards (C+S) applicable to U.S. installations of utility-scale battery energy storage systems. This overview highlights the most impactful documents and is not intended to be exhaustive. Many of these C+S mandate compliance with other standards not listed here, so the reader is cautioned not to use this document as a guideline for product compliance. This guide provides a graphic to show the hierarchy and groupings of these C+S, followed by short descriptions of each. This document also summarizes some of the changes in the 2023 edition of one of the most important standards, NFPA 855, and provides a more detailed bibliography of the featured documents.

First Responders Guide to Lithium-Ion Battery Energy Storage System Incidents: This document provides guidance to first responders for incidents involving energy storage systems (ESS). The guidance is specific to ESS with lithium-ion (Li-ion) batteries, but some elements may apply to other technologies also. This guide provides recommendations for pre-incident planning and incident response. Additional tutorial content is provided for each of the hazard categories. The Bibliography provides references to applicable codes and standards, and other documents of interest.

Energy Storage Emergency Response Plan Template: This document is the result of a collaborative effort to develop a standardized template to guide the development of project-specific emergency response plans, informed by the latest evidence-based strategies and recommendations established by the National Fire Protection Association. This document is intended to be adapted by users as needed to be appropriate to the conditions, environment, staffing, structure, technologies, and blueprint of a given site.

Energy Storage & Safety: Safety is fundamental to all parts of our electric system, including energy storage, and the safe operation of our energy infrastructure is critical to provide the electricity that keeps our lights on, our refrigerators running, our homes air conditioned and heated, and our businesses operating. This fact sheet provides a brief overview of how energy

storage is safe by design, with built in features and strategies used to promote and maintain safe operation.

Frequently Asked Questions (FAQs) about Energy Storage Systems: ACP has compiled a comprehensive list of Battery Energy Storage Safety FAQs for your convenience. Read ACP's FAQ document to learn more in detail.

The Role of Energy Storage on the Electric Grid: Energy storage technologies are uniquely positioned to reduce energy system costs and, over the long-term, lower rates for consumers by: optimizing the grid; bolstering reliability; and enabling a clean grid. Energy storage is, at its core, a resilience enabling and reliability enhancing technology. Across the country, states are choosing energy storage as the best and most cost-effective way to improve grid resilience and reliability.

Claims vs. Facts: Energy Storage Safety: Because energy storage facilities are generally newer than most other types of critical grid infrastructure like substations and transformers, communities may have questions about the safety and reliability of the technology. Amidst these questions, some inaccurate claims have been made about energy storage – this resource addresses some of the most common inaccurate claims about energy storage safety.

The 2020 Fire Code also provides local Authorities Having Jurisdiction (AHJs) with the option to require additional safety features, at their discretion. The 2025 Fire Code currently under development is likely to make many provisions *mandatory* that were previously *optional* per the discretion of the local AHJ, in accordance with the Fire Code Recommendations Report published the New York State Inter-Agency Fire Safety Working Group (FSWG) in 2024 (see Appendix for more detail).

5. Are battery energy storage fires common?

The short answer is no; fire-related incidents at battery energy storage facilities connected to the electric grid are incredibly rare. There have been 23 incidents in the last 10 years at U.S. operating utility-scale battery energy storage facilities, despite battery energy storage deployment growth of more than 25,000% nationally since 2018. In comparison, NFPA estimates that there were more than 210,000 fuel-based vehicle fire incidents in 2023 alone.

Notably, e-bike battery fires have raised significant concerns in New York in recent years, with over 250 e-bike fires in New York City in 2023. E-bikes are not yet regulated as strictly as stationary battery energy storage systems, with many off-market products made with improperly manufactured or modified parts that lack proper testing and UL certification, causing dangerous situations for consumers. To address e-bike battery safety, New York State leaders have launched initiatives to prevent fires caused by uncertified batteries, with initiatives like the "Buy Safe, Charge Safe" campaign and legislation requiring e-bike battery UL testing certification. In contrast, UL testing and certification is already a foundational component of permitting for stationary battery energy storage systems.

While any risk of fire raises legitimate community concerns, there has never been a fire incident at a battery energy storage facility that has spread beyond the secure site of the grid-scale facility. In fact, systems designed in accordance with NFPA 855, which in turn requires compliance with UL 9540 and testing to UL 9540A, have mitigations in place to limit and contain any fire to a single battery cell or module within an energy storage system container. Further, laboratory and real-world testing of emissions from lithium-ion cells during a fire, such as this report from Escondido, California, shows that emissions are similar to those found in plastics, couch, or automobile fires.

6. Given all the safety standards, why have there been fires at grid-facing battery energy storage installations?

Past safety incidents have mainly been due to faulty designs or equipment that would not have satisfied current safety regulations in place in New York. Below is an overview of two high-profile fire safety events at battery energy storage facilities, why they occurred, and lessons learned.

Location of Incident	Surprise, Arizona	Moss Landing, California
Size of system	2 MW	300 MW
Year of system installation	2016	2020
Date of incident	April 19, 2019	January 16, 2025
Why it happened	The battery container did not have proper ventilation, leading to a buildup of gases. When first responders opened the enclosure door, introducing oxygen, the accumulated gases ignited, resulting in an explosion. This has been the only U.S. grid-scale battery storage incident resulting in reported injuries.	The energy storage system was sited in a 75-year-old gas turbine facility not designed to house modern battery energy storage systems. The batteries were not compartmentalized, so the fire was not prevented from spreading from one unit to the next. This resulted in a fire that was 240 times larger than what would have been seen in a single unit fire in a standard containerized unit. The investigation into the root cause of the fire is still ongoing.
Injuries	Four firefighter injuries	No injuries
Lessons learned	Following this event, explosion prevention was a top priority integrated into the 2023 updates to NFPA 855. Proper venting is now required to prevent the accumulation of flammable gases, and deflagration vent panels are required to provide an engineered pathway in a worst-case scenario for expanding pressure to escape in a predetermined direction. A system like this would not be allowed to be built in New York State.	The system was not designed to NFPA 855 standards, which require all facilities to (a) compartmentalize the batteries and (b) undergo large-scale fire testing to demonstrate that in a worst-case scenario, the fire will not spread. Compliance with NFPA 855 ensures that all battery energy storage facilities are sited only in buildings or enclosures that were specifically designed to safely house them. Because New York State has already adopted NFPA 855, a system like the one built at Moss Landing would not be allowed to be built in New York State.

In 2023, New York experienced three incidents at battery energy storage facilities in Jefferson, Orange, and Suffolk Counties. In response, Governor Hochul convened the Interagency Fire Safety Working Group, which evaluated both preventive and reactive standards and practices for battery system fire safety, in addition to analyzing the impacts of the fires. Based on available analyses of air quality, soil, and water data collected by a third-party in the days following the incidents, **the Working Group concluded that there were no reported injuries and no harmful levels of toxins detected.**

The Working Group also partnered with subject matter experts to inspect all operational battery energy storage systems above 300 kW in New York to ensure compliance with current safety standards. Finally, the Working Group reviewed all relevant and current Codes, Standards, and Regulations and provided a summary of recommendations to the NYS Fire Prevention and Building Code Council for consideration in the upcoming 2025 Code update. Notably, while local Authorities Having Jurisdiction (AHJs) currently have the *option* to implement the recommendations under the 2020 Fire Code, they would be *required* to do so under the proposed 2025 Fire Code (see Appendix).

7. Are New York's local fire departments able to respond to a battery fire in the event of an emergency?

Developers of battery energy storage projects in New York State work closely with local fire departments to ensure safe system design, provide training, and share information about risks to ensure first responders are prepared to respond appropriately in the event of an emergency. Indeed, all projects receiving NYSERDA incentives must maintain a safety and emergency response plan tailored to the specific project, developed in collaboration with local fire officials.

The industry also ensures regular, high-quality training for first responders, preparing them for coordinated responses that prioritize safety. Further, the industry supports integrating battery safety experts into the State's emergency response infrastructure to ensure that all local jurisdictions have the support they need to respond in the event of an emergency.

Notably, energy storage systems in New York are required to be designed to: 1) prevent propagation of any fire to adjacent systems or properties, through use of firewalls, clearances, and/or setbacks, and 2) minimize the possibility of personal injury in the event of an emergency. Battery energy storage systems are monitored 24/7, with immediate notifications to local authorities in the event of an incident. No specialized equipment is required to respond to a battery fire as compared to a standard structure fire.

8. What legislative initiatives will help ensure the successful development of energy storage in New York?

Legislator support for the following two initiatives is critical to unlock energy storage in New York and ensure we stay on track to achieving the climate and equity mandates of the Climate Leadership and Community Protection Act:

a. Sales Tax Exemption for commercial energy storage: Fossil fuel equipment, solar, and fuel cells already receive a Sales Tax Exemption. Adding an exemption for commercial energy storage has **bipartisan support** in the robust co-sponsorship of S.1527 (Parker) / A.313 (Paulin). A Sales Tax Exemption for commercial energy storage will accelerate deployment, helping to **meet Climate Act targets** while **reducing costs** to ratepayers and having **minimal fiscal impact** to the State.

b. State permitting process for energy storage 25MW or greater: The permitting process for large energy storage systems can be technically complex, and not all local jurisdictions enforce regulations consistently. To **standardize** this process across the State and to ensure that all large battery energy storage systems built in New York are **consistently held to the highest safety standards**, the industry supports a statewide permitting process for energy storage systems 25 megawatts or greater under the Office of Renewable Energy Siting and Electrical Transmission (ORES), in line with the treatment of renewables and electric transmission infrastructure, as described in S.5506 (Kavanagh).

For more information, please visit:

- New York's Inter-Agency Fire Safety Working Group
- NY-BEST
- American Clean Power
- Alliance for Clean Energy New York

You can also reach out to us directly with any questions at info@ny-best.org.

APPENDIX

Recommended changes to the Fire Code make *optional* provisions *mandatory*

The Fire Code Recommendations Report was released by the Inter-Agency Fire Safety Working Group (FWSG) in July 2024 following fire incidents at facilities in Jefferson, Orange, and Suffolk Counties in 2023. The table below provides a summary of the 11 recommendations provided in the report and describes how the recommended provisions are treated under the 2020 New York State Fire Code and the proposed 2025 New York State Fire Code. Notably, while local Authorities Having Jurisdiction (AHJs) currently have the *option* to implement the recommendations under the 2020 Fire Code, they would be *required* to do so under the proposed 2025 Fire Code.

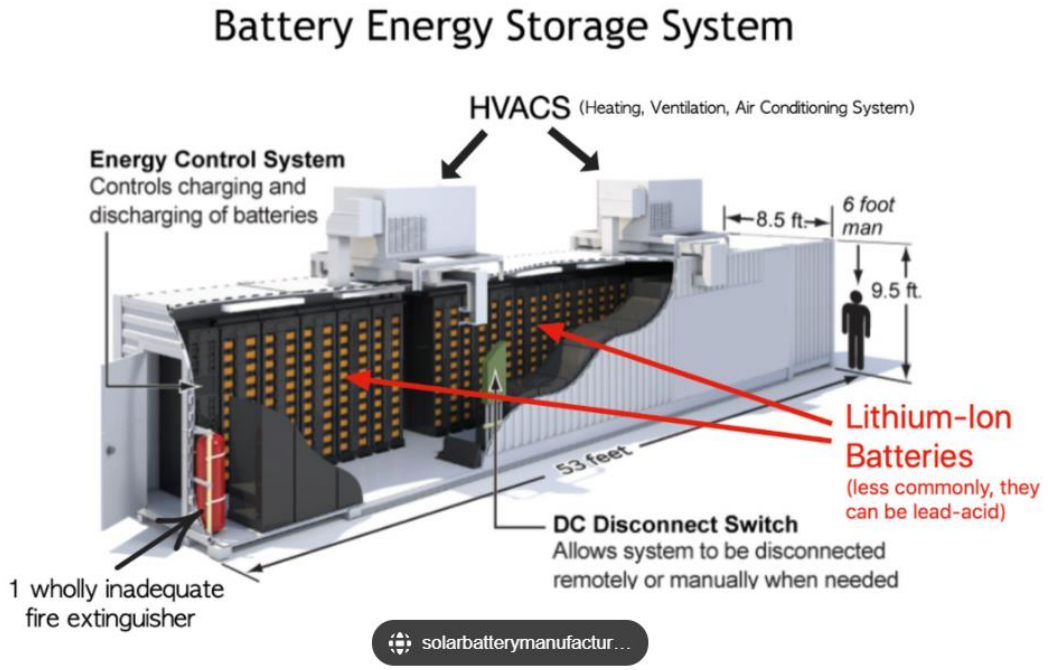
Download the full FWSG report here.

FSWG Recommendation		Treatment under the 2020 Fire Code	Proposed treatment under the 2025 Fire Code
3.1	**Peer-review** by a third-party expert of system installation design.	*Optional* per the discretion of the AHJ (though NYSERDA will conduct peer reviews on all projects >600kWh that receive incentives beginning in 2025).	*Mandatory*.
3.2	**Explosion control** to prevent the accumulation of flammable off-gasses in a worst-case failure scenario.	For indoor and walk-in systems: *mandatory.* For outdoor cabinets: implied but not explicit, *optional* per the discretion of the AHJ (most do require this).	*Mandatory* and explicit for all system types.
3.3	**Fire mitigation personnel** who will be available in the event of an emergency to support local responders, at the owner's expense.	Required to be dispatched immediately in the event of an emergency. Contracted services to comply can be verified by the local AHJ.	Required to be available remotely in 15min and arrive on-site in the event of an emergency within 4hrs.
3.4	**Safety signage** on-site, including contact information for personnel with technical knowledge of the system.	Basic signage required; enhanced signage (including maps of the site) *optional* per the discretion of the AHJ.	Enhanced signage (including maps of the site) *mandatory*.
3.5	**Systems monitoring** to measure voltages, currents, and temperatures within the manufacturer's specifications.	Monitoring systems required; additional 24/7 monitoring by Network Operations Center (NOC) *optional* per the discretion of the AHJ.	Additional 24/7 monitoring by Network Operations Center (NOC) *mandatory*.

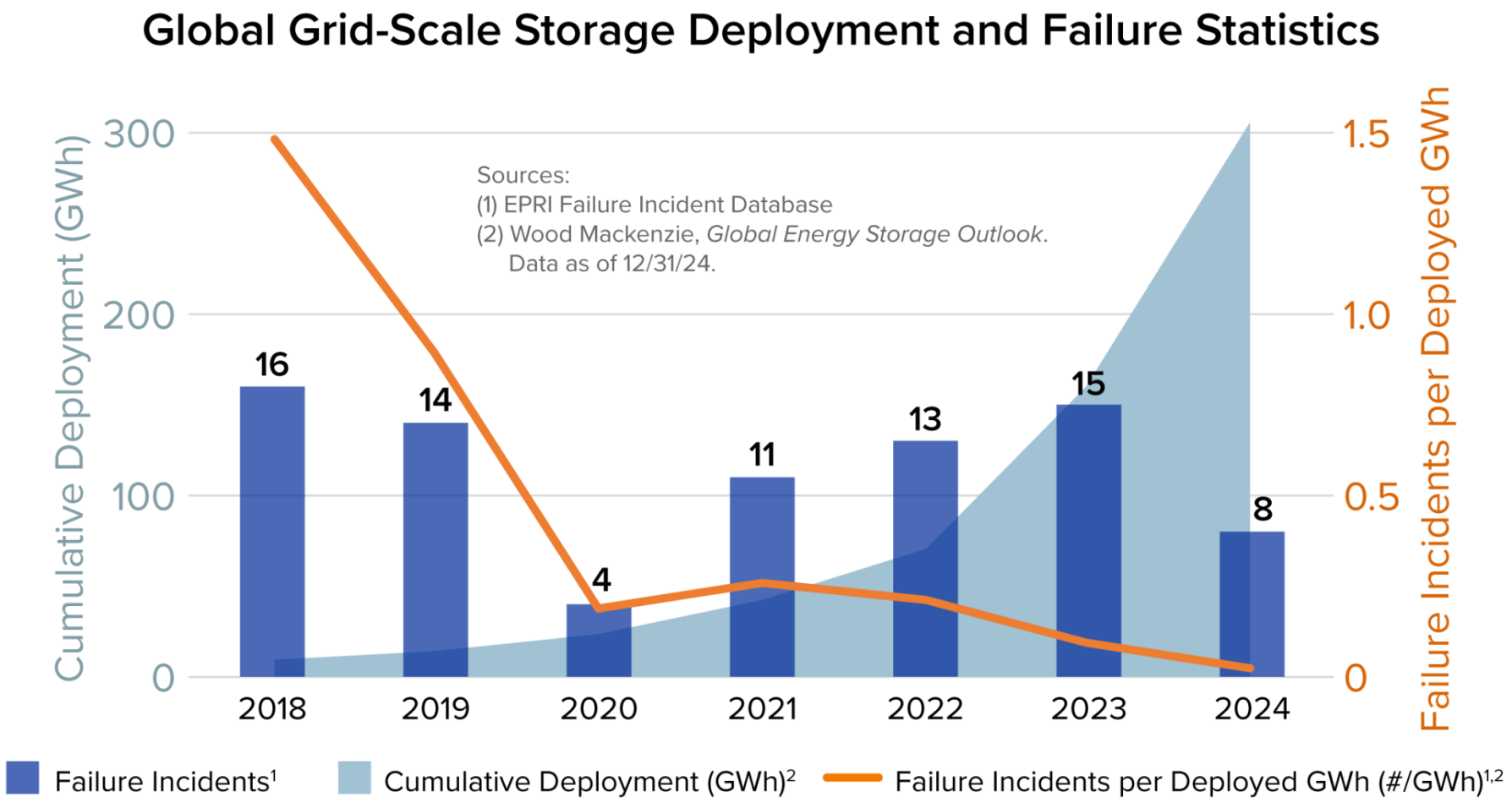
FSWG Recommendation		Treatment under the 2020 Fire Code	Proposed treatment under the 2025 Fire Code
3.6	**Installation security** to prevent unauthorized entry and safeguard appropriately.	Required; additional video surveillance systems *optional* per the discretion of the AHJ.	Additional video surveillance systems *mandatory*.
3.7	**Fire Code exemption** for projects owned or operated by electrical utilities.	Exemption for utilities in place.	Removes exemption for utilities.
4.1	**Emergency Response Plans** and regular **Fire Dept. training** for every battery energy storage installation.	*Optional* per the discretion of the AHJ (though NYSERDA will require this for all projects receiving incentives beginning in 2025).	*Mandatory*.
4.2	**Central Station monitoring of fire alarms** installed in battery energy storage system containers.	*Mandatory*, but with option for AHJs to grant exemptions on a case-by-case basis.	*Mandatory*, and removes option for AHJ exemption.
4.3	Periodic **Special Inspections** by third-party experts to ensure thorough and ongoing safety and compliance, at the expense of the system owner.	*Optional* per the discretion of the AHJ for outdoor systems.	*Mandatory*.
4.4	Inclusion of battery "cabinets" in all Fire Code requirements.	Implied but not explicit; *optional* per the discretion of the AHJ.	*Mandatory* and explicit.

BESS in BLACK DIAMOND?

- THREE QUESTIONS
  - Is it safe?
  - Do we need it?
  - How does Black Diamond benefit?



BESS in BLACK DIAMOND – IS IT SAFE?



The global installed capacity of utility-scale BESS has dramatically increased over the last five years, and while failure incidents continue to occur, the overall rate of incidents has sharply decreased.

The failure rate dropped by 98% from 2018 to 2024 as lessons learned from early failures have been incorporated into the latest designs and best practices.

https://storagewiki.epri.com/index.php/BESS_Failure_Incident_Database

BESS in BLACK DIAMOND – IS IT SAFE?

- **What is the REAL Story…**
  - In 2024, there were 34 BESS fires in the USA
  - 33 included Lithium-Ion Technology
  - 1 used experimental technology
  - 90% of current BESS installations include lithium-ion technology
    - Majority installed before 2015-2020
    - These systems do not have
      - Integrated fire suppression
      - Advanced thermal management
      - UL 9540A Testing protocols
    - **Few incidents involved systems installed after 2021, which follow stricter safety codes.**

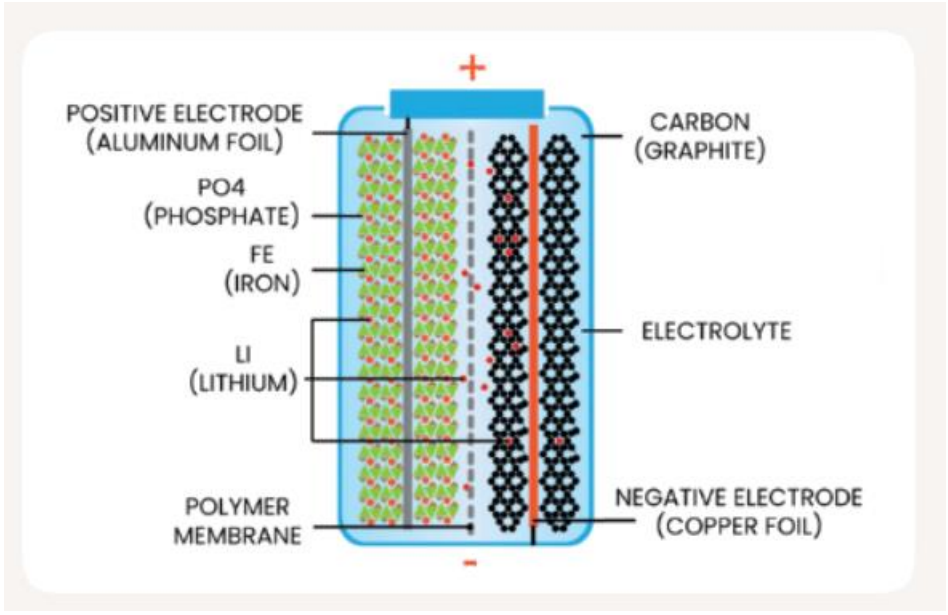
BESS in BLACK DIAMOND – IS IT SAFE?

- **Why Older Systems Are More Vulnerable**
  - Early lithium-ion deployments prioritized energy density over safety
  - Retrofitting older systems is costly and often delayed
  - Many lacked container-level fire isolation or gas detection

- **Key Safety Improvements in modern BESS**
  - Battery Chemistry Advancements
  - Improved Container Design
  - Fire Detection and Suppression
  - Cooling Systems
  - Compliance with National Standards
  - Emergency Planning and Public Coordination

BESS in BLACK DIAMOND – IS IT SAFE?

- **Key Safety Improvements in modern BESS**
  - Battery Chemistry Advancements
    - Use other Technology – (Lithium-ion batteries are fire-prone).
      - Page 2 of the Report shows six types of emerging technologies….
        - Solid State, Lithium-Sulfur, Sodium-Ion, etc.
    - Shift to LFP (Lithium Iron Phosphate)
      - More thermally stable than older chemistries
      - Lower Risk of thermal runaway
    - BD doesn't have to allow Lithium-ion Technology that is prone to fires



Sample Lithium Iron Phosphate Battery

BESS in BLACK DIAMOND – IS IT SAFE?

- **Key Safety Improvements in modern BESS**
  - Battery Chemistry Advancements
  - Improved Container Design
    - Modular Outdoor Enclosures: Reduce fire spread compared to enclosed buildings.
    - Thermal Barriers: Isolate individual battery cells to prevent cascading failures.

BESS in BLACK DIAMOND – IS IT SAFE?

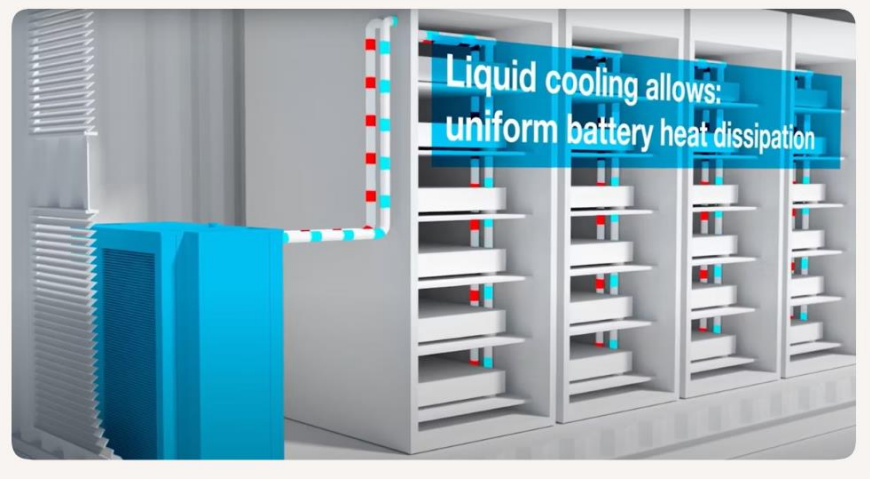
- **Key Safety Improvements in modern BESS**
  - Battery Chemistry Advancements
  - Improved Container Design
  - Fire **Detection** and Suppression
    - Multi-Sensor Monitoring
      - Smoke detectors, gas sensors, & thermal sensors
        - Integrated sensors provide early detection
        - Sensors monitor for hydrogen fluoride, carbon monoxide and other gasses released during thermal runaway.
    - Battery Management System (BMS) Integration
      - Continuously monitors VOLTAGE, TEMPERATURE, & CURRENT for each cell.
      - Automatic shutdown and isolation for cells that exceed limits.
    - UL 9540A Testing
      - System-specific - Standard for evaluating thermal runaway response before fire spreads.

BESS in BLACK DIAMOND – IS IT SAFE?

- **Key Safety Improvements in modern BESS**
  - Battery Chemistry Advancements
  - Improved Container Design
  - Fire Detection and **Suppression**
    - Specialized Suppression Agents
      - Water-based solutions with additives – penetrate batteries more effectively to cool cells and prevent ignition.
      - Aerosol systems – release a fine mist of microparticles to interrupt combustion reactions.
      - Inert gas systems – Use gases like nitrogen or argon to displace oxygen and suppress flames without damaging electronics.
    - Compartmentalization
      - Modern BESS can isolate battery modules to prevent fire from spreading.
    - Automatic Suppression Activation
      - Systems trigger suppression automatically based on sensor data.

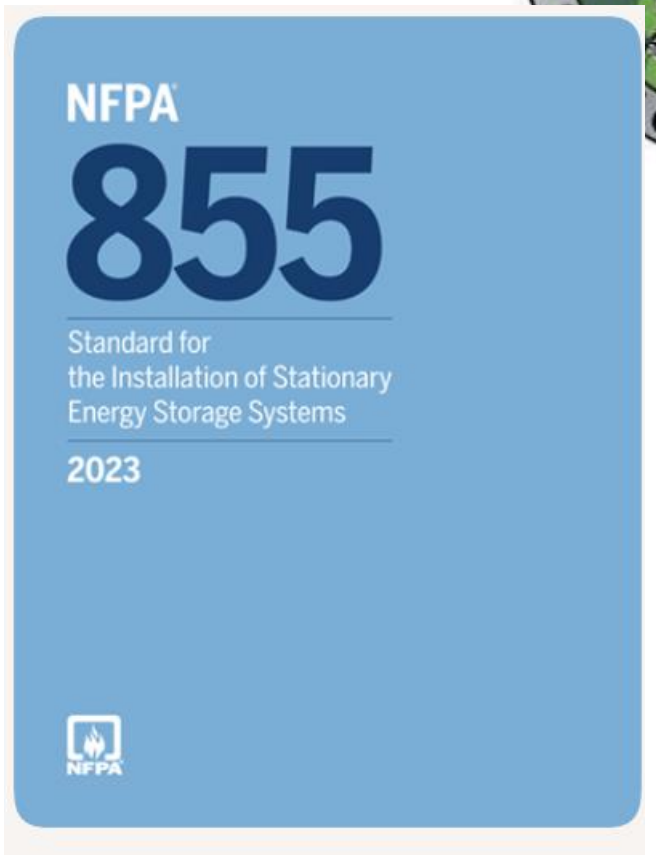
BESS in BLACK DIAMOND – IS IT SAFE?

- **Key Safety Improvements in modern BESS**
  - Battery Chemistry Advancements
  - Improved Container Design
  - Fire Detection and Suppression
  - Cooling Systems
    - Enhanced thermal management: Keeps batteries operating within safe operating temperatures.
    - Redundant Cooling: Prevents overheating during peak load or failure scenarios.



BESS in BLACK DIAMOND – IS IT SAFE?

- **Key Safety Improvements in modern BESS**
  - Battery Chemistry Advancements
  - Improved Container Design
  - Fire Detection and Suppression
  - Cooling Systems
  - Compliance with National Standards
    - NFPA 855: Fire Code for BESS
    - UL 9540A: Thermal runaway testing protocol
    - UL 9540: Certification for complete BESS



BESS in BLACK DIAMOND – IS IT SAFE?

- **Key Safety Improvements in modern BESS**
  - Battery Chemistry Advancements
  - Improved Container Design
  - Fire Detection and Suppression
  - Cooling Systems
  - Compliance with National Standards
    - **NFPA 855: Fire Code for BESS**
      - Title: “Standard for the Installation of Energy Storage Systems”
      - Developed by the National Fire Protection Association
      - Minimum requirements focusing on preventing fire, containment & emergency response.
      - Includes design, installation, operation, maintenance, and decommissioning.
      - Includes fire detection, ventilation, minimum clearance, max capacity, & emergency response.
      - 2023 Edition, published Oct 2022. Update for 2026 expected by end of 2025.

BESS in BLACK DIAMOND – IS IT SAFE?

- **Key Safety Improvements in modern BESS**
  - Battery Chemistry Advancements
  - Improved Container Design
  - Fire Detection and Suppression
  - Cooling Systems
  - Compliance with National Standards
    - NFPA 855: Fire Code for BESS
    - **UL 9540A: Thermal runaway testing protocol**
      - Title: “Standard for Test Method for Evaluating Thermal Runaway Fire Propagation in BESS.”
      - The goal of UL 9540A testing is to provoke thermal runaway at several scales
        - Individual cells – modules – battery units – full installations
        - Assesses how fire or heat might spread and the effectiveness of fire suppression systems.
        - Updated MARCH of 2025.

BESS in BLACK DIAMOND – IS IT SAFE?

- **Key Safety Improvements in modern BESS**
  - Battery Chemistry Advancements
  - Improved Container Design
  - Fire Detection and Suppression
  - Cooling Systems
  - Compliance with National Standards
    - NFPA 855: Fire Code for BESS
    - UL 9540A: Thermal runaway testing protocol
    - **UL 9540: Certification for complete BESS**
      - UL 9540 Certification is a rigorous safety and performance standard for complete BESS systems that ensure they are designed, built, and tested to operate safely and reliably.
      - Effective July 2022. Third Edition – April 2023, effective Sep 30,2024.

Certificate

Certificate no. CU 72403714 0001

License Holder:
Discover Energy Systems corp.
#7-13511 Crestwood Place
Richmond BC V6V 2E9
Canada

Manufacturing Plant:
CN23N6RF

Report Number: CN23N6RF 002 Client Reference: 168426717

Certification acc. to: ANSI/CAN/UL 9540:2020

Product Information

Certified Product: Battery Energy Storage System

Model Designation: 950-0053_1, 950-0053_2, 950-0053_3, 950-0053_4, 950-0053_5, 950-0053_6

Technical Data: DC input /output Voltage: 48V-55.2V
Charge Operating Temperature : 4°C to 52°C
Discharge Operating Temperature : -17°C to 52°C
Other Data: See Appendix (Constr. Data Form)

Remarks:

Appendix: 1

Date of issue: 2024-01-29 (yr/mo/day)

TÜVRheinland

C US

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BESS in BLACK DIAMOND – IS IT SAFE?

- **Key Safety Improvements in modern BESS**
  - Battery Chemistry Advancements
  - Improved Container Design
  - Fire Detection and Suppression
  - Cooling Systems
  - Compliance with National Standards
  - <u>Emergency Planning and Public Coordination</u>
    - Facilities now include site-specific emergency response plans shared with local fire department.
    - Environmental health sampling after incidents shows no public health risk from modern systems.

BESS in BLACK DIAMOND – IS IT SAFE?

- **Key Safety Improvements in modern BESS**
  - Battery Chemistry Advancements
  - Improved Container Design
  - Fire Detection and Suppression
  - Cooling Systems
  - Compliance with National Standards
  - <u>Emergency Planning and Public Coordination</u>
    - Facilities now include site-specific emergency response plans shared with local fire department.
    - Environmental health sampling after incidents shows **no public health risk*** from modern systems.

American Clean Power Association, March 28, 2025 assessment: "…no previous incidents resulted in contamination concentrations that would pose a public health concern or require further remediation." *Even when considering that documented BESS fires include earlier technology and safety standards.

BESS in BLACK DIAMOND – IS IT SAFE?

- **Key Safety Improvements in modern BESS**
  - Environmental health sampling after incidents shows **no public health risk*** from modern systems.
    - Key Findings from real-world incidents:
    - AIRBORNE EMISSIONS – from BESS fires are typically short-lived and localized. Toxic gases like hydrogen fluoride and carbon monoxide dissipate quickly and rarely pose a public health risk beyond the immediate fire zone. (www.power-eng.com)
    - WATER CONTAMINATION – from firefighting is minimal. Lithium-ion combustion products have low water solubility, and standard stormwater management practices help contain and neutralize runoff. (www.power-eng.com)
    - SOIL and GROUNDWATER CONTAMINATION – after major BESS fire showed no contaminant concentrations that would require remediation or pose long-term health concerns. (cleanpower.org)
    - The Fire and Risk Alliance reviewed 35 large-scale BESS fire incidents across the US and found that environmental impacts were significantly lower than those from an industrial or structural fire. (cleanpower.org)

BESS in BLACK DIAMOND – IS IT SAFE?

- **Key Safety Improvements in modern BESS**
  - Battery Chemistry Advancements
  - Improved Container Design
  - Fire Detection and Suppression
  - Cooling Systems
  - Compliance with National Standards
  - Emergency Planning and Public Coordination
- **So, IS BESS SAFE?**
  - According to the Western Way Report, failure rates per installed MWh have dropped by 97% between 2018 and 2023.
  - Modern BESS facilities are now considered as safe as other critical infrastructure like substations or transformers.

BESS in BLACK DIAMOND?

- THREE QUESTIONS
  - Is it Safe?
  - **Do we need it?**
  - How does Black Diamond benefit?

BESS in BLACK DIAMOND?

- **WHY do we need it?**
  - Grid Reliability and Resilience
  - Maximize Renewable Energy
  - Energy Cost Savings
  - Climate and Sustainability Goals
  - Smart Urban Planning
  - Access to funding & Incentives

BESS in BLACK DIAMOND – DO WE NEED IT?

- <u>Grid Reliability and Resilience</u>
  - Grid Stability – regardless of who owns the BESS installation, BESS helps balance supply and demand, reducing outages and improving power quality.
    - Reduces the risk of brown and blackouts.
  - Emergency Support – BESS can be used to provide backup power to critical infrastructure. (i.e. cooling centers, city hall)

BESS in BLACK DIAMOND – DO WE NEED IT?

- Grid Reliability and Resilience
- Maximize Renewable Energy
  - Stores excess solar or wind energy for use when the sun isn't shining or wind isn't blowing.
  - Makes energy "dispatchable" reducing reliance on fossil fuels.

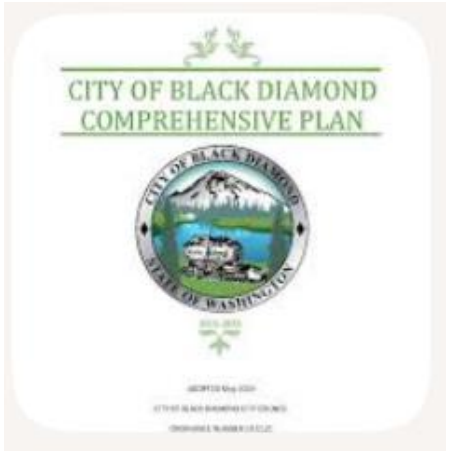
    Unlike traditional power plants that generate electricity on demand, BESS systems store energy and dispatch it when demand is high, or supply is low.

BESS in BLACK DIAMOND – DO WE NEED IT?

- Grid Reliability and Resilience
- Maximize Renewable Energy
- Energy Cost Savings (even without BESS ownership)
  - **Peak Shaving via Third-Party Services** - For a fee, BESS operators can provide an "energy-as-a-service" contract to cities so that the city benefits from reduced "peak charges" on its utility bills.
    - Especially useful for high-load facilities (i.e. water treatment)
  - **Shared Saving Agreements** – Cities can enter into agreements with BESS operators where savings are split between the operator and the city.
  - **Hosting Incentives** – BESS on city property could include lease payments, discounted energy rates, and priority access.

BESS in BLACK DIAMOND – DO WE NEED IT?

- Grid Reliability and Resilience
- Maximize Renewable Energy
- Energy Cost Savings
- Climate and Sustainability Goals
  - Supports City's Climate Goals



The 2015 Black Diamond Comprehensive Plan includes section 4.9 on Climate Change.

- Goals include:
  - Reduction in greenhouse gases.
  - Encourage renewable energy
  - Promote energy efficiency
- Additional Goals in the 2024 Update
- Next Comp Plan update will require a more in-depth Climate Change Element.

BESS in BLACK DIAMOND – DO WE NEED IT?

- Grid Reliability and Resilience
- Maximize Renewable Energy
- Energy Cost Savings
- Climate and Sustainability Goals
- <u>Smart Urban Planning</u>
  - Modular and scalable: Single-family to Industrial scale.
  - Flexible siting: Can be installed in industrial parks, on rooftops, and underground.
  - Can be used to help make individual buildings self-sustaining.
  - Supports microgrids for critical facilities like schools, shelters, emergency facilities, water treatment plants.
  - Enhances disaster preparedness by providing backup power during outages or grid failure.

BESS in BLACK DIAMOND – DO WE NEED IT?

- Grid Reliability and Resilience
- Maximize Renewable Energy
- Energy Cost Savings
- Climate and Sustainability Goals
- Smart Urban Planning
- <u>Access to funding & Incentives</u>
  - Additional Property taxes
    - Property tax is based on assessed value. Installations could be valued in the millions.
    - $10 million installation = $100,000 to $150,000 in annual property tax.
  - Additional sales taxes
    - Mostly during construction phase, but also applies to upgrades, repairs and replacements.
  - Hosting Agreements on City Property could include: lease payments, discounted energy and/or priority access.
  - Grid Improvements could come with: peak shaving, reduced outages.

BESS in BLACK DIAMOND – DO We NEED IT?

- **Why do we need it?**
  - BIG PICTURE… BESS installations are needed because…

🧩 Summary: Why Washington Needs BESS

Benefit Area	Impact in Washington State
Clean Energy Goals	Enables 100% carbon-free electricity by 2045
Grid Efficiency	Reduces peak demand, congestion, and infrastructure costs
Economic Savings	Cuts utility charges and avoids costly upgrades
Community Resilience	Provides backup power and supports emergency services

BESS in BLACK DIAMOND?

- Do we need it?
- Is it Safe?
- **How does Black Diamond benefit?**

BESS in BLACK DIAMOND - BENEFITS?

- **How does Black Diamond benefit?**
  - Property tax revenue
  - Sales tax revenue
  - Grid stability and reliability
  - Environmental benefits
  - Community resilience
  - No ownership costs or liability

BESS in BLACK DIAMOND - BENEFITS?

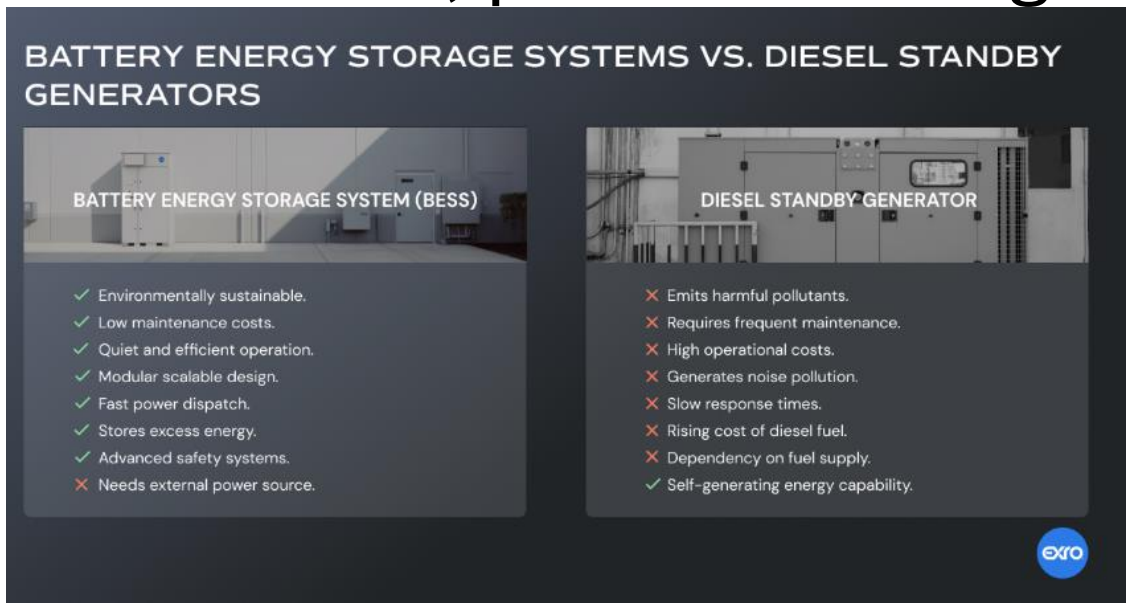
- **How does Black Diamond benefit?**
  - Case Study – City of Arlington, WA
  - Project Overview:
    - Location: 17601 63rd Ave NE, Arlington, WA
    - Developer: Ameresco, Inc.
    - Owner/Operator: Snohomish Co PUD (not the city).
    - System Size: 25MW BESS
    - Parcel Size: 1.5 acres (overall property is 12.4 acres)
    - CUP permit approval 6/19/2025
  - Project Benefits to Arlington
    - Improved Grid Reliability
    - No Capital Investment
    - Property Tax revenue
    - Emergency backup capacity for critical infrastructure.

BESS in BLACK DIAMOND - BENEFITS?

- **How does Black Diamond benefit?**
  - Case Study – City of Arlington, WA (Continued)
  - Property Tax –
    - Assessed Value: Est. at $15m for a 25 MW BESS
    - Average Property Tax Rate: 1.1% in Snohomish County
    - Annual Tax Levy: $165,000
    - 10 Year Total: $1,650,000
  - Sales Tax – (mostly one-time revenue)
    - Project Cost: $15m for 25 MW BESS
    - Sales Tax Rate: Arlington = 10.1%
    - City receives a portion of the sales tax (between 0.85% & 1.0%)
    - Sales tax estimate: $150,000.

BESS in BLACK DIAMOND - BENEFITS?

- **How does Black Diamond benefit?**
  - Property tax revenue
  - Sales tax revenue
  - Grid stability and reliability – slide 19, reduces brown outs and blackouts, provides emergency power.



BESS in BLACK DIAMOND - BENEFITS?

- **How does Black Diamond benefit?**
  - Property tax revenue
  - Sales tax revenue
  - Grid stability and reliability
  - Environmental benefits – slide 22, supports renewable energy.
    - Washington's greenhouse gas emission goal: 95% below 1990 levels by 2050.
    - Washington's Electricity demand is expected to grow 97% by 2050. Requiring 230 million mega-watt hours (MW).
    - Key Drivers:
      - Electrification of transportation (EV mandates by 2035).
      - Electrification of buildings & industrial processes.
      - Replacement of Fossil Fuels all sectors.
      - The increase of data centers to support AI.

BESS in BLACK DIAMOND - BENEFITS?

- **How does Black Diamond benefit?**
  - Property tax revenue
  - Sales tax revenue
  - Grid stability and reliability
  - Environmental benefits
  - Community resilience
    - Role of BESS in meeting WA's 2050 goals:
      - Balancing intermittent renewables like wind and solar
      - Reducing peak demand and grid congestion
      - Providing backup power and resilience during outages
      - Localizing energy storage
      - Minimize the need to purchase power from other states or agencies to meet future demand.
      - ELECTRICITY DEMAND WILL NEARLY DOUBLE BY 2050!

BESS in BLACK DIAMOND - BENEFITS?

- **How does Black Diamond benefit?**
  - Property tax revenue
  - Sales tax revenue
  - Grid stability and reliability
  - Environmental benefits
  - Community resilience
  - No ownership costs or liability – the city carries no liability or responsibility for the BESS assets.

BESS in BLACK DIAMOND - BENEFITS?

- **WRAP IT UP…**
- Batteries today are ubiquitous.
  - They are in our pockets, our purses, our closets, garages… they aren't going anywhere.
  - Yes, there have been fires.
    - But it's a mistake to make this decision based on fear of past events and outdated technology.
  - Technology is changing and improving all the time.
    - Think about the safety improvements in transportation, communication, medicine, etc, etc.
    - Future success is often based on past failure.
    - Future investments in BESS installations within the City will help to diversify the City's revenue sources while having a positive side effect on our environment and helping to meet the state's long-term needs.

BESS in BLACK DIAMOND - BENEFITS?

- **WRAP IT UP…**
  - It is up to us to write an ordinance that includes:
    - Allowed technology
    - Safety requirements
    - Insurance coverage
    - Zoning
    - Setbacks
    - Decommissioning
    - Monitoring Plans
    - Emergency Response
    - Sharing or Priority Agreements
  - We can be as specific as we want to be to ensure that the City and the people who live here benefit while remaining safe.