YELLOW ROSEBUSH
ENERGY CENTER

FREQUENTLY ASKED QUESTIONS ON

BATTERY ENERGY STORAGE SYSTEMS

General Q&A

Why are batteries needed?

As the U.S. energy landscape evolves to incorporate more renewable energy sources, such as wind and solar generation, and less conventional fossil fuel generation, energy storage will play an essential role to stabilize the grid. For the electric grid to function reliably, supply must be matched to demand throughout the course of a 24-hour day. Energy storage systems store excess energy in times of low demand to be used later when it is needed, especially during peak demand hours and in times of emergency or grid outages. Energy storage systems store excess energy in times of low demand and can dispatch energy to the grid when it is most needed, regardless of when the wind is blowing or the sun is shining.

Why is energy storage important?

Energy storage fundamentally improves the way we generate, deliver, and consume electricity. Energy storage helps during emergencies like power outages from storms, equipment failures, accidents or even terrorist attacks. But the game-changing nature of energy storage is its ability to balance power supply and demand instantaneously – within milliseconds – which makes power networks more resilient, efficient, and cleaner than ever before. *(ESA, 2019)*

How does an energy storage system work?

An energy storage system charges by taking AC power from the grid or co-located generation facility and converting it to DC power to store in batteries. The system will automatically stop charging once the battery is at full charge. When there is an energy need on the grid, the system discharges energy back to the grid by converting the energy from DC back into AC.

Is energy storage technology safe?

Yes. Energy storage has been a part of our electricity grid since the 1930s and has a safety record that is similar or better than other electricity generation, distribution, or management methods. Energy storage facilities have multiple layers of automatic protection systems and are typically enclosed by fencing, which prevents the general public from coming into contact with the installations, thus preventing unsafe conditions.

Is energy storage clean?

Yes. Energy storage has no direct emissions requires no pipelines. Its systems typically require a minimal footprint to recycle electricity. Energy storage will also help cut emissions as it takes more of the load from traditional fossil-fuel based generation. *(ESA, 2019)*

Why here?

We site energy storage facilities to maximize benefits to the grid and to rate payers Co-locating solar and batteries at the same site helps to firm up the power supplied by intermittent solar output. Co-location also reduces costs related to site preparation, land acquisition, labor for installation, permitting, interconnection, and developer overhead.

Technical Q&A

How do these batteries compare to the batteries in my phone or computer?

All batteries accept, store, and release electricity on demand. Batteries use chemistry, in the form of chemical potential, to store energy.

The batteries used for grid-scale applications are lithium-ion batteries, which are sealed rechargeable batteries ideally suited for decades worth of use. Grid-scale battery systems utilize the same type of battery cells found all around us incorporated into a state-of-the-art grid-scale resource. These rechargeable batteries are monitored closely on a 24/7 basis by trained professionals. Their heavy-duty design allows the grid-scale battery systems to be charged and discharged daily for decades. The facility itself will be designed with features that fully comply with safety codes and several independent preventative measures, including a battery management system, gas detection, ventilation, fire suppression, and remote monitoring.

Does electricity go straight from the panels to the batteries?

It is possible to design a system where electricity flows directly this way (DC Coupled); however, typically, the locations of solar and storage often involve placing power conversion equipment between the solar and batteries (AC Coupled).

The energy produced by the solar panels can flow directly to the batteries if the electrical grid does not have the demand to use the energy being produced, thus storing the energy for a later time.

Are they sustainable?

Yes. Energy storage batteries have a useful life of approximately 20 years and will require repowering later in the project lifecycle. The original batteries will be removed and recycled for continued use in other applications.

Are battery systems cost-effective?

Yes. Battery energy storage costs continue to decline as the production and supply chains increase efficiencies. Energy storage is at an attractive cost to utilities and other energy users, as evidenced by large increases in grid-scale energy storage installations over the last several years. Current forecasts show energy storage system costs continuing to decrease and demand for renewable energy continuing to increase, leading to an increasing number of installations throughout the U.S.

Will batteries be added to a solar system at start of construction? Or later?

Battery storage can be installed (a) at the time a solar energy facility goes into operation or (b) at a later time to an existing solar system.

How does energy or battery storage work with solar?

The solar panels absorb the energy created by the sun, creating direct current electricity. The battery charges in times of excess solar production and discharges that energy to the grid when there is demand for it. Energy storage helps to balance the grid, creating a more reliable and stable transmission and distribution system.

What maintenance do batteries need? How often?

Annual maintenance is conducted that involves visual inspections, various system checks and tests, and cleaning and adjustment as required.

What are the different types of battery storage installation layouts?

Energy storage installations will either utilize outdoor containers or dedicated-use buildings. For the outdoor container design, batteries will be installed in climate- controlled outdoor containers, with multiple containers daisy-chained to central inverters. An alternate higher density system will utilize a dedicated-use climate-controlled building(s) that will house multiple aisles of batteries in an open-rack configuration connected to inverters outside of the building. There are advantages to both systems depending on local codes and site considerations, but the bulk of the systems to date have been pre-engineered containerized systems.

How are they protected from outside elements? Rain, hail, snow, tornadoes.

Outdoor enclosures are designed with outdoor ratings such as NEMA 3R / IP66 to prevent water ingress. These systems are also designed with appropriate anchor bolts and latching to comply with various wind ratings per the local building code, based upon ASCE 7. This is the same code applied to the design of other commercial and industrial facilities.

What type of batteries will be used?

Generally, all projects will use lithium-ion batteries, with cells similar to those found in cell phones, electric vehicles, and computers.

What size will the system be? Footprint of the facility?

A good rule of thumb is 10-20MW / one acre for a containerized four-hour duration system, though specific site conditions are needed to evaluate the layout fully. Battery building systems will be denser but may have other setback and siting requirements.

What type of enclosure will be used?

This varies by manufacturer. Typically, they are housed in an enclosure similar to a 40’ ISO shipping container or smaller. Some are smaller module-type units that measure 5 ft x 5ft x 7 ft.

Fire & Safety Q&A

What about thermal runway and fires? What is the likelihood of a battery fire?

Lithium-ion cells rarely experience failure leading to fire, however modern codes and standards such as NFPA-855 and UL-9540a require several independent preventative features to be included to minimize the risk of fire. With all these features in place and fully operational, the likelihood of a fire is reduced even further. These features include a battery management system, remote monitoring, gas detection, ventilation, and in some installations, fire suppression.

How does the battery's control system help prevent fires?

All energy storage systems come equipped with a battery management system (BMS) that continuously monitors sensors for temperature, voltage, and current at the battery module level. If the sensors determine a failure is at risk of occurring, the BMS will automatically shut down the battery until the issue is resolved. The sensor groups also issue a failsafe 'heartbeat' signal, ensuring the system will shut down if communication to the sensors is lost.

How will offsite personnel know if an incident has occured onsite?

Remote monitoring will occur over the lifetime of the battery, ensuring that personnel are remotely notified of problems via alarms as soon as they occur.

If a fire does take place, what measures are taken to help minimize the extent of fires?

In most instances of a fire in a containerized battery system, fire water will be applied to the exterior of the container by the fire department to reduce the heat of the container and minimize the possibility of fire spread. Full details of approach will be included in the emergency response plan and fire safety plan.

In addition, battery installations incorporate some form of flammable gas detection / elimination / ventilation equipment. These sensors act to detect, eliminate, and/or ventilate flammable gases from the container atmosphere.

In instances where self-contained outdoor enclosures are utilized, the enclosures are tested per UL- 9540a and equipped with relief mechanisms as required. Additionally, fire suppression can be employed to further reduce damage to internal components.

Fire suppression equipment, including water-based suppression, is required for all battery installations that can be entered by personnel (such as buildings). If required, these systems will be designed to meet all applicable local and national codes.

How will our local fire department be prepared or trained to handle a fire situation at a battery storage system?

An emergency response plan will be developed which will provide detailed response procedures. This plan will be reviewed by the local Fire Marshall and fire department, and training will be conducted to familiarize the local responders with this plan.

What does a developer do to work with the local fire protection personnel to prepare for a new energy storage system?

In addition to the measures mentioned above, emergency signage, emergency operations plans and training are provided in conjunction with local fire services to ensure the hazards are communicated and planned for. An emergency response plan will be developed which will provide detailed response procedures. This plan will be reviewed by the local Fire Marshall and fire department, and training will be conducted to familiarize the local responders with this plan.

What are the steps in a typical fire safety plan for a battery storage system?

A fire safety plan is an extensive document that will be approved by the Fire Marshall and will include site equipment and hazard overview and map, list emergency contacts, document the proper reporting and response procedures, describe the location and descriptions of alarm indication, signage, and emergency switches, describe the fire protection and firefighting equipment, and list required personal protective equipment (PPE) and safety data sheets.

In the event of a fire, what is contained in the water used to extinguish the fire? Is foam used or some special extinguisher fluid?

Water used for fire suppression/cooling to address battery fires is normal fire water piped from city/town sources, hydrants, or other typical fire water sources such as well water or water on fire trucks. No special foam or liquid is required.

While also not required, inert non-toxic “clean agent” non-water-based automatic fire suppression such as FM-200 or NOVEC 1230 may be used in select locations within the building/containers/racking on some systems as additional countermeasures to limit internal damage.

Does fire water after contact with batteries contain toxins or chemicals that can contaminate ground water?

The primary purpose of water being used on an outdoor battery container is to reduce the heat of the container. A vast majority of the water sprayed onto the container will only contact the container housing and will not contact the battery modules themselves. The small amount of water that does leak into the container will be removed as part of the cleanup and decommissioning process.

In the event of a deluge event inside a dedicated-use battery building, the water will be treated in the same manner as deluge water used in other types of electrical fires and dealt with in a similar manner. We are not aware of any ground water contamination issues with battery fire water in these applications.

In the event of a fire, what is contained in the smoke? Are there chemicals or toxins released into the air?

Smoke from any fire can be hazardous to humans, and therefore people should avoid contact with smoke or take measures to reduce their exposure. We are not aware of any data that suggests battery fire smoke is any more or less toxic than residential, commercial, or industrial fires.

Do batteries leak?

Lithium-ion cells do not leak electrolytes during normal operation like some ‘flooded’ lead-acid batteries used in substations and UPS equipment. Lithium-ion battery modules will only leak if they experience catastrophic failure. Most of the leakage will be in the form of gasses, and the volume of liquid electrolyte will be trace amounts of volume compared to that found in the more common flooded lead-acid batteries. These gases and liquids are contained within the energy storage container with safety measures incorporated to deescalate the situation.

Does an energy storage system create noise?

The energy storage equipment will be designed to be consistent with local noise requirements. The noise emitted is no higher than most electrical transformers or HVAC condensers.

Once the construction phase of the energy storage system is complete and the facility is operational, the primary source of noise will be fans associated with the inverter and battery cooling systems and will be like the sound emitted from commercial rooftop HVAC units.

Environmental & Impacts Q&A

What can I expect to see during construction?

The process for constructing an energy storage facility is relatively simple. The construction process may require some heavy machinery or trucks. Typically, there are a few deliveries per day but not enough to provide a large increase in traffic. Workers arrive and leave at the beginning and end of each workday and work occurs during typical business hours.

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What is planned to ensure there are no environmental or visual impacts of an energy storage system?

During the development phase we will look to minimize the impact on the surrounding community by:

· Evaluating adjacent land uses (current and future) to evaluating the compatibility of an energy storage project.

· Minimizing environmental disturbance to the existing site through best management practices with respect to natural resources and storm water and sediment control. Environmental surveys will be conducted for all energy storage projects, and the projects will be coordinated with the appropriate environmental regulatory agencies.

· Developing a comprehensive understanding of local zoning codes to design in accordance with existing requirements and pursue variances when only necessary.

· Utilizing setbacks from property lines and public rights-of-way and strategic landscaping to provide a landscape buffer that reduces and/or eliminates visual impacts of battery storage units from adjacent land uses.

· Utilizing natural and native vegetation in the landscaping to preserve the rural character of the area.