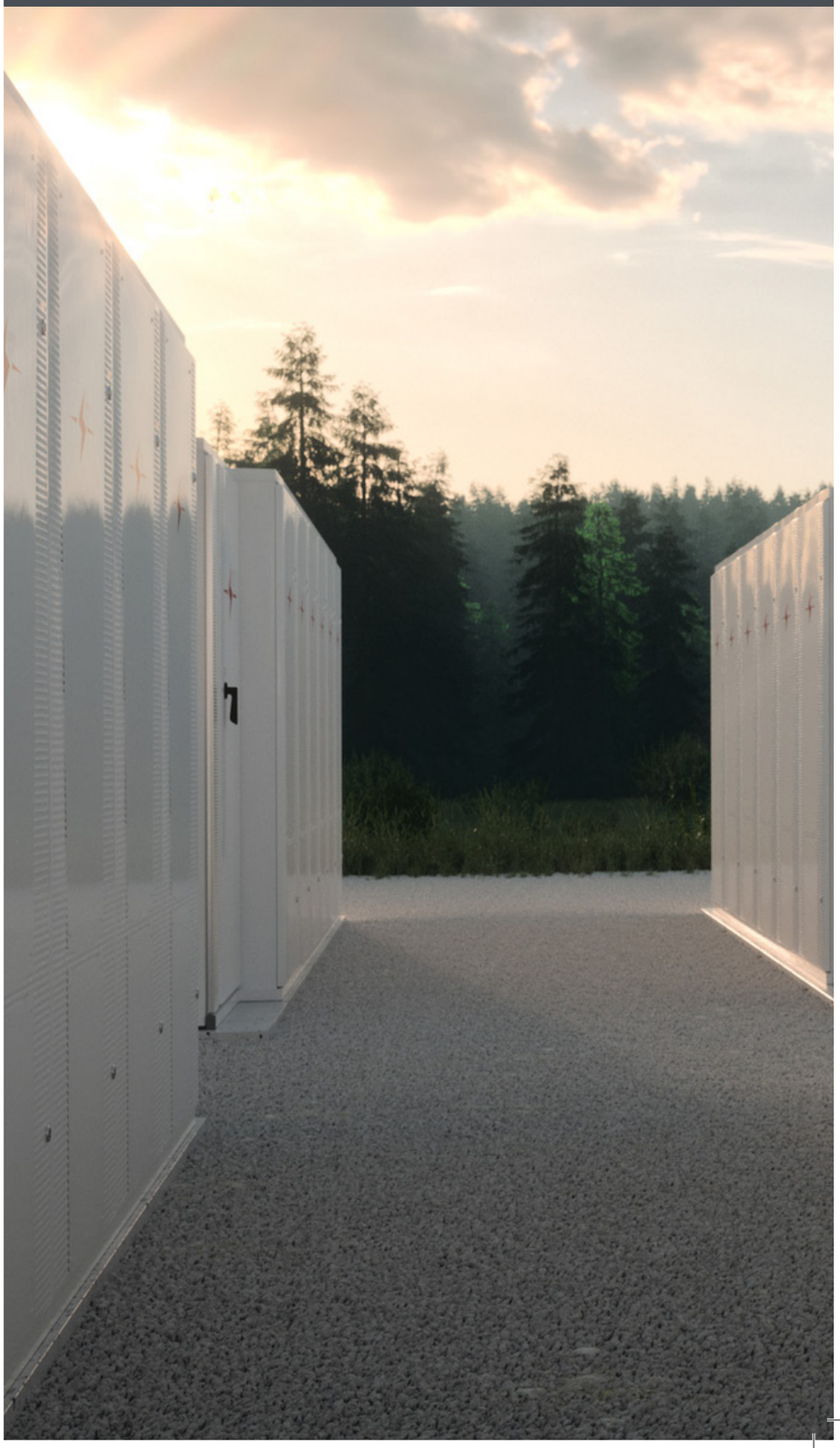
FLICKERTAIL
SOLAR PROJECT

FREQUENTLY ASKED QUESTIONS ON

BATTERY ENERGY STORAGE SYSTEMS



General Q&A

Why are batteries needed?

As the U.S. energy landscape evolves to 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. The electric grid works by matching supply and demand at every moment for the grid to function reliably. 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. Storage helps to place energy on the grid when it is needed, instead of only when it is being produced when the wind is blowing or the sun is shining.

How does an energy storage system work?

In the most basic explanation, 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 children and the general public from coming into contact with the installations, thus preventing unsafe conditions.

Is energy storage clean?

Energy storage has no direct emissions, requires no pipelines, and recycles electricity. Its systems typically require a minimal footprint. (ESA, 2019)

Why here?

1. We site energy storage facilities to maximize benefits to the grid and to customers.
2. Stand-alone storage facilities are typically closer to the electrical load and/or connected to the bulk transmission system (transmission lines/substations) in order to service energy users efficiently.
3. Co-locating solar and batteries at the same site helps to smooth the power supplied by the intermittent solar output and enables the two systems to share some hardware components, which can lower costs rather than having them at different sites.
4. Co-location can also reduce 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 similar to the lithium-ion batteries in your phone or laptop computer, except they are much larger and monitored closely on a 24/7 basis by trained professionals. Grid-scale battery systems utilize the same types of battery cells found all around us, but are incorporated into a state-of-the-art grid-scale resource. Grid-scale batteries are rechargeable, and the heavy-duty design of grid-scale batteries allows them to be charged and discharged daily for decades.

Are they sustainable?

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

How efficient is battery storage?

Battery efficiency is a key metric used to select batteries for a project; the batteries we use have a round trip efficiency of 90-95% or greater (5-10% losses when charging and discharging the batteries). There may also be additional losses when charging and discharging the battery due to other system component losses.

What maintenance do batteries need? How often?

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

What type of batteries will be used?

Generally, all projects will use 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.

How much electricity do they produce?

They produce the same power (MW) as equivalent solar facilities. The energy (MWh) produced is based upon the power and duration: energy = power x time. The nameplate energy rating will generally be based upon a 1- to 4-hour duration depending on the projected use case. For example, a 50 MW x 4-hour system can deliver 200 MWh in a single charge.

What type of enclosure will be used?

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

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 and alarm 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.

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

I. 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.

II. 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.

III. 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.

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 marshal and department, and training will be conducted to familiarize local responders.

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

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.

After contact with batteries, will fire water 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.

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 a catastrophic failure. Most of the leakage will be in the form of gases, and the volume of liquid electrolytes will be trace amounts of volume compared to that found in the more common flooded lead-acid batteries. The liquid electrolyte is technically in the cell itself, although cells are housed within modules, racks, and containers.

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 similar to the sound emitted from commercial rooftop HVAC units.