Battery energy storage systems are here: Is your community ready?

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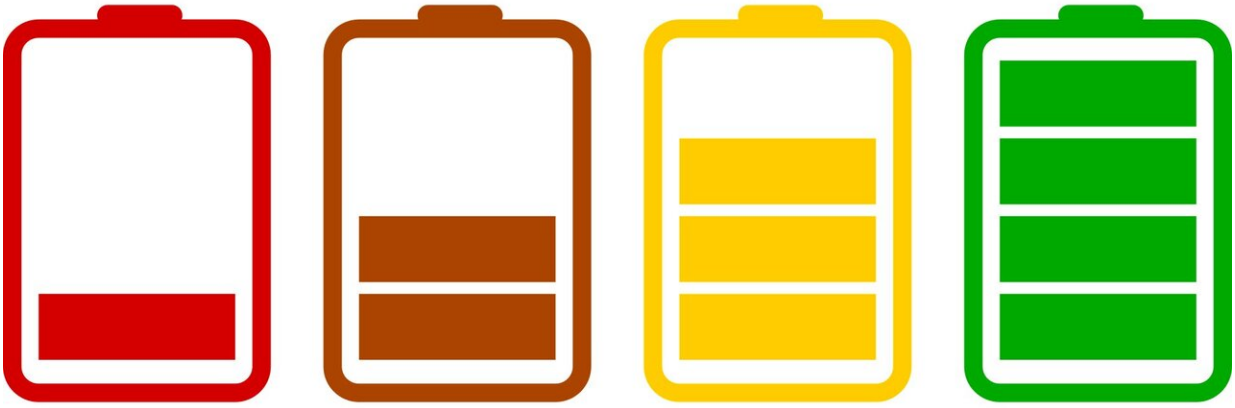

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Across the nation, the transition to clean energy will require thoughtful conversation and robust planning for communities. In fact, many communities are already being asked to evaluate building proposals for a relatively new kind of utility infrastructure: battery energy storage systems (commonly called BESS).

To help this process, Pacific Northwest National Laboratory (PNNL)

experts have assembled BESS resources that communities will need as they look toward their energy goals.

What are battery energy storage systems?

Batteries are a unique class of energy system infrastructure. Because the basic unit is small—either a cell that is just a bit larger than a standard AA battery or a pouch that can be as small as your cell phone battery—BESS are modular and can be configured in virtually any size. Because this is a relatively new energy storage option, many communities don't understand the safety, zoning, and community outreach needed as installments become part of neighborhoods—both in urban and rural areas.

Devyn Powell, an economist at PNNL, surveyed local zoning ordinances and regulators and believes these information gaps can make it difficult for communities and local land use planners to respond to proposed battery storage projects or develop zoning ordinances to guide future expansion. Additional researchers and subject matter experts at PNNL are using fact-based research and real-world experience to help inform near- and long-term planning for BESS, from land use to zoning standards.

Battery energy storage systems—why now?

A new report, Energy Storage in Local Zoning Ordinances, prepared by a team of PNNL energy storage and battery safety experts, defines the potential community impacts of an energy storage project in terms relevant to local planners. It provides real-world examples of how communities have addressed these impacts.

"Local planners already have a lot going on and asking them to become

energy experts in the short time frame of a zoning proceeding—on top of everything else—isn't reasonable," said Jeremy Twitchell, a PNNL energy advisor and co-author of the report.

"This report provides local planners with objective information that can help them fill in those gaps by identifying questions they can ask and conditions they can craft to assure their communities receive the benefits of energy storage while being protected from its risks."

Several states, as well as the federal government, have aggressive decarbonization goals on which they must make progress. One way to meet those goals is by adding wind and solar energy to the grid. These energy sources are sometimes referred to as "variable" due to their dependance on the weather.

Many states have adopted policies to encourage or require the development of energy storage, which provides the flexibility to match wind and solar power to customer demand. These policies, coupled with the falling cost of energy storage technologies, have led to a boom in energy storage deployments.

Battery energy storage systems—what do community members and planners need to know?

With relatively limited infrastructure requirements, needing just a concrete pad to sit on and a connection to the electric grid, BESS can be sited virtually anywhere, including near existing commercial and residential uses.

Since battery energy storage is accelerating quickly and the community need is apparent, planners are faced with several questions around safety, land use perspective, zoning implications, and project permitting. In fact,

relatively few cities and counties appear to have zoning ordinances governing energy storage, further highlighting the need for local planning guidance.

So, how can communities be better prepared?

Most energy storage technologies are expected to use lithium-ion batteries to provide energy on demand for several hours. These types of batteries are most readily available and affordable—great for consumers, community planners, and those focused on grid resiliency. As a modular-type battery, BESS can be customized to different needs. Like a build-your-own menu option, they are flexible—large-scale units can take up as much space as a few acres or as little as the corner of a garage.

Battery storage system failure or fire has been well documented and extensively studied; the PNNL report offers information and suggestions for risk mitigation strategies.

"As with any complex electrical appliance or piece of equipment, failures occasionally occur," said Matthew Paiss, a PNNL battery safety expert and report co-author. "In BESS, while this is rare, it must be considered in the planning process."

Key when preparing for battery installments is for planners to rely on the large body of battery safety information. Paiss cites several resources, including National Fire Protection Association (NFPA) 855, the International Fire Code, and UL Solutions.

"A lot of community uncertainty is about safety considerations and how restrictive to be with BESS to balance aesthetic and safety concerns with deployment or policy goals," added Powell, the report's third co-author.

"Battery energy storage systems are still emerging technologies and

unfamiliar to many local planners. By developing resources that describe key considerations and show what types of regulations have been adopted in other towns and counties, we hope that including common-sense regulations for BESS in local zoning codes will soon become as common as regulations for solar PV."

Zoning considerations, such as sound, odor, and visual and environmental emissions, need to be addressed. While these things might not seem as important as safety, they are still concerns for planners. Most BESS are in electrical enclosures, cabinets, or modified shipping containers.

PNNL researchers suggest that planners consider site location—whether BESS will be housed in new or old facilities—or whether they will they be placed outside, where planners might want to consider trees or other visual barriers. Looking holistically at the size and complexity of a system figures into guidance on sound and odor emissions to neighboring buildings.

And finally, environmental impacts should be considered in the rare event of a failure. Battery systems do not have emissions or environmental impacts during normal operations. During a fire, however, emergency response plans should address the strategy that will be used to mitigate the incident. For example, if water will be used for protecting any exposure, will containment of run-off be required? If smoke presents a potential risk to nearby occupancies, will a shelter-in-place or evacuation be issued?

Change is here for most communities. In fact, it's almost unavoidable—specifically as energy planners work closer with grid planners and other entities to ensure that energy is available when and where needed. However, by using the many tools at their disposal, like state, national, and international codes and standards, planners can help

decrease the risk factors and increase understanding.

That's where PNNL's expertise comes in handy. Nora Hawkins, senior energy policy specialist for the Washington State Department of Commerce, Energy Office, said "Washington's Clean Energy Transformation Act commits our state to an electricity supply free of greenhouse gas emissions by 2045. As such, we are seeing an increase in proposed grid-scale battery energy storage systems and communities that would host these systems are raising important question and concerns.

"Working with PNNL has enabled the state's energy office to more effectively engage with communities, local planning departments, and emergency managers. We are grateful for PNNL's work in promoting national information sharing on how to safely incorporate energy storage into our rapidly transforming clean energy system."

More information: Jeremy B. Twitchell et al, Energy Storage in Local Zoning Ordinances (2023)

Provided by Pacific Northwest National Laboratory

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