Battery Energy Storage System Deployment by Rural Electric Cooperatives

Key Findings

- Storage capacity in rural electric cooperatives is projected to grow from 439 MW to around 1.5 GW in three years.
- NRECA Research identified 136 BESS projects owned or operated by rural electric cooperatives across 27 states. There are currently 76 operational projects, and 40 more are expected to come online between 2025 and 2028. Of the 136 projects, 20 were identified from resources that do not verify the stage of development.
- The operational BESS projects in the electric cooperative landscape were most commonly designed for peak shaving and improving electric service reliability and resilience.

Introduction

According to the U.S. Energy Information Administration, the United States added 10.4 gigawatts of utility-scale (1 megawatt+) battery capacity in 2024, with total installed capacity exceeding 26 gigawatts, a 66% increase over 2023. Forecasts show that BESS deployment is expected to rise in the coming years. EIA also expects increases in wind and solar capacity, which will drive battery storage additions that will be used for increasing the reliability of intermittent generation sources.[1]

Electric cooperatives[2] across the country are increasingly adding battery energy storage systems (BESS) to their portfolios. These batteries will be able to meet a variety of system needs, such as reducing electricity costs during peak demand (called peak shaving), firming intermittent generation, increasing resilience, and transmission and distribution deferment. These advisory uses publicly available data to track the battery storage projects owned or contracted by electric cooperatives and provides an overview of the BESS project deployment by electric cooperatives.

Battery Energy Storage Systems at Rural Electric Cooperatives

NRECA is tracking more than 100 BESS projects that are utility-owned or third-party-owned, where the electric cooperative is the offtaker through a power purchase agreement.[3] There have been 136 BESS projects identified across 27 states as of the first quarter of 2025, and the majority (76) of the projects are operational, while 40 projects are still under development. The other 20 projects were identified from

[1] "Solar and Battery Storage to Make up 81% of New U.S. Electric-Generating Capacity in 2024 - U.S. Energy Information Administration (EIA)," accessed April 11, 2025, https://www.eia.gov/todayinenergy/detail.php?id=64126.
[2] While "electric cooperatives" or "co-ops" will be used, these figures include NRECA's rural public power, tribal, and mutual utility members as well
[3] Information was gathered from publicly available sources.

resources that do not verify the stage of development. North Carolina has the most total BESS projects (43), and it is also where over a third (28) of the operational BESS projects are located.

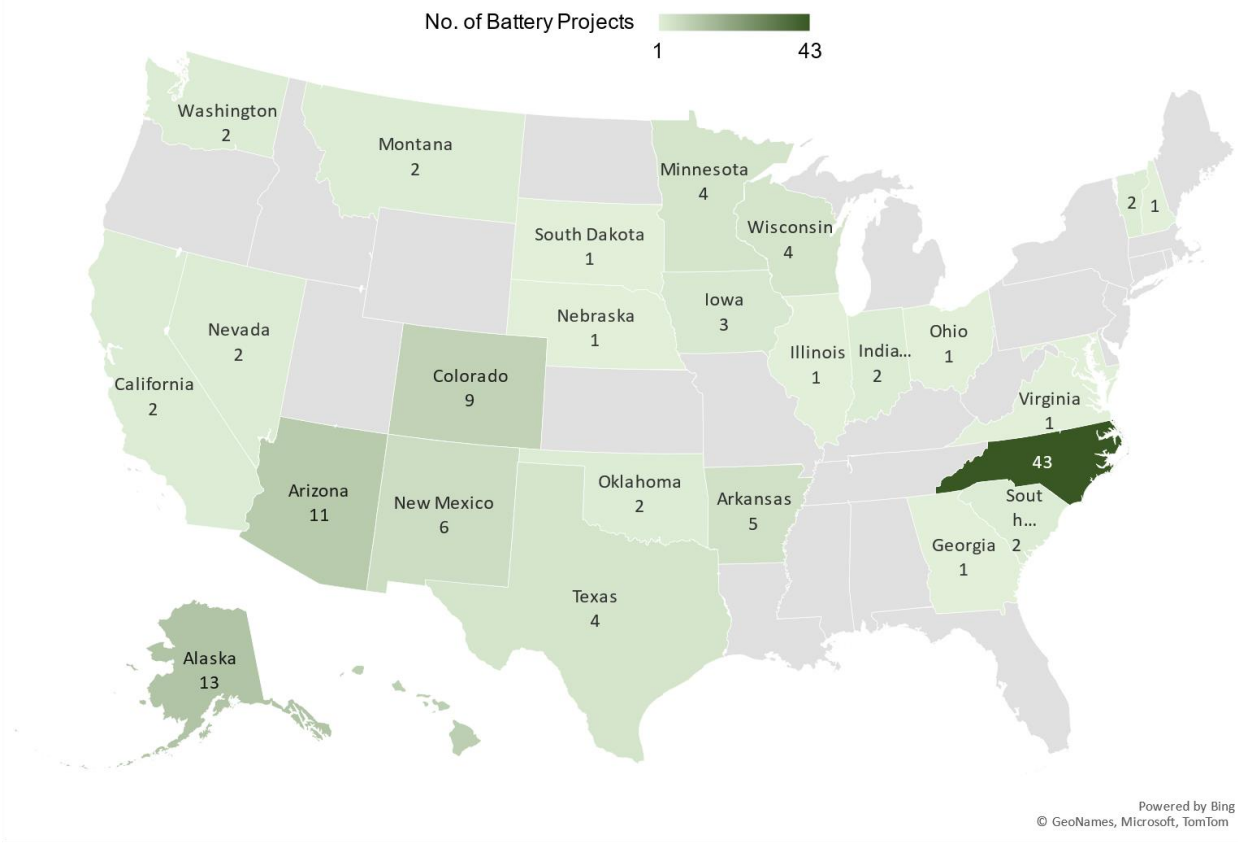

Figure 1. BESS projects by state for electric co-ops

In total, there are 15 operational co-op battery systems that can provide at least 4 hours of stored energy, and an additional 21 BESS projects that are expected to have at least 4 hours of duration. Notably, an electric cooperative in Minnesota is investing in a long-duration iron-air battery system that promises to deliver 1.5 MW of power for 100 hours, which is expected to be in service by the end of the year.[4]

Rural electric utilities have been investing in energy storage projects for over two decades, but a surge of projects came online in 2021 and 2022. Although there has been a decline in BESS project commissions since 2023—only three BESS projects in electric co-ops serving territories in Alaska, California, and Vermont—27 projects were announced in 2024 and at the beginning of 2025. The increased interest of electric cooperatives in energy storage projects may be attributed to the technology's relative affordability. In recent years, prices of lithium have declined, and the availability of direct-pay investment tax credit and battery storage installation credits from the Inflation Reduction Act (IRA) allows cooperatives to benefit

[4] "Cambridge Energy Storage Project," Great River Energy, accessed April 15, 2025, https://greatriverenergy.com/what-we-do/cambridge-energy-storage-project/.

from energy storage technologies.[5,6] Funding streams made available in recent years from federal, state, and local governments have also allowed rural electric co-ops to at least partly finance BESS projects. A mix of federal and state funding at least partially funds several projects identified.

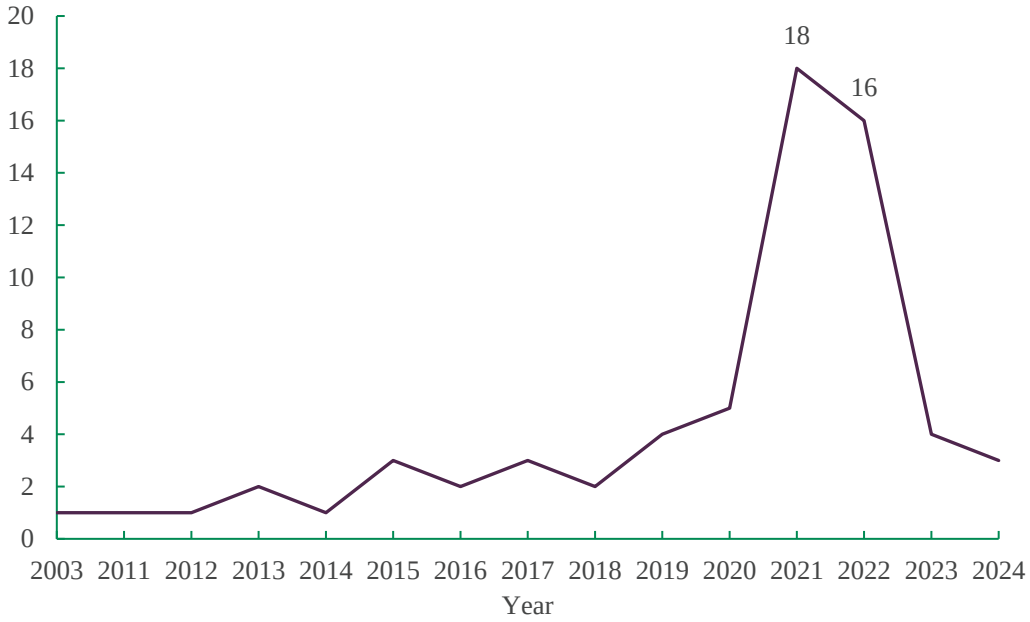

Figure 2. BESS projects commission timeline

The projects identified have rated power ranging from 37 kW to 45.5 MW and have a storage capacity between 94 kWh and 109 MWh. Energy storage projects can be designed to serve a specific or a combination of use cases, also called value stacking. In general, those commissioned by rural electric utilities were intended to achieve electricity cost savings by discharging the battery during peak demand periods while recharging during low demand periods. Many projects were also planned for providing backup power during outages, as well as for pairing with intermittent distributed generation sources to boost electric reliability.

The storage capacity in rural electric cooperatives is expected to increase by at least 2.5 times in the next three years, as over 1 GW of capacity is slated to come online by 2028.

[5] Joseph Bouchard, "New Lithium Discoveries Can Secure America's Clean Energy Future," Text, The National Interest (The Center for the National Interest, January 24, 2024), https://nationalinterest.org/feature/new-lithium-discoveries-can-secure-america%E2%80%99s-clean-energy-future-208808.

[6] NRECA, "Treasury/IRS Direct-Pay (Elective Pay) Credits," Cooperative.com, June 16, 2023, https://www.cooperative.com/programs-services/government-relations/regulatory-issues/Pages/Secure/Direct-Pay-Credits.aspx.

Table 1. Power capacity and storage capacity of anticipated BESS projects

Power Capacity (MW)		Rated Storage Capacity (MWh)
Minimum	0.32	0.26
Maximum	235	940
Median	6.875	18
Total	**1203.2**	3983.5

Table 2. Power capacity and storage capacity of operational BESS projects

Power Capacity (MW)		Rated Storage Capacity (MWh)
Minimum	.037	.094
Maximum	45.5	109
Median	2.5	5
Total	**438.6**	**1046.7**

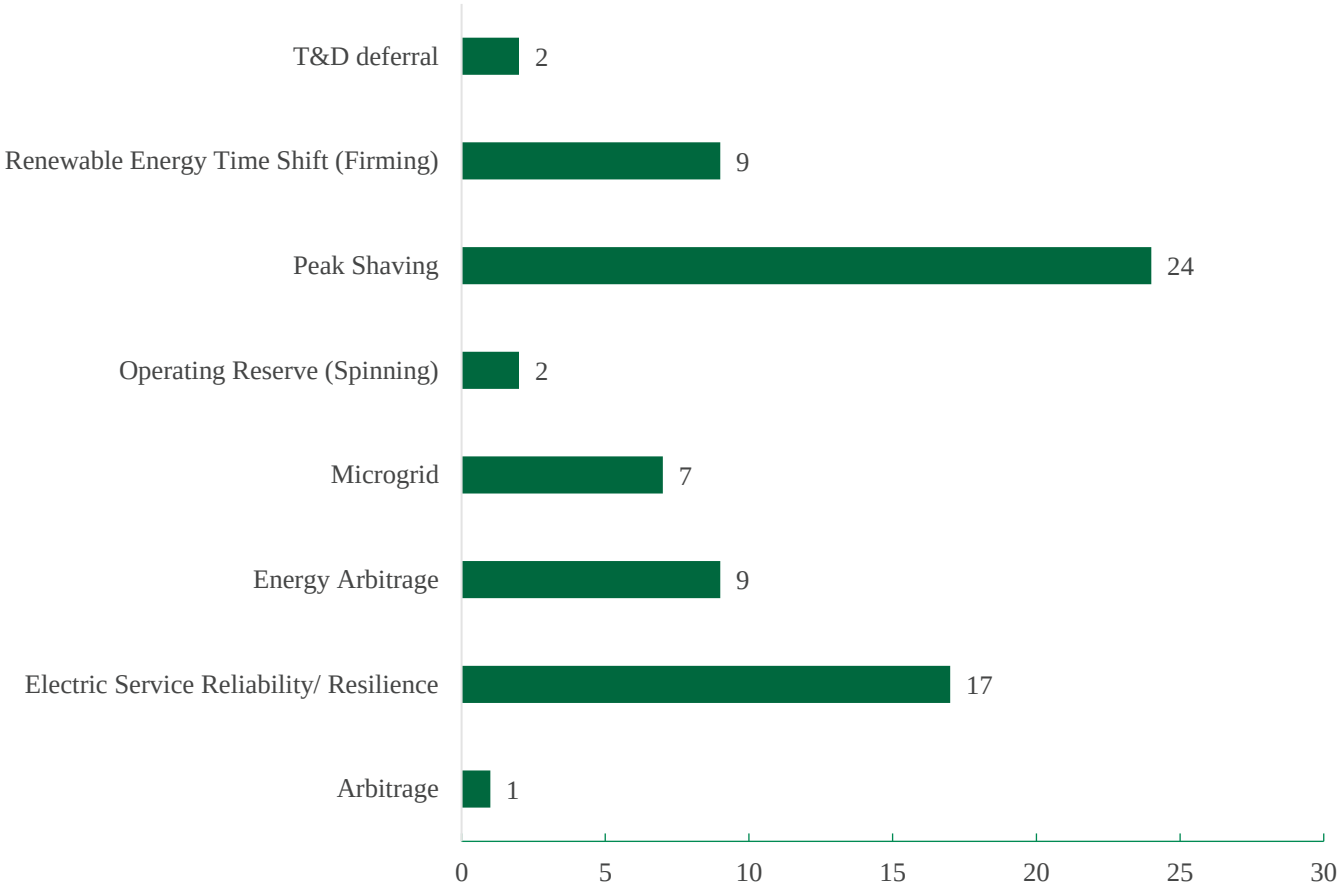

Figure 3. Intended applications of the operational BESS projects

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The majority of the online BESS in electric cooperatives use lithium-ion battery chemistries, which is the type of BESS typically found on the grid today. Three BESS projects use lead-acid batteries, which were the most common chemistry before lithium-ion, but have since fallen out of style due to low energy density and safety concerns from lead-acid cell spills. Finally, two projects are using flow batteries (NiCad, and Zinc), which use a different manner of generating electricity compared to lithium-ion. Another type of flow battery is the vanadium flow battery, which has seen increased demand due to its promising features. Vanadium flow batteries utilize liquid electrolytes, and this type of battery chemistry offers longer duration and does not degrade. This means that they can be discharged fully at 100% without the risk of capacity loss. Despite these advantageous characteristics, vanadium flow batteries are currently limited due to an unstable vanadium supply chain.[7] In 2024, three electric cooperatives from Iowa, Illinois, and Wisconsin announced their BESS projects that will utilize vanadium flow batteries—the first in the electric cooperative landscape.

Table 3. Battery chemistry of the BESS projects

Operational BESS Technology	
Technology	No. of Projects
Lithium-ion	**33**
Lithium-iron phosphate	6
Lead acid	**3**
Flow	**2**
NiCad	1
Zinc	1

Among the operational BESS projects, many are part of hybrid energy systems in combination with other technologies. The most common pairing is with solar photovoltaic (PV) generation because electricity prices typically peak around when the sun sets, and PV plants are unable to produce electricity. The storage can then disperse electricity and help peak shave, the most common use case of BESS projects owned or operated by electric cooperatives can be seen in Figure 3.

Table 4. Resources paired with the batteries in the operational BESS projects

Operational Hybrid BESS Projects		
Paired Resources	No. of Projects	Total (MW)
PV	45	213.0
Wind	3	14.5
Hydropower	1	7.3
Fossil Fuel Generator	7	16.5
Methane/Biogas	1	0.2
Grand Total (MW)		**251.5**

[7] Nancy W. Stauffer, "Flow Batteries for Grid-Scale Energy Storage," MIT News | Massachusetts Institute of Technology, April 7, 2023, https://news.mit.edu/2023/flow-batteries-grid-scale-energy-storage-0407.

Conclusion

The adoption of battery energy storage in rural electric cooperatives has had an uptick in recent years, mostly attributed to the tax incentives made available through the IRA, as well as the relative decline in the cost of battery technology. As of the first quarter of 2025, electric cooperatives have about 500 MW of energy storage capacity in operation. This is projected to reach about 1.5 GW in three years based on new project announcements, as interest in maximizing the benefits of solar and wind grows, combined with economic drivers such as direct-pay investment tax credit, battery storage installation credits, and the relatively cheaper price of the technology compared to past years.

References

Bouchard, Joseph. "New Lithium Discoveries Can Secure America's Clean Energy Future." Text. The National Interest. The Center for the National Interest, January 24, 2024. https://nationalinterest.org/feature/new-lithium-discoveries-can-secure-america%E2%80%99s-clean-energy-future-208808.

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Additional Resources

As part of the Outreach for Advanced Storage Integration and Support (OASIS) project[8], NRECA Research released a report last October on BESS deployment by our members. That report, and an associated webinar are available here.

In addition, as part of the Rural Energy Storage Deployment Program (RESDP)[9], NRECA Research worked with the Pacific Northwest National Laboratory (PNNL) to produce a Battery Energy Storage System Safety Report focused on the importance of codes and standards for BESS safety, which can be found here.

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[8] OASIS is a federally funded initiative aimed at providing NRECA members access to educational tools and resources to empower them to integrate energy technologies with their generation systems.

[9] The goal of the RESDP program is to successfully deploy battery storage systems at rural critical infrastructure served by electric cooperatives to increase resiliency, improve system efficiency and to collect best practices and lessons learned from these deployments with electric cooperatives across the country.