Stored Potential

The impacts of utility-scale battery energy storage systems on communities and the grid

Report / August 2026

Authors and Acknowledgments

Authors

Erifili Draklellis
Aradhana Gahlaut
Lauren Shwisberg
Celia Tandon

Authors listed alphabetically. All authors are from RMI.

Contacts

Erifili Draklellis, edraklellis@rmi.org
Celia Tandon, celia.tandon@rmi.org

Copyrights and Citation

Erifili Draklellis, Celia Tandon, Aradhana Gahlaut, and Lauren Shwisberg, *Stored Potential: The impacts of utility-scale battery energy storage systems on communities and the grid,* RMI, 2026, **https://rmi.org/resources/stored-potential**.

Acknowledgments

The authors would like to thank Bev Bendix, Drew Beyer, Jesse Cohen, Genevieve Lillis, Sarah Toth Kotwis, and Gaby Tosado for their review and feedback throughout the development of the report.

About RMI

Rocky Mountain Institute (RMI) is an independent, nonpartisan nonprofit founded in 1982 that transforms global energy systems through market-driven solutions to secure a prosperous, resilient, clean energy future for all. In collaboration with businesses, policymakers, funders, communities, and other partners, RMI drives investment to scale clean energy solutions, reduce energy waste, and boost access to affordable clean energy in ways that enhance security, strengthen the economy, and improve people's livelihoods. RMI is active in over 50 countries.

Table of Contents

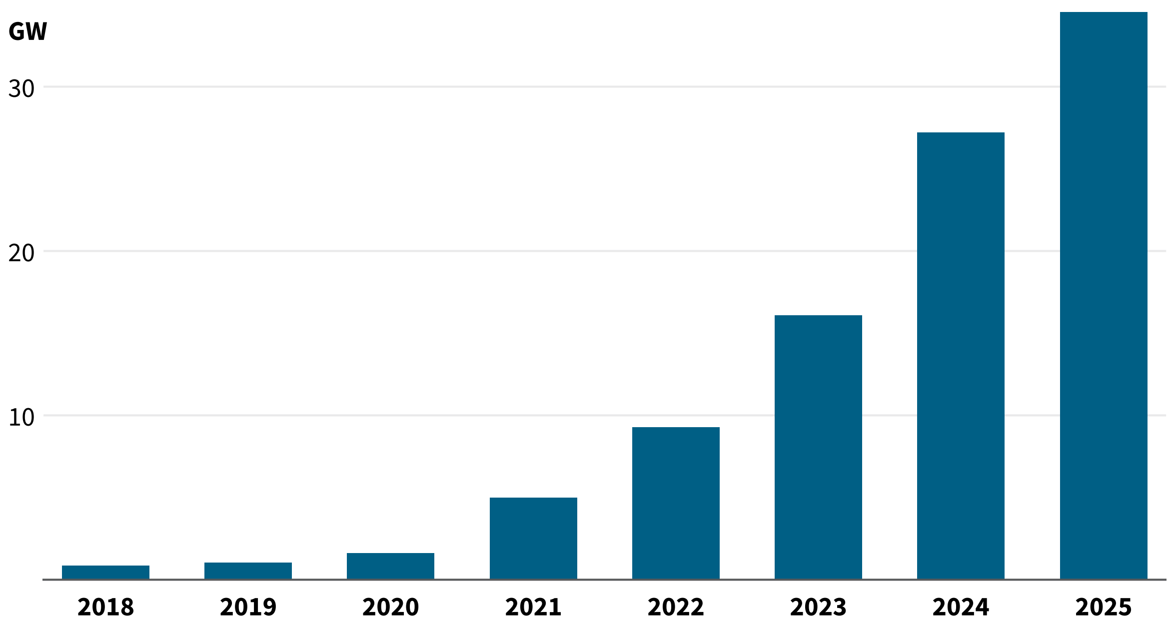
Introduction

Across the United States, communities are facing difficult choices about how to balance reliability, affordability, and local priorities when planning the future of their electric systems. Battery energy storage system (BESS) projects are among the several resource options utilities are adopting to integrate renewable generation, manage peak demand, and support grid reliability.

Since 2018, BESS capacity deployed in the United States has increased more than 40-fold (see Exhibit 1), with much of this growth occurring in Arizona, California, and Texas. Looking ahead, federal interconnection and planning data indicates that roughly 67 gigawatts (GW) of battery storage projects are planned to come online by 2030, making batteries the second-largest source of new electric capacity after solar and exceeding planned additions of new natural gas generation.[i] BESS capacity is expected to increase by more than 300% by 2033.[1]

Exhibit 1

Cumulative operating battery storage capacity in the United States (through July 2025)



RMI Graphic. Source: US Energy Information Administration (EIA) Form 860

As deployments have increased, batteries have started to play a more visible operational role during extreme weather and peak-load conditions, generating data about how their performance compares with more established resource types. At the same time, public concern has highlighted the importance of

i Natural gas is made up mostly of methane, a warming gas about 80 times more powerful than carbon dioxide. The US Energy Information Administration (EIA) Preliminary Monthly Electric Generator Inventory (EIA-860M) tracks existing and planned electric generating capacity reported by developers and utilities, including battery storage projects with expected online dates through 2030. Data was accessed via the EIA electricity data portal: **https://www.eia.gov/electricity/data/eia860m/**.

system design, siting, and emergency preparedness for battery projects. Given the pace of deployment, communities and local decision makers need clear, consistent information about the impacts of these systems. This report examines large-scale (i.e., 100 megawatts [MW] and greater) BESS projects across the United States, drawing on available data to assess their reliability contributions, economic and fiscal impacts, health and environmental benefits, and the evolving safety landscape around improving storage technologies.

Reliability

Power systems are designed to meet electricity demand at all hours of the year, including during rare but critical moments, such as extreme weather or unexpected equipment failures. Batteries can support grid reliability in several ways: they respond almost instantly to small imbalances on the grid, which is known as ancillary services; they help smooth sharp shifts in demand or generation, such as when solar output falls in the evening, often called ramping support; and they can deliver sustained power during the highest-risk peak hours, providing what grid planners call resource adequacy.

Battery performance during periods of grid stress and outage risk

When weather is most extreme, electricity demand typically rises and the grid must work harder to maintain reliability. To understand whether batteries help the grid during these moments, RMI examined how BESS facilities performed during the hours of greatest operational stress. For California and Texas, we identified the specific hours when real-time market prices were highest. These hours serve as a clear indicator of system stress because prices spike when the grid has limited flexibility and maintaining reliability becomes more difficult. We then assessed whether batteries provided meaningful contributions during those high-price hours, when their performance matters most for avoiding blackouts.

BESS deployment on stressed grid days in California

As of 2025, California had deployed more than 14.5 GW of battery storage capacity following roughly 15 years of sustained policy, procurement, and market support. That total capacity represents approximately 38% of California's recent peak demand.[2]

To assess how batteries perform during periods of highest grid stress, we evaluated California's seven tightest days in 2024 and examined battery performance during those hours.[ii] Across these tight hours, batteries delivered a consistent and material share of system output. During the most stressed hours of that year, batteries supplied 13%–19% of total generation. Although this share is comparable to typical evening discharge levels, storage maintained high output under scarcity conditions, operating at roughly 64% of installed capacity when reliability risks were greatest.[iii] Gas plants, by comparison, produced about 67% of their installed capacity under the same conditions, in part because some units were offline or derated in the heat.[iv] In other words, during peak-risk hours, BESS facilities can provide capacity similar to gas-fired peaker plants.[v]

---

ii We define the "tightest days" as the seven days in 2024 with the highest real-time wholesale electricity prices (locational marginal prices) in the California Independent System Operator (CAISO). High prices signal periods when demand is high relative to available supply, and when the grid most depends on flexible resources like batteries to maintain reliability.

iii To estimate batteries' share of generation during the most stressed hours on the tightest days in 2024, we analyzed the four consecutive hours with the highest average real-time prices and calculated total battery discharge during those hours using CAISO operational data. Batteries' contribution was measured as the share of total system generation over the same hours.

iv Derating is a temporary reduction in a power plant's available capacity because of operation conditions (such as extreme heat) or equipment limitations.

v Peaker plants are generating units that operate only during periods of highest demand or system stress. These comparisons draw on installed nameplate capacity for battery storage and gas units reported in EIA-860. Performance data for each resource during the tight hours analyzed in the preceding section, including September 2024 conditions, was derived from publicly available operational data from GridStatus to capture real-time discharge during high-priced and high-load hours.

This represents several gigawatts of fast, flexible capability that show up precisely during periods when the grid has the least operational headroom. Because most charging occurs during high midday solar energy production, storage has also improved the efficiency of existing clean resources.

Case Study: California's 2022 heat wave

California's September 2022 heat wave illustrates how batteries can support grid reliability during severe system stress. Over eight days of record-setting temperatures, electricity demand reached an all-time high of 52 GW.[3] During peak hours, batteries delivered 3.4 GW of capacity and supplied 85.4 gigawatt-hours (GWh) of energy.

Independent analyses from ICF found that battery performance during the heat wave materially strengthened the system's ability to maintain reserve margins.[4] At the moment of system peak on September 6, batteries provided roughly 6% of total electricity on the grid. Although that share may appear modest, it represented a substantial addition of fast, dispatchable power during the hours of highest stress compared with prior summers. According to ICF, this BESS contribution was a "key difference-maker that contributed to … preventing blackouts" by helping maintain reserve margins.[5] Avoiding outages during extreme heat is especially important because a lack of electricity can increase heat-related illness and mortality; disrupt access to medical care, food, and cooling; and impose significant economic losses on households and local businesses.[6]

The value of this additional battery capacity becomes even clearer in comparison with California's August 2020 heat wave, just two years earlier. At that time, the California Independent System Operator (CAISO) had less than 1 GW of installed battery storage. Despite a lower peak demand of 46.8 GW, the system faced rolling blackouts because of insufficient reserves.[7] The contrast highlights how batteries can strengthen grid reliability and reduce the risk of outages during stress events.

BESS deployment on stressed grid days in Texas

Texas has reached a comparable absolute level of deployment as California, but in a much shorter time. As of 2025, the Electric Reliability Council of Texas (ERCOT) has approximately 14.5 GW of installed battery capacity against a peak demand of 85.6 GW. That means batteries can now cover roughly 17% of total peak load.[8] The electricity markets in California and Texas are structured differently, so batteries play a slightly different role in supporting reliability on the Texas grid during stressful periods.[vi]

In 2025, as the state added more storage, batteries began providing a noticeable share of power during tight hours. On the most stressed days that summer, batteries supplied about 6%–9% of all electricity during the costliest hours, delivering up to 7 GW of fast-responding power.[9]

ERCOT compensates batteries for two primary reliability roles. They provide ancillary services, responding within seconds to balance supply and demand and maintain grid stability, and they deliver electricity during the highest-demand hours through the energy market. In recent years, most battery participation in Texas has been concentrated in ancillary services. As the battery fleet grows and system demand increases, a larger share of activity is shifting toward delivering energy during peak hours.[10] As ERCOT's markets continue to evolve, these resources are likely to play an even larger role in keeping Texas communities safe during extreme conditions.

Texas recently got a real-life look at what happens when batteries provide less support to the grid. Because of a change in market rules in December 2025, many battery projects reduced their participation or submitted higher-priced offers for certain grid-stability services for one day. ERCOT normally procures roughly 6 GW across these services. When lower-cost battery participation declined, the cost of keeping the grid steady jumped sharply, exceeding five times normal levels in some hours. Across approximately 5 GW of ancillary services, prices averaged about $30 per megawatt-hour (MWh) above typical levels, equivalent to roughly $3.6 million in additional wholesale market costs over just 24 hours.[vii] Grid conditions that day were otherwise normal, which made the impact even clearer: batteries are contributing to keeping electricity costs lower and giving operators more tools to maintain a stable, reliable system.

Thus, across different regions and market designs where they have reached a noticeable level of deployment, batteries are playing a perceptible role in providing lower-cost reliability during times of grid strain. In California, years of investment have created a battery fleet that consistently delivers power during the most stressful hours, helping avoid blackouts. In Texas, as the battery fleet has grown, we are already seeing the same pattern emerge; during the tightest conditions of 2025, batteries delivered several gigawatts of flexible, affordable power at the moments the grid needed it most.

---

vi The ERCOT analysis follows the same structure as the CAISO analysis, with one key difference: instead of using real-time locational marginal prices to identify tight hours, we use ERCOT's real-time pricing signal known as System Lambda, which reflects the marginal cost of maintaining reliability and increases sharply when operating reserves are scarce. To identify tight conditions, we ranked all days in 2025 by daily peak load to determine the 10 tightest days in the year and analyzed the four hours on each day with the highest System Lambda. Using ERCOT operational data, we calculated total battery discharge during these hours and compared it with total system electricity generation over the same hours. Batteries' share of generation during these periods ranged from 6% to 9%, reflecting variation across days and hours.

vii These figures are drawn from an analysis shared publicly by Aaron Zubaty, CEO of Eolian, based on ERCOT day-ahead market outcomes for December 5, 2025. The figures are based on analysis of Regulation Up, Non-Spin Reserve Service, ERCOT Contingency Reserve Service, and Responsive Reserve Service.

Cost of providing reliability services with battery storage

For the past few decades, meeting electricity demand during the highest-risk peak hours — resource adequacy — has relied primarily on gas-fired peak-demand (peaker) plants, which operate only a small fraction of the year but have high operating costs that are traditionally passed on to customers.

A growing body of analysis shows that BESS facilities can deliver similar resource adequacy value at a lower cost compared with building new peaker plants:

- A 2023 Brattle Group analysis found that using utility-scale battery systems instead of building new gas peaker plants could save the average household about $180 over the plants' lifetime while delivering the same level of resource adequacy and costing society about one-third less overall.[viii]
- Findings from Strategen Consulting and the Clean Energy States Alliance's Maine case study are similar: replacing soon-to-retire peaker plants with utility-scale BESS facilities costs about 22% less than building new gas peakers.[ix]

Furthermore, surging global demand for gas turbines has strained supply chains and driven up costs for new gas plants, increasing the competitiveness of BESS plants.[11] This gap represents meaningful savings for customers while maintaining the same level of resource adequacy.

---

viii The 2023 Brattle Group analysis compares the net societal cost of providing 400 MW of resource adequacy from a new gas peaker versus a new utility-scale battery in a modeled utility system. The net societal cost includes resource costs, energy and ancillary service impacts, and emissions impacts. This total cost difference is divided by the assumed 1.75 million customers to estimate average household savings over a peaker plant's 20-year lifetime. See Real Reliability: The Value of Virtual Power, The Brattle Group, May 2023, **https://www.brattle.com/real-reliability/**.

ix The 2024 Strategen Consulting and Clean Energy States Alliance analysis compares the societal net cost of replacing incumbent peaking capacity with utility-scale BESS facilities and new gas peakers in Maine. The net societal cost includes the relative costs of the capacity assets, revenue impacts in Independent System Operator of New England's (ISO New England) capacity market, and emissions impacts. See *Battery Storage for Fossil-Fueled Peaker Plant Replacement: A Maine Case Study*, Strategen Consulting and Clean Energy States Alliance, April 2024, **www.cesa.org/wp-content/uploads/Battery-Storage-for-Fossil-Fueled-Peaker-Plant-Replacement-A-Maine-Case-Study.pdf**.

Affordability

Market price impacts of battery storage during high-demand periods

The same conditions that strain the grid during extreme heat or extreme cold also drive some of the highest electricity prices of the year. Electricity prices are set by supply and demand. In peak summer and winter weather, demand may remain elevated into the evening, causing the system to rely on the costliest generators to meet the last increment of load. These costly units are typically gas peaker plants that run infrequently but set higher market prices when they do.[x] As such, a larger supply of lower-cost resources would lower electricity prices.[12]

BESS projects are beginning to change how the grid meets this high-cost demand. By charging during low-priced midday hours and discharging during tight evening periods in regions with solar, batteries reduce reliance on the most expensive plants and help moderate price spikes. In practice, every megawatt supplied by storage during these hours is a megawatt not supplied by a higher-marginal-cost, fuel-based plant. By reducing the need for more expensive generation, BESS facilities can reduce both the cost of producing electricity and the market price, lowering overall system costs for utilities and communities.[13]

In California, this dynamic has become apparent. By spring 2024, installed storage exceeded 10 GW, giving batteries enough scale to consistently influence evening market conditions. On April 30, 2024, for example, batteries discharged a record 6.8 GW during the net-peak period, demonstrating that they can now cover a sizable share of demand at the hours when costs are typically highest. As the following case study shows, these effects accumulated across the high-load days of July 2024, translating into avoided costs for utilities and customers.

Case study: Battery dispatch and wholesale price outcomes in California (July 2024)

July 2024 was a significant operational test for the California grid. High temperatures drove sustained air-conditioning use, and CAISO recorded some of its highest summer peak loads since 2020 heat waves with rolling blackouts. Evening demand remained elevated well after sunset, a pattern that has historically led to heavy peaker-plant use and high wholesale prices. In 2024, however, CAISO had a large fleet of BESS assets to shift low-cost midday solar generation into these peak hours.

x According to the US Government Accountability Office, peak-demand power plants operate when cooling and heating needs are the highest and are mostly fueled by gas. See "Electricity: Information on Peak Demand Power Plants," GAO-24-106145, US Government Accountability Office, May 21, 2024, **https://www.gao.gov/products/gao-24-106145**. Peaker plants typically have low capital costs but high variable operating costs and therefore operate only during periods of high electricity demand, when wholesale prices are elevated. In these hours, peaker plants are often dispatched at the margin and tend to set the wholesale market price for electricity. See *Decarbonizing the Peak: Background*, **https://www.mass.gov/doc/background-decarbonizing-the-peak**.

Our analysis of CAISO market data for July 2024 finds that BESS facilities avoided an estimated $29 million in peak energy costs in just one month.[xi] Those savings are generated by two pathways:

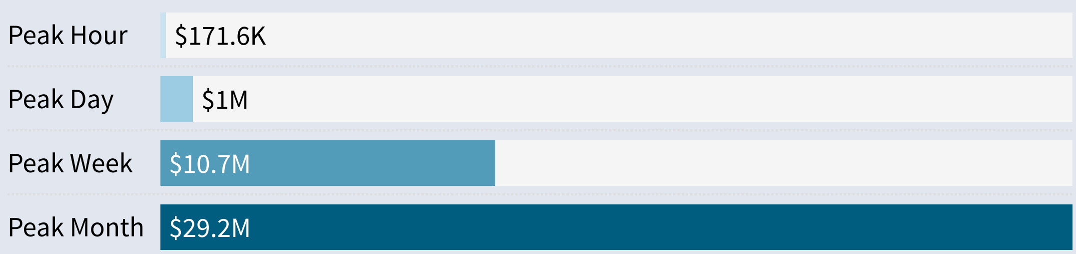
1. BESS plants displacing peaker generation: Batteries supplied 717 GWh of electricity during peak hours in July 2024, directly displacing energy that would otherwise have been generated by higher-cost gas peaker plants. This reduced the total cost of producing electricity during those hours.

2. Lowering the market price: By adding lower-cost supply during peak hours, batteries often prevented the most expensive power plants from setting the market price, keeping costs down for utilities and, ultimately, households and businesses.

The estimated $29 million in peak cost savings help avoid seasonal surges in monthly utility bills for the 32 million electric customers served by CAISO (see Exhibit 2).[14]

Exhibit 2

Peak energy cost savings from BESS dispatch (CAISO, July 2024)



Dispatch includes stand alone batteries and hybrid solar plus BESS.

RMI Graphic. Source: RMI analysis

As more batteries come online and operate daily, these avoided costs have the potential to accumulate further. Over time, BESS facilities can also provide deeper savings by consistently managing demand peaks — resulting in shifting procurement to low-cost solar and avoiding the need for further transmission and distribution infrastructure buildout.

These findings are not limited to California. Aurora Energy Research's analysis shows that significant battery storage deployment in Midcontinent Independent System Operator (MISO) territory could shift low-cost energy into periods of peak demand, driving up to $27 billion in system cost savings by 2035 compared with a system with minimal storage; the analysis shows that as storage scales over time, price spikes on high-demand days may fall by more than 60%, reducing overall energy costs and operational strain.[15]

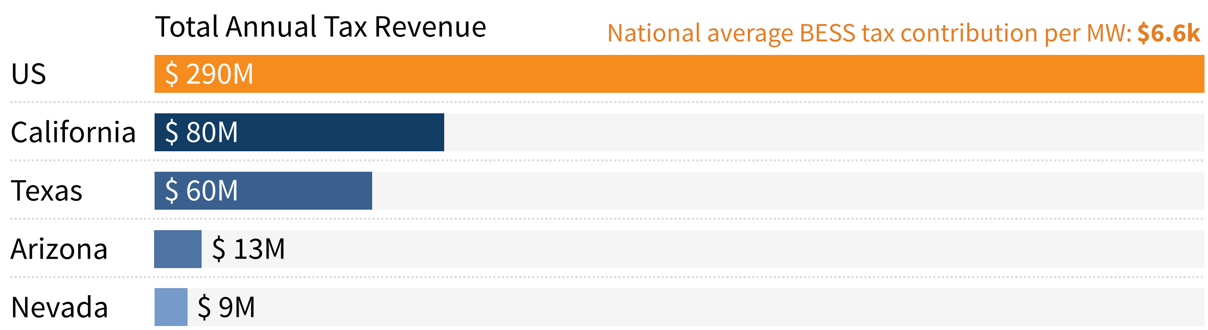
xi These savings reflect the impact of stand-alone hybrid solar plus BESS facilities.

BESS and local tax revenue

Most of a battery storage project's value lies in equipment and infrastructure (such as containers of battery cells, inverters, and grid connections), making them high-value taxable assets. Local governments assess this property much as they do other electricity generation infrastructure. Reviewing project agreements in states including California, Massachusetts, Nevada, and Texas, we found the average annual tax contribution from BESS projects is around $6,600/MW of capacity in gross tax revenue (see Exhibit 3).[xii] Depending on the local tax rate, project size, and whether the developer has a tax abatement or payment agreement, that number can range from about $2,000/MW to more than $10.000/MW each year.

Exhibit 3

Estimated annual tax contributions from BESS projects by state (2025)



Values are gross taxes owed including Payments In Lieu Of Taxes (PILOT)

RMI Graphic. Source: Cleanview Battery Storage Project Database, EIA, RMI Analysis

---

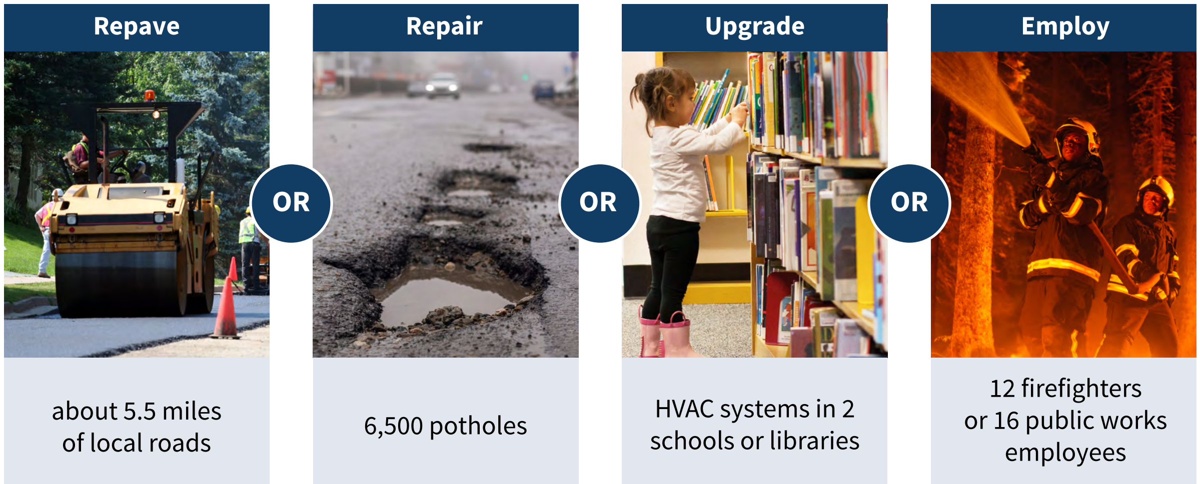
Thus, a utility-scale BESS of 200 MW represents between $1.3 million and $2 million in annual tax revenue that can help fund host community infrastructure and services such as transportation, education, and public safety (see Exhibit 4).[16] By the end of 2026, all battery projects installed in the United States could generate over $440 million each year in tax revenue for local communities,[xiii] which is equivalent to what is spent annually to educate nearly 30,000 K–12 students.[17] In Carver, Massachusetts, a single 150 MW battery storage project will deliver about $1.6 million annually — roughly 4% of the town's total budget — which could fund critical community investments, such as a new fire station or salaries for 18 local schoolteachers per year.[18]

xii RMI calculated $ per MW unit tax revenue by reviewing tax agreements for multiple energy storage projects, including the Morro Bay Vista project in California (**https://www.morrobayca.gov/DocumentCenter/View/19424/2024-05-31-Brattle-Report---Economic-and-Fiscal-Benefits-of-Vistra-Morro-Bay-BESS-Project**), Medway (**https://archive.townofmedway.org/sites/g/files/vyhlif12846/f/uploads/medway_grid_pilot_3-18-24.pdf**), Chelsea Energizar (**https://chelsearecord.com/2024/07/03/council-approves-pilot-agreement-with-storage-facility/**), and Cranberry Point (**https://mjthomaslaw.com/town-of-carver-approves-pilot-agreement-for-150-mw-battery-energy-storage-system**) in Massachusetts, Purple Sage Energy Center (**https://www.energy.nv.gov/siteassets/content/programs/reta/Purple_Sage_Energy_Center_fiscal_note.pdf**) and Townsite Solar 2 (**https://www.energy.nv.gov/siteassets/content/programs/reta/Final_Order_Townsite_Solar_2_LLC.pdf**) in Nevada, and Anemoi (**https://myrgv.com/local-news/2023/12/01/hidalgo-county-approves-tax-abatement-on-190m-battery-storage-project/**) in Texas.

xiii The year 2026 is used as the endpoint for this estimate because it reflects the furthest year for which national battery energy storage deployment projections are available with relatively high confidence, based on projects that are already operating, under construction, or have secured interconnection and financing. BESS installed capacity across the United States in 2026 is sourced from EIA's *Short-Term Energy Outlook*, 2026, **https://www.eia.gov/outlooks/steo/pdf/steo_full.pdf**.

Exhibit 4 Scale of potential tax revenue impacts from BESS projects

$2 million in annual tax revenue from a single 200 MW BESS project could help communities:



RMI Graphic. Source: ADA Striping, Ashpapro, LatestCost, US Department of Transportation, US Department of Labor, WHYY

Case study: Medway Grid Project PILOT provides long-term stability in Massachusetts

In 2022, the town of Medway, Massachusetts, approved a payment in lieu of taxes (PILOT) agreement for a 250 MW BESS that will bring in about $2.3 million per year for 20 years, totalling roughly $46 million.[xiv] These predictable payments ensure consistent funding for town services, especially in Massachusetts, which offers property-tax exemptions for BESS projects.[xv] PILOTs like this help cities recoup what would be lost in property taxes because of state exemptions and can help ensure that residents see direct, long-term benefits from hosting clean energy projects.

Case Study: Nevada's Townsite Solar and Purple Sage projects

Nevada's state tax policy allows renewable projects, including BESS facilities, to apply for partial property-tax abatements. Even with these reductions, the community benefits remain substantial: the Townsite Solar 2 (167 MW) and Purple Sage Energy Center (400 MW) projects will generate more than $500,000 and $3.4 million in payments to local governments each year, respectively, even after abatements.[19] Additionally, the Libra Solar + BESS project is expected to generate more than $170 million in property and sales taxes.[20] Even when tax breaks are used to attract investment in renewable energy (such as solar, wind, and BESS projects), communities can still benefit economically.

---

xiv PILOT payments are assumed to be equivalent to taxes owed for the purpose of this analysis.

xv Massachusetts General Laws Chapter 59, Section 5, Clause 45 offers a property tax exemption for clean energy investments, including solar plus storage systems, from local taxation for a 20-year term.

Health, Environmental, and Safety Considerations

Potential health impacts of BESS deployment

As discussed previously, BESS projects can provide fast, flexible capacity similar to fossil-fueled peaker plants. Yet the quick ramping up of peaker plants to meet sudden surges in demand makes them high emitters of criteria air pollutants, such as nitrogen oxides and sulfur dioxide, which are linked to respiratory illnesses and other adverse health outcomes.[xvi,21] These emissions have real costs for nearby communities. For example, the Environmental Protection Agency's (EPA) Co-Benefits Risk Assessment (COBRA) tool estimates that a newly approved gas-fired peaker in Chesterfield County, Virginia, will generate more than $16.7 million in health costs for the county over its lifetime.[xvii]

In contrast, BESS projects charged with clean energy operate without combustion and avoid air pollution impacts. As aging peakers retire, if BESS facilities replace some of their capacity, communities can see substantial health benefits. For example, analysis using EPA's COBRA tool estimates that replacing the 500 MW Port Jefferson peaker with a BESS could yield $5.3 million in annual health savings for Suffolk County, New York, and substituting the 240 MW LaPorte peaker in Harris County, Texas, with a BESS could avoid $3.8 million per year.[xviii] Although these benefits are most pronounced in host communities, they also extend into surrounding regions.

To illustrate the broader potential impact, we used EPA's COBRA tool to model a hypothetical scenario in which the 66 GW of storage expected to come online by 2030 displaces generation from existing gas-fired peaker plants.[xix] Assuming the resultant emissions reductions are distributed evenly across the United States, this would result in an estimated $400 million in annual nationwide health savings — equivalent to the cost of 150,000–670,000 emergency room visits, depending on insurance coverage.[xx]

---

xvi Criteria air pollutants are six commonly found air contaminants regulated by the EPA under the Clean Air Act. See "Criteria Air Pollutants," EPA, April 14, 2026, https://www.epa.gov/criteria-air-pollutants.

xvii EPA's COBRA screening model estimates the health costs associated with increased nitrogen oxides and sulfur dioxide emissions from Dominion Energy's proposed Chesterfield peaker over an assumed 20-year lifetime. The unit was represented as a gas combustion turbine using the capacity factor and emissions profile of the Lincoln Combustion Turbine in North Carolina, a comparable facility in technology and vintage. See "Virginia SCC Approves Proposal for Natural Gas Plant in Chesterfield," CBS 6 New Richmond, November 25, 2025, www.wtvr.com/news/local-news/chesterfield-energy-reliability-center-approved-nov-25-2025.

xviii RMI estimated the health benefits using EPA's COBRA screen tool, drawing emissions reductions inputs from the Clean Energy Group's Peaker Plant Mapping Tool, https://www.cleanegroup.org/initiatives/phase-out-peakers/maps/, and the EPA's Continuous Emissions Monitoring System, https://www.epa.gov/emc/emc-continuous-emission-monitoring-systems. For the purposes of this analysis, we focused on peaker plants in or near population centers, rather than facilities in remote areas. This approach is intended to illustrate potential community-level health impacts associated with energy infrastructure that is near where people live. While siting decisions vary by geography, this proximity is broadly comparable to how many BESS projects are proposed or developed near load centers. Port Jefferson, like many peaker plants across the country, can operate on multiple fuels and at times burns oil as a secondary fuel, which can result in higher emissions during peak operation.

xix RMI's analysis is based on EIA-860 2024 data, November 25, 2025, https://www.eia.gov/electricity/data/eia860m/.

xx RMI estimated the health benefits using EPA's COBRA screening tool, drawing average emission reductions inputs from the EPA's Continuous Emissions Monitoring System. Replaced capacity was adjusted assuming a 75% marginal ELCC for a 4-hour BESS and 61% for a gas combustion turbine, and converted to displaced energy assuming a 5.3% capacity factor for gas-fired peaker plants. Emissions reductions are distributed across all U.S. counties. A 2028 emissions baseline is used as a proxy for 2030 air quality. See "How much is an ER Visit With Insurance? What to Expect Before You Go," HSA for America, Dec 17, 2025, https://hsaforamerica.com/blog/how-much-is-an-er-visit-with-insurance/.

Understanding BESS safety

Community safety is a critical consideration for any energy infrastructure, and fire risk is top of mind for communities in evaluating new technologies. This section contextualizes BESS fire risk by comparing incident frequency relative to rapid system growth and evaluating safety performance over time.

BESS projects have expanded at remarkable speed across the United States, representing one of the fastest infrastructure buildouts in recent years.[22] Despite this rapid pace of deployment, fire incidents of utility-scale BESS facilities remain extremely rare. Data from the Electric Power Research Institute's (EPRI) Battery Energy Storage System Failure Database shows that utility-scale and commercial-and-industrial BESS facilities average roughly 2.5 fires per year nationwide, with at least half confined to a single battery container.[xxi] Overall, only about 0.6% of operating BESS facilities experienced a fire between 2019 and 2024.[xxii]

Comparisons with other energy infrastructure highlight how relatively uncommon BESS fire incidents are. The US Department of Transportation's Pipeline and Hazardous Material Safety Administration (PHMSA) reported that gas pipeline fires occurred roughly once every four days between 2010 and 2018, which is about 35 times more frequent than the recent rate of BESS fires.[23] Over the past five years, gas pipelines have averaged two incidents per day, including fires and other significant safety events, resulting in an average of 11 fatalities and 43 injuries per year.[xxiii] Though infrequent, major recent gas plant incidents, such as the 2010 Kleen Energy plant explosion in Middletown, Connecticut, which killed six employees, and the 2017 Sentinel Energy Center valve explosion in North Spring, California, which killed one employee, illustrate the safety risks tied to gas operations.[24] There have been no reported deaths due to a utility-scale BESS fire incident in the United States.

BESS incidents have declined over time. Although BESS capacity in the United States increased more than 20-fold, the rate of fire incidents has dropped sharply, falling nearly 90% per GW from 2019 to 2024 (see Exhibit 5).[xxiv,25] This steep decline reflects improved system designs, stronger safety codes, and the widespread deployment of safer battery chemistries.

---

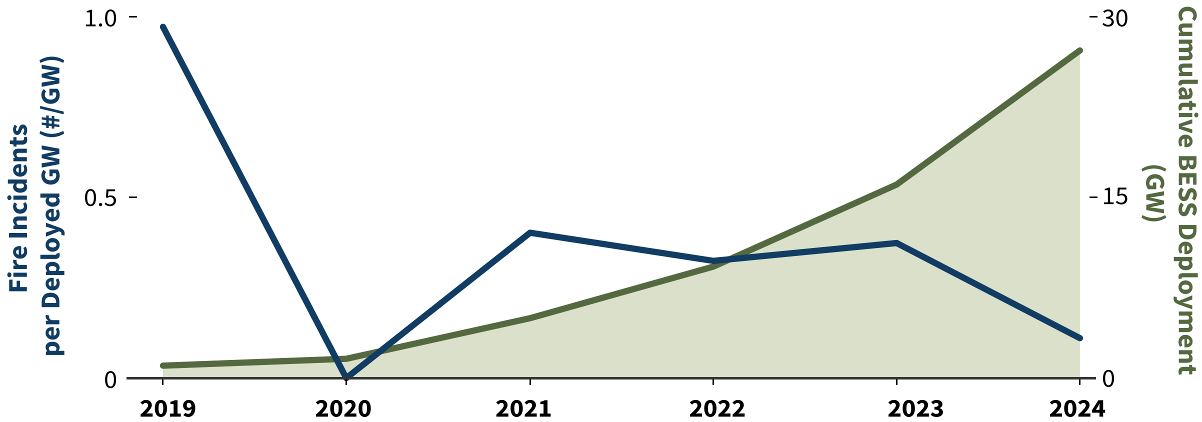
xxi Fire incidents are defined as BESS failure events that involve fire or explosion; events limited to smoke or overheating are excluded. These incidents are caused by a BESS or component failure rather than an exogenous cause of failure (e.g., wildfire affecting the system). See *BESS Failure Incident Database,* EPRI, accessed June 27, 2026, **https://storagewiki.epri.com/index.php/BESS_Failure_Incident_Database**.

xxii Analysis includes only operating battery facilities with nameplate capacities above 1 MW, used as a proxy for utility-scale BESS facilities. See *BESS Failure Incident Database,* EPRI, accessed June 27, 2026, **https://storagewiki.epri.com/index.php/BESS_Failure_Incident_Database**.

xxiii PHMSA defines incidents as any event involving the release of gas or liquefied natural gas (LNG) that results in a fatality or hospitalization, significant property damage, large unintentional gas loss, or emergency shutdown of an LNG or storage facility. See PHMSA's *Pipeline Incident Report Criteria*, **https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/2025-07/PHMSA%20Incident%20Report%20Criteria%20Change%20History%202021-01-11_1.pdf**; and "Pipeline Incident 20 Year Trends," **https://www.phmsa.dot.gov/data-and-statistics/pipeline/pipeline-incident-20-year-trends**.

xxiv In 2020, the number of BESS fire incidents fell to zero and has remained low since. See BESS Failure Incident Database, EPRI, accessed June 27, 2026, **https://storagewiki.epri.com/index.php/BESS_ Failure_Incident_Database**.

Exhibit 5 BESS capacity and fire incidents (2019–2024)



RMI Graphic. Source: EPRI, EIA, RMI Analysis.

Early BESS plants relied on nickel manganese cobalt (NMC) battery cells, which offer higher energy density but carry greater combustion risk. The market has since shifted toward lithium iron phosphate (LFP) batteries, valued for their superior thermal stability, lower costs, and longer life cycles.[26] LFP accounted for about 80% of new global battery storage in 2023, up from roughly 65% in 2022.[27] This shift aligns with declining fire rates in the United States.

Notably, no utility-scale (100+MW) LFP-based facility has experienced a fire since at least 2019.[xxv]

Enhanced safety standards have further strengthened performance and reduced fire risks. Updates to the International Fire Code and National Fire Protection Association (NFPA) standards establish more robust siting and design requirements, including upgraded fire barriers, active cooling systems, and improved fire-testing protocols.[28] Under the 2026 edition of NFPA 855, battery systems are typically deployed in modular 20- to 40-foot containers with 1–5 MWh per unit. By contrast, the Moss Landing Vistra battery facility that caught fire in 2025 co-located approximately 300 MWh of energy storage in battery racks. Furthermore, most modern systems are outside, unlike the Moss Landing system, which was inside a 1950s building.[29]

When these rare fires do occur, available evidence to date suggests they have had limited long-term environmental and health impacts. Temporary precautionary measures, such as shelter-in-place and evacuation orders, have been issued during active events, but post-incident testing has found pollutant levels below regulatory thresholds. A review by the Fire and Risk Alliance LLC (FRA) of environmental sampling from 35 documented large-scale BESS fires in the United States between 2012 and 2024 found no contaminant concentrations that would pose a public health concern.[xxvi]

---

xxv RMI analysis based on *BESS Failure Incident Database,* EPRI, **storagewiki.epri.com/index.php/BESS_Failure_Incident_Database**.

xxvi FRA reviewed airborne contamination sampling conducted on site, off site, and within nearby communities, as well as relevant sampling of water from firefighting activities, automatic suppression system runoff, and groundwater testing in specific instances. See *Assessment of Potential Impacts of Fires at BESS Facilities,* FRA and the American Clean Power Association, August 21, 2025, **https://cleanpower.org/wp-content/uploads/gateway/2025/03/Assessment-of-Potential-Impacts-of-Fires-at-BESS-Facilities_FINAL_Sep-2025.pdf**.

Modern BESS fire response practices are also designed to minimize or prevent soil and water contamination by allowing battery cells to burn in a controlled, isolated manner while avoiding direct water suppression.[30] According to FRA, unless water is applied directly to burning batteries, cooling water used on adjacent equipment or battery container exteriors to prevent fire spread is comparable to rainwater and will not contain contaminants.[31] If direct water suppression is used, standard stormwater management practices, similar to those used for other industrial fires, can help prevent contaminated runoff from reaching natural water sources. Ongoing improvements in emergency response practices continue to reduce these risks.

Even in the high-profile 2025 Moss Landing fire, which destroyed the entire BESS facility, the fire was contained on site, and official assessments by the EPA and California agencies found contaminant levels were generally below health-based screening thresholds and not indicative of a public health risk.[xxvii] Importantly, the Moss Landing facility's design differed significantly from modern systems: it used an older, noncontainerized design, NMC batteries with higher fire risk, and a preexisting enclosed space. Such a configuration would not be permitted under today's codes and standards.[32]

Although resident health reports are still being investigated and continued study of the site is critical, industry and regulators have already advanced design, technology, and regulatory changes. Together, these measures are likely contributing to the observed steady reduction in the already low risk that BESS fires pose to surrounding communities and the environment.

Mechanisms to shape benefit outcomes

Communities and developers have demonstrated ways to work together to ensure that safety impacts and community benefits align with local needs and concerns. Although BESS can deliver significant benefits without formal agreements, proactive project agreements and clear siting guidelines can further reduce risks and support durable outcomes for host communities.

The Medway Grid Project in Massachusetts provides one of the most concrete examples of how local governments can have safety, environmental, and financial commitments from battery facilities through negotiated agreements, thereby taking advantage of this significant emerging market.

Case Study: Medway Energy Center Host-Community Agreement

The Massachusetts town of Medway (mentioned earlier in this report) entered into a host-community agreement with Medway Grid LLC for a 250 MW/500 MWh BESS plant.[33] The project is one of the largest stand-alone BESS facilities proposed in New England and offers a template for pairing community benefits with strong safety standards.

xxvii Many reliable sources, including the US EPA, county environmental health agencies, and grassroots community groups, provide a comprehensive view of the environmental conditions. See "Testing and Monitoring," Monterey County, https://www.readymontereycounty.org/emergency/2025-moss-landing-vistra-power-plant-fire/testing; "EPA Completes Air Monitoring Near Moss Landing Vistra Battery Fire," EPA, January 20, 2025, https://www.epa.gov/newsreleases/epa-completes-air-monitoring-near-moss-landing-vistra-battery-fire; and "A Year Out from One of the World's Largest Battery Facility Failures," Inside Climate News, January 16, 2026, https://insideclimatenews.org/news/16012026/a-year-out-from-one-of-the-worlds-largest-battery-facility-fires/.

In addition to the PILOT agreement payments discussed earlier, the Medway Energy Center Host Community Agreement establishes several dedicated funds, including:

- Sidewalk fund — one-time $250,000 contribution for pedestrian and roadway safety improvements
- Water/environmental master plan fund — $50,000 contribution to support the town water system and other related planning efforts
- Community resilience and sustainability fund — $50,000 annually to support resilience, climate, and sustainability programming
- Risk-reduction training position fund — $97,500 over five years to enhance firefighter preparedness and BESS-related emergency response capacity
- Property-value security fund — compensation of up to $25,000 per homeowner within 300 feet for verified property-value impacts, backed by a $50,000 escrow account[xxviii]
- Abutters' landscaping fund — $85,000 to support landscaping improvements for abutting properties and mitigating visual impacts

Second, the agreement requires a comprehensive emergency response plan reviewed by the local fire department, annual first-responder training and equipment support, and an independent third-party safety study before commissioning. The project must comply with nationally recognized baseline safety standards, including NFPA 855 and Underwriters Laboratories 9540A, and maintain on-site stormwater controls to capture any fire-suppression runoff in the event of an accident.

Medway also prepared detailed Battery Energy Storage System Siting Guidelines in 2022.[34] These guidelines informed the facility's design, including:

- Sound-attenuation barriers up to 22 feet high and vegetation buffers
- Ten-foot, vegetation-clearance zones to limit fire risk
- Noise and air-quality monitoring protocols with required post-construction reporting
- Traffic management planning and police details during construction

Medway's experience demonstrates that the combination of host-community agreements, siting guidelines, and safety standards can be a powerful tool for aligning community priorities with BESS development.

---

xxviii Research to date finds no statistically significant impact of operational utility-scale BESS projects on nearby residential property values. Using a stacked event-study difference-in-differences analysis across 178 BESS projects in California, Massachusetts, and New York, researchers at the University of Pennsylvania found no measurable price effects for homes near operational facilities relative to comparable properties farther away. See "The Impact of Utility-Scale Battery Energy Storage Systems on Nearby Property Values," Yixin Gwee, University of Pennsylvania, 2025, **https://repository.upenn.edu/handle/20.500.14332/61488**.

Conclusion

The evidence assembled in this report demonstrates that large-scale BESS facilities are becoming an increasingly important component of the US power system. Available data shows that batteries provide measurable grid-reliability value during periods of peak system stress, reduce exposure to high-cost peaking generation as well as system blackouts, and can contribute significant revenues in the communities where they are sited (see Exhibit 6). These operational and economic effects are already observable in markets with substantial deployment, such as California and Texas, and are expected to become more prominent as additional systems come online.

Exhibit 6 Summary of BESS reliability, affordability, and safety impacts

Keeps the lights on during extreme conditions

- BESS provided 13%–19% of electricity during the most grid-stressed hours in California (2024)
- Batteries provided a critical 3.4 GW of peak demand during California's 2022 heatwave, playing a key role in avoiding blackouts

Lowers electricity costs and contributes tax revenue

- BESS saved $29 million in one month (July 2024, California) by reducing peak energy prices
- US utility-scale BESS systems generate $1.5 million to $2 million per year in local tax revenue on average

Maintains community safety

- No deaths from utility-scale BESS fires in the United States
- No fires in large-scale (100+ MW) facilities with newer LFP systems
- Fire risk down ~90% since 2019
- Less frequent safety incidents than with gas infrastructure

RMI Graphic.

At the same time, available data indicates that safety concerns associated with utility-scale BESS facilities remain comparatively low and have declined over time as newer technologies and updated codes have been adopted. Most documented incidents have been contained on site, have not resulted in long-term environmental or health impacts, and have occurred exclusively at facilities using earlier battery chemistries or predating modern design standards. As communities evaluate new projects, these trends provide important context for comparing risks across different types of energy infrastructure.

Over the next five years, BESS deployment is expected to grow at 30% annually in the United States given the significant power system reliability and affordability benefits of battery technologies.[35] As the scale and geographic spread of BESS deployment grows, decision makers will continue to assess how these systems interact with local priorities related to community reliability, affordability, environmental quality, safety, and economic development. The findings presented here are intended to support those evaluations by providing a consistent, evidence-based understanding of the risks and benefits observed to date, as well as the mechanisms communities are using to shape project outcomes.

Endnotes

1 *Securing Battery Energy Storage Systems from Cyberthreats: Best Practices and Trends*, The Brattle Group, December 2025, **https://www.brattle.com/wp-content/uploads/2025/12/Securing-Battery-Energy-Storage-Systems-from-Cyberthreats_Final.pdf**.

2 Miles Farmer et al., *The Storage Gap: Deployment Challenges in the East,* GridLab, 2026, **https://gridlab.org/portfolio-item/storagegap/**.

3 *California ISO Peak Load History 1998 through 2023*, California Independent System Operator (CAISO), accessed July 2, 2026, **https://www.caiso.com/documents/californiaisopeakloadhistory.pdf**.

4 *Summer Market Performance Report for September 2022*, CAISO, November 17, 2022, **https://www.caiso.com/Documents/SummerMarketPerformanceReportforSeptember2022.pdf;** and "Battery Energy Storage and Rolling Blackouts in California," ICF, October 2022, **https://www.icf.com/insights/energy/battery-energy-storage-blackouts-california**.

5 *Summer Market Performance Report for September 2022*, November 17, 2022.

6 Joan A. Casey et al., "Power Outages and Community Health: A Narrative Review," *Current Environmental Health Reports* 7, no. 4 (December 2020): 371–383, **https://doi.org/10.1007/s40572-020-00295-0**; and Elizabeth Harnett et al., *Power Outages Cost More Than We Account For. Better Data Could Help: What Insurers, Utilities, and Communities Need to Better Assess Power Outage Risk and Boost Resilience*, RMI, January 5, 2026, **https://rmi.org/power-outages-cost-more-than-we-account-for/**.

7 "Open Access Same-Time Information System (OASIS)," CAISO, accessed February 23, 2026, **https://www.caiso.com/systems-applications/portals-applications/open-access-same-time-information-system-oasis.**

8 Farmer, *The Storage Gap*, 2026.

9 "ERCOT Historical Load and Storage Data," GridStatus.io, accessed January 2025, **https://www.gridstatus.io**.

10 "Batteries Have Reshaped ERCOT's Ancillary Services Procurement," GridStatus.io, January 16, 2025, **https://blog.gridstatus.io/batteries-ercot-ancillary-services-2024/**.

11 Jesse Cohen, Tyler Fitch, and Lauren Shwisberg, *Gas Turbine Supply Constraints Threaten Grid Reliability; More Affordable Near-Term Solutions Can Help,* RMI, June 18, 2025, **https://rmi.org/gas-turbine-supply-constraints-threaten-grid-reliability-more-affordable-near-term-solutions-can-help/**.

12 "Utility Transition Hub: Economic Dispatch Dashboard," RMI, 2024, **https://utilitytransitionhub.rmi.org/economic-dispatch/**.

13 "Utility Transition Hub," 2024.

14 "Our Business," CAISO, accessed July 2, 2026, **https://www.caiso.com/about/our-business**.

15 *Battery Energy Storage Impact and Benefits Assessments in MISO*, Aurora Energy Research, 2025, **https://go.auroraer.com/l/885013/2025-07-29/pny4d/885013/1753797537FU0B9Zvy/Aurora_ACP_BESS_Impact_Analysis_MISO_Final_Report_07.18.2025.pdf**.

16 *Status of the Nation's Highways, Bridges, and Transit: Conditions & Performance Report to Congress, 25th Edition*, US Department of Transportation, Federal Highway Administration, and Federal Transit Administration, 2024, **https://www.fhwa.dot.gov/policy/25cpr/pdf/CP25_Full_Report.pdf**; "Porthole Repair Cost: Complete 2026 Guide," Asphapro, March 15, 2026, **https://asphapro.com/blog/pothole-repair-cost.html**; "Asphalt Repair in Los Angeles: Professional Solutions for Safe and Durable Pavement," ADA Striping, accessed July 2, 2026, **https://ada-striping.com/los-angeles-asphalt-repair-guide/**; "Asphalt Pothole Repair Cost 2026," Latest Cost, October 29, 2025, **https://latestcost.com/asphalt-pothole-repair-cost/**; "Mayor Parker Budget Plan Could Fund More Library Heating and Air Conditioning Fixes Next Year," WHYY, March 16, 2026, **https://whyy.org/articles/philadelphia-budget-plan-library-heating-cooling**; and "Employer Cost for Employee Compensation — March 2026," US Department of Labor, Bureau of Labor Statistics, June 12, 2026, **https://www.bls.gov/news.release/pdf/ecec.pdf**.

17 Education Data Initiative, *U.S. Public Education Spending Statistics*, February 2, 2017, **https://educationdata.org/public-education-spending-statistics**.

18 Matthew J. Thomas, "Town of Carver Approves PILOT Agreement for 150 MW Battery Energy Storage System," October 9, 2025, **https://mjthomaslaw.com/town-of-carver-approves-pilot-agreement-for-150-mw-battery-energy-storage-system**; "Town of Bernardston, MA, Spent $1.6 Million to Acquire Land and Buildings Needed to Build the Bernardston Fire Station," April 15, 2026, **https://www.rd.usda.gov/newsroom/news-release/usda-announces-1-million-investment-bernardston-during-national-public-safety-telecommunicators-week**; and *Massachusetts Department of Elementary and Secondary Education Teacher Salaries Report*, February 6, 2026, **https://profiles.doe.mass.edu/statereport/teachersalaries.aspx**.

19 *Townsite Solar II LLC, Findings of Fact, Conclusions of Law, and Order*, Nevada Governor's Office of Energy, October 9, 2024, **https://www.energy.nv.gov/siteassets/content/programs/reta/Final_Order_Townsite_Solar_2_LLC.pdf**; and *Renewable Energy Partial Abatement of Property Taxes, Purple Sage Center, Noble Solar, LLC,* Nevada State Department of Taxation, September 12, 2024, **https://www.energy.nv.gov/siteassets/content/programs/reta/Purple_Sage_Energy_Center_fiscal_note.pdf**.

20 *Arevia Power Seals Landmark Power Purchase Agreement with NV Energy for Largest Solar Energy and Battery Storage Project in Nevada*, Arevia, 2024, **https://areviapower.com/june-6-2024-press-release/**.

21 "Energy Storage Peaker Plant Replacement Project: Technical and Policy Documentation," Physicians, Scientists, and Engineers for Healthy Energy, May 2020, **https://www.**

psehealthyenergy.org/wp-content/uploads/2023/04/Peaker-Technical-Documentation.pdf.

22 "Solar, Battery Storage to Lead New U.S. Generating Capacity Additions in 2025," US Energy Information Administration (EIA), February 24, 2025, https://www.eia.gov/todayinenergy/detail.php?id=64586.

23 "Pipeline Incidents Continue to Impact Residents," FracTracker Alliance, December 7, 2018, https://www.fractracker.org/2018/12/pipeline-incidents-impact-residents/.

24 "Kleen Energy Natural Gas Explosion," US Chemical Safety Board, June 28, 2010, https://www.csb.gov/kleen-energy-natural-gas-explosion/; and "North Palm Springs Power Plant Death Involved Valve Explosion," *Desert Sun*, March 6, 2017, https://www.desertsun.com/story/news/2017/03/06/palm-springs-power-plant-medical-emergency/98824382/.

25 *BESS Failure Incident Database,* EPRI, June 19, 2026, https://storagewiki.epri.com/index.php/BESS_Failure_Incident_Database; and *EIA-860 2024*, EIA, November 25, 2025, https://www.eia.gov/electricity/data/eia860m/.

26 "Why We Don't Need to Worry Too Much about the Latest Grid Battery Fire," Canary Media, January 27, 2025, https://www.canarymedia.com/articles/energy-storage/moss-landing-fire-reveals-flaws-in-the-battery-industrys-early-designs.

27 *Batteries and Secure Energy Transitions*, International Energy Agency, April 25, 2024, https://www.iea.org/reports/batteries-and-secure-energy-transitions.

28 "Why We Don't Need to Worry Too Much about the Latest Grid Battery Fire," January 27, 2025.

29 *Assessment of Potential Impacts of Fires at BESS Facilities*, FRA and the American Clean Power Association, August 21, 2025, https://cleanpower.org/wp-content/uploads/gateway/2025/03/Assessment-of-Potential-Impacts-of-Fires-at-BESS-Facilities_FINAL_Sep-2025.pdf.

30 *First Responders Guide to Lithium-Ion Battery Energy Storage System Incidents*, American Clean Power Association, July 2023, https://cleanpower.org/resources/first-responders-guide-to-bess-incidents/.

31 *Assessment of Potential Impacts of Fires at BESS Facilities,* August 21, 2025.

32 "Why We Don't Need to Worry Too Much about the Latest Grid Battery Fire," January 27, 2025; and *Assessment of Potential Impacts of Fires at BESS Facilities,* August 21, 2025.

33 *Host Community Agreement for the Medway Grid Battery Energy Storage System*, Town of Medway and Medway Grid LLC, executed September 7, 2022, https://climate.law.columbia.edu/sites/climate.law.columbia.edu/files/content/CBAs/Medway%20Grid%20BESS%20HCA.pdf.

34 *Medway Grid Battery Project*, Massachusetts Department of Public Utilities and Energy Facilities Siting Board, updated 2024, https://www.mass.gov/info-details/medway-grid-battery-project.

35 *United States Grid-Scale Energy Storage Outlook 2024*, Wood Mackenzie, July 1, 2024, https://www.woodmac.com/reports/power-markets-us-grid-scale-energy-storage-outlook-2024-150289219/.

Erifili Draklellis, Celia Tandon, Aradhana Gahlaut, and Lauren Shwisberg, *Stored Potential: The impacts of utility-scale battery energy storage systems on communities and the grid,* RMI, 2026, **https://rmi.org/resources/stored-potential**.

RMI Innovation Center
22830 Two Rivers Road
Basalt, CO 81621

www.rmi.org