UTILITY ENERGY STORAGE

Utilities have to respond to wide fluctuations in energy demand throughout the day and year. Conventionally, this has meant firing up peaker plants when demand is highest. Utility-scale energy storage enables utilities to store energy generated by intermittent renewable energy resources and to redeploy this energy when demand is highest. With enough utility scale storage in place, natural gas peaker plants can eventually be retired from use.

Various storage methods are available at utility scale, including: very large batteries; the use of pumped hydro (in which intermittent energy sources are used to pump water behind a dam, and the water is released to power a turbine when the energy is needed); the use of concentrated solar plants to heat molten salt (which can then be used to heat water and produce steam for electricity generation when energy is needed); compressed air; and flywheels (in which intermittent energy sources are used to power a mechanical rotor that spins in a nearly frictionless enclosure; when more energy is needed, the inertia of the spinning rotor can be used to drive a turbine to produce electricity). All of these technologies are improving in efficiency and coming down in price.

Pumped hydro accounts for 95% of U.S. energy storage at present,[1] with a capacity of 19.3 GW.[2] There are currently 43 pumped hydro plants in the U.S., and the DOE estimates that the storage capacity of pumped hydro could be doubled in the future through addition of new plants.[3] Pumped hydro can have impacts on groundwater and surface water systems. All current pumped hydro stations are “open-loop,” meaning that they are integrated into naturally flowing waterways. It is thought that the impacts to terrestrial and aquatic ecosystems of “closed-loop” systems which are entirely separate from existing waterways would be lower because these systems are located “off-stream” and have greater siting flexibility than open-loop systems.[4]

To bring more utility-scale energy storage into being, experts say that regulatory agencies should incentivize deployment of energy storage through pricing models, demonstration-scale plants, energy storage standards, capacity payments, grants, feed-in-tariffs, peak reduction

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[1] U.S. Department of Energy (January 15, 2021). “U.S. hydropower market report.” https://www.energy.gov/eere/water/downloads/us-hydropower-market-report

[2] IRENA. 2021. *Renewable capacity statistics 2021.* https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2021/Apr/IRENA_RE_Capacity_Statistics_2021.pdf

[3] DOE. “Pumped storage hydropower.” https://www.energy.gov/eere/water/pumped-storage-hydropower

[4] DOE. *A comparison of the environmental effects of open-loop and closed-loop pumped storage hydropower.* https://www.energy.gov/sites/prod/files/2020/04/f73/comparison-of-environmental-effects-open-loop-closed-loop-psh-1.pdf

incentives, investment tax credits, accelerated depreciation, and clear enabling regulations and guarantees that investments will be compensated.[5,6,7]

- Fishery friendliness: Energy storage has the potential to improve the fishery friendliness of the overall energy portfolio by enabling reductions in total energy used. Impacts may vary with technology type. Pumped hydro may raise concerns related to disruption of water flows and sediment regime. Battery production may impact fisheries through mining and disposal of mineral components. These concerns should be addressed as part of a fishery friendly approach to climate action.
- Co-benefits: Co-benefits of distributed energy storage include energy resilience and cost savings.
- Environmental externalities: Pumped hydro may raise concerns related to disruption of water flows and sediment regime. Battery production may impact wildlife and human habitat through mining and disposal of mineral components. These concerns should be addressed as part of a fishery friendly approach to climate action.
- Policy catalysts: Utility-scale energy storage can be promoted through capacity payments, grants, feed-in-tariffs, peak reduction incentives, tax incentives, accelerated depreciation, demonstration-scale plants, storage standards, carbon pricing, renewable/clean energy portfolio standards, and clear enabling regulations and guarantees that investments will be compensated.
- More information:
    - Drawdown: Utility-scale energy storage
    - IRENA: *Utility-scale batteries: Innovation landscape brief*
    - Department of Energy: 2020 grid energy storage technology cost and performance assessment
    - Department of Energy: Pumped storage hydropower
    - University of Michigan Center for Sustainable Systems (2021). "U.S. grid energy storage fact sheet."
    - Katz, Cheryl (December 15, 2020). "In boost for renewables, grid-scale battery storage is on the rise." *Yale Environment 360.*

Continue reading at https://fisheryfriendlyclimateaction.org/solutions

[5] Project Drawdown. "Utility-scale energy storage." https://drawdown.org/solutions/utility-scale-energy-storage
[6] IRENA. *Utility-scale batteries: Innovation landscape brief.* https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2019/Sep/IRENA_Utility-scale-batteries_2019.pdf
[7] NREL. *Grid-scale battery storage: Frequently asked questions.* https://www.nrel.gov/docs/fy19osti/74426.pdf