Microgrids

As storms become stronger and electricity demand increases, the traditional electricity grid needs innovation and development to keep up. Microgrids, localized grids that can disconnect from the traditional grid to operate independently, can strengthen grid resilience and help mitigate grid disturbances. Microgrids are built to run independently, with the ability to generate, store, and distribute energy separate from or in addition to a conventional power grid.

Accessing energy and separating from the energy grid at large is called "islanding." Islanding allows microgrids to function even if the main power grid is down. This allows microgrid operators, such as housing developments, local government buildings, or commercial businesses, to maintain power during outages. Additionally, it helps to alleviate pressure on the main grid, as microgrids can offload and use their own energy during periods of peak demand.

Microgrids Example: Blue Lake Rancheria Tribe - The Blue Lake Rancheria Tribe owns a casino resort in Northern California, set on the 76-acre reservation. The tribe runs a microgrid powered by solar panels, with energy stored in Tesla batteries. Not only does the microgrid save 175 tons of carbon emissions per year, but it also has kept electricity running during blackouts. In 2019, amid wildfires in the state, 13,000 people fled to the casino during a planned blackout. The microgrid was able to provide the energy needed to power medical devices and fuel a municipal water system.

Photo Credit: Blue Lake Rancheria

Virtual Power Plants (VPPs)

A virtual power plant (VPP) is a collection of small-scale energy sources that, combined, can provide energy to the grid similarly to traditional power plants. VPPs can generate their own energy, often through solar panels, electric vehicle chargers, and smart water heaters. These energy sources come from thousands of households and businesses, linked together into a unified system by advanced software and technology. This process adds to the energy supply, alleviating pressure from power plants during high demand.

VPPs are deemed "virtual" due to their lack of a central physical facility. Instead, they aggregate energy from several smaller-scale producers. VPPs are able to skirt typical transmission and distribution bottlenecks by building and deploying technology quickly.

VPPs Example: Rocky Mountain Power Program - The Rocky Mountain Power company, based out of Salt Lake City, runs a program that allows customers to participate in a VPP. Customers who generate solar power receive additional benefits if they opt to install battery storage systems as well. These battery storage systems allow stored energy to flow to the greater electric grid. The customers benefit from lower rates while Rocky Mountain Power is able to use the collectively stored energy in times of peak demand (as opposed to requesting more energy from overrun power plants).

Similarities

- Both Microgrids and VPPs are able to generate distributed renewable energy, and store this energy at the distribution level.
- Both Microgrid and VPPs can save facilitators and ratepayers large sums of money through energy generation and lower pressure on the grid.

Differences

- Microgrids can "island" from the greater power grid, functioning independently. VPPs are often tied more strictly to the electricity grid.
- Microgrids rely more heavily on physical materials and innovations while VPPs depend more heavily on smart metering and information technology.
- Microgrids are typically constrained to a smaller geographic location. VPPs are able to operate across broader geographic areas.
- Microgrids face large political and legal constraints. VPPs are able to better navigate regulatory hurdles.

Legislation

Virtual Power Plants

- ****Colorado S.B.24-218 (enacted 2024):** Encouraged forward looking investment by tying the utility's Distribution System Planning (DSP) directly to cost recovery; creates a virtual power plant program.
- ****Colorado H.B.22-1013 (enacted 2022):** Appropriated $3.5 million to the Colorado Department of Local Affairs and the Colorado Energy Office for rural electric cooperatives and municipal utilities to develop microgrids in areas at risk from natural disasters.
- **Texas S.B.1699 (enacted 2023):** Requires the Texas PUC to establish a demand reduction goal and establish an aggregated distributed energy resources (or VPP) pilot program. Provides retail electric providers the ability to create VPP programs; authorizes the Texas PUC to establish rules for VPP providers; clarifies that VPP program operators are not power generation companies.
- **Virginia H.B.2346 (enacted 2025):** Requires the creation of a statewide Virtual Power Plant pilot program.

Microgrids

- ****New Hampshire S.B.230 (passed Senate 2025):** Empowers the NH public utilities commission to approve dedicated public purpose multi-customer microgrids. In most states, these are currently unable to be developed due to outdated statutes.
- ****Colorado H.B.1013 (enacted 2022):** Appropriated $3.5 million to the Colorado Department of Local Affairs and the Colorado Energy Office for rural electric cooperatives and municipal utilities to develop microgrids in areas at risk from natural disasters.
- ****Texas S.B.2627 (enacted 2023):** Established the Texas Backup Power Program, a pilot program to fund the deployment of microgrids at critical facilities, including groceries stores, gas stations, nursing homes, public safety buildings, and more.