Microgrids: Where's the Beef?

EEI Transmission, Distribution and Metering

Microgrids

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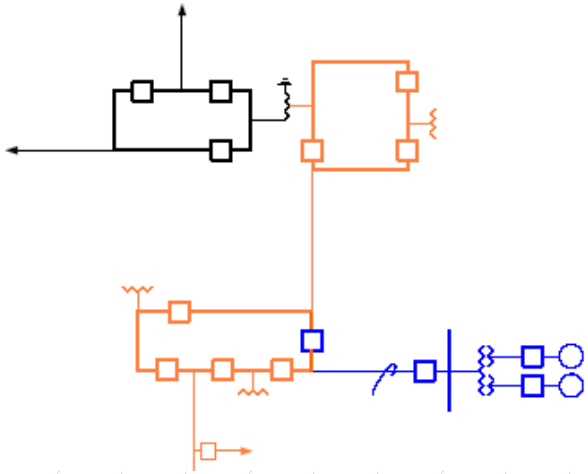

Key Points

- We've seen this movie.
  - Microgrids a throwback – to even before there were movies.
  - Capstone – first modern "microgrid."
- The defining characteristic of the microgrid – complete or episodic separation from the grid – is anathema to scale economies.
- Microgrids create micro versions of the "seams" FERC has been trying to eliminate.

Some Ancient History

- At the turn of the *last* century (yes, 1900) cities were marked by many “microgrids” – islands of little utilities.
- Soon thereafter we adopted Samuel Insull’s vision of the regulated franchised utility and got rid of the island model.
- The island model made no sense.

Insull Is Still Right

- There are enormous scale economies in the transmission and distribution of electricity.
- There are enormous efficiencies in interconnecting generation so that the least-cost sources of electrons and of ancillary services are used every hour, day and week of the year.
- There is tremendous reliability benefit from the diversity provided by hundreds of generation resources.

Although Occasionally We Forget

No Market Efficiency Benefits

- Integration is what maximizes the ability of least-cost resources to reach load.
- By interfering with least-cost dispatch, microgrids can only raise energy costs. It's just math:
  - At any time the marginal (variable) cost of microgrid generation is either below or above the marginal cost of grid generation deliverable to the microgrid. If below, the microgrid generation should run and, if above, the microgrid generation should not run.
  - Centralized least-cost dispatch ensures that this happens.
  - Autonomous decision-making by a microgrid operator cannot improve on that – either for the grid or for the microgrid.

Any Reliability Benefit at Huge Cost

- Grid is planned now to avoid reliability standard violations and to provide highly reliable generation supply (1-in-10 LOLE).
- Microgrid can improve on reliability only at the cost of redundancy:
  - Redundant generation to avoid outage from loss of supply.
  - Redundant distribution to avoid outage from distribution system failure (most common cause of outages).
- This redundancy – inherently inefficient due to isolated design – comes at a huge cost to someone.

Research Shows Cost > Benefit

- Rigorous analysis in microgrid case studies conducted by GE (sponsored by NYSERDA).
- Take first one in Broome County, NY:
  - The average annual outage period in Broome County is 2 hours.
  - For a microgrid to make sense "... the expected number of days without power must be 17 or more each year in order for the project to be cost-effective."
  - In other words: Current annual outage experience at the Broome County site is 2 hours. A microgrid would make sense if expected outages each year were measured in *weeks*.
- Unfortunately, this research is ignored.

Why Do We Care?

- Customers who highly value reliability can install back-up generation -- as they have done for decades.
- Microgrids are a luxury. Customers should of course be able to pay for a luxury if that is what they want (and there is no adverse impact on grid reliability).
- But microgrids are not a luxury that other customers (or taxpayers) should have to pay for.

P.S., It Helps If It Actually Works

- Nation's "flagship" microgrid at the University of California, San Diego failed its real world test during the 2011 Southwest Blackout:
  - "The university's two 13.5 MW Trident turbines were running full-bore when power from the utility abruptly went dead. With no time to shed their load, the turbines also shut down, and the campus lost electricity. Restoring power to the entire campus took five hours, while Greater San Diego took 13 hours." http://www.eenews.net/stories/1059996047
  - The UCSD campus was closed the next day like other campuses and facilities in San Diego.
- Begging the question of what the UCSD microgrid actually accomplished.

Thank You!

Full article in *Fortnightly* available here,
http://www.energy-counsel.com/docs/Microgrids-Wheres-the-Beef-Fortnightly-November2015.pdf