What is a microgrid anyway?

DOE: “… “a group of interconnected loads and distributed energy resources within clearly defined electrical boundaries that acts as a single controllable entity with respect to the grid.”

Optional

- Local Distribution Network
- Capable of “islanding
- Building >> Community
- Size Range (<150 MW)
- Multiple RE generation resources
- Control system
- Communications
Microgrid | HOMER Energy History

- Developing country diesel grids - NREL adds RE
- NREL starts exploring islands and Arctic communities
- Campus, military and industrial microgrids
- Microgrids NOW come full circle back to US cities
Microgrid Markets / Characteristics

- (GTM) 2,430 operational US microgrids / 187 developers
- $40 billion by 2023 worldwide
- Asia will have the most global microgrid capacity
- US Average size (product-led) 1 MW
- US Average size (technology neutral) 2-30 MW
- Microgrid teams: “Multiple personality disorder”
- HOMER Energy | 70,000 projects / 3 Million runs | 193 countries
Map of Operational Microgrid Deployments by End-User Type Across the Continental U.S.*

- Commercial
- Military Installation
- University/Research Facility
- City/Community
- Public Institution
- Island
- Remote Community
- Multiple End User Types**

Source: GTM Research, U.S. Microgrid Tracker Q3 2017

* The size of the bubbles correspond with the total capacity (MW) installed in that location.
** Microgrids are mapped based on city location; when multiple microgrids are in the same city they may get the multiple end user designation. In some cases for data privacy, data is given at a state or national level. In these cases, the microgrids are mapped at the center of the state.
US Microgrids: The Value Trifecta

• Resilience
• Environmental Benefits
• Cost Cutting

Other values: Economic development, cyber security, ancillary (grid) services to utilities
Maui Brewing Company: C&I Microgrid
Maui Brewing Co.

- Environment
- Cost cutting
- 34¢ kWh C&I rates

- 100% Renewable Goal
- 1 MW PV / will expand
- 3 MWh storage
- Biofuel generators
- $7M cost (state incentives)
- $300,000 pa savings
California: Microgrid Resilience / Fires
California is Moving Fast on Microgrids

- 20 MG PG&E / June 2020
- Humboldt County - Community Microgrids
- 18 Microgrids for Santa Barbara Schools (solar PV, ESS, EV)
- Goleta Load Pocket - Santa Barbara Community Microgrid

CA has generous grants for storage and microgrids (unlike CO)
Sandbar Solar: Off the Grid in Santa Cruz
Sandbar Solar: Cutting energy costs

- Two year delay to get electricity for new building
- $75,000 “interconnection study” required by PG&E
- 60 kW solar (which over produces)
- 90 kWh flow batteries
- 60 kW gas generator
- Off the grid, right in downtown Santa Cruz
- Worked closely with city to reduce generator time
UCSD: Campus Microgrid
UCSD “Pearls on a Necklace”

- 1200 acres / 450 buildings / UCSD 36,000 students (CU 33,000)
- 13 MW natural gas / cogen / absorption chillers
- District cooling
- Energy efficient buildings/green roofs
- 3 MW solar network
- 2.8 MW fuel cell uses waste methane (wastewater plant)
- 2.5 MW energy storage system
- EV charging research center / very fast EV growth
UCSD: “The buildings come first”
PITT OHIO: C&I Microgrid
PITT OHIO: Trucking/Logistics - Parma, OH

- Two microgrids in freight centers
- Parma Ohio / 1 MW
- Saving $256,000 per year in utility bills
- Direct DC power for data center + lighting
- Battery operated forklifts and lighting
- LEED certified building
- 50 kW PV, wind, batteries
- EV charging
- Permanent lab for University of Pittsburgh engineering students
Pittsburgh: Resilience Microgrids / Flooding

HOMER Energy by UL

1/25/20 | Mayor's Conversation about Climate & Local Clean Energy: Microgrids for Cities
Pittsburgh: High flood risk

- Homeland Security grant to improve resilience
- Identified neighborhoods with high “resilience risk”
- Plan for multi-user community microgrids for emergencies (w/ cell, health, water, first responder facilities)
More! City Microgrids

• Cleveland $100 Million City Center Microgrid
  — Economic development and cyber security
  — Partnership w/ local utility => Natural gas
• New York City Microgrids
  — Over a dozen / $40 million
• Massachusetts
  — Multiple microgrids in small cities
Microgrid Use Cases for Boulder

- First responders (and protect police cars from hail)
- Facilities with big demand charges (EcoCycle, wastewater)
- Cannabis growers (but problems w/ split incentives)
- EV charging (peak demand reduction)
- C&I facilities
- CU Campus
HOMER Energy Resources

Microgrid News:  www.microgridnews.com
Software and consulting:  www.homerenergy.com
Email me:  Lili.Francklyn@homerenergy.com

Questions?