CSI Center for Sustainable Infrastructure

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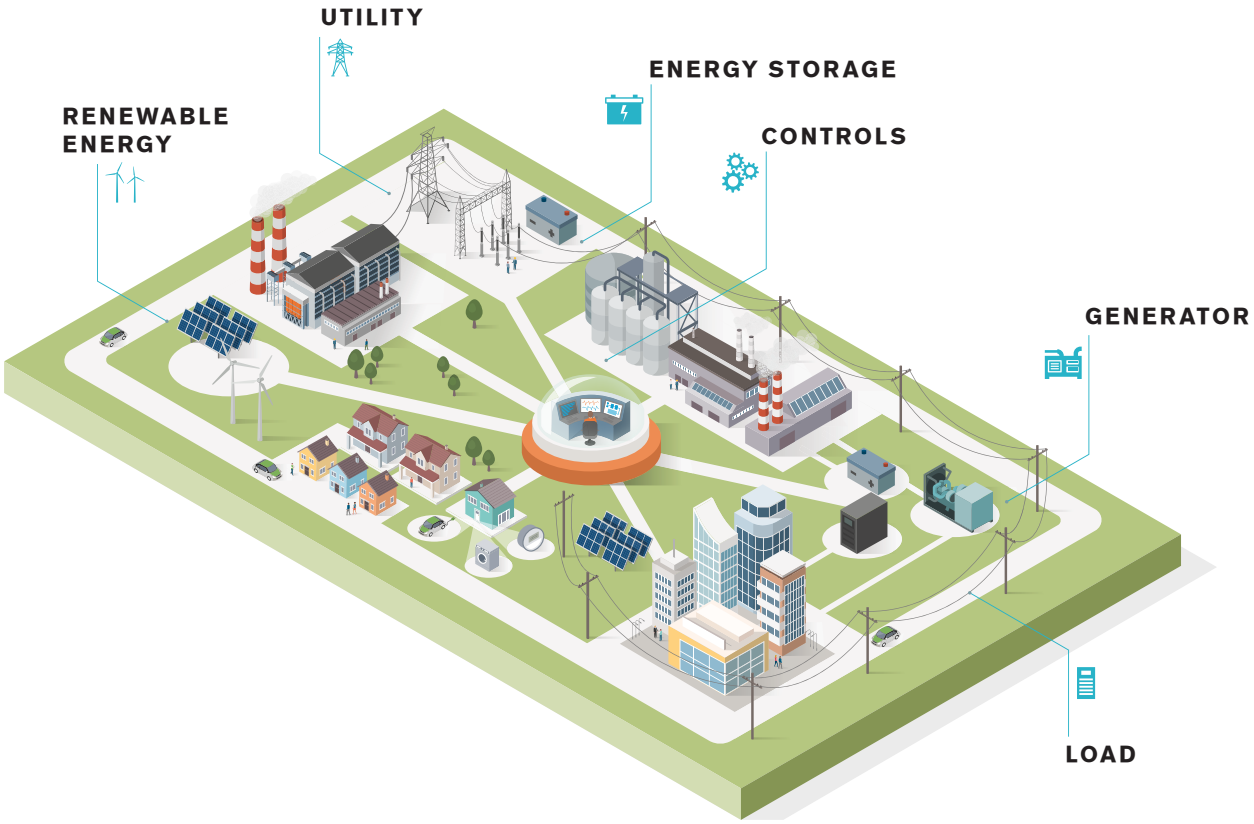
MARCH 5, 2020



ELECTRIC POWER DISTRIBUTION

MICROGRID ENERGY SYSTEMS

WHAT IS IT?

A micro-grid provides electricity within a defined area from multiple sources. It manages and balances regional grid supplies with distributed electricity generators such as solar panels, wind power, generators, storage batteries and distribution lines. The micro-grid operates as a sub-unit of a broader electrical utility network or completely independent of it. Micro-grids are an excellent tool to manage renewable energy generation in limited areas to balance costs, demand, and resilience.

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MOST COMMON USES?

- Micro-grids provide electricity
- Microgrids combine various distributed energy resources to balance supply and demand in a defined service area
- Any use that runs on electricity might connect to the system including buildings, vehicles, heating and cooling systems
- Micro-grids can often be used to provide backup power
- They increase reliability and resilience as they are designed to operate autonomously when disconnected from the traditional electrical grid
- Microgrids can cut expenses as they can reduce reliance on expensive grid energy by prioritizing use of locally available renewable energy sources first
- Microgrids are useful in remote locations as they can be entirely managed using available renewable energy generators such as wind, tidal, and solar photovoltaic panels.
- Microgrids have their own electronic management systems that balance loads between users, supply sources, and batteries.
- Sometimes micro-grids are co-located with thermal energy district systems that share and move thermal energy between users.

HOW DO YOU CREATE A MICROGRID?

The technology to manage and operate a microgrid is fairly mature. However, experience in microgrid implementation is still somewhat rare. Many mechanical-electrical-plumbing designers and contractors can do the design and many more can do the installation.

DESTINATION/FATE

- Microgrids require maintenance as do all infrastructure systems. However, once the capital cost for implementing the system is retired, on-going maintenance and operating costs can be much lower than the costs per kilowatt from grid resources.
- A microgrid system might be sold to a third party who then operates the system. They may charge tenants for debt, overhead, and sometimes profit just as the larger utilities do.

CONCERNS

Deciding who owns and operates a microgrid can become a potential stumbling block if the beneficiaries of the system are interested in the additional skills required to maintain and operate the system.

OPPORTUNITES FOR INTEGRATION

- Recover power from waste process heat in small generators.