

## MICRO-GRIDS by Patty Nussbaum

A Micro-Grid is a stand-alone electrical island that can be connected to the power grid. When connected to the grid it looks like any other electricity consumer. Standing alone it is a distributed system with its own generation and load.

DOE has been tasked with modernizing the country's electrical power grid. The modernized grid is often referred to as the Smart Grid and Micro-Grid technology is part of the ongoing discussion of the challenges and opportunities surrounding a smarter electrical grid.

Blackouts, national security concerns and natural disasters (in Louisiana this often means hurricanes or tropical weather) highlight our dependence on electricity. Plant production stops, refrigerated and frozen food spoils, traffic lights stop working and traffic grinds to a halt, credit card and ATM transactions stop and gas pumps don't work. The centralized grid structure makes us more vulnerable. Other countries like Germany and Japan, which did not have a large central grid to work around have developed a more distributed approach with photo-voltaic (PV) solar power and advanced battery storage technology respectively. A micro-grid system for urban applications and another for suburban applications taken from the Shimizu Company website are shown below.

[http://www.shimz.co.jp/english/theme/sit/technology\\_03.html](http://www.shimz.co.jp/english/theme/sit/technology_03.html).

Micro-Grids take advantage of distributed resources and support the smart grid concept of "islanding". Islanding allows the distributed generator to continue generating power when there is no power coming from the utility. The Micro-grid uses things such as rooftop PV solar, fuel cells, combined heat and power, and perhaps even electric vehicles (where the grid is taking power from the vehicle's storage battery rather than the other way around). In this way a building or a community can generate enough electricity to sustain itself until the larger utility grid is restored.

The United States military is looking to the Micro-Grid to ensure energy security as well as to meet renewable energy goals. The military has of long history of self-sufficiency and this technology is a natural extension of military resiliency as it relates to national security.

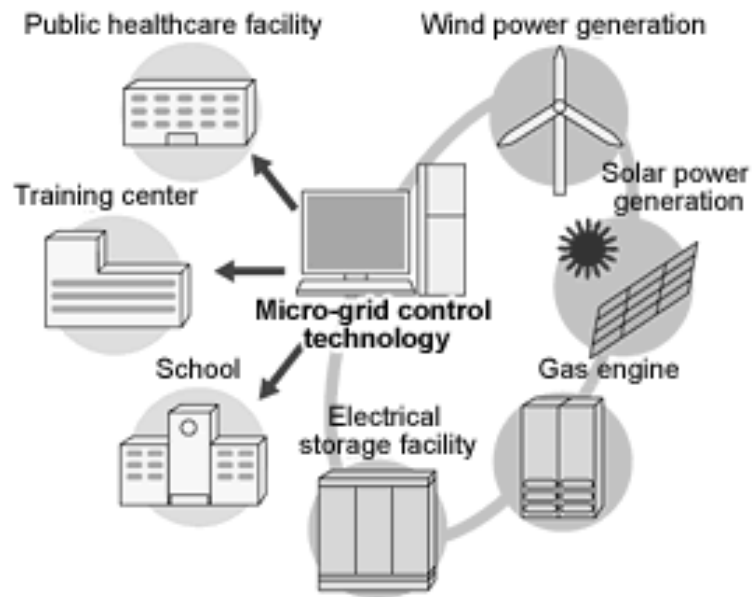
The U. S. Department of Energy's Office of Electricity Delivery and Energy Reliability funded a microgrid R&D effort called the Consortium for Electric Reliability Technology Solutions (CERTS) (<http://certs.lbl.gov/certs-der-micro.html>).

The micro-grid concept treats load and generation as a single, distributed system that can operate on its own as an island or connected to the larger utility grid. This is a piece of the larger Smart Grid concept of an affordable, integrated power system that can isolate itself from the power grid when needed such as in the event of a blackout or brownout situation and then automatically reconnect when the event is over.

The Smart-Grid of the future will no doubt have distributed resources that automatically detect and respond to problems. It will also be resilient when faced with "attack" or natural disasters and have rapid restoration capabilities.



Micro-Grid System – Urban



Micro-Grid system Suburban