Microgrids for the Department of Defense

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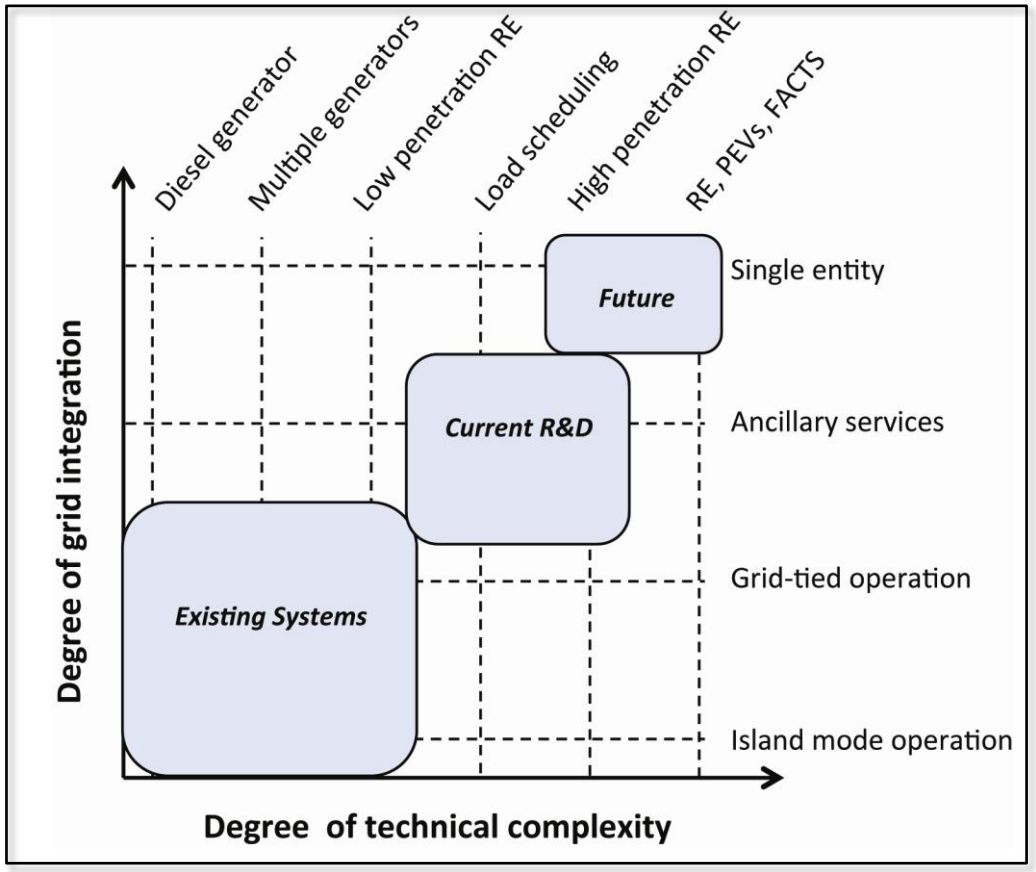
A Definite Need

- **Current State**
  - **Older infrastructure**
  - **Poor energy efficiency**
  - **Backup diesel generators**
- **Opportunity**
  - **Willingness to innovate**
  - **Well defined physical boundaries and stakeholders**
  - **Facilities representative of the larger grid**



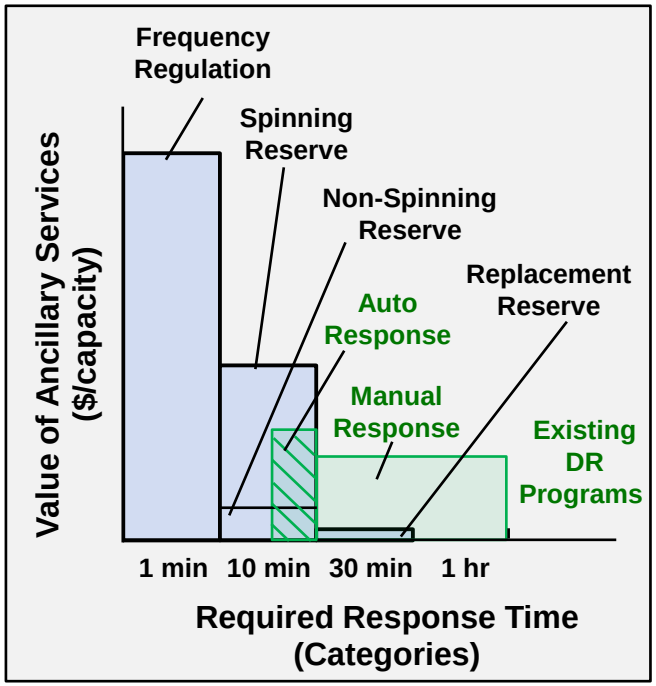
Critical defense missions depend on the commercial grid, with only spot generators as backup

Microgrids Must Be Cost Effective

table 1. ESTCP-funded projects demonstrating interactions with ancillary service markets and internal peak-shaving efforts.

	Location	Lead Performer	Market Location
Frequency response	Portsmouth Naval Shipyard, Maine	Ameresco	ISONE
	Los Angeles Air Force Base, California	LBNL	CAISO
Nonspinning reserve	Fort Irwin, California	Honeywell International	CAISO
Demand response	Naval District, Washington, D.C.	Weston Solutions	PJM
Peak shaving	MCAS Miramar, California	Raytheon	CAISO
	Fort Bliss, Texas	Lockheed Martin	Private utility
	Fort Bragg, North Carolina	Honeywell	Private utility
	Fort Bragg, North Carolina	Robert Bosch	Private utility

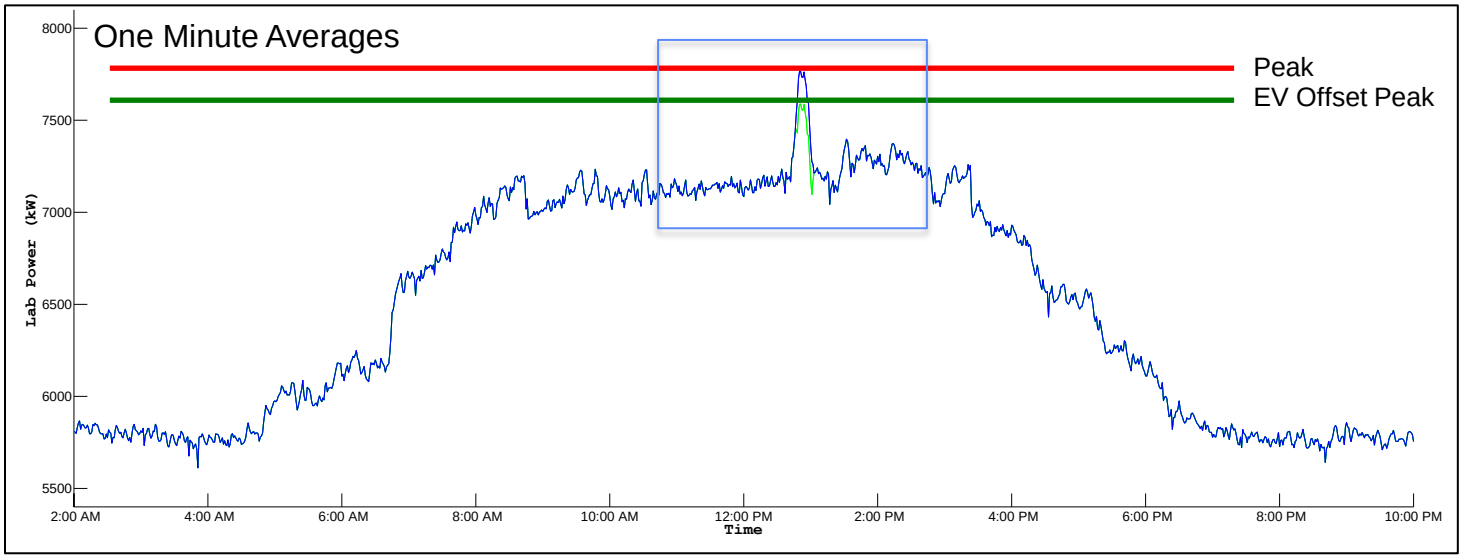
Value increases as response time decreases



- **Provide benefits to the local utility during grid-tied operation**
- **Consider the installation energy system as a single entity relative to the grid**
  - **Aggregates energy storage, generation, and loads behind the fence line**
- **DoD is funding a number of pilot projects focused on the ancillary service markets**

DoD Electric Vehicle Initiative

- **The DoD is planning to replace several hundred fleet vehicles with EVs**
  - **Three year program at six installations**
  - **EVs must be cost neutral relative to conventional vehicles**
- **MIT/LL has shown a savings of $391/vehicle/month through peak shaving**
  - **$23/kW peak demand charge**
  - **Potentially more significant benefits through frequency regulation**



Principle Challenges

- **Cyber security concerns can severely constrain connectivity on DoD installations**
  - **Integrating systems onto the base network can take months (or more) for approvals**
  - **Cyber requirements for ICS systems are ill defined**
- **Systems must me cost effective as a whole**
  - **A price (¢/kWh) for energy security is unlikely any time soon**
  - **Ability to bundle simple cost saving measures with energy security improvements is critical**
- **Need to show that microgrids provide higher reliability at a lower cost then current systems**