# DOE EAC Panel

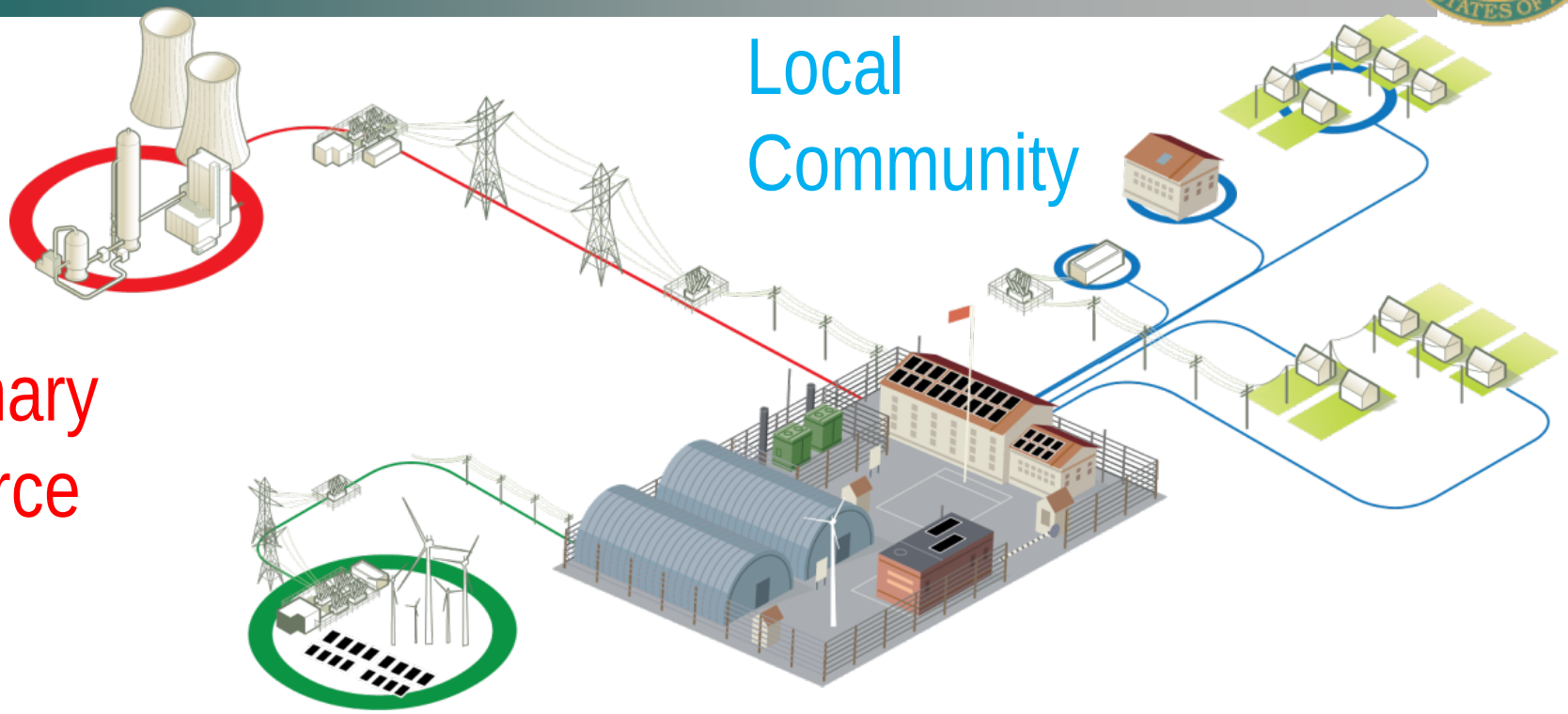
# Micro-grids: Current and Future Development Plans

Moderated by: Wanda Reder, Smart Grid Sub-Committee Chair

Electricity Advisory Committee Meeting
June 30, 2015

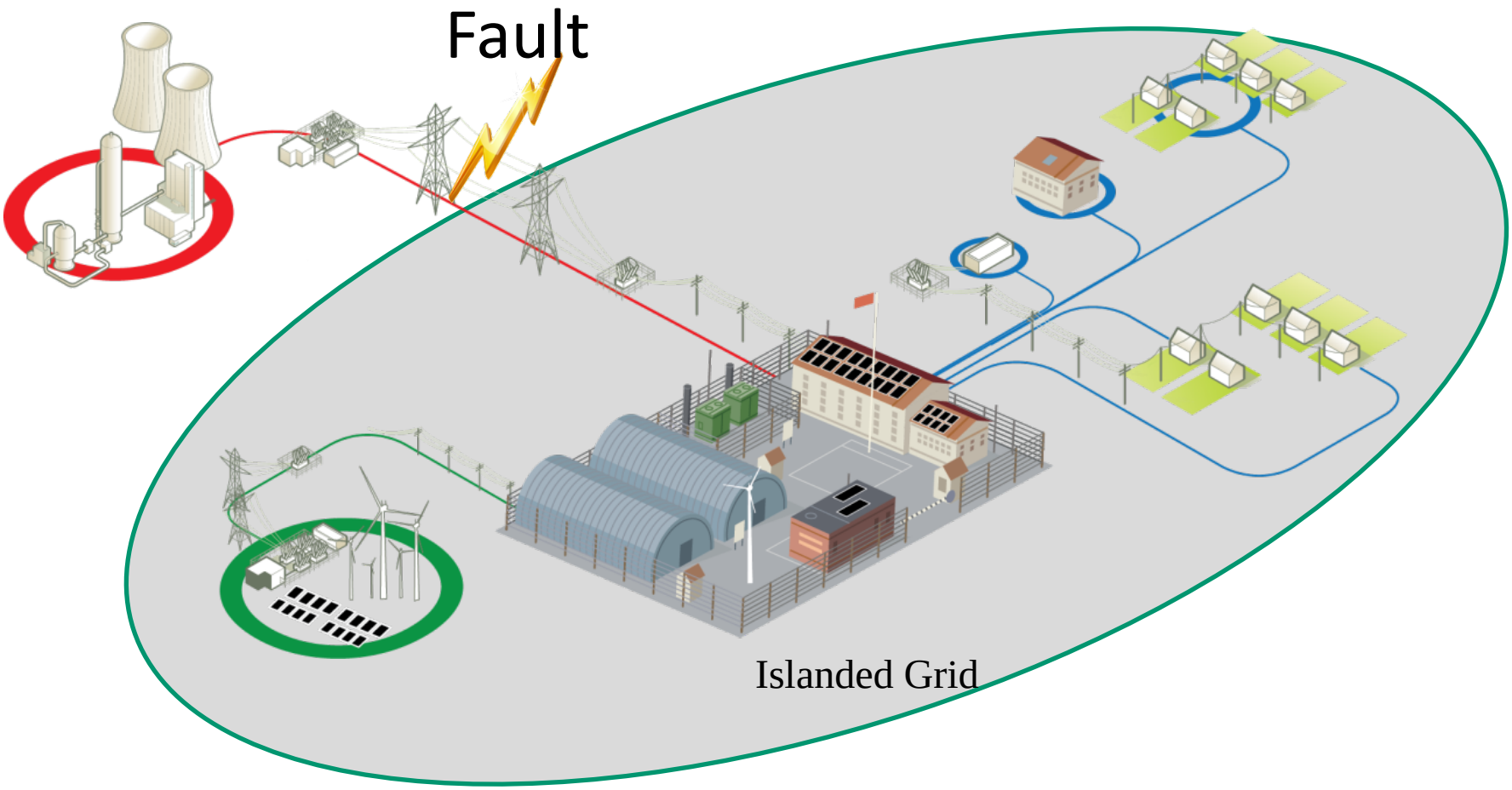
8:30 to 10:00 am

# What is a Micro-grid?




Micro-grid is a localized grouping of distributed electricity sources, loads, and storage mechanisms which can operate both as part of the central grid or independently as an island.

# What is a Micro-grid?



# Various Types of Micro-grids

- Consumer Micro-grid
  - single consumer with demand resources on consumer side of the point of delivery, (e.g. sports stadium)
- Community Micro-grid
  - multiple consumers with demand resources on consumer side of the point of delivery, local objectives, consumer owned, (e.g., city,. campus, military bases, universities, remote locations)
- Utility Micro-grid
  - supply resources on utility side with consumer interactions, utility objectives

# Why Micro-grids?
# Resiliency and Energy Security

- The issue:
  - Outages and catastrophic events have a clear impact on economic output and impact on social services
  - Declining reliability of grid
  - Increased dependency

- Benefits:
  - Provide **local power** during outages
  - Provide **local reliability** and power quality
  - Ensure reliability, especially for **critical loads**
  - **Cyber security**
  - Promotes **energy independence** and community

# Why Micro-grids?
# Efficiency and Optimization

- The issue:
  - High cost of energy at remote locations
  - Market development needed
  - Increasing electrical rates
  - Solar PV and diesel fuel price trends
  - Harvest more bi-directional value

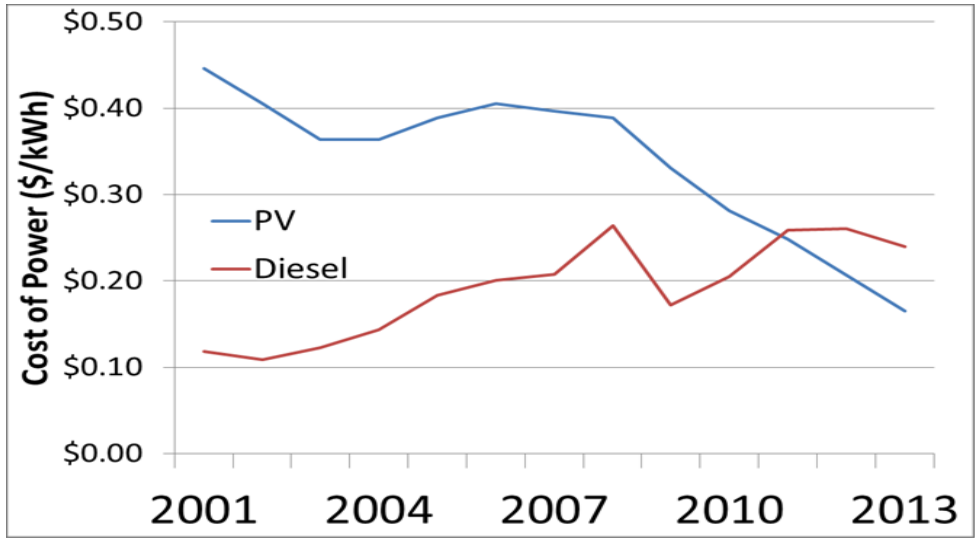
- Benefits
  - Save on electric bills: **peak reduction and offset energy**
  - Reduce electricity **loss** from local generation
  - Create ability to **provide ancillary** services for the grid
  - Use Combined Heat and Power

# Distributed Generation Costs Trends

Micro-grids incorporate storage with renewables and can:

- Smooth intermittency
- Minimize reverse power flow, keeps voltage within limits
- Store output and release coincidental with local load
- Control ramp rate

**Solar PV and Diesel Technology Power Cost Trends: 2001-2013**




*(Source: HOMER Energy )*

Advanced Microgrids: Building the Business Case, Navigant, Feb 2015

# Why Micro-grids?
# Green Integration and Operations

- The issue:
  - Mandated public policy
  - Increasing renewable penetration

- Benefits
  - Improve ability to **manage variability** of loads, renewables locally
  - Support **integration** of smart grid,  renewables, DER

# Paying for My Micro-grid…

- Government Funding (Temporary?)
- Distributed Generation
- Ancillary Market Participation
- Utility Savings
- Fuel Savings
- Capital Expenditure Savings
- Cost Avoidance (ICE Calculator)

# Micro-grid Panelists

- Objective - Discuss how to…
  - Quantify intangibles such as resiliency and reliability
  - Design markets that are the most receptive to micro-grids
  - Overcome the major barriers/challenges for higher deployment
  - Facilitate necessary changes in the utility's role to accommodate a growing number of independent micro-grids
- Panelists
  - **David Treichler** - Oncor Electric Delivery
  - **Edward Krapels** - Anbaric Transmission
  - **James Gallagher** - NY State Smart Grid Consortium
  - **Nancy Pfund** - DBL Investors