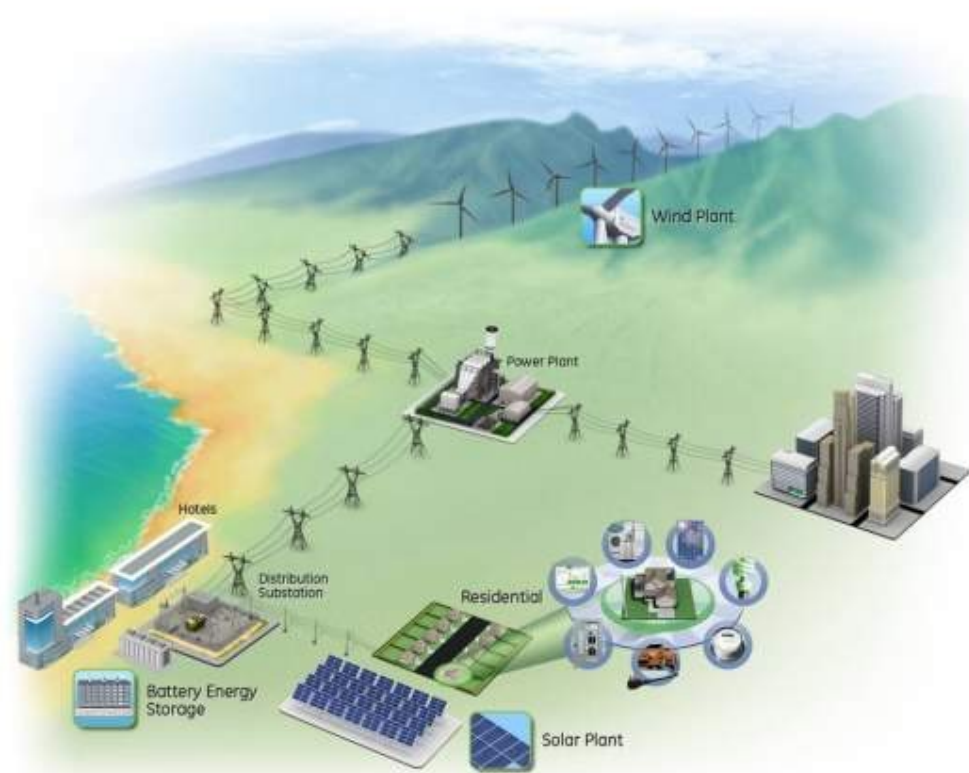


Department of Energy's Smart Grid Demonstration Projects on Maui

HCEI Plenary Session

December 6, 2011

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Hawaii Natural Energy Institute



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School of Ocean and Earth Science and Technology
University of Hawaii at Manoa

Presentation Overview

- **Discuss DOE RDSI Maui Smart Grid Project**
- **Describe DOE SEGIS Project**
- **Collaboration efforts with NEDO**



DOE RDSI MAUI SMART GRID PROJECT



Project will Manage Distributed Energy Resources (DER) to Support Grid Operations



Key Technologies:

Home Area Networks (HAN)

Battery storage

Advanced Metering Infrastructure (AMI)

Distribution management system

DOE RDSI Maui Smart Grid Project Objectives

Reduce distribution circuit peak loading by >15%

- Coordinate battery storage and demand response to meet peak demand

Improve service quality

- Use smart meters for outage detection
- Distribution monitoring and optimization to improve voltage profiles

Inform consumer energy decisions

- Communicate energy use with web portals and in-home displays
- Support new pricing methods

Support grid stability

- Substitute for conventional reserves with demand response and storage
- Improved monitoring voltage, current, and PV output

Enable greater utilization of as-available renewable energy sources

- Increase demand during off-peak periods



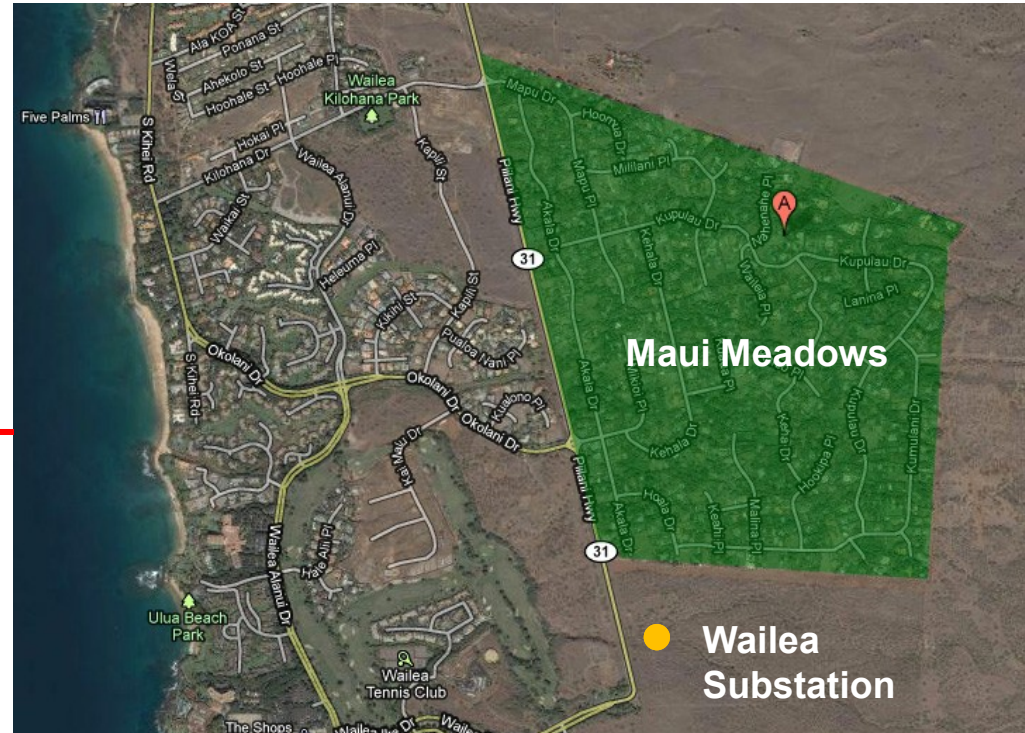
Project Located in South Maui

Maui

Kahului

Kihei

Wailea



Basic System Facts:

MECO system peak load \approx 200MW

Firm generating capacity \approx 240 MW

Kaheawa Wind plant = 30 MW

Approx. 90 MW of potential renewables within project period

Project will use 2 circuits @ Wailea Sub.

Maui Meadows: 650+ homes

Other circuit with resorts and commercial



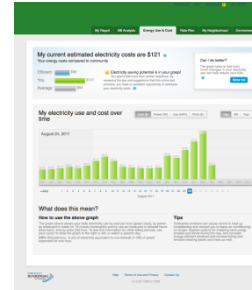
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Home Area Networks (HAN)

enabling customer feedback, demand response, and PV monitoring

Customer feedback



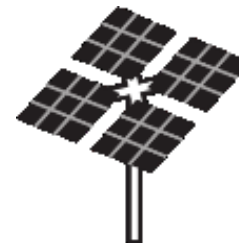
Demand Response

- Reduce demand in emergencies

PV Monitoring

- Report output from PV Systems

Smart Meter

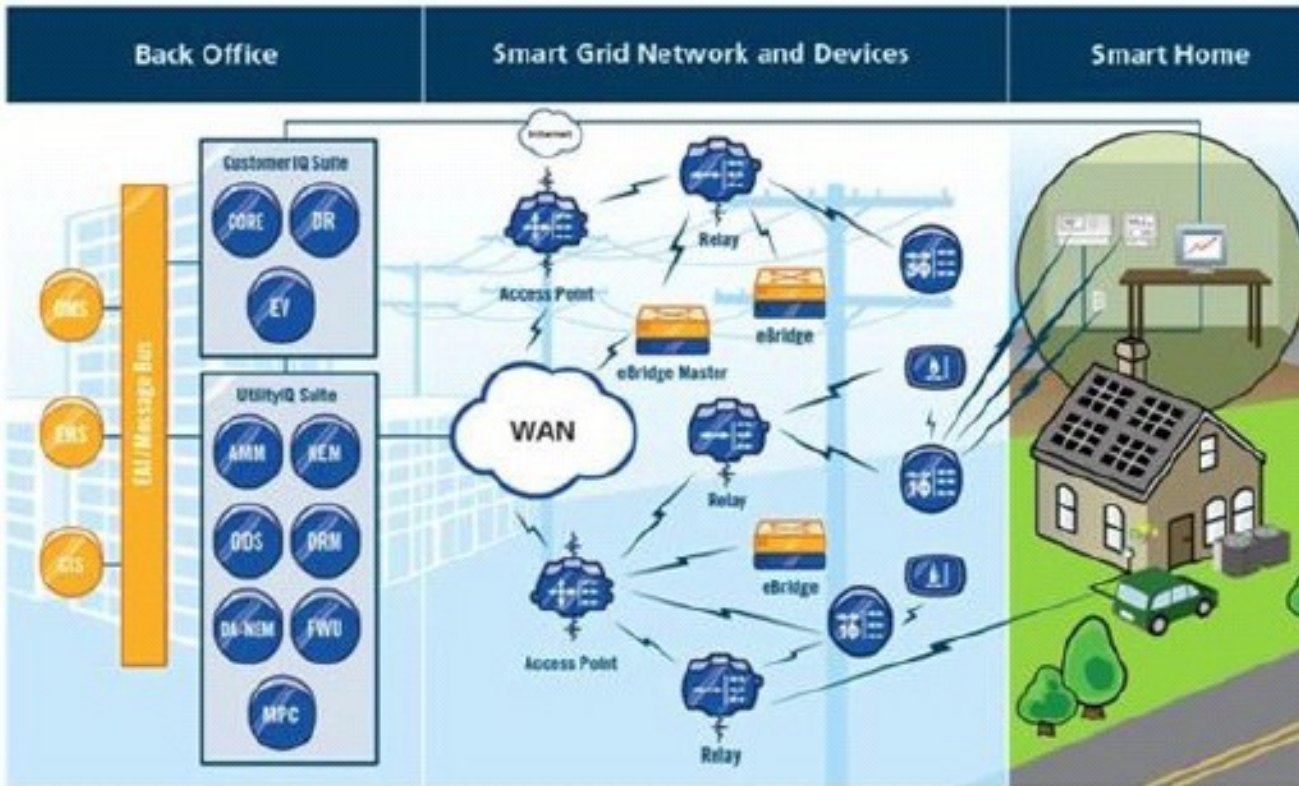


- Records energy use
- Reports outages
- Communicates with in-home devices

Silver Spring Networks is technology provider for this system

Advanced Metering Infrastructure (AMI)

providing two-way communications between utility and customer



Wireless mesh network

AMI supports:

- report demand
- outage detection
- voltage monitoring
- in-home technology

Silver Spring Networks is technology provider for this system



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Battery Energy Storage System (BESS)

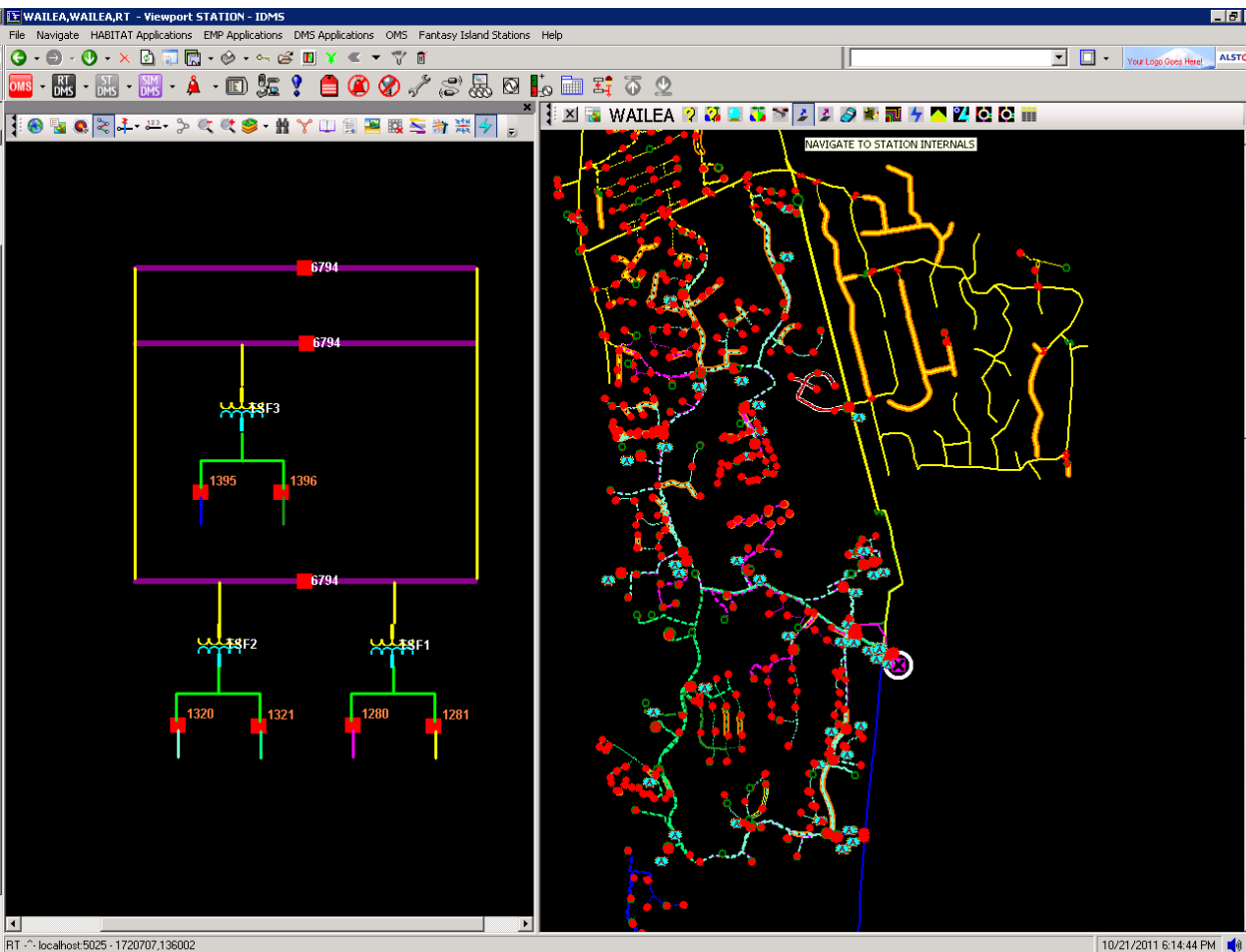
Multiple Benefits

1. BESS located at Wailea Substation
2. Manage peak load → Discharge for 1-2hr during peak
3. Voltage regulation → Manage variability caused by load and PV
4. Renewables Integration
 - Non-spinning reserve → Rapidly inject power, and bridge to fast-start generation.
 - Reduce wind curtailment → Charge off peak during excess energy periods



Distribution Management System (DMS)

Visualize distribution system data and manage system assets



Wailea Substation

Distribution System

Model

Data

Visualize distribution system data

Dynamic load flow model

Volt/VAR optimization

Developing decision support “dashboard”



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Update on Project Community Outreach

Outreach started in August

- Letters to residents, informing local decision makers, meetings
- Address community concerns about new technologies
- www.mauismartgrid.com

Signed up 100 volunteers to date

Held community meeting last week



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Update on Project Community Outreach



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DOE Solar Energy Grid Integration Systems (SEGIS)

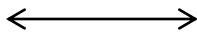
*Development and Demonstration of
Smart Grid-Enabled PV Inverters*



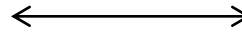
PV Inverters Integrated into Home Area Network (HAN)

enabling two-way communication and grid support features

Integrate into
Utility
Software
Applications



SSN
Smart
Meter



Smart Grid-Enabled Inverter



Fronius Inverter: 3 kW - 5 kW

- **Grid support features developed to meet German grid codes**

Project will demonstrate inverters at two utility sites – Maui Electric and Oklahoma Gas & Electric



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Collaboration with NEDO

Supporting scoping efforts over past year

Show interoperability of US and Japanese technologies

– specific focus on PV inverters and “Micro-DMS”

Compare results between projects

Support and assist with community outreach



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Mahalo!

Questions?



For more information please visit:



www.mauismartgrid.com