

Development and Demonstration of Smart Inverters for High-Penetration PV Applications

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SYSTEMS INTEGRATION

OBJECTIVES AND PARTNERS

- » Enable high-penetration residential PV
- » Lower grid integration costs
- » Test benefits to utility of inverter control



Principal Investigator

- » Provide program management and analysis of benefits and impacts of smart grid inverter control capability



Technology Lead

- » Provide end-to-end, standards-based, Smart Grid communications for inverters



Inverter Technology Lead

- » Provide inverter with Advanced Grid Functionality (AGF)



Services Lead

- » Provide system installation, training, and customer support



Co-Utility Lead

- » Assess benefits to utility of inverter control capability

Co-Utility Lead

- » Assess impact of inverter to mitigate voltage fluctuations and output variability on distribution feeder

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SOLUTION ARCHITECTURE

Utility Back Office Systems

Inverter Management & Control Software

- » Provision inverter on network
- » Manage PV Production Data
- » Send control signals to inverter
- » Monitor status of inverter



- CustomerIQ™**
- » Utility web portal
 - » Customer can see net bill impact & solar production

Smart Grid Network

Silver Spring Networks Network Interface Card

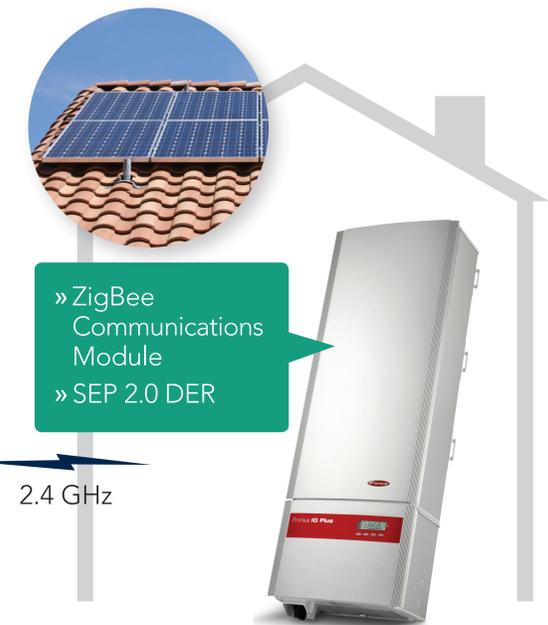
- » SEP 2.0 over 2.4 GHz ZigBee
- » 900 MHz utility smart grid network
- » Retrieve PV production data
- » Send inverter control signals through network



Silver Spring Networks Access Point



- Smart Meter**
- » Utility owned
 - » Home's primary meter



- » ZigBee Communications Module
- » SEP 2.0 DER

- Based on Fronius IG Plus V Inverter**
- Advanced Grid Functionality (examples)
- » Remote generation curtailment
 - » Remote control of reactive power supply
 - » Low voltage ride through

SOLUTION OVERVIEW

- » Smart Energy Profile 2.0 – Distributed Energy Resources (DER) Function Set
- » Smart inverter with Advanced Grid Functionality (AGF)
- » Standards-based Smart Grid communication module (NIC)

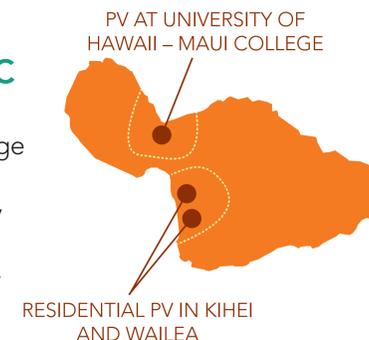
FIELD TRIALS



NORMAN, OK

OKLAHOMA GAS & ELECTRIC

- » Assess benefits to utility of inverter control, including conservation voltage reduction
- » Assess new business model for utility owned Smart Grid Inverters
- » Demonstrate new smart grid inverter systems near the end of a feeder



PV AT UNIVERSITY OF HAWAII – MAUI COLLEGE

RESIDENTIAL PV IN KIHEI AND WAILEA

MAUI ELECTRIC COMPANY

- » Demonstrate new Smart Grid Inverter systems
- » Test, control, and monitor inverters to enable higher penetration of PV