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

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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

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)

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

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

Home

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

Smart Meter
» Utility owned
» Home’s primary meter

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

FIELD TRIALS

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

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

SunShot
U.S. Department of Energy