NVEnergy

Distributed Energy Resources Trial

PV+Storage+Advanced DSM

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Overview

Consumer Information Gateway Development
and Integration to Enable Price-Responsive and Direct Load Control

Department of Energy RDSI Grant (2009-2015)

- Reduced Peak demand by over 65% *(Compared to code built homes)*
- 50% Cost Share

Partnership

- NV Energy, Pulte Homes, UNLV

Project Site Villa Trieste

- 185 LEED Platinum homes completed

Integration Objectives

- Smart Meters
- Distributed Generation ~ 2 kW PV Systems
- Residential Battery Storage ~ 8 kWh Lithium-Ion
- Energy Efficient Construction
- Display of Aggregated Energy Information
- Demand Responsive Thermostats
- Automated Intelligent Agents

NV Energy Objectives

Test/Validate	• Test and integrate new technologies (smart meters, home energy management systems, storage, PV)
Technology Integration	• Effectively integrate premise-based systems with grid management
Demand Side Management	• Develop and optimize peak load management strategies
Grid Impacts	• Evaluate potential grid benefits of premise-based systems
Customer Impacts	• Gauge customer impact and interaction with energy management systems
Cost Effectiveness	• Assess cost/benefit of technology packages
Technology Roadmap	• Develop distributed energy resources roadmap and new customer energy solutions

Current Status

All Homes Sold

- Include PV systems and home energy management systems

10 Battery Energy Storage Systems (BESS) Installed

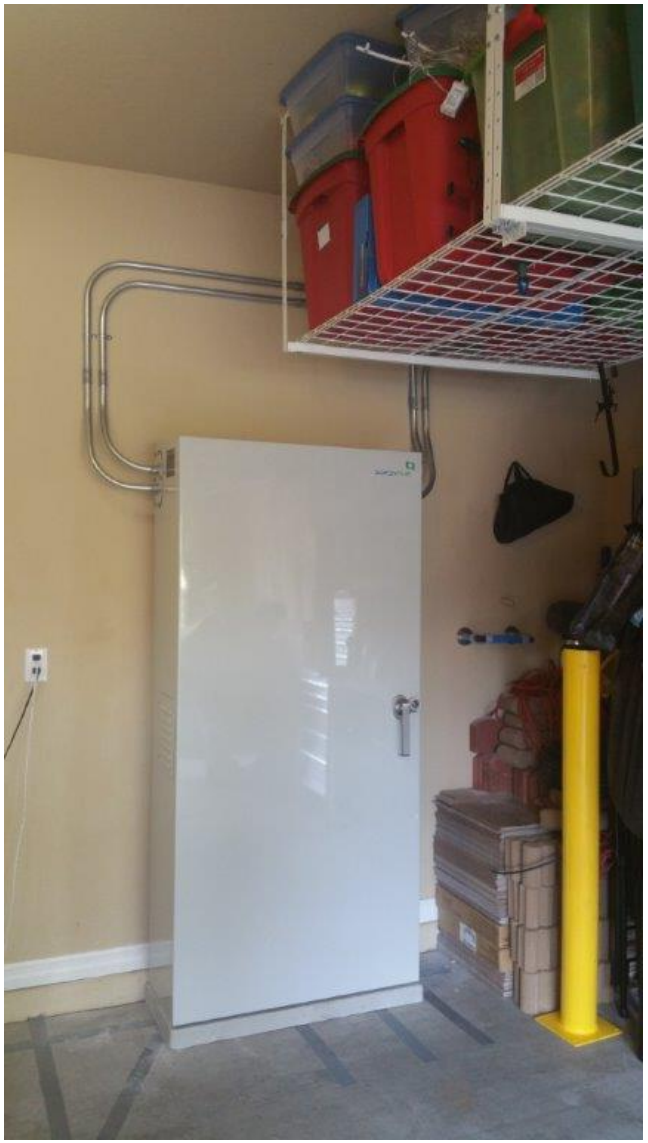
- Five more systems ordered

Smart Meter Gateways Installed

- Redundant hardware exists for energy information collection
- Hardware based information display technology

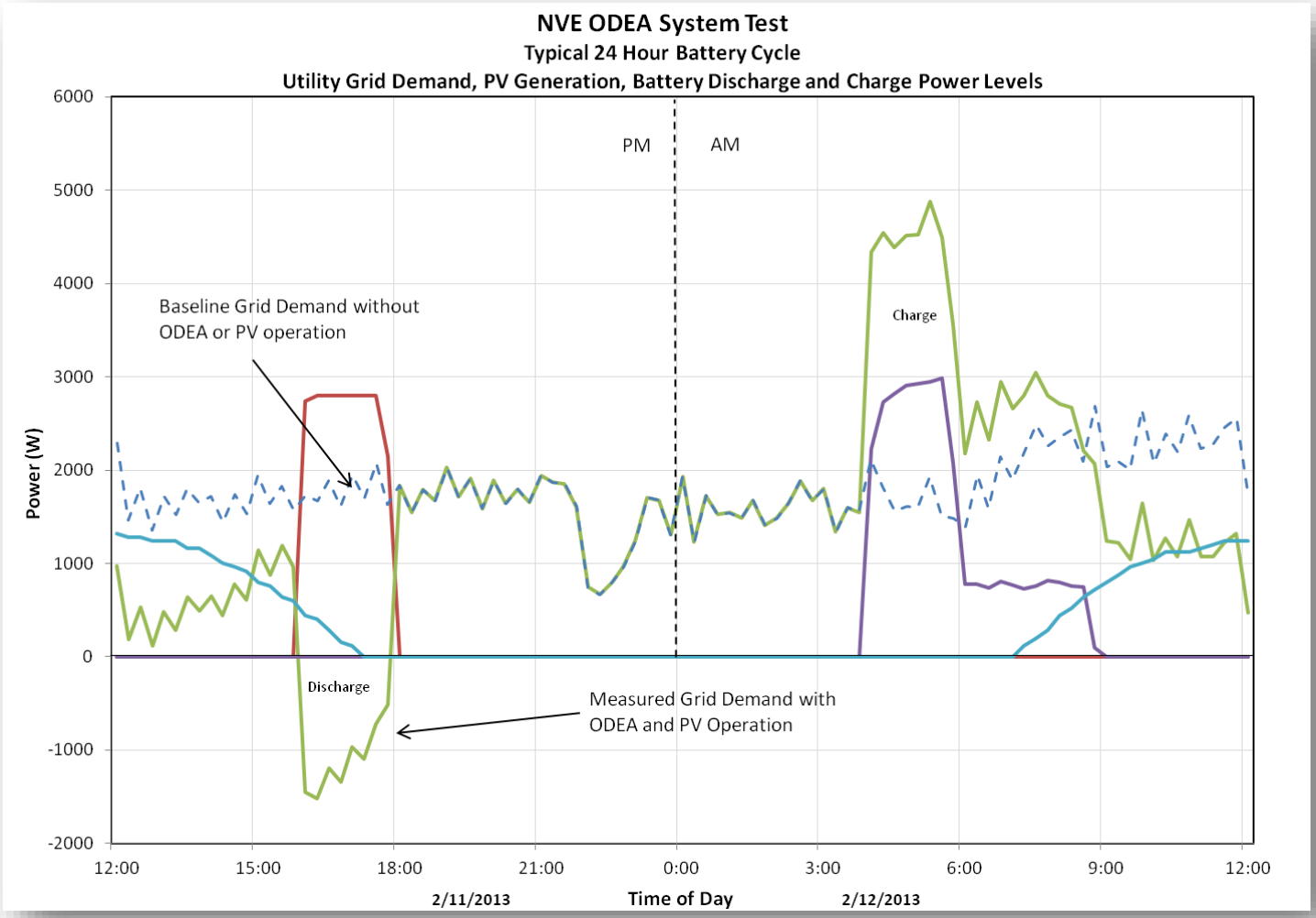
Integration Testing On-Going

- BESS hardware and software still in testing phase
- Still need to fully integrate premise-based systems and grid systems
- Integration challenges persist due to varying levels of technology maturity and integration challenges related to vendor product design and implementation strategies



Battery Testing Ongoing

[Battery plus PV System]



- **Green**: Customer's net demand for energy from the grid
- **Red:** Battery discharge
- **Purple:** Battery charge
- **Blue** (solid): PV output
- **Blue** (dashed): Customer's baseline

Next Steps

Improve Real-Time Energy Information

Expand/Enable software based displays using tablets, mobile phone, computer

Continue Integrations

Integrate BESS with Premise-Based Systems

Integrate Premise-Based Systems with NV Energy Systems

Explore Additional Benefits

Attempt to configure BESS to support:

- Voltage, frequency, and renewable firming use-cases

Existing and Potential Grid Benefit Streams

Existing: *Traditional Demand Response (DR)*	Peak Shaving / Shaping	
	Operating Reserve (10-min spinning reserve)	
	Generation Dispatch Optimization	
Potential: *Demand Response + PV + Battery Storage*	Area and Distribution Operations:	Frequency Regulation
		Voltage Support
		Power quality control
	Renewables Integration	Firming intermittent generation (e.g., PV)
		Renewable Energy Time-Shift
	Customer Benefits	Cost reduction depending upon rate structure
		Receiving benefits for delivering grid services

Key Findings & Identified Gaps

Key Findings

- Lessons learned allowed NV Energy to launch next generation demand response systems
- Value of Integrated Energy Efficiency and Demand Response
- Networked platforms facilitate data rich applications and remote upgrade capabilities
- Two types of optimization—premise specific and grid level—can interoperate for higher all around value
- Traditional DR vs Fast DR and DERs
- Battery permitting and inspection processes were defined

Identified Gaps

- Battery Energy Storage System maturity level
- Standards and Open protocols
- Significant variation across technology vendors
- DRMS (or EMS) requires evolution to DERMs
- DER grid services benefits not actualized yet

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Thank You