SMART GRID DEMONSTRATION IN LOS ALAMOS, NEW MEXICO, USA

Los Alamos' local perspective on smart grid technology

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OVERVIEW

- Los Alamos Dept of Public Utilities
- History of Collaboration
- Project Description
- Local perspective on Demonstration Project with NEDO:
  + Demonstration Results;
  + Integration into production environment;
  + The future

Courtesy: Los Alamos National Laboratory

LOS ALAMOS, NEW MEXICO, USA

LOS ALAMOS, NEW MEXICO, USA

LOS ALAMOS DEPT OF PUBLIC UTILITIES

Provide electric, water, natural gas, and wastewater services to Los Alamos.

LOS ALAMOS DEPT. OF PUBLIC UTILITIES

* Municipal Utility – local control
* Vertically integrated, generation through distribution
* System configuration suitable for demonstration
* Challenging environment
  + High elevation - 7,320 ft or 2,231 m
  + Frequent hail storms
  + Frequent lightning strikes

HISTORY OF COLLABORATION

- 2010 Collaborated on a Demonstration Smart Grid project in Los Alamos, NM
  + NEDO, LANL and DPU
- 2012 Project completed and commemorated with a ribbon cutting ceremony
- 2014/04 Phase 1 completed: Significant penetration of utility scale renewable energy on a residential electric grid
- Today Phase 2 continues: Smart Meter research currently underway to be completed next year 2015/04.

SIGNING CEREMONY - MARCH 2010

RIBBON CUTTING CEREMONY–SEPT 2012

PROJECT DESCRIPTION

- **Demonstrate high penetration of renewable energy on the electric grid to meet a residential community's needs.**

- **Use innovative smart grid technology as a way to solve challenges associated with intermittent renewable energy –**
  - *Balance loads and absorb output fluctuations*
  - *Shave peak electric demand to smooth electric loads*
  - *Predict and plan electric production, and contribute to the grid, to optimize sales price*

PROJECT DESCRIPTION

- 1 MW of PV Generation
- 8.3 MWh of battery storage
- Micro EMS
- Smart House
  - 3.4 kW
  - 24 kWh battery
  - Heat pump water heater
  - Smart meter
  - Smart appliances
  - Home Energy Management Systems
- 1600 Smart Meters – Mesa Smart Meter Study
- 100 Smart Meters – Seasonal Smart Meter Study
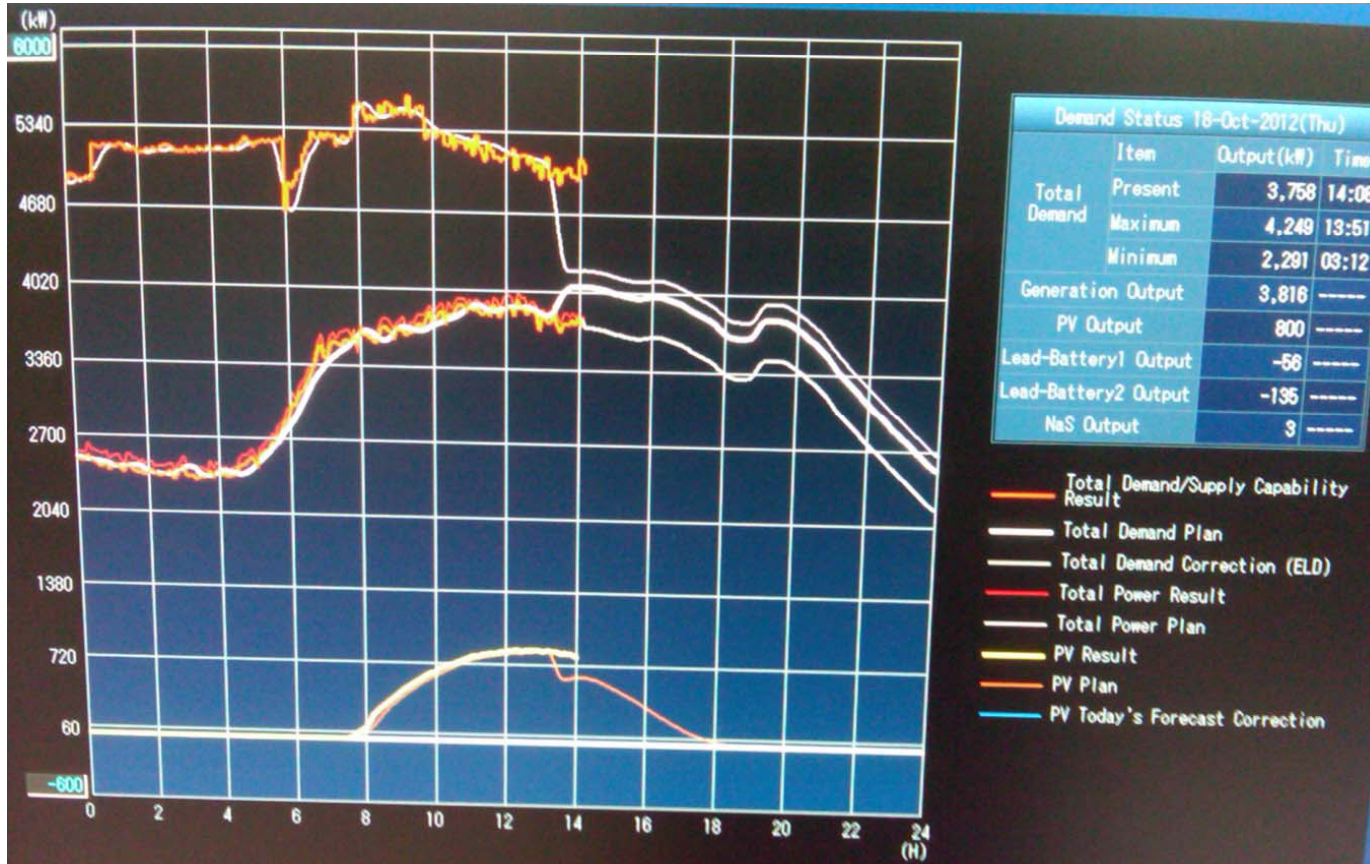
Courtesy: Kyocera, Inc

1 MW PHOTOVOLTAICS

Lead Acid

Sodium-Sulfur

8.3 MWH OF BATTERY STORAGE

MICRO ENERGY MANAGEMENT SYSTEM

SMART HOUSE

MESA SMART METER STUDY-VOLUNTEERS

SEASONAL SMART METER STUDY – INSTALL AT VOLUNTEER'S HOME

LOCAL PERSPECTIVE ON DEMONSTRATION PROJECT WITH NEDO

DEMONSTRATION RESULTS

- **Utility Scale PV Array on residential distribution grid**
  - Appreciation of the complexity of integrating renewable energy on the electric grid
  - Stabilize PV output with battery systems using the Micro EMS
  - Grid protection schemes need to adapt to islanding situations for microgrids
  - Technology will require new skills for DPU employees

DEMONSTRATION RESULTS

- ✖ **Smart House**
  - ✚ HEMS can respond to dynamic pricing, optimize energy consumption between PV, battery, and smart appliance for an individual home
  - ✚ Smart house with Transfer cut-out and Stabilization system can island
- ✖ **Smart Meters**
  - ✚ Most customers want consumption data via smart meters to make smart choices. In-home display or web portal (100 and 1600 Smart Meter programs)
  - ✚ Deploying 1600 smart meters to customer in an experimental environment as opposed to a regulatory environment (positive experience)
  - ✚ Customers actually respond to dynamic pricing

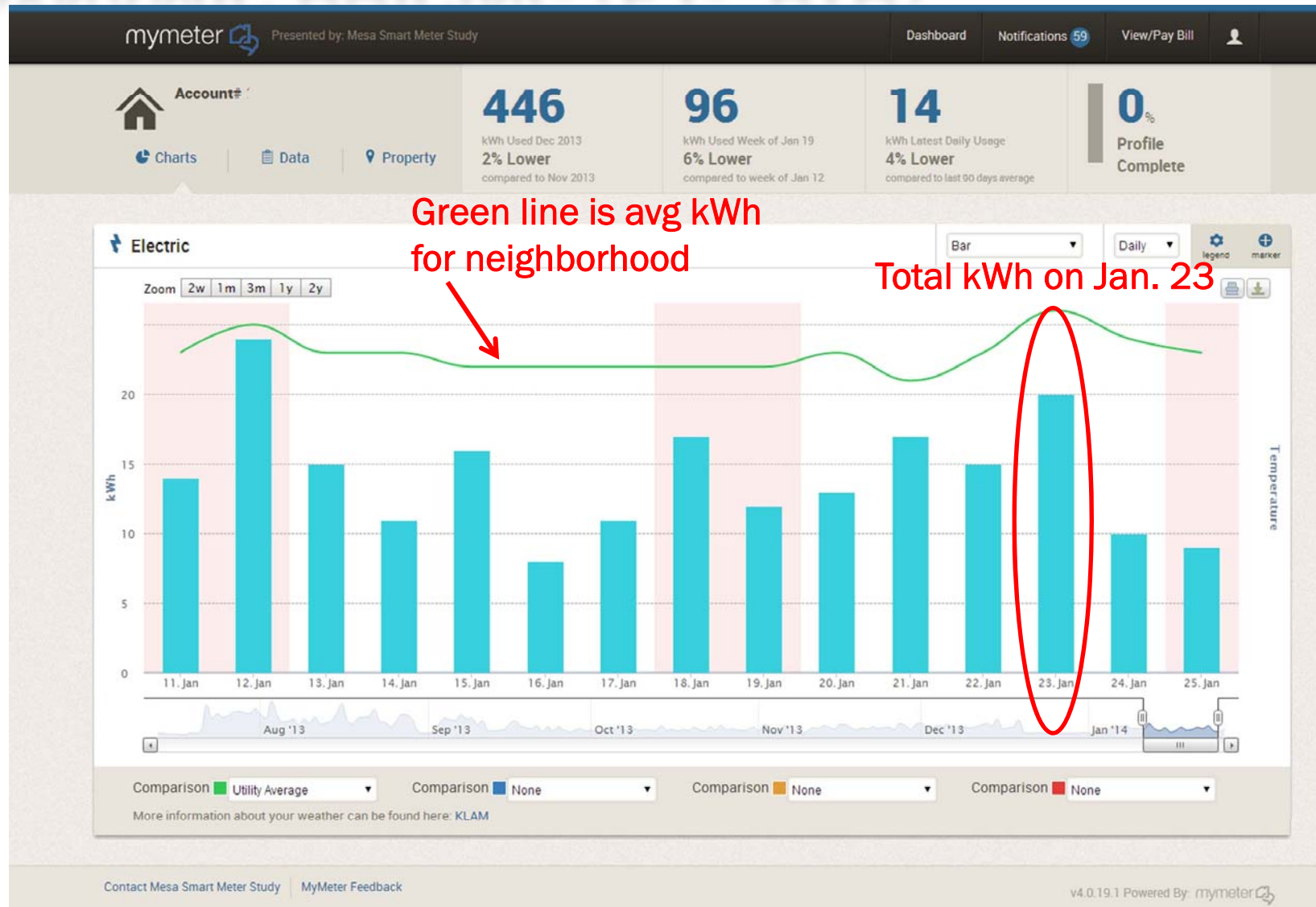# STABILIZING PV OUTPUT – MICRO EMS
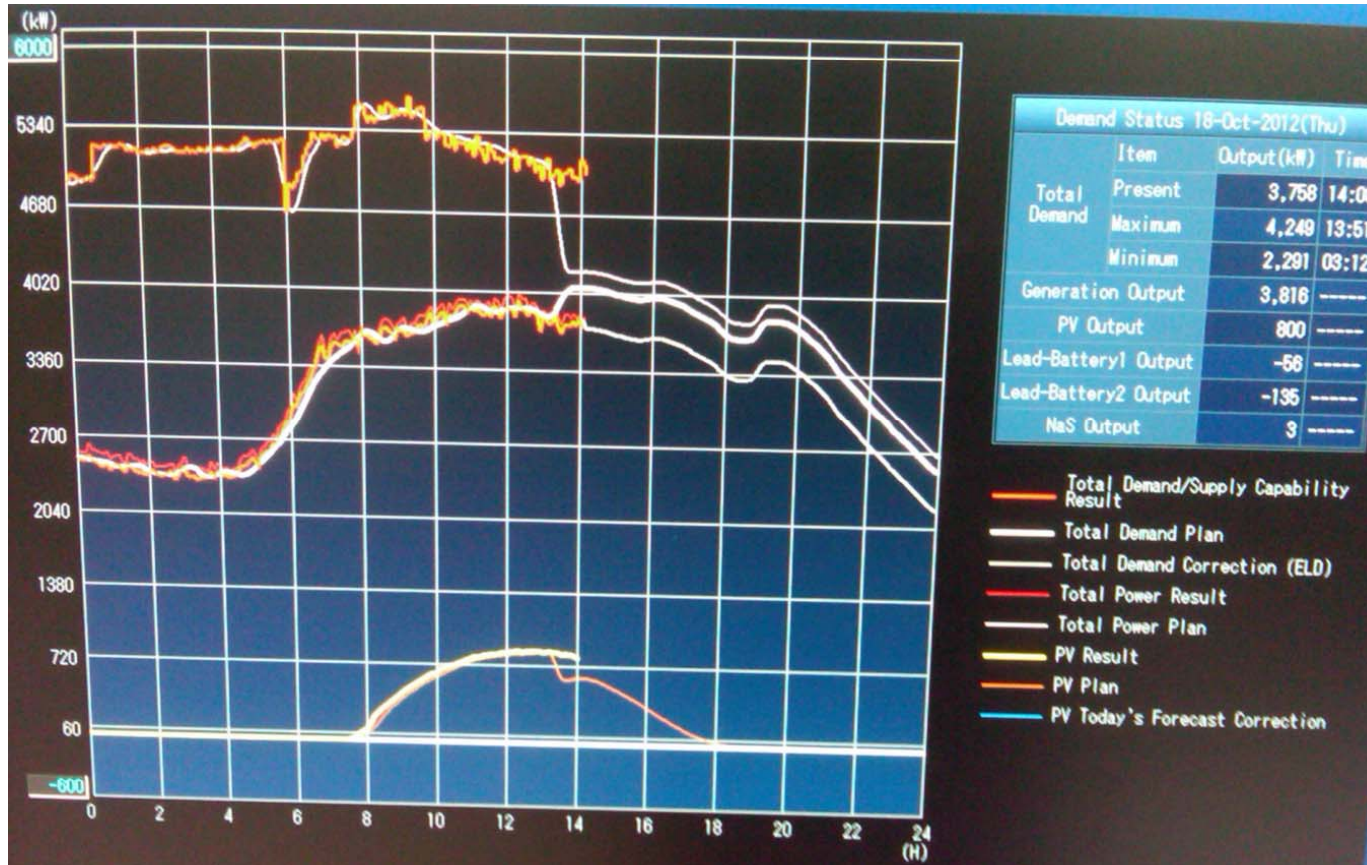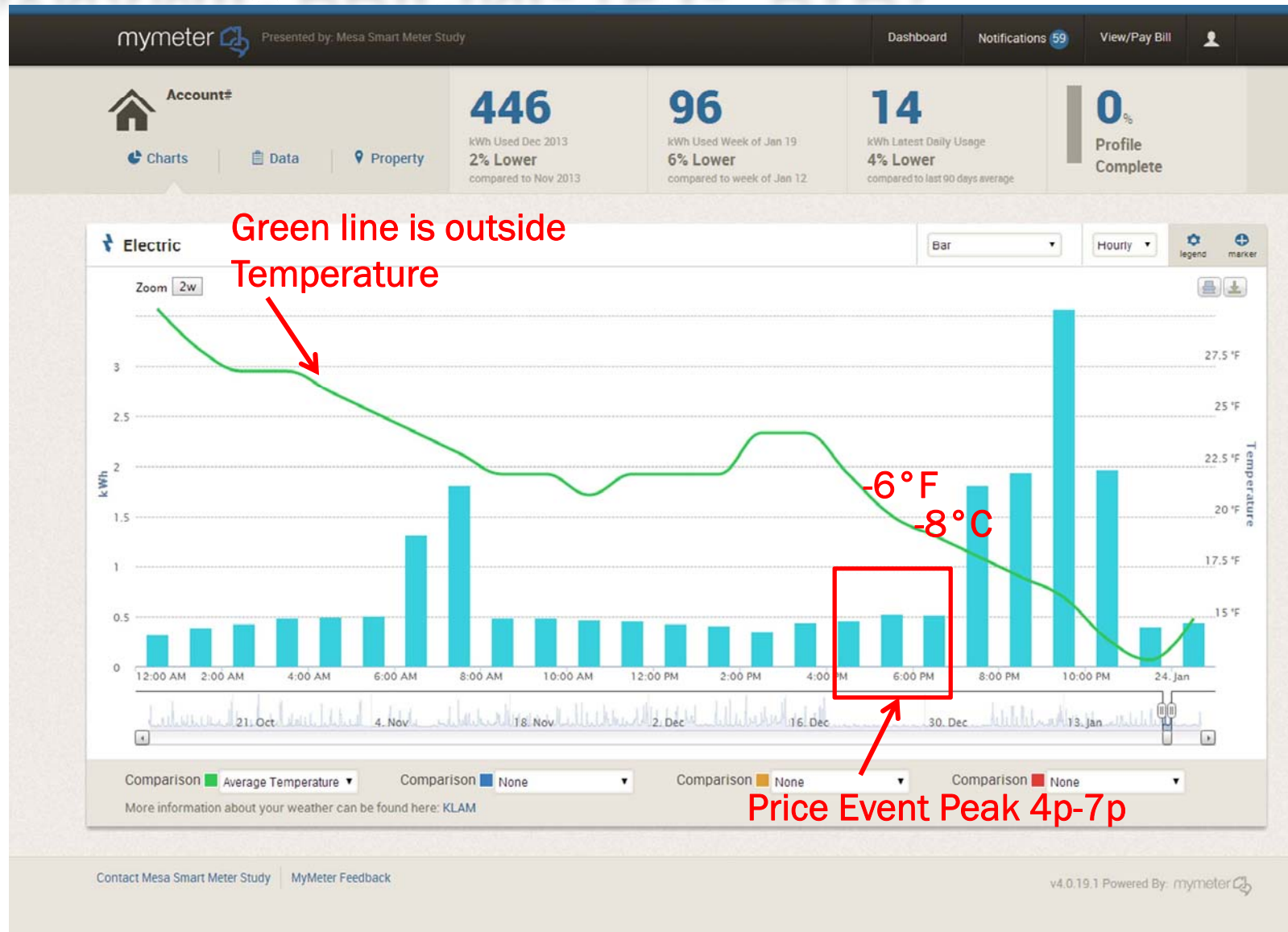
SMART HOUSE OPTIMIZING POWER - HEMS
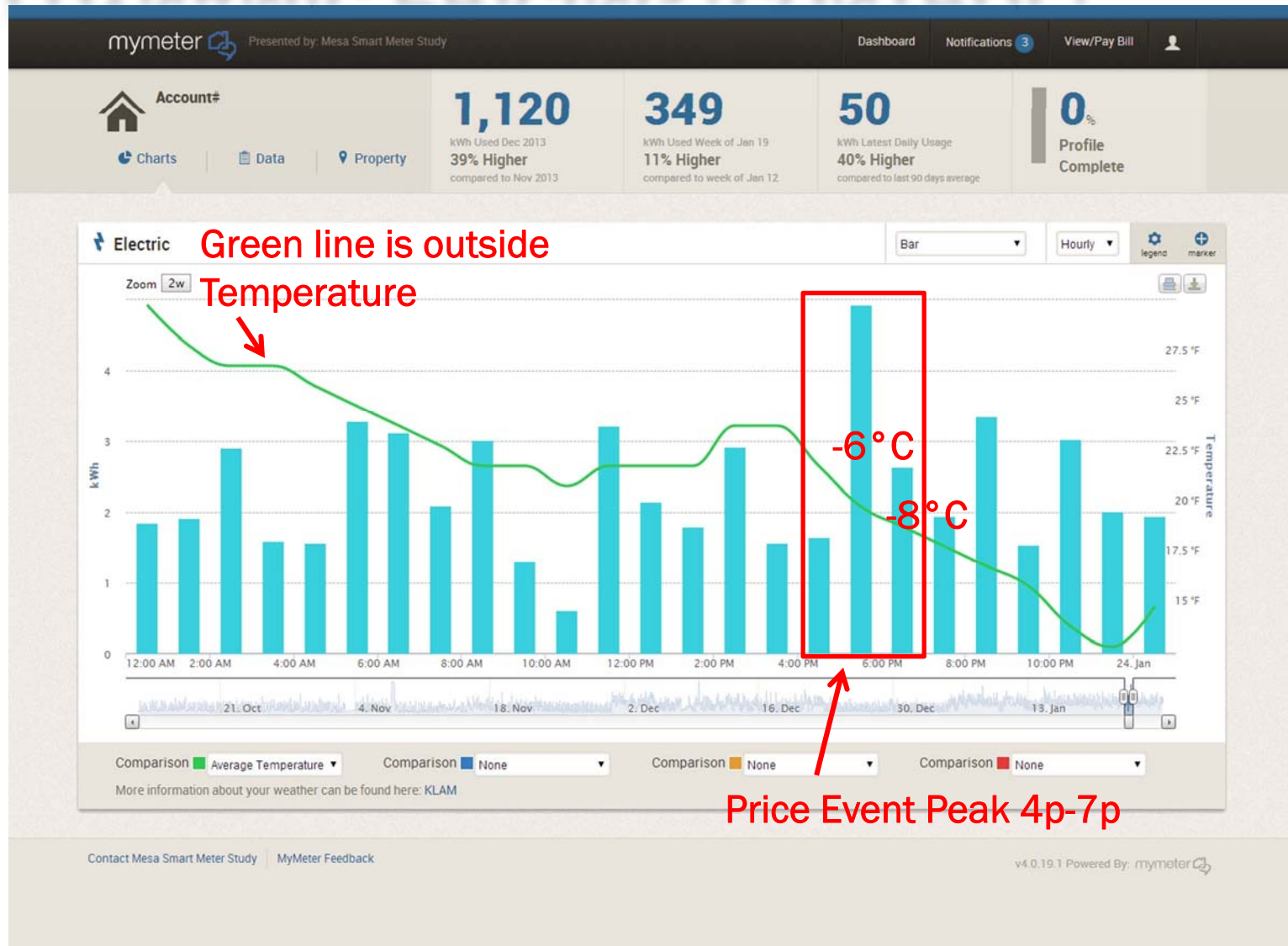
IN-HOME DISPLAY (CUSTOMER DATA)

DYNAMIC PRICING (E.G. PTR)

DYNAMIC PRICING (E.G. PTR)

NO DYNAMIC PRICING (CONTROL)

INTEGRATION INTO PRODUCTION ENVIRONMENT

- Discharge batteries to shave peak loads - Mico EMS
- Like to use batteries for spinning reserves
- Compare value of peak shaving vs. spinning reserves
- Expand smart meters for natural gas & water
- Eliminate meter rereads with smart meters
- Outage management (smart meters to identify electric outage and restoration)
- Improve customer engagement with smart meters (Customer in control - track own electric consumption)
- Surface mount of the PV array complicates maintenance activities

OUTAGE MANAGEMENT

LOOKING TO THE FUTURE

- ✖ Second MW of PV on the landfill in FY2015
- ✖ Islanding capability to simplify power restoration
- ✖ Continue research (UNM & NMSU)
  - + EPSCoR Grant: Connecting and integrating mircogrids in NM to disconnect but also stabilize power quality
  - + DOE Microgrid Grant: Using microgrids to island and preserve critical loads during emergencies
- ✖ Partner with research university to develop workforce required by grid of the future

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THANK YOU