

NEDO/LOS ALAMOS COLLABORATIVE MICROGRID RESEARCH PROJECT

**RAFAEL DE LA TORRE, PE, DEPUTY UTILITIES MGR on behalf of
JOHN E. ARROWSMITH, UTILITIES MANAGER,
LOS ALAMOS COUNTY and LOS ALAMOS DEPT OF PUBLIC UTILITIES TEAM***

JUNE 15, 2011 IN LOS ALAMOS, NM

*Deputy Utility Managers: Janet Bettinger; Steve Cummins, PE; James Alarid, PE;
Project Leads: Gaylyn Meyers; Anne Laurent; Gerald Martinez; Darryl Tabor; Matt Casados;
Julie Williams-Hill; and Research partner: LANL.

PRESENTATION OVERVIEW

- Los Alamos Dept. Public Utilities (DPU)
- Partners
- NEDO NM Collaborative Demonstration
 - Los Alamos Projects
 - Microgrid demonstration
 - Smart House demonstration
 - Albuquerque Project (not covered)
 - Smart Building demonstration
- Project Management Challenges
- Project Update

LOS COUNTY DEPARTMENT OF PUBLIC UTILITIES

- A Utility Company owned by Los Alamos County
- Annual Budget \$70 Million+ (FY2012)
- Plant & Equipment valued at approx. \$100 Million
- Approximately 8,200 customers
- Approximately 22,000 Meters
- 95 Full Time Employees
- Four separate utilities
 - Electric (produce and distribute)
 - Water (produce and distribute)
 - Natural Gas (distribute)
 - Wastewater (collect and treat)
- Producer of Electricity
- DPU Resources
 - 25 MW; two hydro facilities (own and operate)
 - 36 MW; San Juan Gen. Station Unit 4, coal-fired (7% ownership)
 - 10 MW (entitlement); Laramie River Station, coal-fired
 - 20 MW (entitlement); WAPA, hydro
- Renewable Energy represents approx 20 – 25%
- System size: 90 MW peak, 550 GWH annually

DPU GENERATION RESOURCES



18 Megawatt Abiquiu Hydroelectric Facility

15 MW Plant between two turbines
3 MW low-flow turbine addition MAY 2011
Located in Rio Arriba County

WHAT GOT US HERE

- The Richardson administration had an agreement with NEDO whereby NEDO would invest in smart grid technology in NM;
- In June 2009, the State of NM invited all NM utilities to put forth a package and be the host utility for NEDO smart grid projects; (Kit Carson Electric Coop, Roosevelt Electric Coop, NMSU, NM Tech, and LACDP were the finalists)
- In August 2009, the State of NM, NEDO, and the 5 other utilities made up the NM Green Grid Initiative which applied for ARRA DE-FOA 36 funding (sought \$250M but wasn't successful);
- However, in early 2010, NEDO choose LACDPU to host 2 of 3 smart grid demonstration projects largely because of its autonomy (LACDPU had renewable projects underway – Low Flow Turbine and PPA for 1 MW), local government control of electric utility, and LANL participation;

PARTNERS

- NEDO
 - New Energy and Industrial Government Development Organization;
 - Made up of 19 Japanese entities including government, research, and major tech companies such as Toshiba, Hitachi, Kyocera, NEC, etc.
 - Fund smart grid projects throughout the world
- LACDPU offers experimental challenges such as high elevation, mountainous terrain, extreme weather/changes, lightning, etc; Municipal Status offers autonomy, local government control of electric utility, can adopt rules, special rates within 90 days, etc.; (Japanese electrical companies don't offer smart-grid integration flexibility);
- LANL provides energy modeling and simulation, scientific research, data management, etc;

JAPAN-NM SIGNING CEREMONY MARCH 5, 2010



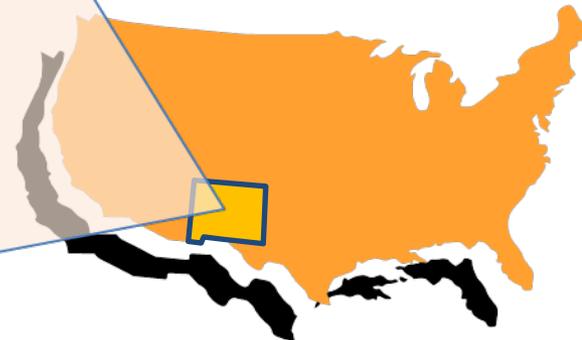
NEDO-NM COLLABORATIVE DEMONSTRATION

NEDO Objectives:

- Demonstrate smart technologies which are difficult to test in Japan.
- Introduce smart Japanese technologies in U.S.
- Contribute to International Standards.



- ★ Los Alamos Projects
(Micro-grid and NEDO House)
- ★ Albuquerque Project
(Smart Building – Aperture Bldg
at Mesa Del Sol)



NEDO NM PROJECTS

LOS ALAMOS

(I) Microgrid distribution demonstration

(II) NEDO (smart) House demonstration

- **Los Alamos**

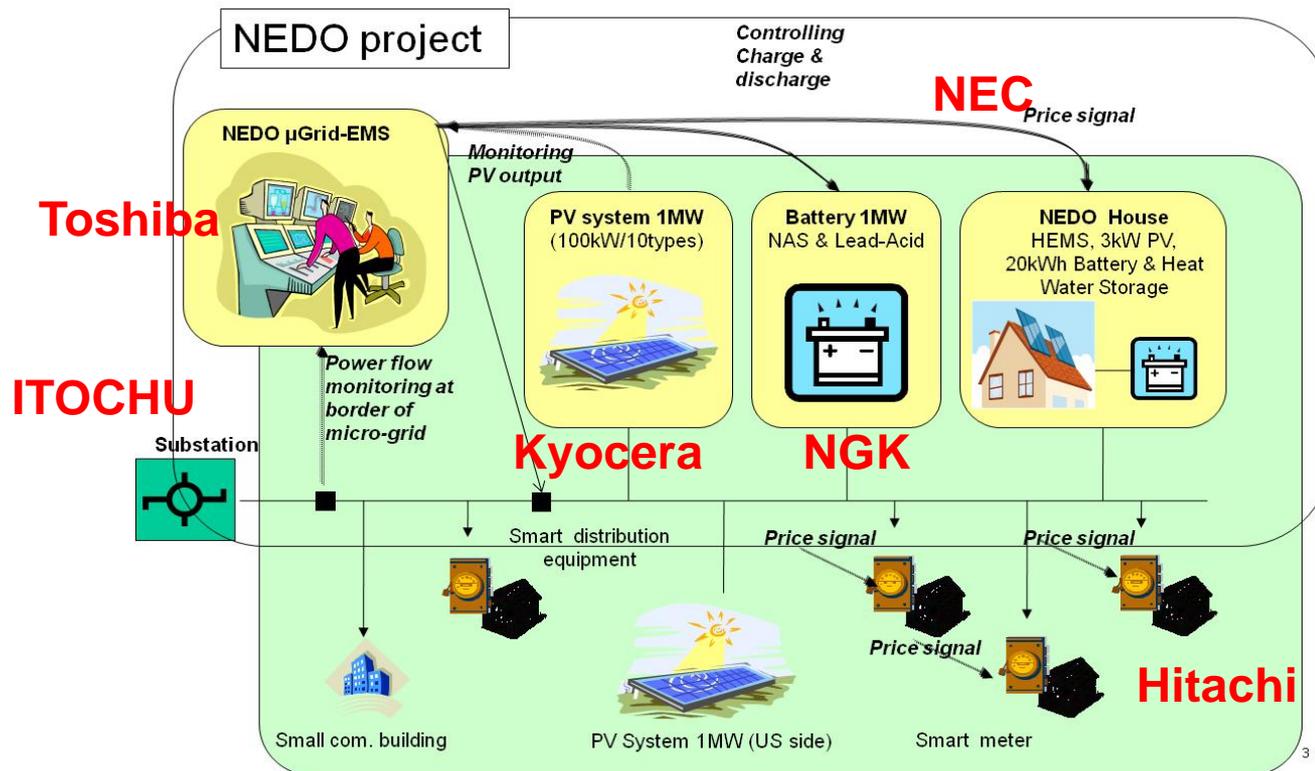
- Altitude: 2200m
- Population: 20 thousand

ABQ

(III) Commercial Bldg demonstration

(I) Microgrid Distribution Demonstration

- 1 megawatt Japanese PV, 1.8 megawatt battery storage, 8.3 megawatt hours capacity
- Demonstrate integration and control of Japanese PV technology with micro EMS system on U.S. distribution grid (m-EMS is unique and only one of few in the world)
- Demonstrate several PV penetration levels (25%, 50%, etc.) on Feeder 16
- Demonstrate PV Islanding capabilities on Feeder 16 (several hours)



Graphic: Courtesy of Dr. Hideki Hayashi, Toshiba Corp.

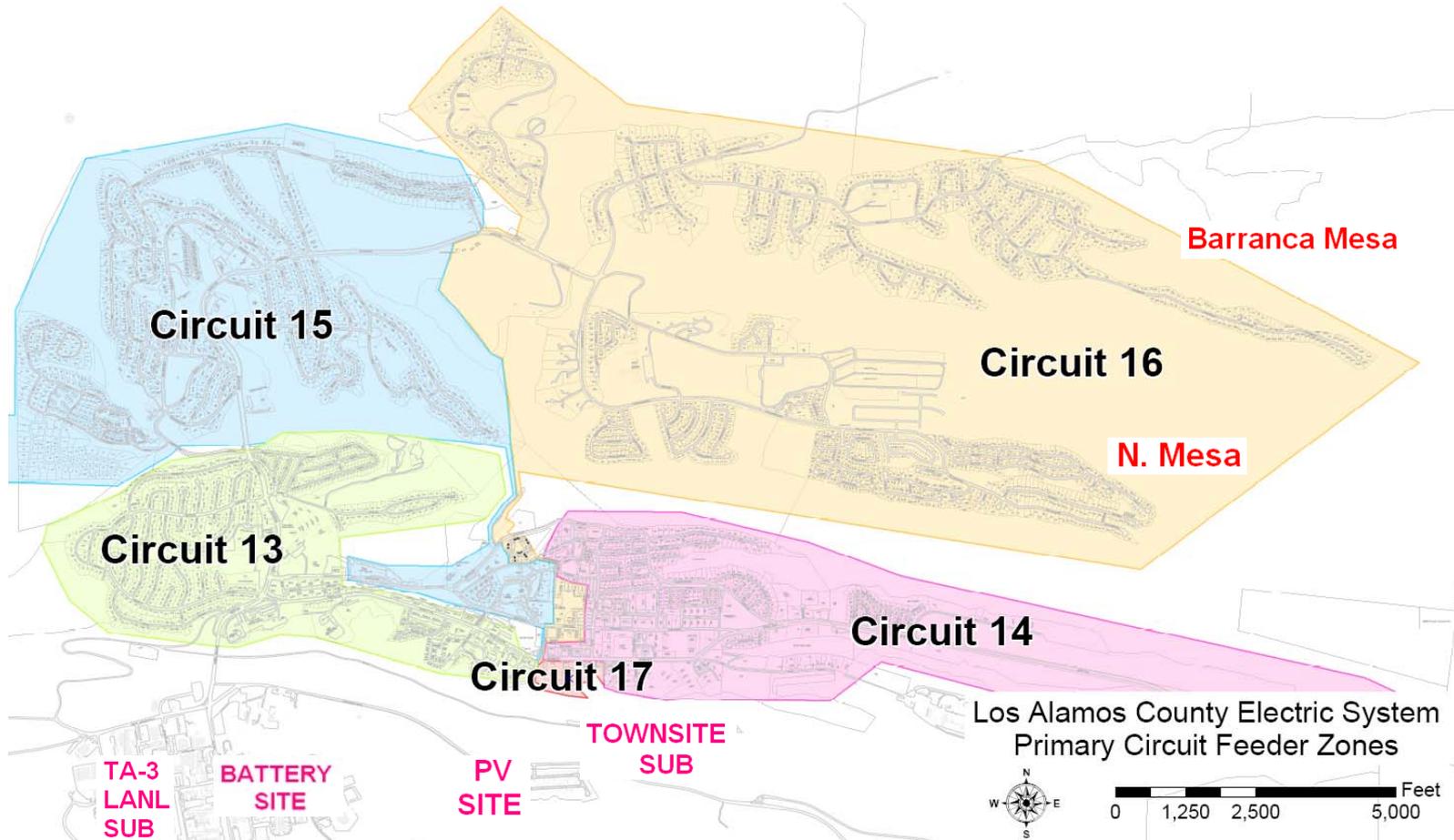
LOCATION OF MAJOR EQUIPMENT HUBS

- TA-3 substation is the primary Los Alamos power source located inside LANL
- Battery and PV sites are located at the Los Alamos County Landfill
- Townsite substation is located in downtown Los Alamos



Feeder 16 Service Area

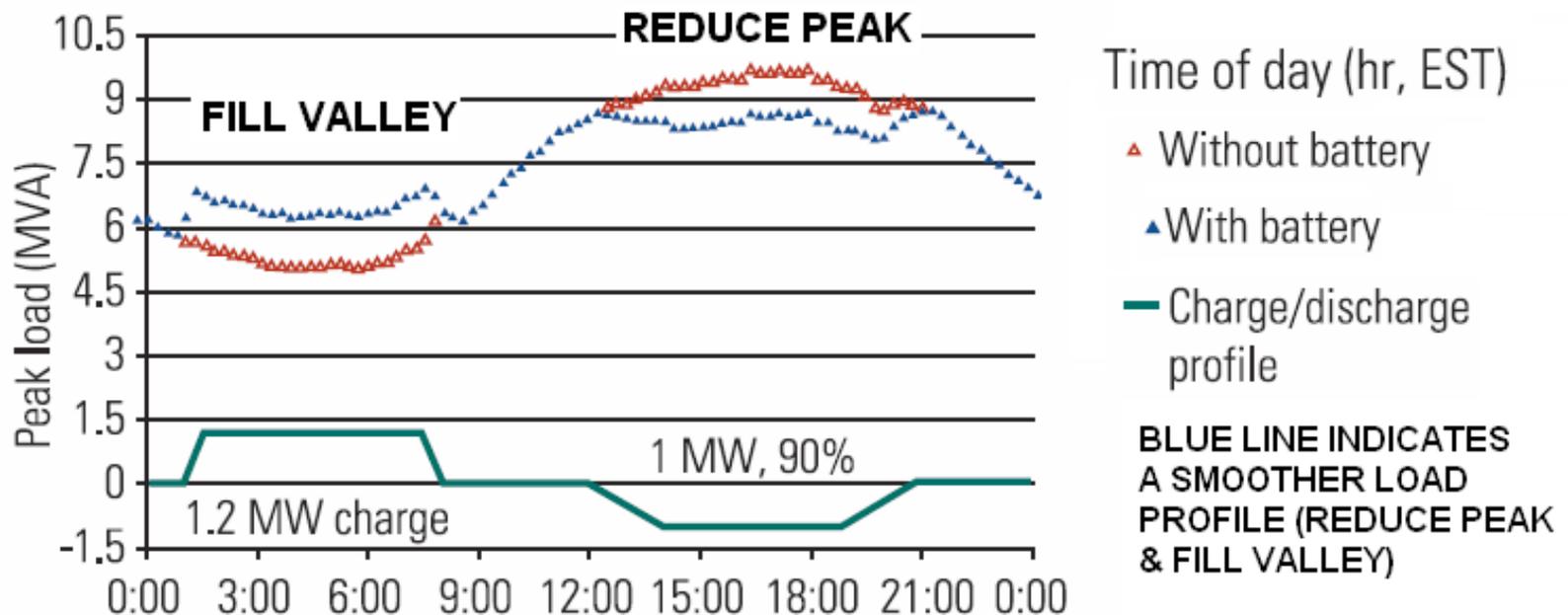
- Circuit 16 provides power to Barranca Mesa and North Mesa
- Load varies from 1.5 MW to 3.5 MW; approximately 1900 customers



Microgrid Demonstration Objectives

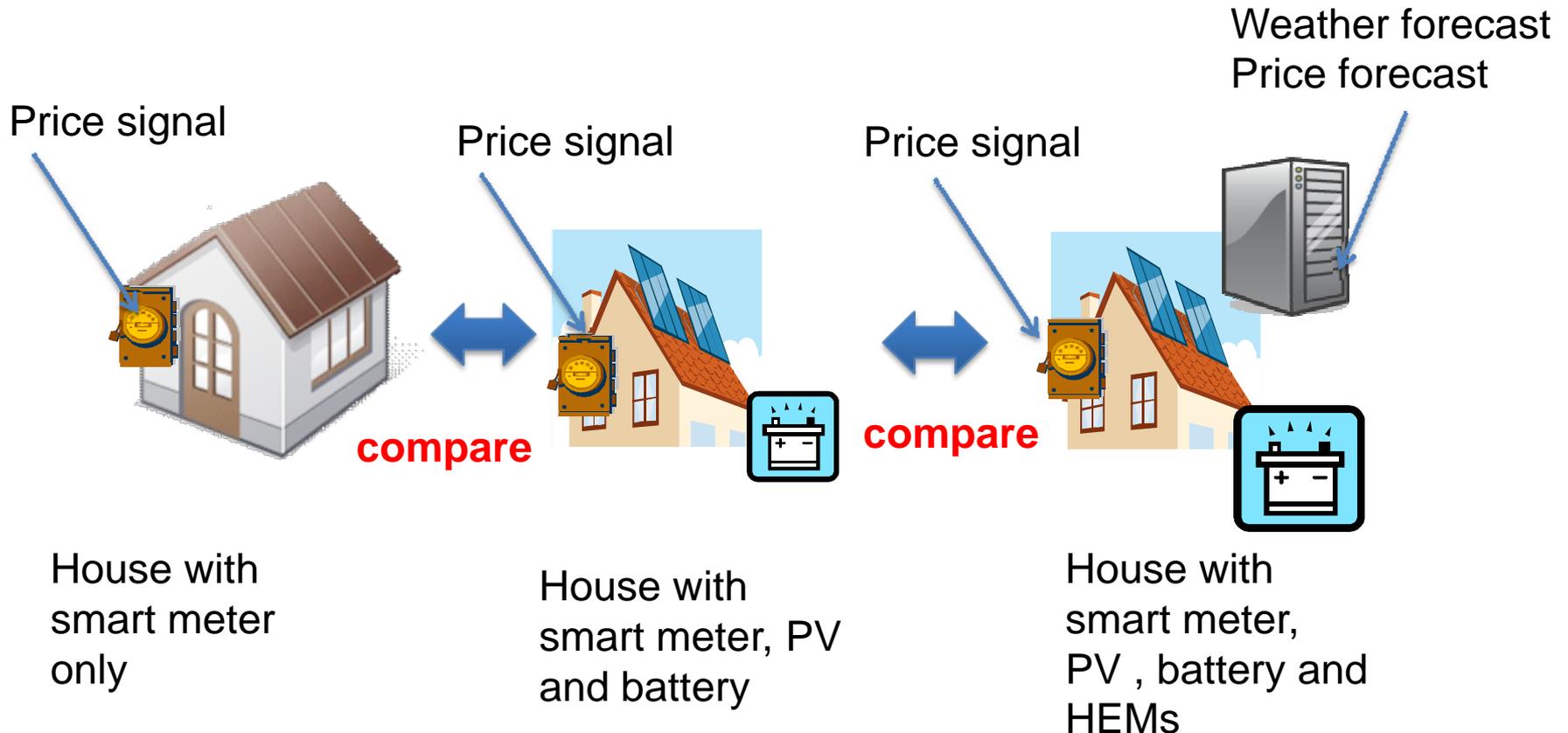
OBJECTIVE:

- Idea is to have the ability to integrate and schedule the energy from PV and Batteries into the overall Los Alamos resource power pool.
- Manage the PV and Battery energies under different operating scenarios. For example, having the ability to provide a firm PV/Battery output under varying cloud coverage conditions; i.e. making PV power firm and dispatch able
- Having the ability to incorporate real-time pricing into the charging/discharging of the batteries when it makes most economical sense.



(II) NEDO (smart) House Demonstration

- Smart House with 3 kilowatt PV, 20 kilowatt hours storage batteries, heat pump storage equipment, demand side management equipment, (HEMs) Home Energy Management System with real time pricing and communication system.
- Will measure and compare demand response to other houses in Los Alamos

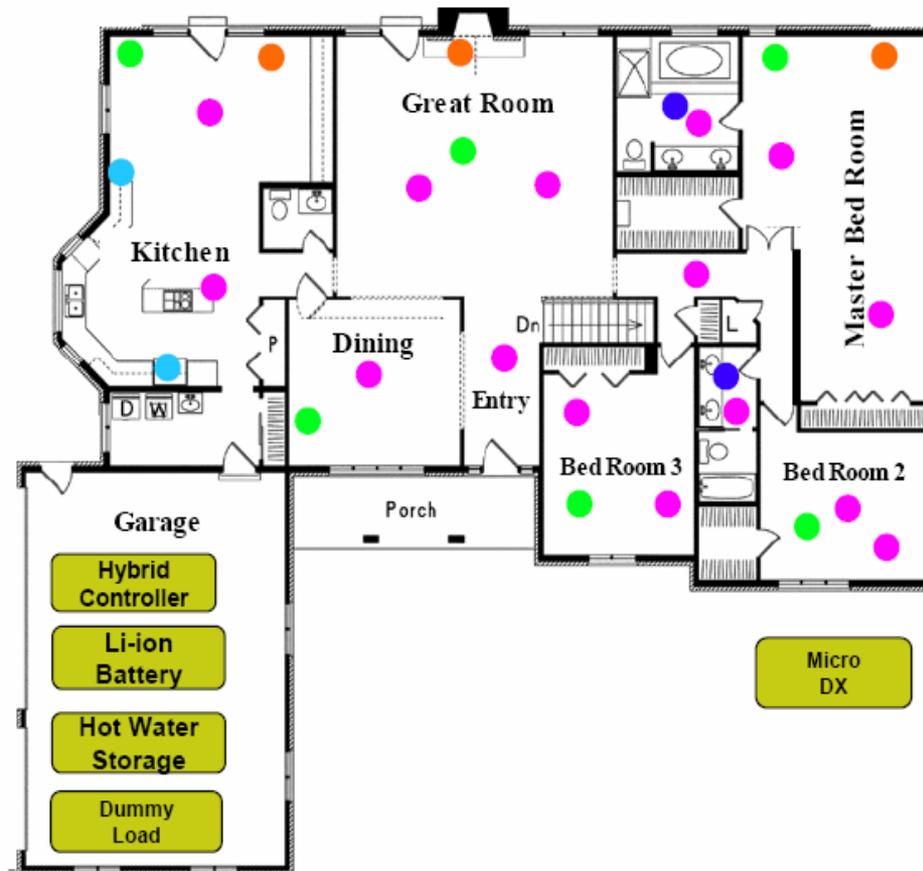


Smart House floor plan (Example)

Smart house will be the same structure as typical house in LAC

Assumption : One-story house, 2,900 Sq. feet (269m²)

3 bed rooms + Garage (3 Bays)

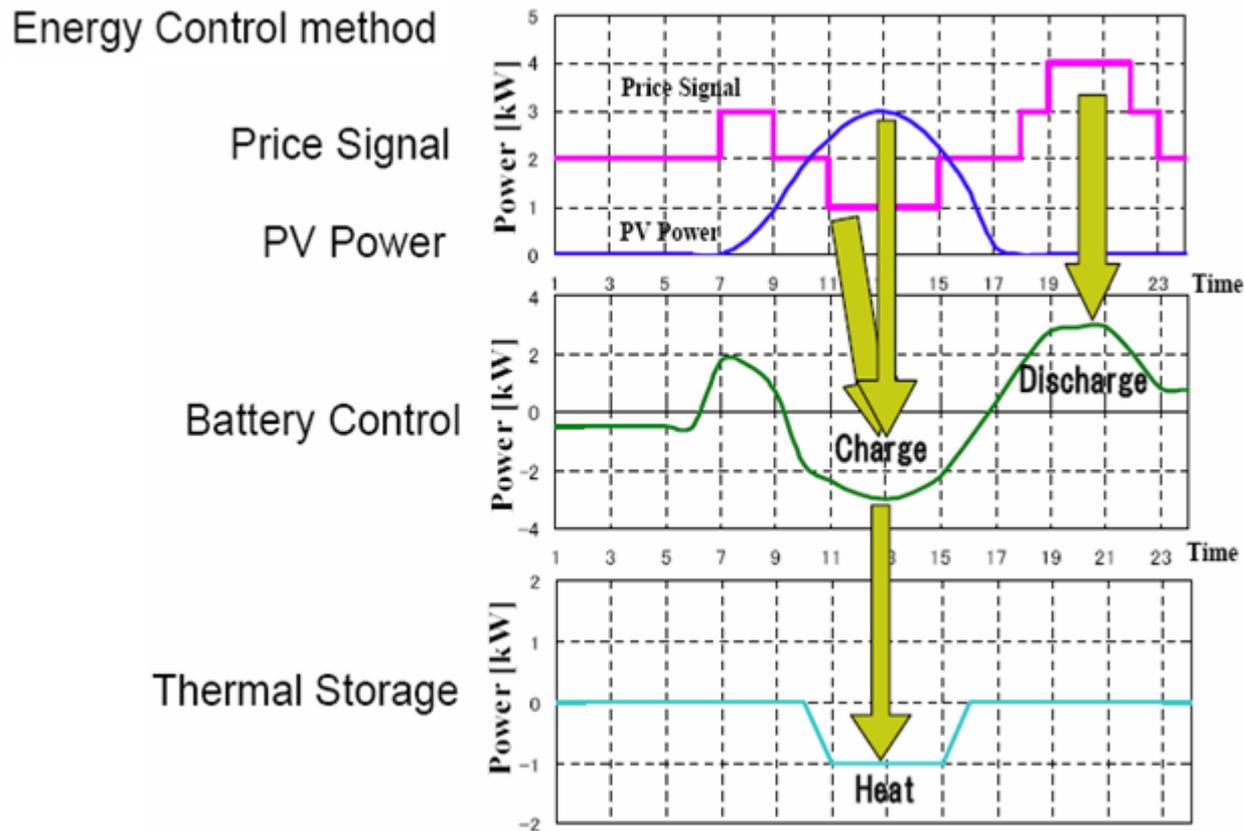


- | | | |
|---------------------|------------------|-------------------|
| LCD TV : 3 | Refrigerator : 2 | Hot Water Storage |
| Air conditioner : 6 | LED Light : 15 | |

NEDO House Demonstration Objective

OBJECTIVES:

- Demonstrate control between the micro-EMS and smart house HEMS (via price signals)
- Demonstrate the HEMS system can operate the smart house equipment under the varying conditions. For example, based on PV forecast, under pseudo load patterns, and based on demand response (real-time pricing).following condition



PROJECT MANAGEMENT CHALLENGES

- No Overall Project Manager:
 - Toshiba is lead on PV micro-grid project (total of 10 companies)
 - Kyocera is lead on Smart House (total of 7 companies)
 - Toshiba is lead on Use Case Development (total of 5 companies)
- Complexity of Project:
 - Project Interpretation (LAC view versus NEDO view versus Company View)
 - Project demonstration goals (participation, data sharing, real-time vs gap)
 - USA Engineering Requirements (NMCID, NEC, NESC, etc.)
 - Construction set to begin Sept. 1st for battery, Nov. 1st for PV, NEDO house equipment installation by the end of year; prime contractor is Shimizu but will need to hire NM licensed contractors (not known at this time)
- Building on Landfill site on DOE land:
 - PV on newly closed landfill; GCL (geo synthetic clay liner) cap; settlement rate is unknown – tray design; site contour – H2O runoff, shading, etc.
 - Lease still shuffling between NNSA and LAC lawyers

PROJECT MGMT CHALLENGES CONT.

- No NEDO NM Presence:
 - Often times, no one to direct questions to
 - NEDO is aware of progress thru Toshiba and Kyocera
 - Meetings every 45 days but with individual groups
- Technical People Working Together:
 - Sometimes “too many cooks in the kitchen”
 - Japanese set agenda; really focuses on their items/goals
 - Sometimes difficult to get US point across (particularly with permitting, engineering review, etc.)
 - Time zone differences, lots of email exchanges
- Culture/Language:
 - Need to learn some things about Japanese culture, always concerned with unintentional mannerism
 - Sometimes interpretation is an issue, re-phrase, speak slow

PROJECT STATUS UPDATE

- From Design Perspective, there has been major milestones including:
 - PV Foundation Design on a closed (capped) landfill **COMPLETE**
 - 100% Construction Documents **COMPLETE**
 - NMED approval of Landfill Closure Plan **COMPLETE**
 - DPU contractor ready to “cap landfill” **MOBILIZING JUNE 1ST**
 - Tentative Battery Construction Start, September 2011
 - Tentative PV Construction Start, November 2011
 - NEDO house design is underway
- From the Use Case Demonstration:
 - Framework for all Use Cases (except for Islanding) has been established
 - Ready for simulation/impact analysis phase
- **What the FUTURE holds: 3 Year Operation/Demonstration:**
 - Green energy flowing into the LAC Grid, produced locally!
 - Knowledge gained/Research on smart grid technologies
 - Transfer Ownership of system to LAC after 3 years

NEDO-LOS ALAMOS NM PROJECT



- On behalf of the County and Los Alamos Dept of Public Utilities, I thank you for attention.

