Integrating PHEV with Austin Energy's Smart Grid

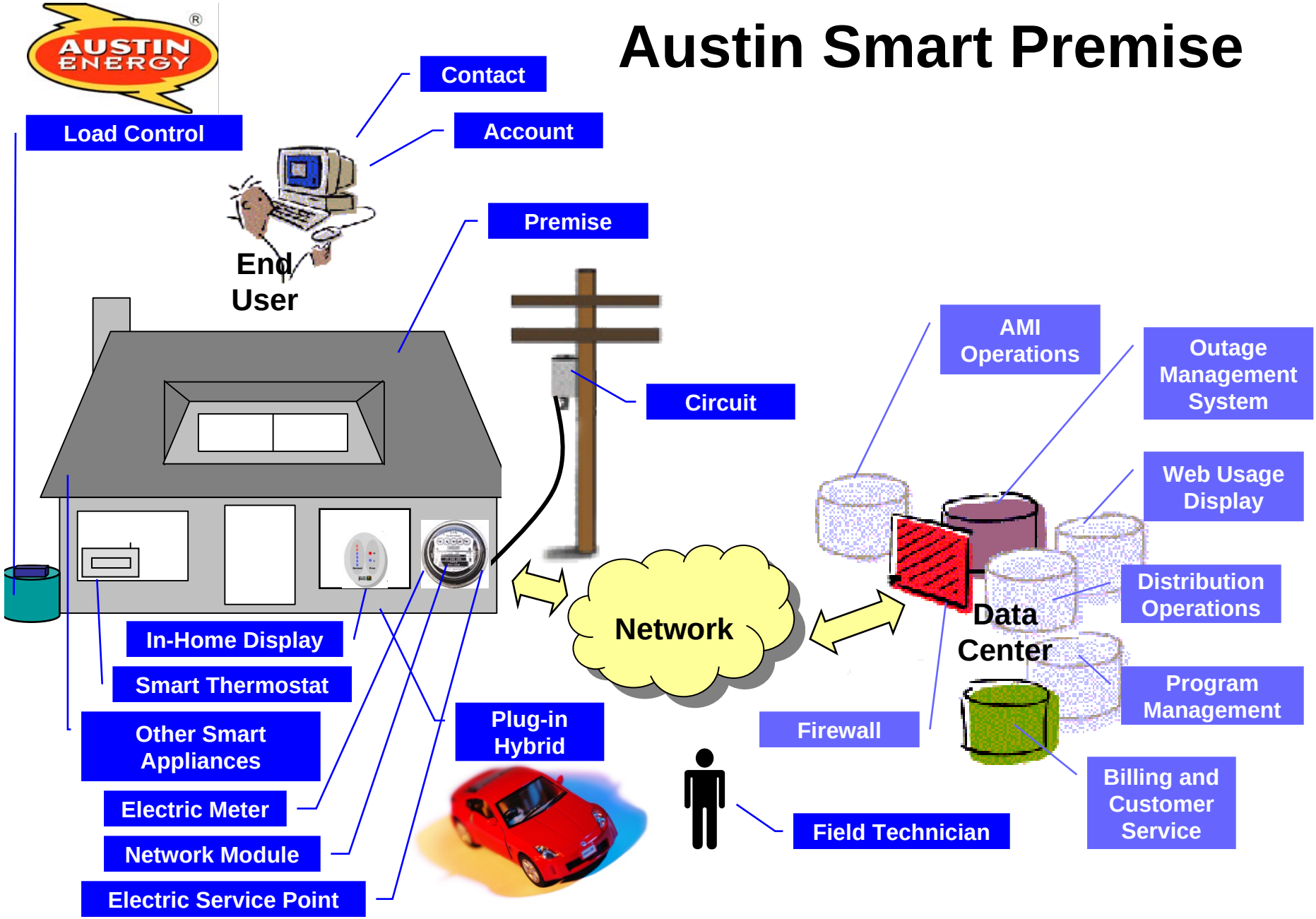
NARUC Annual Meeting
November 17, 2008
New Orleans, Louisiana

Larry Alford
Manager, Distributed Generation
Strategic Planning & Enterprise Development
Austin Energy

About Austin Energy

- 9th largest public power utility in the USA
- Over $1.2 billion in annual revenues
- Servicing almost 400,000 premises representing ~1 M population
- Leader in conservation and renewable energy
- Leader in the use and management of distributed generation
- Leader in PHEV

Austin Smart Premise

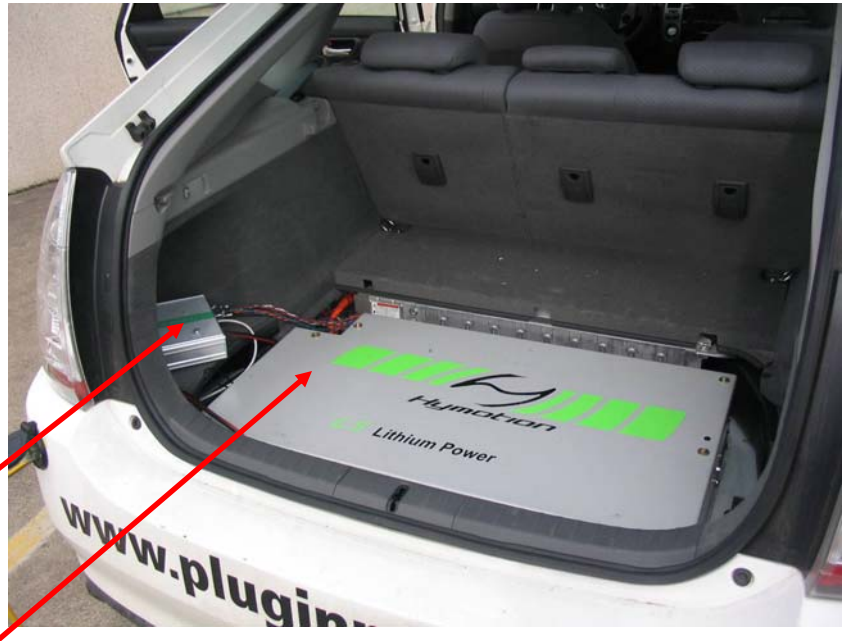


Plug-In Partners is a national grass-roots initiative to demonstrate to automakers that a market for flexible-fuel Plug-In Hybrid Electric Vehicles (PHEV) exists today.

- Initiated January 2006
- Objectives successfully completed October 2008

AE PHEV Pilot Project

- 2 Toyota Prius Hybrids – Charge Management Pilot
- 100,000 PHEVs Modeled on Austin Energy Grid



V2Green Charge Management System

A123 Systems Hymotion L5 Conversion

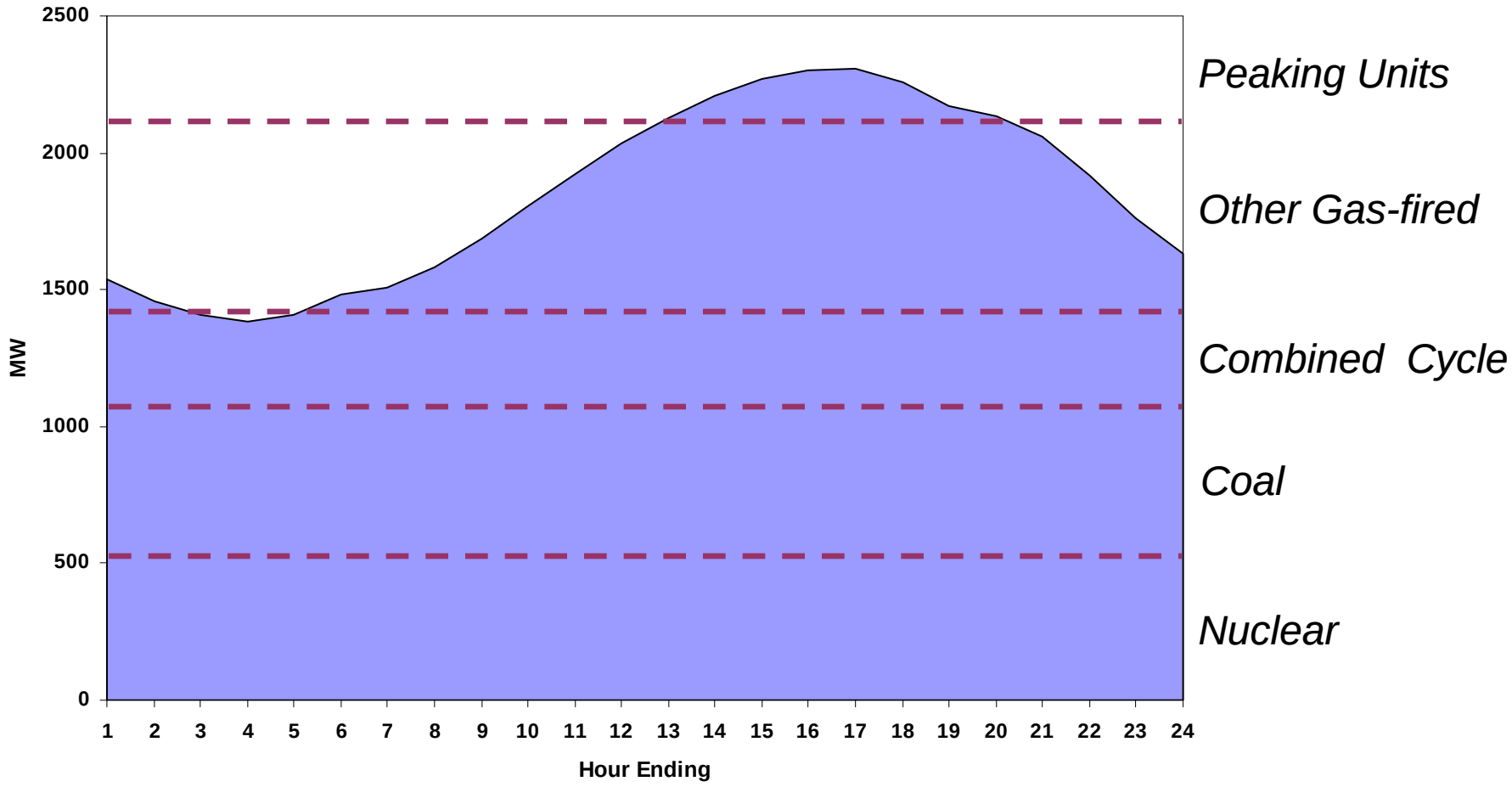
PHEV vs Generating Capacity

How Many PHEVs Can the Power System Accommodate Without Increasing Capacity?

*Answer using the "Valley Filling" Method**

***Pacific NW National Laboratory:** *Impacts Assessment of Plug-In Vehicles on Electric Utilities and Regional US Power Grids*

Summer Day Load Profile



PHEV Potential Impact

With Existing Generation Fleet

(assuming utilities have some control over PHEV charging)

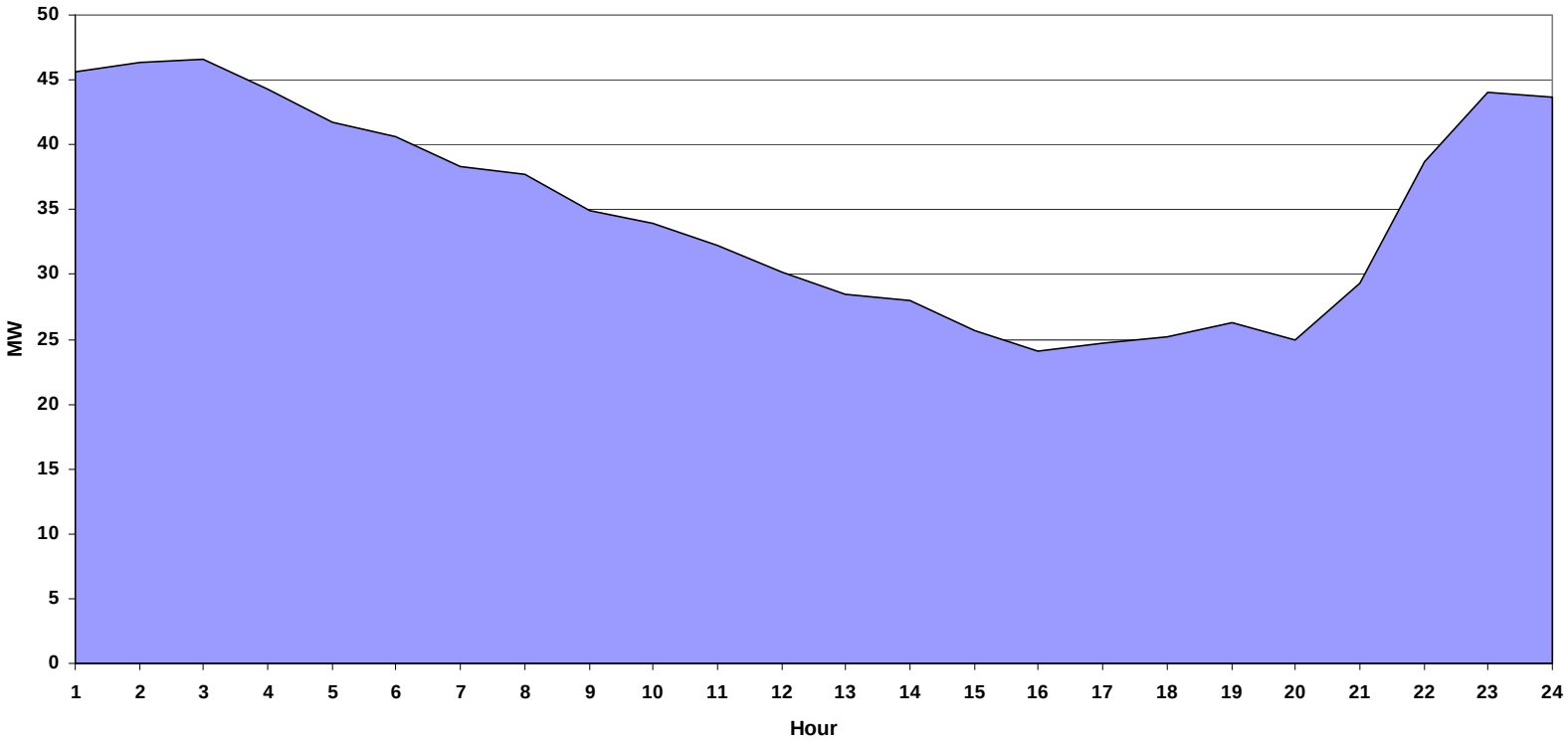
- Increased electric system minimum load
- Increased utilization of baseload generation
- Decreased power plant cycling
- Positive impact on earnings and electric rates

Source: DOE PNNL

PHEV vs Wind Capacity

PHEV facilitates wind energy utilization in regions where wind generation is strongest at night

Wind Generation – Sweetwater



August 2007

Charging Scenarios

- **Manual** on/off charging
- Charging during a **time window** (on-peak/off-peak)
- **Time-centered** charging (aligns charging with peak wind)
- Charging with **price signals** (time-of-use or real-time)
- **Goal** charging (grid **ancillary services** such as regulation or following a **wind signal**)
- **Location** specific charging

Results Summary
(assuming 1.0 kW per hour charging rate)

- No new generation required to charge 100,000 PHEV on AE grid between 12:00 AM and 8:00 AM
- Value of AE grid ancillary services
  - One Way (Grid-to-Vehicle only): $122 per vehicle
  - Two Way (Grid-to-Vehicle & Vehicle-to-Grid): $225 per vehicle
- ~ 50% of AE premises are multi-family (no PHEV outlet)
- Transformer loading is a potential issue without PHEV charge management

Emissions Comparison

(100,000 Vehicles @ 14,600 miles/year or 40 miles/day in AE Grid)

	NO_x (tons)	CO_2 (tons)
Existing Tailpipes (Travis County)	1,774	669,680
All Day Charging* (Electric Miles)	79	313,300
12:00 AM to 8:00 AM Charging* (Electric Miles)	79	304,455
Reduction	**95%**	**54%**

*1 kW charging for 8kWh per day per vehicle

Thank You!

Larry.alford@austinenergy.com

Phone (512) 322-6228