When Altruism Begins at Home: It Takes a Community of Energy Users

Mike Legatt, Ph.D.
Principal Human Factors Engineer
Electric Reliability Council of Texas, Inc.
(512) 248-4232 / Michael.Legatt@ercot.com
@MichaelLegatt

Core Philosophy:

“All organizations are perfectly aligned to get the results they get.”

Arthur W. Jones

Shouldn’t the same be true for all power grids?

The Bulk Power System

• Presidential Policy Directive 21: Energy and communications infrastructure especially critical because of their enabling functions across all critical infrastructure areas

• DOE: “A resilient electric grid… is arguably the most complex and critical infrastructure.”
The Texas Legislature restructured the Texas electric market in 1999 by unbundling the investor-owned utilities and creating retail customer choice in those areas, and assigned ERCOT four primary responsibilities:

- **System Reliability** - Ensure reliability and adequacy of regional electric power.
- **Open Access to Transmission** - Ensure nondiscriminatory access to transmission/distribution systems for all buyers and sellers.
- **Competitive Retail Market** - Facilitate retail registration and switching.
- **Competitive Wholesale Market** - Ensure accurate accounting for electricity production and delivery among the generators and wholesale buyers and sellers in the region.

**QUICK FACTS**

- 75% of Texas land, 90% of Texas load
- More than 43,000 miles of transmission lines
- 550+ generation units
- 68,305 MW peak demand (set August 3, 2011)
- Most wind generation of any state
- 5th largest wind producer in the world
- > 40% of the grid has run on wind
- > 10,000 MW wind capacity

ERCOT’s primary responsibility is grid reliability.

This is accomplished by:

- Matching generation with demand (moving the right generators to meet demand)
- Operating the transmission system within established limits
- Facilitating competitive markets
Macomber Map

Macomber Map now available to the public as an open source application: http://MacomberMap.codeplex.com

On-peak vs. off-peak demand

“Duck Curve”

Non-summer months — Net load pattern changes significantly starting in 2014

Ramp need >13,000 MW in three hours

Potential over generation

ERCOT Load Case Study

Mar. 9, 2011
5:15 PM
31,262 MW
(Dallas: 84°)

Aug. 3, 2011
5:00 PM
66,416 MW
(Dallas: 107°)
ERCOT Load Case Study

Refrigerator
Microwave / toaster
Living room / TV
Kitchen lights
Garage

HVAC

Emissions Differences

- For those focused on CO\(_2\) & NO\(_x\), 80% emissions reduction per mile driven off grid marginal power.
- Slightly higher SO\(_2\) emissions per mile
- Reduced UFPM emissions + greater distance from major population centers
- Scaling of emissions monitoring and mitigation from millions of cars to hundreds of power plants
- Controllable EV charging could offset intermittent renewables

When you charge matters

- Pricing Signals
- Demand Response
- Targeted Load Shedding
  - Virtual Peaking Plants
- Altruistic Load Shedding
  - Situation Awareness
  - Public Outreach
  - Positive psychology & messaging
  - Public memory: Feb. 2nd, 2011

Maintaining the system within its limits
• 1,776 users brought up their Android/iPhone apps in response to a conservation notification popup.
• 828 of them (46.7%) clicked the ‘I did this’ button in response to conservation recommendations.
• In addition, media outreaches through television, radio, text message, social media and email went out.
January 6, 2014

News Release
January 07, 2014

Demand for power in ERCOT region hits new winter peak

Conservation Alert discontinued

“We appreciate the consumer response to our conservation request yesterday, as well as the steps generation and transmission companies in the ERCOT region have taken to prepare for today’s power needs,” said Ben Woolley, director of System Operations.

Staying Focused…

[Image of caution sign: This sign has sharp edges. Do not touch the edges of this sign. Always, the officer is not ahead.]