



Considerations for Integrating Residential Load Resources into the NYISO

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Earth Networks' Connected Savings

November 21, 2016



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SAVINGS

Our Parent Company – Earth Networks

Unmatched data intelligence from IoT sensors to ensure safety, comfort, efficiency & savings

Large IoT Sensor Network

Global weather observations
Connected home devices &
sensors

Big Data Processing

25+ terabytes real-time data
daily
7+ billion daily transactions

Unique Data Collection & Signal Processing Capabilities

Connecting Weather & Energy

Rapidly Expanding IoT Partner Ecosystem

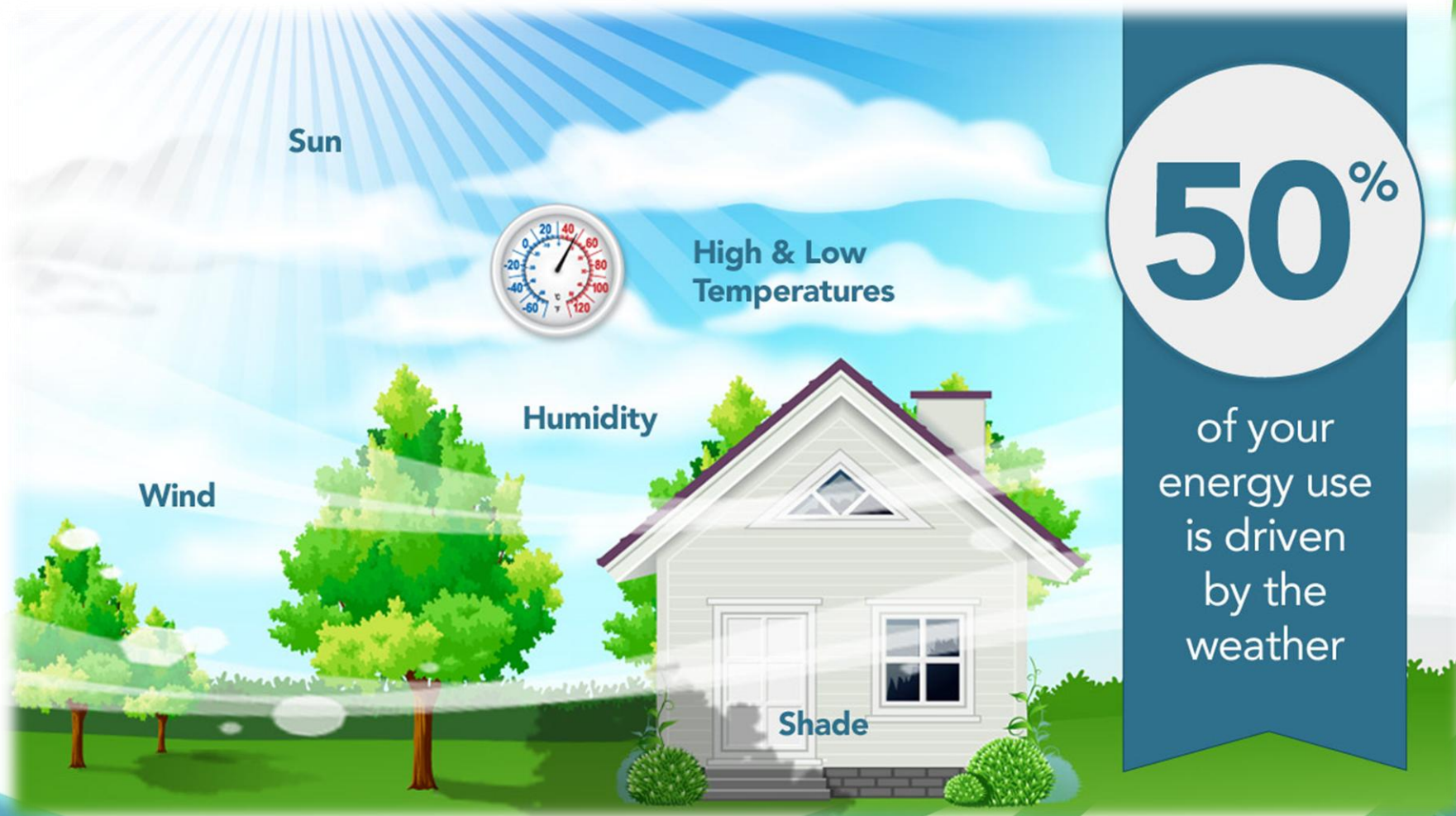
Washington DC . New York . San Jose





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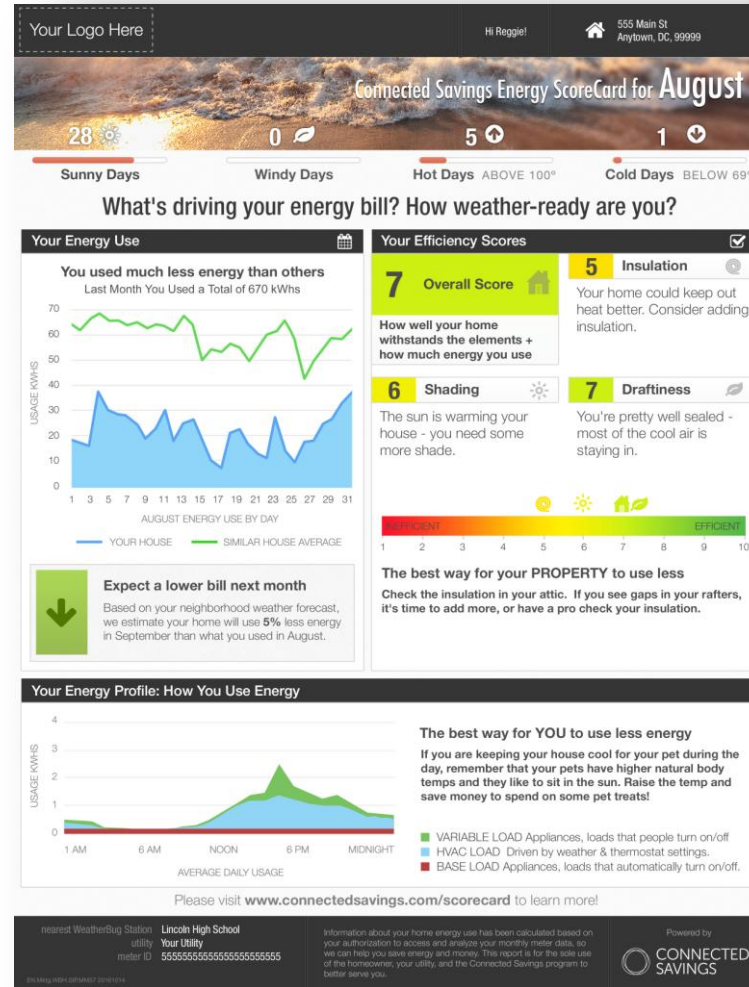
Weather is the Biggest Driver of Home Energy Use



Connected Savings Energy ScoreCard

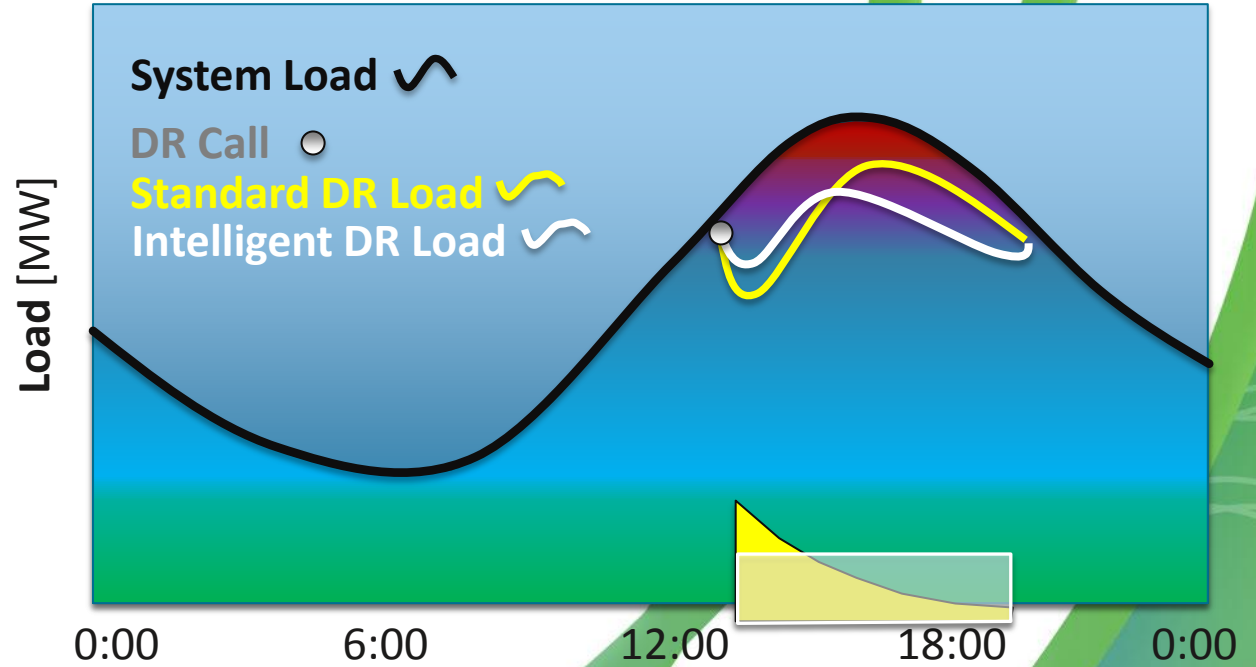
The Energy ScoreCard is a Virtual Energy Audit that educates the Consumer on:

- **HOW** weather impacts their energy use
- **WHY** they are using more energy than peer houses
- **WHAT** they can do with home specific tips to reduce their energy consumption



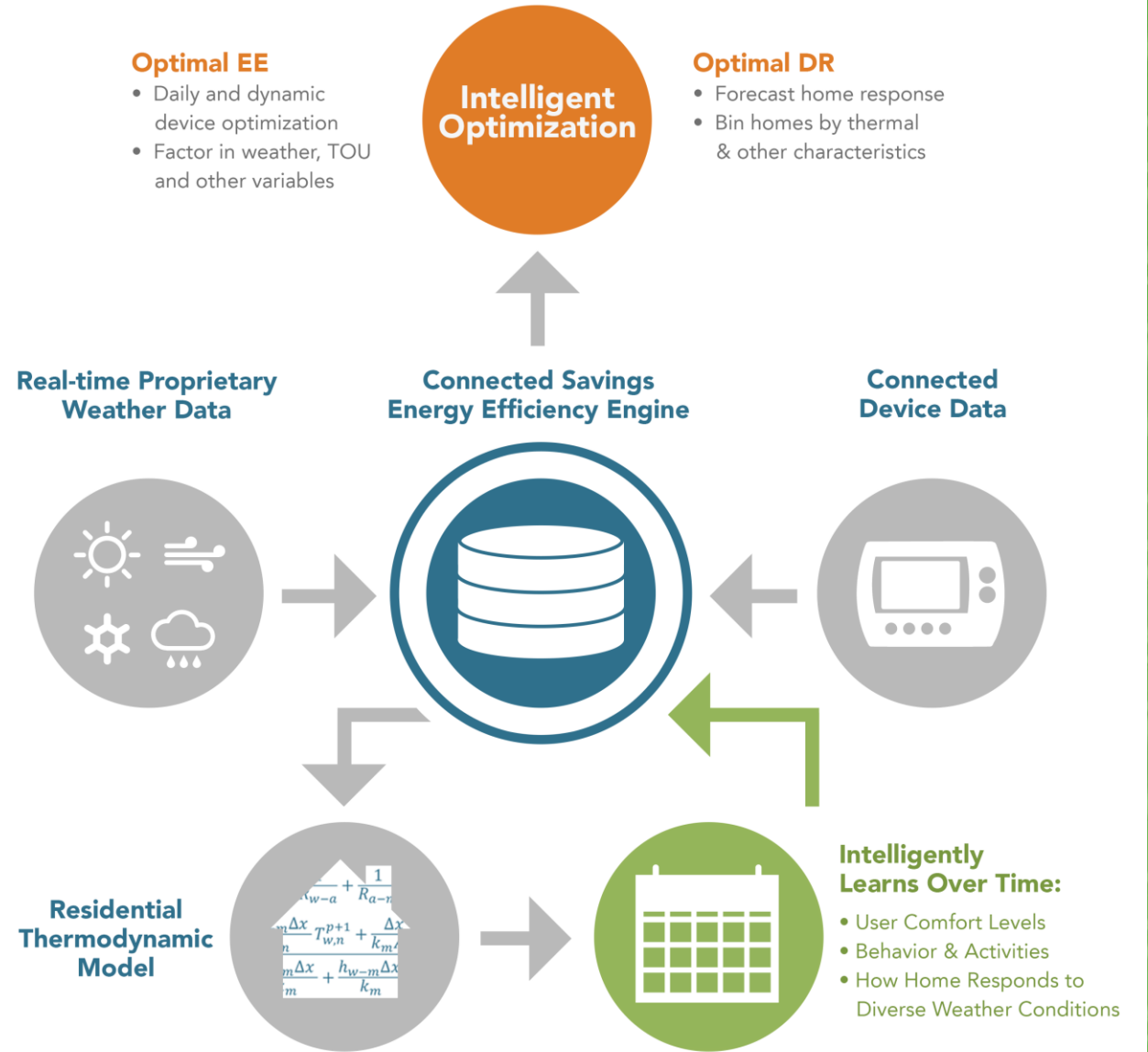
Why We Need Intelligence

- Load administrators want uniform load reduction
- Dispatching all resources at once will result in uneven reduction
- Need to intelligently control the level and timing of the setbacks



Intelligent EE & DR Platform

- Turn a connected home into a smart home
- Maximize load shed with comfort
- Device agnostic architecture

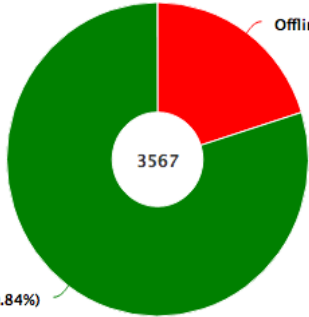


Connected Savings Intelligence (CSI)

- The Energy Insight Portal (EIP) provides utilities full monitoring and control capabilities to maintain grid health
- Initialize, control and summarize DR events and provides insights to make the right decisions

CURRENT DEVICE SUMMARY UPDATED 13 MINUTES AGO

OEM: All



ENROLLMENTS - (82322) Table Chart

Enrollment Date	Number of Enrollments
09/22/2016	35
09/21/2016	8
09/20/2016	10
09/19/2016	53
09/18/2016	3

Showing 21 to 25 of 651 entries

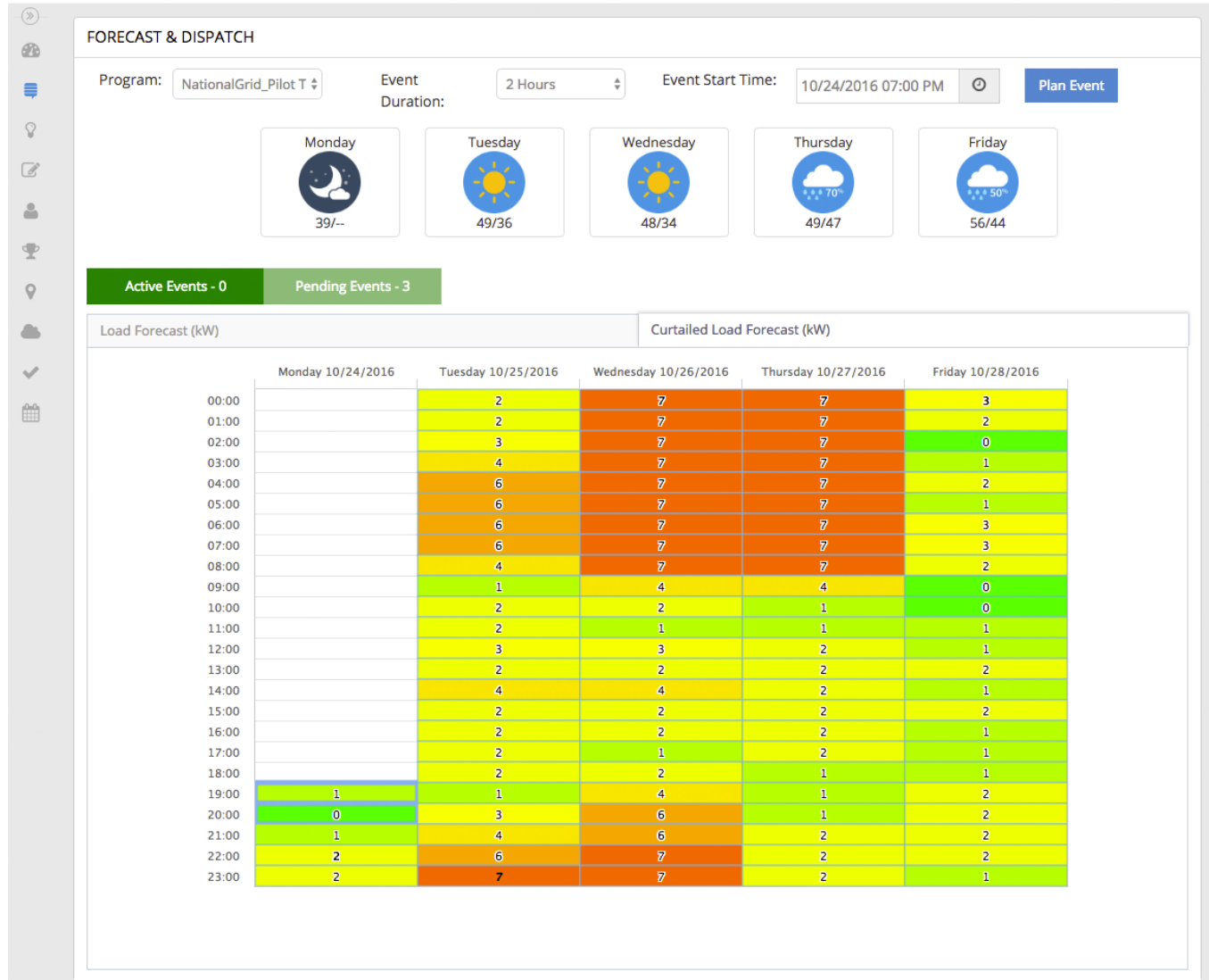
DR EVENT SUMMARY

Active Events - 0 Pending Events - 3 Past Events - 629

Program Name	Date	Start Time	Duration
Ercot	10/24/2016	07:30 PM	3 hrs
Ercot	10/24/2016	04:30 PM	3 hrs
Ercot	10/24/2016	11:40 AM	3 hrs
Ercot	10/24/2016	10:12 AM	3 hrs
Ercot	10/24/2016	10:00 AM	3 hrs
Ercot	10/24/2016	09:25 AM	3 hrs
Ercot	10/24/2016	04:00 AM	3 hrs
Ercot	10/21/2016	05:15 PM	1 hrs
Ercot	10/21/2016	03:10 PM	3 hrs
Ercot	10/21/2016	09:20 AM	3 hrs
Ercot	10/20/2016	02:30 PM	3 hrs
Ercot	10/20/2016	10:10 AM	3 hrs
Ercot	10/19/2016	04:10 PM	3 hrs
Ercot	10/19/2016	03:29 PM	3 hrs
Ercot	10/19/2016	03:10 PM	3 hrs
Ercot	10/19/2016	02:58 PM	3 hrs

CSI: Load Forecasting

Provide load and capacity forecasting based on each home's thermodynamic model and our hyper-accurate weather data



Discussion of NYISO Inclusion of Small Customer Loads

What We Will Cover

- Smart Trends and the Evolution of DR
- AMI is a Condition for Take-off
- Frictionless Enrollment and Registration
- Access to Meter Data
- Defining Performance and Pricing

Smart Trends

Business in a Digital World

- Uber, the world's largest taxi company, owns no vehicles.
- Facebook, the world's most popular media owner, creates no content.
- Alibaba, the world's most valuable retailer, has no inventory.
- Airbnb, largest accommodation provider, owns no real estate.

Platform Opportunity for Energy Markets

Changing Economics of Small Customer Participation

- Residential was burdened by upfront /implementation costs.
- Now customers adopt and pay for technology/ service to improve control, connectedness, health and safety, comfort and freedom, increase efficiency, reduce environmental impact.
- Already, 10% of all customers have communicating thermostats, 40% of new homes have them installed.
- Platforms can market online, provide remote services, aggregate and monetize value created.

Major New Participants are Entering the Market

*New Moore's Law of Multiplying Devices....2007—10 million; 2013—3.5 billion; 2030—100 Trillion
IPv6 will expand the available addresses to 340 Trillion, Trillion, Trillion*



AMI is a Prerequisite for Participation of Small Customers

Consumption Data, Granular Enough for Market Settlement is the Coin of the Realm

- Residential and small commercial loads each offer relatively small incremental contributions, and therefore, revenues.
- Potential revenues cannot justify deployment of sub-metering today, in most cases even using a sampling process (cost and dynamic populations)
- Customers move relatively frequently, so stranded costs are an issue
- NY is on Schedule to have AMI in time for the NYISO Process

Creating and Monetizing the Value of Smart Things

Steps for Aggregations of Small Customers to Participate

- Attract, Enroll and Connect Customers
 - Pathway for Third Party Access to Meter Data
 - Utility/ISO Authenticates Participating Customer
 - Customer Authorizes Access to Meter Data
 - Register Load Resources in the Program/Market
- Demonstrate Availability and Performance—Match the Performance Measurement and Payment to the Character of the Resource—and Settlement

Enrollment Partner Enrollment Process

The screenshot shows the top of a website with the WeatherBug Home logo and navigation links: Products, Get WeatherBug Home, Utilities, Partners, About Us, Contact. Below the navigation is a dark banner with the text "Honeywell WeatherBug Home Enrollment". The main content area features a headline "Upgrade your Honeywell thermostat software to save BIG!" followed by a paragraph explaining the free software upgrade. A "GET STARTED" button is prominently displayed. Below the button, there is a note about needing a Honeywell TCC username and password, and a link to the Total Connect Comfort website for password recovery. The footer contains copyright information for Earth Networks and links to Privacy Overview, Privacy Policy, EULA, and FAQs.

WeatherBug Home® Products | Get WeatherBug Home | Utilities | Partners | About Us | Contact

Honeywell WeatherBug Home Enrollment

Upgrade your Honeywell thermostat software to save BIG!


Claim your **free** software upgrade for your Honeywell thermostat to save money, stay comfortable and keep the lights on in Texas during peak energy use times.

Upgrade and get:

- **Additional Savings** – Save on average \$75* a year on your energy bill! This software upgrade optimizes your Honeywell thermostat to cool and heat your home at the best times, considering the daily weather forecast, so you stay comfortable and save! [Learn more](#)
- **Home Energy ScoreCard** – Get a monthly virtual home energy report, neighbor comparisons, and customized energy-saving recommendations. [Learn more](#)

You'll also be able to help Texas when the electrical grid gets too stressed. We'll keep you comfortable while we manage your energy use during expensive peak times (demand response) to help keep the electrical grid stable and the lights on in your neighborhood! You can always opt-out if you want – no problem. Get started below!

Honeywell



**An independent WeatherBug Home Weather Optimization study found that participating customers saved \$71 – \$117 off of their energy bills. Results may vary.*

[GET STARTED](#)

You'll need your Honeywell TCC username and password.

Don't remember your password? Please go to the Total Connect Comfort website, and click 'Forgot Password'. If there are any changes to your Honeywell account information, please update your account **before** enrolling into WeatherBug Home.

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Customer Authentication

Honeywell | Total Connect Comfort

Before connecting your thermostat to the demand response program you need to create an account and set up your thermostat on the Total Connect Comfort website.

www.MyTotalConnectComfort.com

Email address

Password

[Forgot Password?](#)

SIGN IN

Customer Authorization

Honeywell | Total Connect Comfort

By clicking "I ACCEPT," I acknowledge and agree that:

- Honeywell will share certain information about me and my thermostat system (for example, name, contact information, and thermostat usage information) with third parties in order to participate in the Demand Response Program.
- I am permitting the Demand Response Program or service to control the thermostat(s) I select.
- My use of the Demand Response Program will also be subject to the Demand Response Program end user license agreement (or similar terms of use) and any information disclosed by Honeywell and me to Demand Response Program will be subject to the Demand Response Program privacy policy.

I ACCEPT

Connect to the Participating Thermostat

Honeywell | Total Connect Comfort

Please select one or more of the following thermostats.

WeatherBug HQ

Homerator 6695

Houston, Tx

THERMOSTAT Already selected

OK

Confirm the Customer's Intension

WeatherBug Home[®] Products Get WeatherBug Home Utilities Partners About Us Contact

Honeywell WeatherBug Home Enrollment Home / Honeywell WeatherBug Home Enrollment / Honeywell WeatherBug Home Enrollment

Honeywell WeatherBug Home Enrollment

Please take a look at your information received from Honeywell. Make sure everything is accurate then 'Submit' below.

Need to edit your information? [Go here](#) (opens a new window to Honeywell's website) and click the settings cogwheel for the location(s) you want to update. Once finished, come back to this window and [refresh this page](#).

Houston, Tx - 12200 Gulf Fwy, Houston, Texas 77075

First Name * Last Name *

Street Address *

E-mail Address

City * State * Zip Code *

Number of Thermostats

Please tell us:

Yes, I want to stay comfortable, save money and help Texas!

What kind of bill do you receive? *

What is the square footage of your home? *

1 - 1500 1501 - 2500 2501 - 3000

3001 - 5001 5000+

WeatherBug HQ - 12410 Milestone Center Drive, Germantown, Maryland 20876

Sorry, this location is currently not supported by the WeatherBug Home Demand Response program.

* Indicates Response Required

I agree to the WeatherBug Home terms and conditions

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Access To Meter Data

How complex the process is impacts commercial viability

- Aggregator must repeat this same process for access to the meter data. Removing Friction from the system critical.
- Energy Hub White Paper Documents Commercial Impact
- What Entity Acts as the Repository of Meter Data?
 - TX and Ontario have central repository
 - ERCOT actually does performance validation directly
 - Other markets the utilities are the repositories (Are they directed or incented to facilitate access?)

Access to Meter Data is Everything

Every State is Separately Addressing the Issue of Meter Data Access

- Tension between protecting privacy and enabling new technologies/apps from third-party providers for consumers
- Regulators worry about having authority to oversee and stop/correct untoward behavior, So ESCOs have access but not other 3rd Party Services Providers
- California simply blocks access of bad actors
- PA requires a license
- Texas, Illinois, Ontario addressing issues

Automate Data Access and Transfer

There is Access and there is Access

- Green Button Connect is being Implemented Differently
- Technical Implementation of GBC alone is not sufficient for commercial viability
 - Standardizing Data Transfer is Important
 - But, consumers have new expectations for online transactions, and the time and effort required
- Wide variety of current systems (Smart Meter Texas, utility implementations, California Click-Through Working Group)

Small Customer Loads are Weather Sensitive

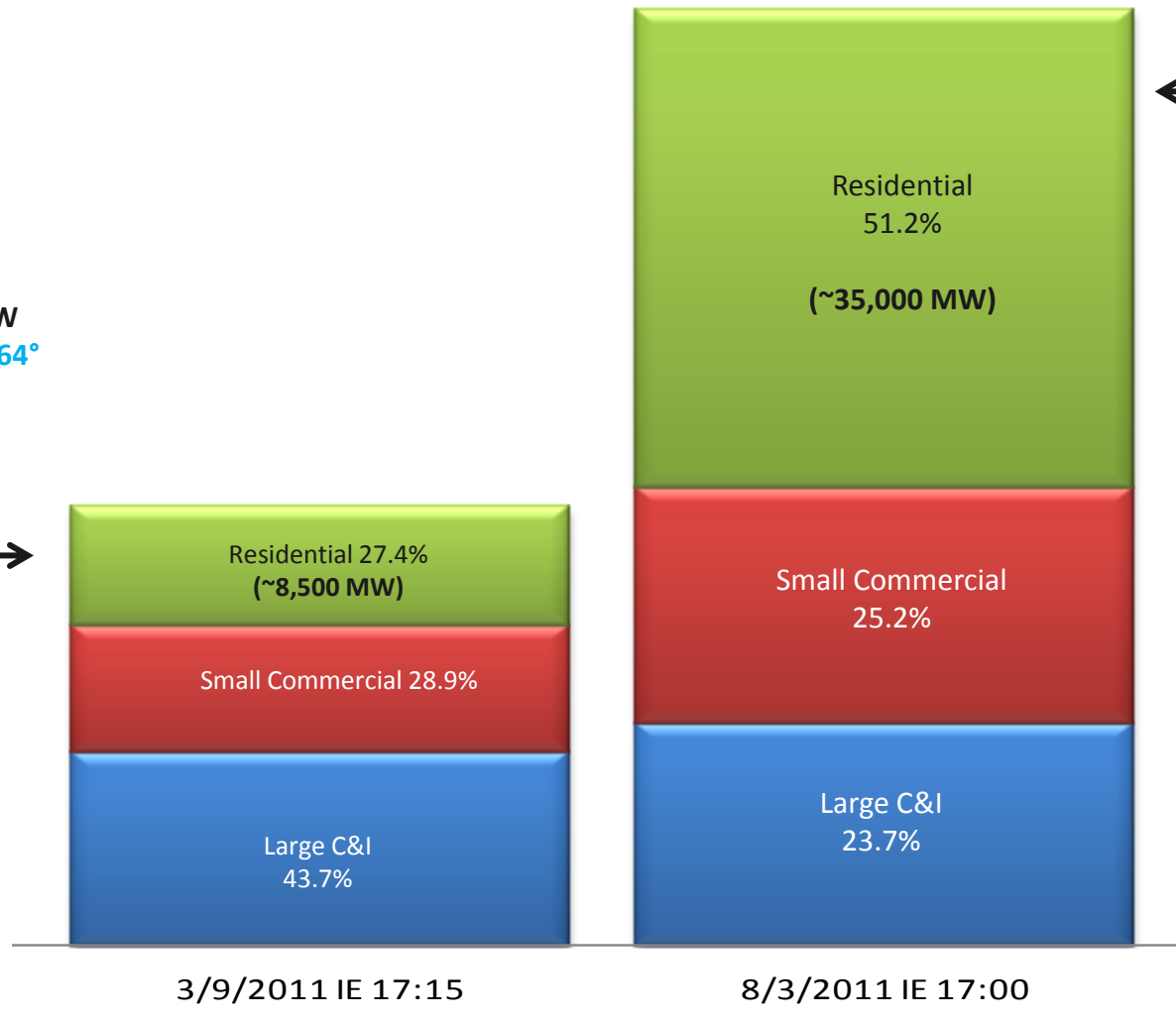
Small Consumer's loads are dominated by space conditioning

- What that means:
 - They vary seasonally
 - They are not like industrial loads
 - Their ability to provide load reduction depends on their load
 - The load depends on the weather
 - The capacity to reduce load is variable, but predictable and reliable
 - Their capacity to contribute to reliability or capacity is correlated with the most likely time it will be needed

Value: Weather Sensitive Loads Drive Peak

Wednesday
March 9, 2011
5:15 PM
ERCOT Load: 31,262 MW
Temperature in Dallas: 64°

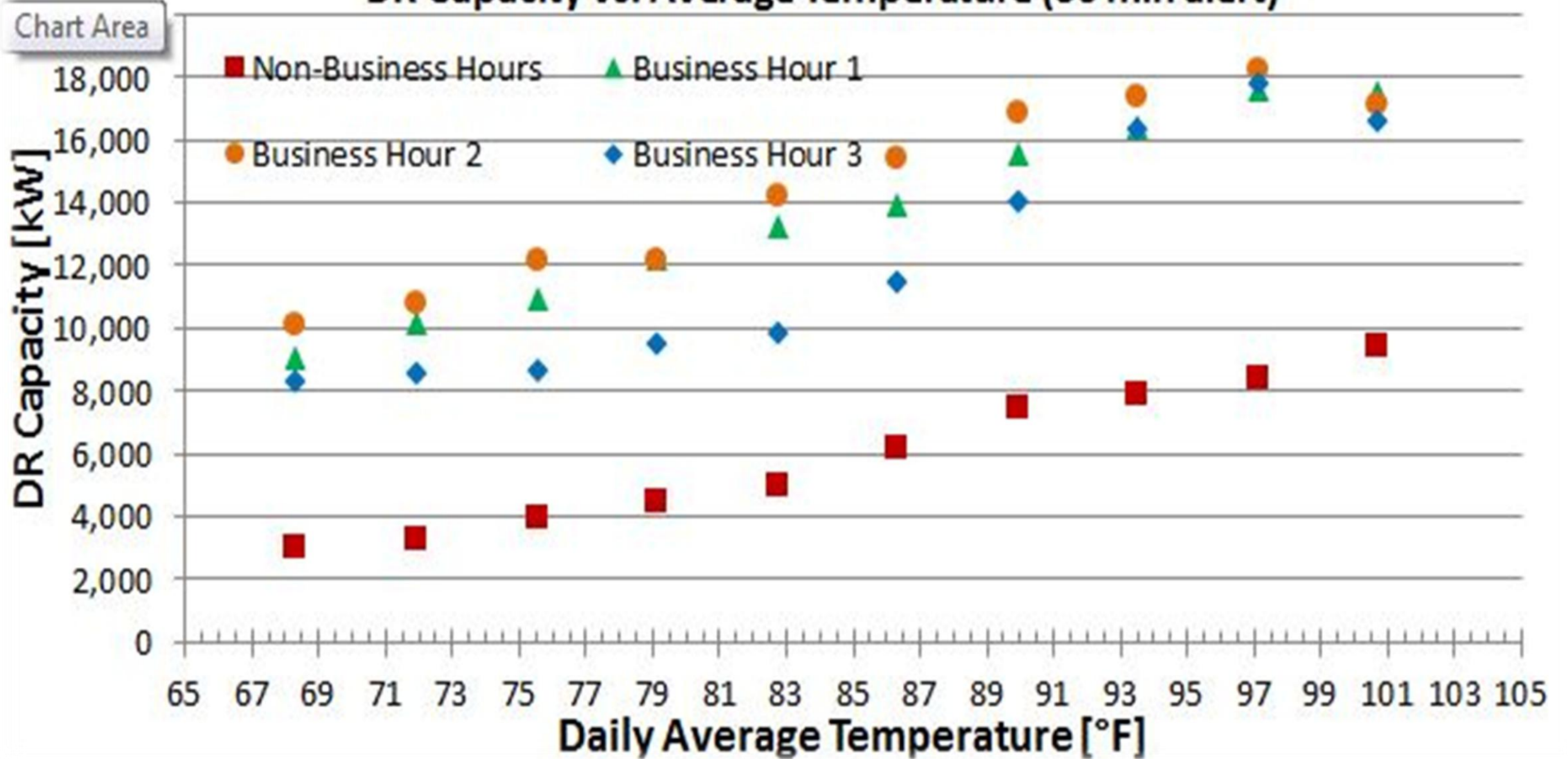
← Wed., Aug. 3, 2011
5:00 PM
ERCOT Load: 68,416 MW
Temperature in Dallas: 109°



37,000 MW of weather-sensitive load -- 54% of peak

- Customer class breakdown is for competitive choice areas; percentages are extrapolated for munis and co-ops to achieve region-wide estimate
- Large C&I are IDR Meter Required (>700kW)

DR Capacity vs. Average Temperature (30 min alert)



What Are We Measuring?

Predictable, Reliable, Variable

- Residential Loads are dominated by weather sensitive loads
- Performance expectations and pay should be aligned with the character of the load resource:
 - Measure the exact performance of the resource when called (“drop-by” baseline) and pay based on performance (Texas ERS), or
 - Measure the demand at the time of the event (“drop-to” baseline), and pay for the willingness to stay offline (PJM Base Capacity or Capacity Performance)

Pay for Performance

Transparency benefits ERCOT and Aggregators

- ERCOT ERS allows mass market aggregations to be bid according to what they are able to provide when most needed
- ERCOT calls at least two events a month for tests, although a previous event can replace the need for a test
- Pays for the actual performance (averaged)

Accurately Measuring Baselines

The larger the Aggregation the more Accurate the Estimation in Control Groups

- Most existing baselines were created for relatively stable industrial loads (Previous 5 of 10, high 3 of 5 days, etc.)
- All tend not to measure residential/weather sensitive loads well, and mostly under measure.
- SCE found even with day-of adjustment of 300% not accurate
- Nexant study found Control Group Protocols most accurate (Random Control Testing or Propensity Score Matched Groups)
- Option is “Like Days” Matching

Base Capacity

A different definition of Capacity

- Weather Sensitive Loads agree, upon being called to drop to a pre-agreed upon demand level on the system, called a Firm Service Level (FSL)
- Monitoring and verification of performance is quite simple; the load simply has to be able to demonstrate through meter data that it's demand remained below the FSL
- This works for Weather Sensitive Loads, because on a cooler day, the load may already be down: no sense in punishing it for behaving as would be expected.

Registration of Residential Load Aggregations

Residential Aggregations are Dynamic

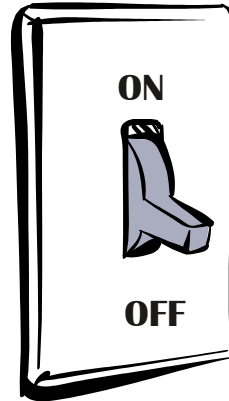
- Aggregators of residential loads, once a commitment is made to a market, initiate an on-going marketing effort
- Customers are continuously being enrolled, so actual resource is growing, and periodic enrollment adjustments are important
- Customers are also leaving continuously: allow replacement
- ISO process for registering the elements of a resource needs to handle large numbers and churn automatically
- Allow reasonable minimum resource size

Possible Program/Market Formats

Residential Loads are Flexible, Resilient

- Emergency Resource Service Only
- Capacity Resource Only
- Energy Resource Only
- Capacity Resource with Must Offer Obligation
- Ancillary Service

Questions?



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Thank You!

Questions?

