Retail Smart Grid Trends

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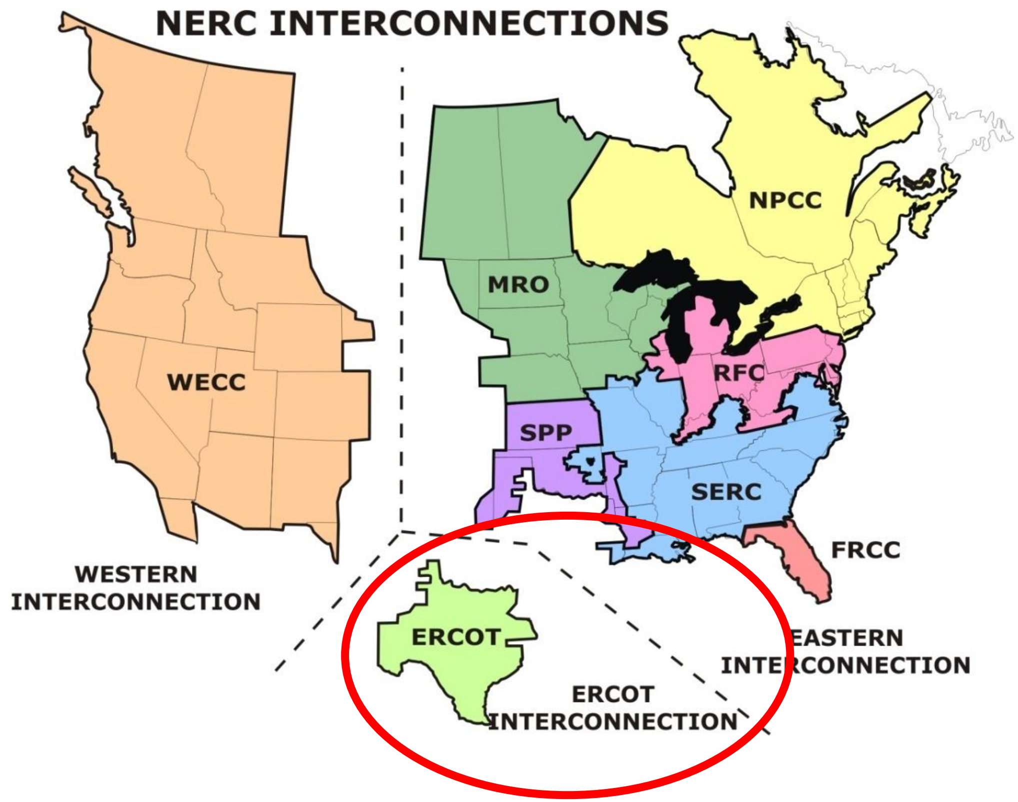
UT Energy Week: "How Smart Grids Enable Consumers"
Feb. 18, 2015

U.S.-Canadian Bulk Power Grids

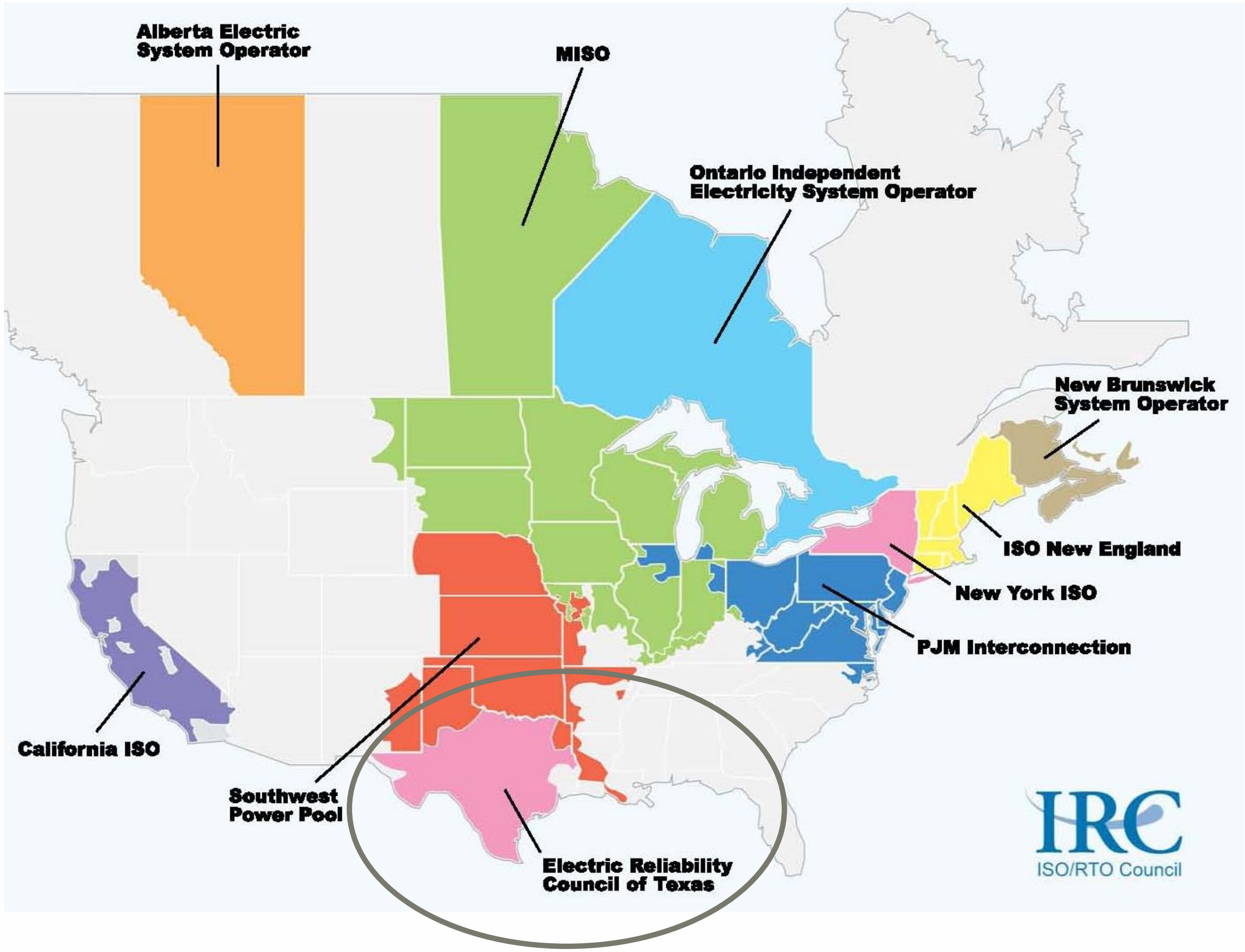


ERCOT connections to other grids are limited to direct current (DC) ties, which allow control over flow of electricity

- The ERCOT Region is one of 3 grid interconnections in USA-Canada
- The ERCOT grid:
  - Covers 75% of Texas land
  - Serves 90% of Texas load
  - 68,305 MW all-time peak (Aug. 3, 2011)
  - >43,000 miles of transmission lines
  - >550 generation units
  - Physical assets are owned by transmission providers and generators, including municipal utilities and cooperatives

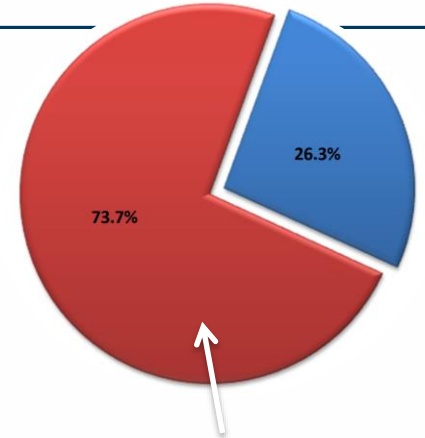
North American ISOs and RTOs

Independent System Operators and ***Regional Transmission Organizations*** are the 'air traffic controllers' of the bulk electric power grids



Background: Advanced Metering

- In 2005, Texas Legislature passed a law (HB 2129) enabling accelerated cost recovery for Transmission & Distribution Utilities in retail choice areas for installing Advanced Metering Infrastructure (AMI)



Retail choice areas
~74% of ERCOT Load

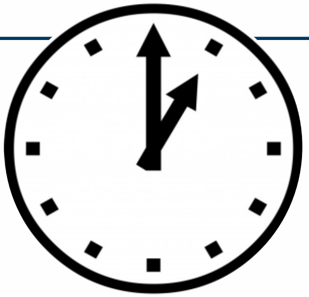
- Subsequent PUC Rules required each meter to measure load in 15-minute intervals, and for each Retail Electric Provider (REP) to be settled at wholesale on that 15-minute data
  - This ensures that the benefits of any customer action to reduce Load during a high-price period will flow directly back to the REP in settlement

- Other benefits include automatic meter reading and real-time outage detection

Background: Retail Products

- Today, 4 investor-owned TDUs have implemented AMI
  - 6.7 million meters in service as of 12/14: nearly 100% of retail choice customers
- In 2013 ERCOT, working with REPs, began to track growth of smart grid retail product offerings enabled by AMI data:
  - Dynamic pricing
  - Other retail demand response or behavioral shift incentives
- REPs have now provided headcounts of their customers enrolled in various product types on two snapshot dates: 6/15/13 and 9/30/14
  - Additional ERCOT analysis, including responses to (rare) price events and shifts in behavior by Time of Use customers, coming later

Product type: Time of Use (TOU)



- *Pricing ($/kWh) that varies by day and/or hour, but with fixed and known values*
- Examples: <u>Free Nights</u>, <u>Free Weekends</u>
  - Numerous variations available from multiple REPs

Residential TOU Enrollment	
2013	**2014**
135,320	290,328

- Footnotes:
  - 222,000+ were new to TOU in 2014
  - Fairly high attrition rate: -62,794 from the 2013 total

Product type: Peak Time Rebate (PTR)

- *Payment incentive for reducing load during events identified by REP*
  - Prior notification by email, text, robo-call, etc.
- Numerous variations available from multiple REPs

Customer type	2013	2014
Residential	2,410	410,765
Commercial & Industrial	58	3,007

- Footnotes:
  - Some REPs made PTRs available to all customers in their portfolio
    - Some of these REPs reported their entire portfolio on PTR, regardless of whether they called an event
    - Others reported numbers only for those that actually provided DR in a called event
  - Inconsistencies difficult to resolve
    - Data collection from REPs is voluntary (not required by market rules)
    - Creating simple descriptions of all product types is proving elusive

Products: Real-Time Pricing (RTP) + Block & Index (B&I)

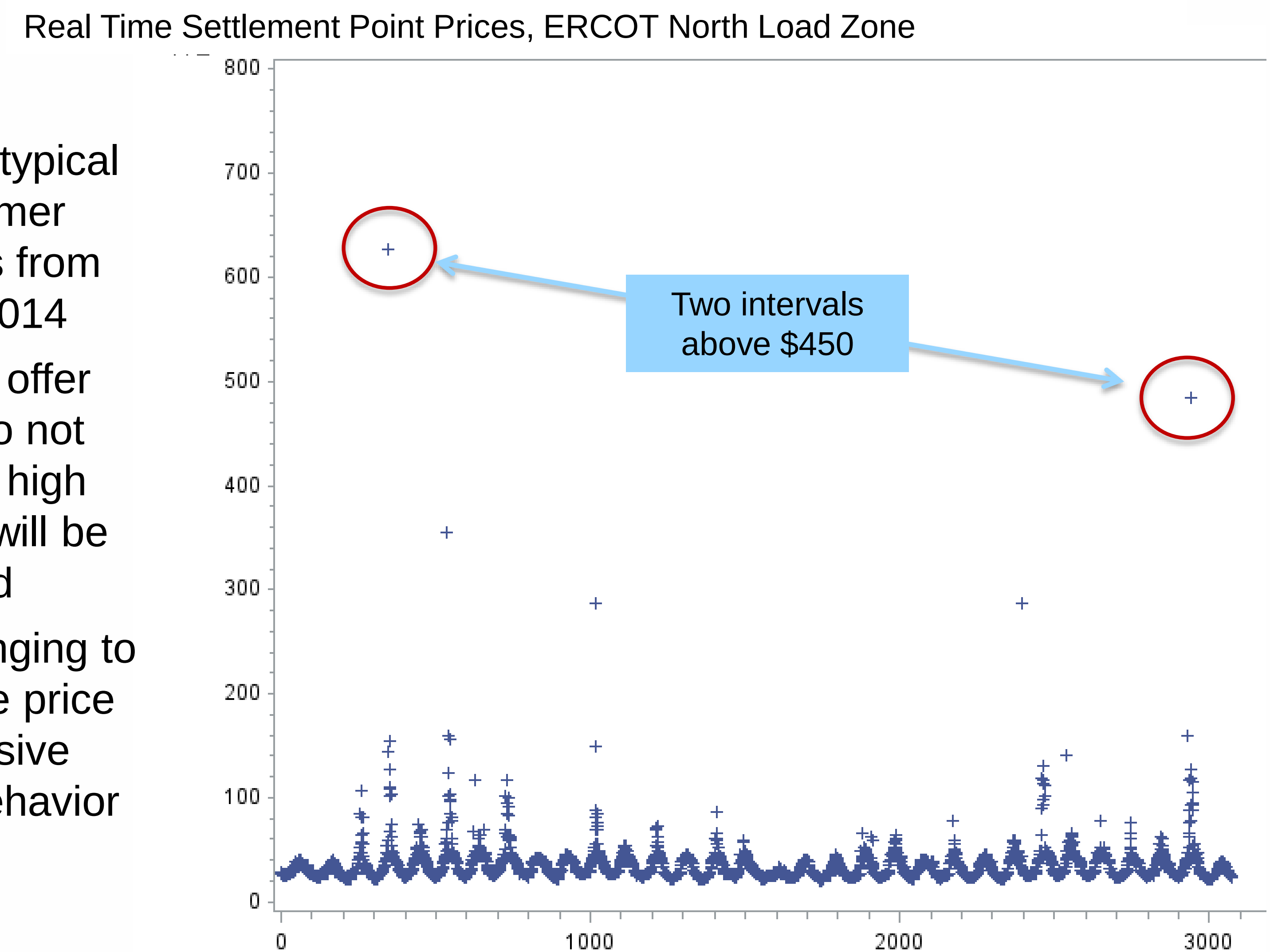
- RTP: *Pricing tied directly to Load Zone Settlement Point Prices in the ERCOT real-time market at all times*
  - Subject to change every 15 minutes
- B&I: *Fixed pricing most hours but exposure to RTPs in others*
  - Many variations on the B&I theme
- Both are offered by numerous REPs, almost exclusively to C&I customers

Commercial & Industrial Enrollment		
	2013	**2014**
RTP	4,358	9,700
B&I	23,928	6,976

- Footnotes:
  - Indicates some migration from B&I to RTP
  - Evidence elsewhere of migration from B&I to Peak Rebate plans

Aug. 2014 Wholesale Prices

- This is typical of summer months from 2012-2014
- $9,000 offer caps do not ensure high prices will be realized
- Challenging to analyze price responsive load behavior



Additional thoughts

- Collecting data on retail price offerings is not a pure science; many lines are blurred
  - Some confusion on product definitions
  - REP offerings not necessarily easy to match to the ERCOT categories
  - REP databases may not be built to track product types through a customer's history
- This helps to explain some of the 2013-14 transitions, but makes year-to-year headcount tracking an inexact science

Caveats & disclaimers duly noted, I hope

Big Picture

- Let’s not miss the forest while looking at the trees

A significant chunk of the retail market now has some kind of incentive for DR, price response, or behavioral shift :

- ~ 12% of residential
- > 8% of C&I
- Overall, nearly 5-fold increase in customer counts from 2013-2014

- A decade after the Legislature enabled AMI, the retail smart grid is starting to take hold
- More detail: http://www.ercot.com/calendar/2015/2/3/31977-DSWG

Questions?