Retail Smart Grid Trends

Paul Wattles
Senior Analyst, Market Design & Development

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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)

• 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

Retail choice areas
~74% of ERCOT Load
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:** Free Nights, Free Weekends
  - Numerous variations available from multiple REPs

<table>
<thead>
<tr>
<th></th>
<th>Residential TOU Enrollment</th>
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<tbody>
<tr>
<td><strong>2013</strong></td>
<td>135,320</td>
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<tr>
<td><strong>2014</strong></td>
<td>290,328</td>
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- **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

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<thead>
<tr>
<th>Customer type</th>
<th>2013</th>
<th>2014</th>
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<tbody>
<tr>
<td>Residential</td>
<td>2,410</td>
<td>410,765</td>
</tr>
<tr>
<td>Commercial &amp; Industrial</td>
<td>58</td>
<td>3,007</td>
</tr>
</tbody>
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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

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<th>Commercial &amp; Industrial Enrollment</th>
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<tr>
<td>RTP</td>
<td>4,358</td>
<td>9,700</td>
</tr>
<tr>
<td>B&amp;I</td>
<td>23,928</td>
<td>6,976</td>
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- 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

Real Time Settlement Point Prices, ERCOT North Load Zone

Two intervals above $450
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
Questions?