Understanding Consumer Behavior in the Public Power Model

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Tennessee Valley Authority

- A federal corporation funded entirely by power sales
- Provides electricity, economic development, flood control, and navigation
- Service Area:
  - 7-state region
  - 80,000 square miles
  - 9 million people
  - 700,000 businesses and industries
- Fiscal Year 2010 Revenue: $10.9 billion
  - 85% Wholesale – 155 Distributors
  - 15% Retail – ~60 Direct Serve
- Regulator
TVA’s Mission

Low-cost Power

Economic Development

Environmental Stewardship

Technological Innovation

River Management

Our Mission
TVA’s VISION

One of the Nation’s Leading Providers of Low-Cost And Cleaner Energy by 2020

- Low Rates
- Cleaner Air
- High Reliability
- More Nuclear Generation
- Responsible Stewardship
- Greater Energy Efficiency
TVA’s Customer Base

TVA provides power to 155 Distributors

- 105 municipalities
- 50 cooperatives
- Distributors accounted for 85% of TVA’s Fiscal Year 2010 operating revenue

The munis and coops serve approximately:

- 3.8 million residential customers
- 700,000 commercial and industrial customers

TVA also provides power to ~60 direct serve retail customers

- Industries directly served accounted for 12% TVA’s Fiscal Year 2010 operating revenue
# The Good, the “Not So Good”, and the Ugly

<table>
<thead>
<tr>
<th>Issue</th>
<th>Good</th>
<th>“Not So Good”</th>
<th>Ugly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rates</td>
<td>Alignment of TVA and customers’ interest in “low rates”</td>
<td>Competing customer interests in cost of service and rate design</td>
<td>“Non-profit means you can ‘afford’ a price break for <em>ME</em>”</td>
</tr>
<tr>
<td>Regulation</td>
<td>TVA sets its wholesale rates</td>
<td>TVA is “regulator” of its customers</td>
<td>“Does anyone know a benevolent regulator?”</td>
</tr>
<tr>
<td>Financing</td>
<td>TVA has low-cost of debt as a source of capital</td>
<td>Legacy of past decisions</td>
<td>Mandated debt ceiling</td>
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<tr>
<td>Feedback</td>
<td>Open dialogue and direct customer feedback without cloud of regulatory proceedings</td>
<td>Everyone has an opinion on pricing and rate decisions</td>
<td>Impossible to make all 155 distributors and 60 direct serve customers happy</td>
</tr>
<tr>
<td>EE/ DR</td>
<td>Extensive opportunities that meet objective of <em>lower customer bills</em></td>
<td>Rate impacts for distributors and non-participants</td>
<td>“What’s in it for <em>ME</em>?”</td>
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</tbody>
</table>
Many critical (rate-related) decisions – More Opinions

- Wholesale Rate Change
- Dynamic Pricing – Seasonal Time of Use and Real-Time Pricing
- Energy Efficiency & Demand Response
- Integrated Resource Plan

Attempting Consensus – Making Tough Decisions

- Focus on public power mission & doing “right thing” for ALL customers
- Change must be accepted versus forced via regulatory action
- Must create trust with constituencies
- Knowing when to make the tough call
Former TVA Pricing Structure

No Price Change Regardless of Season
TVA Wholesale Rates Based on End-Use Customer Class

- **Winter** (Dec-Mar)
  - Same Price

- **Spring** (Apr-May)
  - Same Price

- **Summer** (June-Sept)
  - Same Price

- **Fall** (Oct-Nov)
  - Same Price

Graph showing pricing costs across different seasons:
- **Winter Costs**
- **Summer Costs**
Seasonal Time-of-Use Pricing Structure

Higher at Seasonal Peak Hours; Lower at All Other Times

Winter (Dec-Mar)

Spring (Apr-May)

Summer (June-Sept)

Fall (Oct-Nov)

Midnight 6 a.m. Noon 6 p.m. Midnight
TVA Price Responsive Pricing Products

Wholesale
- 39 (of 155) distributors elected Seasonal Time of Use rate
- Remaining distributors are on Seasonal Demand & Energy rate
- “Smart Grid” programs introduced for demand response

Retail
- Seasonal Time of Use rates available for Residential & small commercial (some distributors)
- Seasonal Time of Use rates available for > 1 MW customers (all distributors)
- Real-time pricing (originally introduced in 2001)
- Interruptible call products based on economics and reliability

Demand Response incorporated into Supply Side Planning
## Responsive Loads Within The Valley

**Price & Demand Response Integrated Into Supply Side Planning**

<table>
<thead>
<tr>
<th>Wholesale Pricing (1)</th>
<th>Retail Pricing (1)</th>
<th>Demand Response</th>
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</thead>
<tbody>
<tr>
<td>Wholesale Time Of Use</td>
<td>Retail Time of Use</td>
<td>Wholesale</td>
</tr>
<tr>
<td>Wholesale Demand &amp;</td>
<td>(mimic of wholesale)</td>
<td>Distributor Bid Based *</td>
</tr>
<tr>
<td>Energy</td>
<td>(More significant Price Differentials)</td>
<td>(166 MW)</td>
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<tr>
<td></td>
<td>Real-time Pricing</td>
<td>Direct Load Control *</td>
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<tr>
<td></td>
<td>(Hourly energy Pricing)</td>
<td>(60+ MW)</td>
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<tr>
<td></td>
<td>“Modified Real-time Pricing”</td>
<td>Retail</td>
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<tr>
<td></td>
<td>(Hourly Energy Pricing &amp; Allocated Capacity)</td>
<td>EnerNOC (220 MW)</td>
</tr>
<tr>
<td></td>
<td>STOU BCD</td>
<td>CPP (7 MW) *</td>
</tr>
</tbody>
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- **Wholesale**
  - Distributor Bid Based *
    - (166 MW)
  - Direct Load Control *
    - (60+ MW)

- **Retail**
  - EnerNOC (220 MW)
  - CPP (7 MW) *

- **Demand Response**
  - Reserve Preservation
    - (450 MW+)

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(1) Programs historically in place or in place as of 4/1/2011

**Programs being rolled out between 2012 & 2013; estimated demand response**
Seasonal Time of Use Enrollment & Contract Quantities
(Customers with Contract Demands > 1 MW)

Customer Count and Contract Quantities Growing

A  Time of Use Pilot Opens

B  Rate Change - Early Subscription Opens

Contract Demand (kW)

Number of Customers
During the peak week of Summer 2010, there was an approximate 400 MW of peak demand reduction.

Customers and contract demands have almost doubled since this point in time (Time of Use Pilot)
Energy Efficiency and Demand Response programs

The Valley

$3.2 billion* net benefit for the TVA system

**Distributors**
- Peak load reduction
- Deferred distribution investment of ~$40 million based on 2015 load
- Greater customer satisfaction

**End-users**
- Benefits to the Valley exceed all costs by approximately two times
- $350 million per year levelized bill savings over next 20 years
- Helping improve comfort, productivity, and value in homes, business and industry

**TVA**
- Avoided capacity and energy savings of 2.2 times program and incentives
- Avoided capital and energy costs of $6 billion through 2030
- Scalable, providing resource planning flexibility

*Net benefit equals 20 years net resent value of total program benefits less total program costs.*
Public Power And Change Observations

- Trial and error is acceptable
  - Flexibility to adjust based on customer feedback and response
  - Biggest opponents can become biggest advocates
  - Provide opportunities for all customers

- The speed of change is directly proportional to trust

- Sometimes small changes are MUCH bigger than appearance

- Introducing price response can be cultural in nature (requiring facilitation, encouragement,
  - The amount of price response is often a function of the situation

- Change creates more change
  - Demand for more products and services arises from changes