Residential Demand Rates: APS Case Study

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Arizona Public Service Company
Arizona’s largest and longest-serving electric utility

Customers: 1.2 million (89% residential)

Service Territory:
• 34,646 square miles
• 11 of the 15 Arizona counties

2014 Peak Demand: 7,007 MW
• All time high of 7,236 in July 2006

Generation Capacity: Over 6,400 MW of owned or leased capacity (~9,400 MW with long-term contracts)
• Including 29.1% interest in Palo Verde Nuclear Generating Station, the largest in the U.S.

Transmission & Distribution: 34,937 miles
• Transmission: 5,958 miles
• Distribution: 28,979 miles
APS Residential Demand Rates

- Started in 1981 as a mandatory rate for new homes with central air conditioning

- Today, over 110,000 (11%) customers have voluntarily selected the rate

- APS helps customers select the best rate at time of new service or through website rate comparison tool

- Today’s metering technology has enabled this level of sophisticated rate offering
APS’s Residential Demand Rate Evolution

Mid 1970’s
Residential use of central air conditioning (AC) flourishes in the Phoenix area – begins to drive system peak demand

Late 1970’s
APS requests approval of a mandatory residential demand rate for any new home with central air conditioning - charges based on 1) the highest kW demand in a single hour; 2) kWh energy consumed; and 3) a basic service charge

Early 1980’s
APS implements inclining block and TOU rates and demand rate becomes voluntary

Early 1990’s
Almost all TOU Adoption is demand based

Early 2000’s
TOU Adoption exceeds 40% and demand adoption ebbs to just over 7%
APS
Historical Customer Count
Standard vs. Time of Use vs. Demand TOU
APS
Historical Customer Count Percentage
Standard vs. Time of Use vs. Demand TOU

Standard
TOU - Energy
TOU - Demand
How did APS reach 11% demand rate adoption?

Point of Sale
Leverage the new service process to educate customers on their rate options and the best rate fit

Technology Enhancements
Initially, residential demand rates were marketed with load control technology that would limit peak demand, for example, by limiting an electric clothes dryer or electric water heater from turning on at the same time as an air conditioning unit

Rate Calculator and Customer Lifestyle
Average monthly consumption is very different for each rate family:
Inclining Block Rate = 700 kWh
Energy Only TOU = 1,300 kWh
Demand Based TOU = 2,000 kWh
Residential TOU-Demand Rate

<table>
<thead>
<tr>
<th></th>
<th>Service Charge ($ per Month)</th>
<th>Demand Charges ($ per kW)</th>
<th>Energy Charges ($ per kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Service Amps</td>
<td>$ 16.91</td>
<td>Summer $13.50</td>
<td>Peak $0.08867</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Winter $9.30</td>
<td>Off Peak $0.04417</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Summer $0.08867</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Winter $0.05747</td>
</tr>
</tbody>
</table>

1. Demand is based on the highest one-hour kW read during on-peak hours in a billing month.
2. On peak hours are 12 noon to 7 pm, excluding weekends and holidays.
## Typical Monthly Demand by kWh Range

<table>
<thead>
<tr>
<th>Monthly kWh</th>
<th>IB kW</th>
<th>TOU-E kW</th>
<th>TOU-D kW</th>
<th>TOU-D vs IB kW</th>
<th>TOU-D vs TOU-E kW</th>
</tr>
</thead>
<tbody>
<tr>
<td>500-1000</td>
<td>4.3</td>
<td>4.3</td>
<td>3.8</td>
<td>11%</td>
<td>13%</td>
</tr>
<tr>
<td>1000-1500</td>
<td>6.0</td>
<td>5.9</td>
<td>5.0</td>
<td>17%</td>
<td>15%</td>
</tr>
<tr>
<td>1500-2000</td>
<td>7.2</td>
<td>7.0</td>
<td>6.2</td>
<td>14%</td>
<td>12%</td>
</tr>
<tr>
<td>2000-2500</td>
<td>8.8</td>
<td>7.7</td>
<td>7.4</td>
<td>16%</td>
<td>5%</td>
</tr>
<tr>
<td>2500-3000</td>
<td>10.5</td>
<td>9.8</td>
<td>8.3</td>
<td>21%</td>
<td>15%</td>
</tr>
</tbody>
</table>
Peak Day Load Shapes
TOU-Demand, TOU-Energy
kW per hour of day, July peak day

On-peak hours
Demand Charge Concepts (Examples)

1 hr Max, e.g. 5.6 kW

Top 10 hr Avg Max, e.g. 4.3 kW

5 hr Avg Max, Contiguous Hours, e.g. 4.0 kW

Options Considered:
- 15 min, 30 min or 1 hour demand
- Additional contiguous hours
- Additional non-contiguous hours
- Super peak kWh – maximum day
- On-peak only vs untimed
- Limits or caps
Concluding Thoughts

- Residential demand charges can work

- Residential demand charges can be understood by residential customers

- Residential demand charges can reduce a customer’s peak demand and result in a win for both the customer and the utility

- Technology can help simplify the customer experience and improve results