

Dynamic Pricing

Excerpts from

“Benefits of Demand Response in Electricity Markets and Recommendations for Achieving Them”

A Report to the United States Congress by the Department of Energy Pursuant to Section 1252 of the Energy Policy Act of 2005

- Two Keys to quantifying demand response benefits (pg 31)
 1. Measures of customer acceptance and participation rates in dynamic pricing and demand response programs.
 - Factors
 - Type of incentives offered
 - Program requirements (notice, duration, and frequency of curtailments)
 - Program design and implementation (marketing, customer education and information, technical assistance)
 - 2. Measures of the extent to which individual customers curtail load in response to either time-varying prices or demand response program incentive payments
 - Price Elasticity
 - Residential price elasticity varies depending on demographic differences and climate.
 - Industrial and commercial price elasticity varies by market. Certain industries can vary their consumption more than others.
 - **ALL ELASTICITIES INCREASE WHEN AMI INCREASES**
 - Absolute or relative load impact
 - Used to measure benefits from non-pricing demand response programs. For example, interruptible air conditioning. (This summary focuses on dynamic pricing)
- Price Elasticity (pg32-33,88)
 - Overall Average Elasticity in Studies Ranges from **.08** to **.14** (Ten studies examined by the DOE)
 - TOU Residential
 - Average elasticity **.13** (ranges from .07 to .22)
 - CPP Residential
 - Average elasticity **.09** (ranges from .04 to .13)
 - RTP Residential
 - Average elasticity **.08** (ranges from .05 to .12)
 - RTP for large industrial and commercial
 - Average elasticity **.10** (ranges from .02 to .27)

http://www.oe.energy.gov/DocumentsandMedia/congress_1252d.pdf

Table C-1. Demand Response Program and Pricing Studies: Estimated Price Elasticity of Demand

Type of Program	Target Market	Region (Utility)	Demand Response Impact (average per customer)	Comments
TOU	Residential	U.S (utilities in five states)	<u>Elasticity of Substitution</u> 0.14 average; 0.07 to 0.21 range depending on electric appliance holdings	Pooled results from five residential TOU pilots in the late 1970s. Sources: Caves <i>et al.</i> (1984) and Faruqui and George (2002).
TOU/ CPP	Residential and Small Commercial	U.S. and International (various utilities)	<u>Own-Price Elasticity</u> -0.3 (average of 35 studies); -0.1 to -0.8 range across the studies	The authors calculated the simple average of own-price elasticity estimates from 35 studies of TOU or CPP. Source: King and Chatterjee (2003)
CPP	Residential	California (PGE, SCE, SDG&E)	<u>Elasticity of Substitution</u> 0.09 average (July-Sept.); 0.04 to 0.13 range across climate zones	Population of about 1,000 residential customers, including control groups, in 2003/4 California Statewide Pricing Pilot. Elasticity range across climate zones attributed to differences in A/C saturation (7-73%). Source: Charles River Associates (2005)
Day ahead RTP	Residential	Illinois (Com Ed, Community Energy Cooperative)	<u>Own-Price Elasticity</u> -0.04 average (2003); -0.08 average (2004); -0.05 to -0.12 range across customer segments (2004).	Population of about 1,000 customers in 2004; \$0.12/kWh maximum hourly price. Own-price elasticities were reported for six different customer segments defined in terms of housing type (single- or multi-family) and A/C equipment type (window, central, or none). Source: Summit Blue Consulting (2005)
	Med./Large C&I (>200 kW)	Georgia (Georgia Power)	<u>Own-Price Elasticity</u> -0.01 to -0.28 range across customer segments and hourly price levels	Population of about 1,600 customers. Elasticities were estimated for seven different customer segments at four different price levels, ranging from \$0.15 to \$1.00/kWh. Source: Braithwait and O'Sheasy (2002)
	Med./Large C&I (>100 kW)	U.K. (Midlands Electric)	<u>Hourly Own-Price Elasticity</u> -0.01 to -0.27 range in maximum hourly elasticities, across customer segments	Population of about 500 customers, most with peak demand >1 MW. Hourly own-price and substitution elasticities were calculated for each of five different industry classifications. Source: Patrick and Wolak (2001)
	Large C&I (>1 MW)	North and South Carolina (Duke Power)	<u>Average Peak-Period Own-Price Elasticity</u> < -0.01 to -0.38 range across customers	Population of about 50 customers, some with 8 years experience on RTP. Hourly own-price were calculated for each customer, and averaged over the peak period (2:00-9:00 p.m.). Source: Taylor <i>et al.</i> (2005)
	Large C&I (>1 MW)	Southwest U.S. (Central and Southwest Services)	<u>Elasticity of Substitution</u> 0.10 to 0.27 range across customer segments and definitions of the peak period	Population of 54 customers, segmented into two groups, with firm day-ahead hour-ahead notice of hourly prices. Elasticities estimated for each group and for different definitions of the peak period. Source: Boisvert <i>et al.</i> (2004)
	Large C&I (>2 MW)	New York (Niagara Mohawk)	<u>Elasticity of Substitution</u> 0.11 (average); 0.02 to 0.16 range across customer segments	Population of about 150 customers. Individual customer elasticities vary substantially within sectors: e.g., most manufacturing customers are either highly responsive or not at all. Source: Goldman <i>et al.</i> (2005)

Note: Elasticity values are the averages of all participants' elasticity at all price levels, unless otherwise noted. Elasticity of substitution values are for intraday substitution between peak and off-peak periods, while own-price elasticities are the average value, unless noted as hourly.

Braithwait and O'Sheasy (2002) analyzed data from participants in Georgia Power's RTP program, the largest in the country. The authors estimated own-price elasticities for seven