The Potential Impact of Declining Rates and Increasing Efficiency in Texas

By Julia Harvey*

Peak energy demand consumption in ERCOT is projected to exceed generation resources by 2015. In light of resource adequacy concerns within the region, potential drivers of the growing load segment represented by residential electricity consumption should be evaluated and integrated into load forecasting efforts. Residential cooling is one of several major contributors to ERCOT peak load, increasing to over 50% of total peak during the hottest summer conditions. Thus this end-use presents a prime target for efficiency analysis, and its use should be assessed in light of policies that motivate customers to conserve during peak periods.

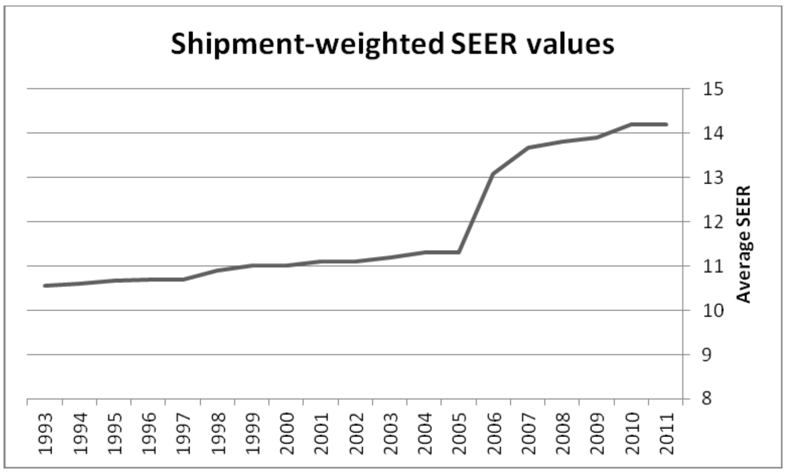
This article examines how the reciprocal trend of declining retail rates in Texas and increasing appliance efficiency standards, particularly those associated with Central Air Conditioning (CAC) units, may hypothetically impact residential consumption by producing a wealth effect in which an increase in perceived wealth is accompanied by an increase in spending. This argument centers on the hypothesis that the reduction of electric rates seen over the past three years and higher average seasonal efficiency ratings, as measured by Seasonal Energy Efficiency Ratio (SEER), may together produce a rise in consumption. The wealth effect of a decrease in electricity prices will induce lower thermostat settings which will overwhelm the reduction in consumption resulting from increasing CAC efficiency standards, leading to a net increase in energy consumption. As shown in this analysis, increasing CAC SEER ratings may in fact be compounding this trend.

Retail rates in the deregulated ERCOT market in Texas have declined 18% since 2006.[1] This trend is counter to that shown by national residential electricity prices, which have increased approximately 25% since 2005.[2] According to price theory, a change in retail rates will have an implied demand elasticity associated with it, in that customers will adjust to changes in price by adjusting their consumption of electricity. Extensive research has been conducted in an attempt to estimate long-run price elasticity, which is a normalized measure of how the usage of electricity changes when its price changes by one percent. The adjacent table includes the long-run residential price elasticities estimated in the literature.

Reference	*Residential Long-Run Price Elasticity*
EIA Model (2003)[3]	-0.49
Dahl and Roman (2004)[4]	-0.43
Bernstein and Griffin (2005)[5]	-0.32
Itron Brown Bag Seminar (2006)[6]	-0.21
National Institute of Economic and Industry Research (2007)[7]	-0.25
Paul, Myers and Palmer (2009)[8]	-0.40
Shu and Hyndman (2010)[9]	-0.42

Range of Residential Long-Run Elasticity Estimates

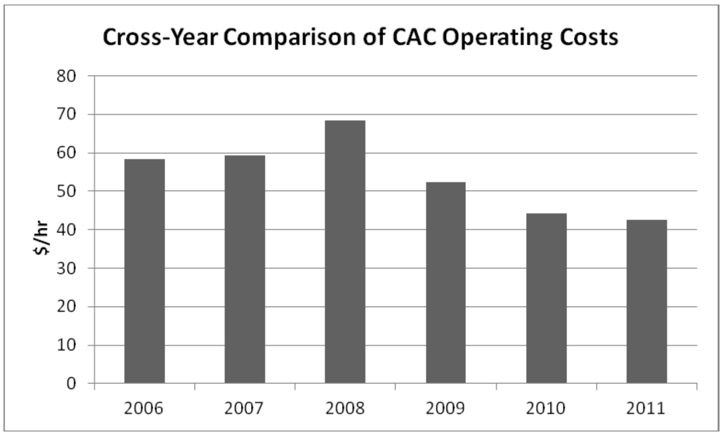
As retail rates have fallen in ERCOT, a negative elasticity value would indicate a proportionate increase in consumption. Average retail electric rates for customers in August of 2006 were \$0.126/kWh, decreasing to \$0.105/kWh by August of 2011.[10] The expected increase in consumption due to lower prices may be partly offset by increased SEER standards in place for CAC systems. An average SEER value for each age range was determined using historical Air Conditioning, Heating, and Refrigeration Institute (AHRI) shipment-weighted data, given the age distribution reported by customers in Texas in the Residential Energy Consumption Surveys (RECS) conducted by the U.S. Energy Information Administration. The distribution of reported CAC age released in the most current RECS report is assumed to be consistent for other years of the analysis. The average SEER value is a weighted average of these AHRI average SEER values. Although the AHRI data is based on national sales data and not on regional or market-specific information, the national data should be reasonably close to the averages for the majority of CAC owners in Texas. The change in SEER rating over time can be seen in the first figure on the next page.



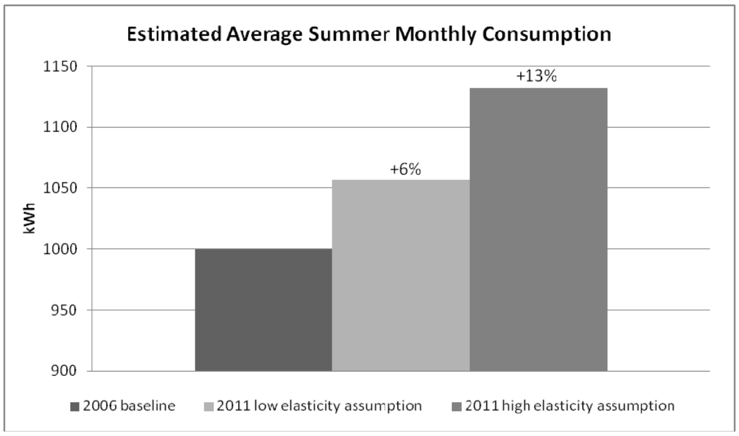
While greater SEER values should theoretically reduce kWh usage, the SEER standard increase actually compounds the price reduction and thus consumption increase induced by lower rates. Assuming the only cost driver is the price de-

* Julia Harvey is based in Austin, TX. She may be reached at juliaharvey@gmail.com
See footnotes at end of text.

crease and SEER increase from August 2006 to August 2011, the operating cost per hour drops by almost 30%. The decrease in CAC operating costs will likely continue as SEER averages increase. This trend is shown in the figure at mid-page.



A cost reduction in CAC operation due to increasing SEER and decreasing retail rates is not an undesirable thing in itself. Low electricity bills allow consumers to maintain safe temperatures in their homes during extreme summer weather conditions. However, greater average unit efficiency may encourage customers to reduce thermostat settings in the interest of comfort and may promote behavioral inertia as it relates to conservation. Applying the highest and lowest elasticity values seen in the literature (-0.21 and -0.49) to a hypothetical single family dwelling summer monthly consumption of 1,000 kWh (and ignoring the impact of any other independent variables), we can estimate the potential increase in consumption over time due to reductions in the estimated operating cost. Consumption projections are estimated by calculating the impact of price elasticity on the percentage change seen in CAC operating costs, incited by decreases in retail rates and increases in average SEER. This produces the following potential average monthly electricity usage increases, wherein greater kWh consumption produces similar electric bills.



Although reduction in retail rates may produce an increase in consumption, it is worth noting that the combined effect of lower prices and reduced electrical needs for air conditioning might permit Texans to spend the dollar savings on things other than electricity. However, these other expenditures may also be likely to eventually lead to higher energy consumption. Indeed, according to the 2009 EIA RECS report, the residential per square foot energy consumption in Texas increased 17% from 2005 to 2009.

While additional research is needed to assess the contribution of price, SEER, and other exogenous variables to changes in per capita energy use and demand, this basic analysis points to a wealth effect that may be driving residential cooling load in ERCOT. Along with greater penetration of more efficient appliances and home weatherization upgrades, policies, programs, and enabling technologies could help support residential conservation rather than consumption during critical peak periods. Policies that facilitate dynamic pricing, real-time electricity monitoring, direct load control and other load management initiatives may help offset the resource insufficiencies driven by residential cooling load.

Footnotes

[1] Rate data based on an average of all rates offered by Retail Electric Providers in Texas, and 1000 kWh per month usage, Public Utility Commission of Texas, Competitive Markets Division, Retail Electric Service Rate Comparisons, http://www.puc.state.tx.us/industry/electric/rates/RESrate/RESratearc.aspx

[2] Energy Information Administration, Average Retail Price of Electricity to Ultimate Customers: Total by End-Use Sector, 2002-July 2012.

[3] Energy Information Administration, calculated from the following price path scenarios using NEMSAEO2003: AEO99: S.H. Wade, "Price Responsiveness in the NEMS Building Sector Models," in Energy Information Administration, Issues in Midterm Analysis and Forecasting 1999, DOE/EIA-0607(99) 1999.

[4] Dahl, C., and C. Roman. 2004. Energy Demand Elasticities – Fact or Fiction: A Survey Update. Unpublished manuscript.

[5] Bernstein, M.A., and J. Griffin. 2005. Regional Differences in Price-Elasticity of Demand for Energy. The Rand Corporation Technical Report.

[6] Itron. "Accounting for Price in Your Forecast – Measures and Metholodologies," Brown Bag Seminar. 2006.

[7] National Institute of Economic and Industry Research. 2007, The Own Price Elasticity of Demand for Elec-

tricity in NEM Regions. Tech. rep., National Electricity Market Management Company.

[8] Paul, Anthony, Erica Myers and Karen Palmer. 2009. A Partial Adjustment Model of U.S. Electricity Demand by Region, Season, and Sector. Resources for the Future Discussion Paper.

[9] Fan, Shu and Rob Hyndman. 2010. The Price Elasticity of Electricity Demand in Southern Australia. Department of Economics, Monash University.

[10] Rate data based on an average of retail rates offered assuming 1000 kWh per month usage, Public Utility Commission of Texas, Competitive Markets Division, Retail Electric Service Rate Comparisons, http://www.puc.state.tx.us/industry/electric/rates/RESrate/RESratearc.aspx

IAEE/Affiliate Master Calendar of Events

(Note: All conferences are presented in English unless otherwise noted)

Date	Event, Event Title and Language	Location	Supporting Organization(s)	Contact
2013				
April 22-23	6th NAEE/IAEE International Conference *Energy Resource Management in a Federal System: Challenges, Constraints & Strategies*	Lagos, Nigeria	NAEE/IAEE	Adeola Adenikinju adeolaadenikinju@yahoo.com
June 16-20	36th IAEE International Conference *Energy Transition and Policy Challenges*	Daegu, Korea	KRAE/IAEE	Hoesung Lee hoesung@unitel.co.kr
July 28-31	32nd USAEE/IAEE North American Conference *Industry Meets Government: Impact on Energy Use & Development*	Anchorage, Alaska	USAEE/IAEE	USAEE Headquarters usaee@usaee.org
August 18-21	13th IAEE European Conference *Energy Economics of Phasing Out Carbon and Uranium*	Dusseldorf, Germany	GEE/IAEE	Georg Erdmann georg.erdmann@tu-berlin.de
2014				
June 15-18	37th IAEE International Conference *Energy and the Economy*	New York City, USA	USAEE/IAEE	USAEE Headquarters usaee@usaee.org
September 19-21	4th IAEE Asian Conference *Economic Growth and Energy Security: Competition and Cooperation*	Beijing, China	CAS/IAEE	Ying Fan yfan@casipm.ac.cn
2015				
May 24-27	38th IAEE International Conference *Energy Security, Technology and Sustainability Challenges Across the Globe*	Antalya, Turkey	TRAEE/IAEE	Gurkan Kumbaroglu gurkank@boun.edu.tr