

COMMONWEALTH OF KENTUCKY
BEFORE THE PUBLIC SERVICE COMMISSION OF KENTUCKY

In the Matter of:

ELECTRONIC REVIEW OF THE ADEQUACY) ADMINISTRATIVE
OF KENTUCKY'S GENERATION CAPACITY) CASE NO. 387
AND TRANSMISSION SYSTEM)

2020 ANNUAL RESOURCE ASSESSMENT FILING
OF
KENTUCKY UTILITIES COMPANY
PURSUANT TO APPENDIX G
OF THE COMMISSION'S ORDER
DATED DECEMBER 20, 2001
AS AMENDED BY THE
COMMISSION'S ORDER
DATED MARCH 29, 2004

FILED: MARCH 31, 2021

The undersigned, **Tim A. Jones**, being duly sworn, deposes and says that he is **Manager – Sales Analysis and Forecast for LG&E and KU Services Company**, and that he has personal knowledge of the matters set forth in the responses for which he is identified as the witness, and the answers contained therein are true and correct to the best of his information, knowledge and belief.



Tim A. Jones

Subscribed and sworn to before me, a Notary Public in and before said County and State, this 29th day of March 2021.



Notary Public

Notary Public ID No. **603967**

My Commission Expires:

July 11, 2022

VERIFICATION

COMMONWEALTH OF KENTUCKY)
)
COUNTY OF JEFFERSON)

The undersigned, **Ashley M. Vinson**, being duly sworn, deposes and says that she is Manager – Transmission Policy and Tariffs for LG&E and KU Services Company, and that she has personal knowledge of the matters set forth in the responses for which she is identified as the witness, and the answers contained therein are true and correct to the best of her information, knowledge and belief.

Ashley Vinson

Ashley M. Vinson

Subscribed and sworn to before me, a Notary Public in and before said County and State, this 18th day of March 2021.

Judith Schoeder

Notary Public

Notary Public ID No. 603967

My Commission Expires:

July 11, 2022

KENTUCKY UTILITIES COMPANY

**2020 ANNUAL RESOURCE ASSESSMENT FILING
PURSUANT TO APPENDIX G OF THE COMMISSION'S ORDER
DATED DECEMBER 20, 2001, IN ADMINISTRATIVE CASE NO. 387
AS AMENDED BY THE COMMISSION'S ORDER DATED MARCH 29, 2004
FILED MARCH 31, 2021**

ITEM NO. 1

The information originally requested in Item 1 of Appendix G of the Commission's Order dated December 20, 2001, in Administrative Case No. 387, is no longer required pursuant to the Commission's Order of March 29, 2004, amending the previous Order.

KENTUCKY UTILITIES COMPANY

**2020 ANNUAL RESOURCE ASSESSMENT FILING
PURSUANT TO APPENDIX G OF THE COMMISSION'S ORDER
DATED DECEMBER 20, 2001, IN ADMINISTRATIVE CASE NO. 387
AS AMENDED BY THE COMMISSION'S ORDER DATED MARCH 29, 2004
FILED MARCH 31, 2021**

ITEM NO. 2

The information originally requested in Item 2 of Appendix G of the Commission's Order dated December 20, 2001, in Administrative Case No. 387, is no longer required pursuant to the Commission's Order of March 29, 2004, amending the previous Order.

KENTUCKY UTILITIES COMPANY

**2020 ANNUAL RESOURCE ASSESSMENT FILING
PURSUANT TO APPENDIX G OF THE COMMISSION'S ORDER
DATED DECEMBER 20, 2001, IN ADMINISTRATIVE CASE NO. 387
AS AMENDED BY THE COMMISSION'S ORDER DATED MARCH 29, 2004
FILED MARCH 31, 2021**

ITEM NO. 3

RESPONDENT: Tim Jones / Michael Sebourn

3. Actual and weather-normalized monthly coincident peak demands for the just completed calendar year. Demands should be disaggregated into (a) native load demand (firm and non-firm) and (b) off-system demand (firm and non-firm).

Response:

See Table 3, which shows the actual and weather-normalized native Kentucky Utilities Company (“KU”) peak demands. The normalized native KU stand-alone peak demands are available only on a seasonal (summer/winter) basis.

Table 3 – KU Native and Off-System Demands for 2020 (MW)

Time of Monthly Native Peak	Actual			Normal Weather (Seasonal)	Off-System ¹		
	Native Peak	Non-Firm	Firm	Native Peak	Firm	Non-Firm	Total
1/22/2020 8:00	3,642	0	3,642	3,955	0	4	4
2/14/2020 9:00	3,461	0	3,461		0	100	100
3/6/2020 20:00	2,761	0	2,761		0	2	2
4/15/2020 7:00	2,489	0	2,489		0	2	2
5/26/2020 14:00	2,663	0	2,663		0	305	305
6/10/2020 15:00	3,210	0	3,210		0	201	201
7/21/2020 15:00	3,571	0	3,571	3,589	0	260	260
8/13/2020 14:00	3,345	0	3,345		0	1	1
9/9/2020 15:00	3,184	0	3,184		0	301	301
10/22/2020 16:00	2,472	0	2,472		0	224	224
11/18/2020 8:00	2,858	0	2,858		0	50	50
12/2/2020 9:00	3,319	0	3,319		0	133	133

¹ The allocation of off-system sales between LG&E and KU is handled in the After-the-Fact Billing process in accordance with the Power Supply System Agreement between LG&E and KU. The individual company sales will include an allocation of the sales sourced with purchased power and allocated to the individual company based on each company's contribution to off-system sales.

KENTUCKY UTILITIES COMPANY

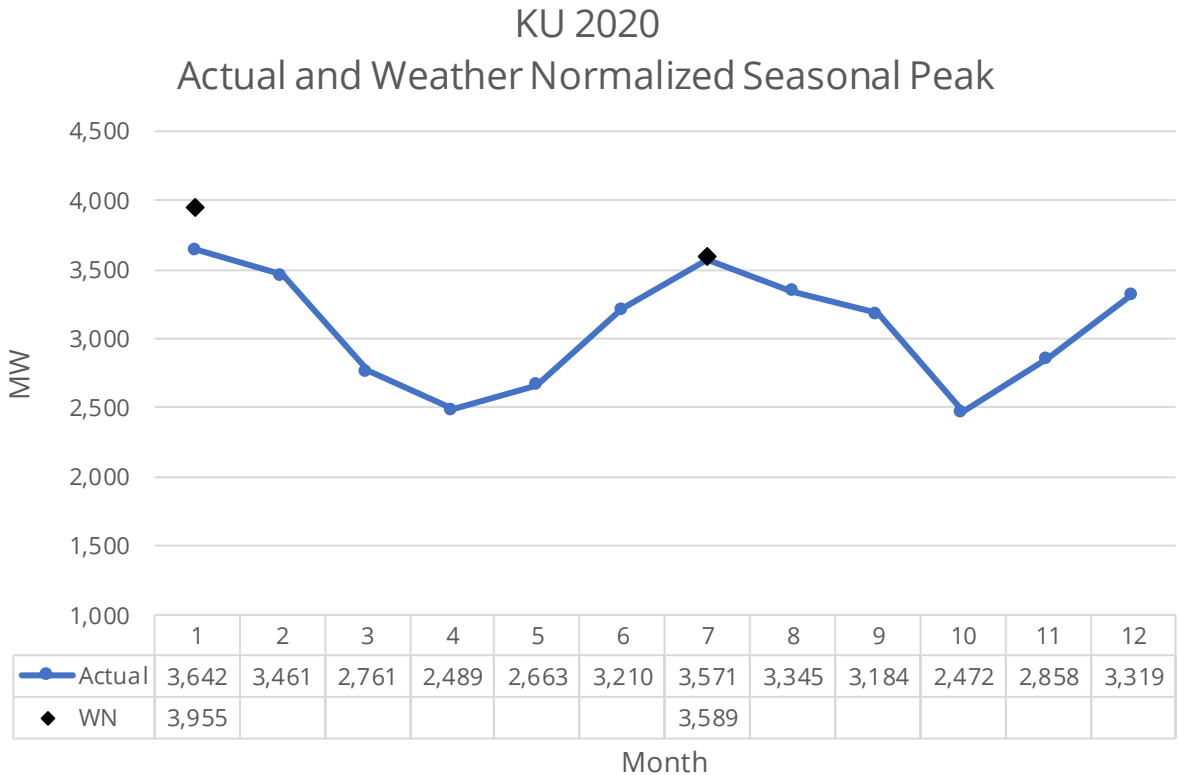
**2020 ANNUAL RESOURCE ASSESSMENT FILING
PURSUANT TO APPENDIX G OF THE COMMISSION'S ORDER
DATED DECEMBER 20, 2001, IN ADMINISTRATIVE CASE NO. 387
AS AMENDED BY THE COMMISSION'S ORDER DATED MARCH 29, 2004
FILED MARCH 31, 2021**

ITEM NO. 4

RESPONDENT: Tim Jones

4. Load shape curves that show actual peak demands and weather-normalized peak demands (native load demand and total demand) on a monthly basis for the just completed calendar year.

Response:



KENTUCKY UTILITIES COMPANY

**2020 ANNUAL RESOURCE ASSESSMENT FILING
PURSUANT TO APPENDIX G OF THE COMMISSION'S ORDER
DATED DECEMBER 20, 2001, IN ADMINISTRATIVE CASE NO. 387
AS AMENDED BY THE COMMISSION'S ORDER DATED MARCH 29, 2004
FILED MARCH 31, 2021**

ITEM NO. 5

The information originally requested in Item 5 of Appendix G of the Commission's Order dated December 20, 2001, in Administrative Case No. 387, is no longer required pursuant to the Commission's Order of March 29, 2004, amending the previous Order.

KENTUCKY UTILITIES COMPANY

**2020 ANNUAL RESOURCE ASSESSMENT FILING
PURSUANT TO APPENDIX G OF THE COMMISSION'S ORDER
DATED DECEMBER 20, 2001, IN ADMINISTRATIVE CASE NO. 387
AS AMENDED BY THE COMMISSION'S ORDER DATED MARCH 29, 2004
FILED MARCH 31, 2021**

ITEM NO. 6

RESPONDENT: Tim Jones / Michael Sebourn

6. Based on the most recent demand forecast, the base case demand and energy forecasts and high case demand and energy forecasts for the current year and the following four years. The information should be disaggregated into (a) native load (firm and non-firm demand) and (b) off-system load (both firm and non-firm demand).

Response:

- a) See Table 6a. The values in Table 6a reflect the impact of KU's Energy Efficiency programs.
- b) Off-system sales ("OSS") projections for 2021-2025 contained in Table 6b are based on the combined KU and LG&E (together the "Companies") current plan. For OSS, only base case total sales energy projections exist for 2021-2025. The projections consist of the expected market sales, denoted as "Wholesale OSS." All OSS are non-firm.

Table 6a – KU Demand and Energy Forecast

	2021	2022	2023	2024	2025
Base Case Energy Sales (GWh)	18,357	18,487	18,459	18,439	18,364
High Case Energy Sales (GWh)	19,091	19,409	19,584	19,783	19,884
Base Case Energy Requirements (GWh)	19,570	19,708	19,679	19,657	19,577
High Case Energy Requirements (GWh)	20,230	20,561	20,745	20,955	21,060
Base Case Native Peak Demand (MW, Winter)	3,846	3,888	3,886	3,891	3,868
High Case Native Peak Demand (MW, Winter)	3,976	4,056	4,097	4,148	4,161

Table 6b – Combined Companies Total Base Case OSS Energy Projection (GWh)

	2021	2022	2023	2024	2025
Existing OSS	0	0	0	0	0
Wholesale OSS	286	206	135	191	229
Total OSS	286	206	135	191	229

KENTUCKY UTILITIES COMPANY

**2020 ANNUAL RESOURCE ASSESSMENT FILING
PURSUANT TO APPENDIX G OF THE COMMISSION'S ORDER
DATED DECEMBER 20, 2001, IN ADMINISTRATIVE CASE NO. 387
AS AMENDED BY THE COMMISSION'S ORDER DATED MARCH 29, 2004
FILED MARCH 31, 2021**

ITEM NO. 7

RESPONDENT: Michael Sebourn

7. The target reserve margin currently used for planning purposes, stated as a percentage of demand. If changed from what was in use in 2001, include a detailed explanation for the change.

Response:

As part of the 2018 Integrated Resource Plan (“2018 IRP”), the Companies established an optimal reserve margin range of 17% to 25%. The range provides an optimum level of reliability through various system operating conditions. The 2018 IRP was filed with the Commission in October 2018.²

A detailed explanation of the current target reserve margin is documented in the report titled, “2018 IRP Reserve Margin Analysis,” included in Volume III of the Companies’ 2018 IRP.

² *In re the Matter of: The 2018 Integrated Resources Plan of Louisville Gas and Electric Company and Kentucky Utilities Company*, Case No. 2018-00348, filed on October 19, 2018.

KENTUCKY UTILITIES COMPANY

**2020 ANNUAL RESOURCE ASSESSMENT FILING
PURSUANT TO APPENDIX G OF THE COMMISSION'S ORDER
DATED DECEMBER 20, 2001, IN ADMINISTRATIVE CASE NO. 387
AS AMENDED BY THE COMMISSION'S ORDER DATED MARCH 29, 2004
FILED MARCH 31, 2021**

ITEM NO. 8

RESPONDENT: Michael Sebourn

8. Projected reserve margins stated in megawatts and as a percentage of demand for the current year and the following 4 years. Identify projected deficits and current plans for addressing these. For each year identify the level of firm capacity purchases projected to meet native load demand.

Response:

See Table 8. No reserve margin deficits are projected. The Companies will monitor load requirements and evaluate supply alternatives to address future capacity deficits.

**Table 8 - Summer Reserve Margin Forecast - Combined Companies
(MW, Base Energy Requirements Forecast)**

	2021	2022	2023	2024	2025
Gross Peak Load	6,399	6,433	6,430	6,428	6,420
Demand Side Management	-288	-294	-300	-305	-311
Net Peak Load	6,111	6,139	6,130	6,123	6,109
Existing Capability ³	7,189	7,190	7,190	7,190	7,188
Small-Frame SCCTs ⁴	61	47	47	47	47
Curta ilable Service Rider	127	127	127	127	127
Proposed Solar Power Purchase Agreement ⁵	0	0	60	60	60
OVEC Purchase ⁶	152	152	152	152	152
Demand Conservation Program	63	61	60	58	56
Total Supply	7,592	7,577	7,635	7,633	7,630
Reserve Margin	1,481	1,438	1,505	1,511	1,521
Reserve Margin %	24.2%	23.4%	24.5%	24.7%	24.9%

³ Existing capability is shown assuming that Mill Creek Unit 1 will retire by the end of 2024 and that the ability to simultaneously operate Mill Creek Units 1 and 2 is limited through 2024 due to assuming that daily NO_x emissions at the Mill Creek Station will continue to be limited to 15 tons per day, effectively reducing the Mill Creek Station's summer capacity rating by approximately 300 MW. Existing capability also excludes small-frame SCCTs, CSR, the proposed solar PPA, OVEC, and demand conservation, which are each shown on separate lines in the table, and includes 1 MW derates on E.W. Brown Units 8 and 9, which are planned to be resolved by the end of 2024.

⁴ Paddy's Run Unit 11 was retired in March 2021. Zorn is planned to be retired by the end of 2021.

⁵ For illustrative purposes, the proposed 100 MW solar PPA is included as a planned resource assuming that the project will be completed before the summer of 2023. However, the project's development is ongoing with significant milestones to clear before completion. Its expected energy output at the time of the Companies' summer peak load was assumed to be 60% of its maximum output.

⁶ OVEC's capacity reflects the 152 MW that is expected to be available to the Companies at the time of the summer peak.

KENTUCKY UTILITIES COMPANY

**2020 ANNUAL RESOURCE ASSESSMENT FILING
PURSUANT TO APPENDIX G OF THE COMMISSION'S ORDER
DATED DECEMBER 20, 2001, IN ADMINISTRATIVE CASE NO. 387
AS AMENDED BY THE COMMISSION'S ORDER DATED MARCH 29, 2004
FILED MARCH 31, 2021**

ITEM NO. 9

The information originally requested in Item 9 of Appendix G of the Commission's Order dated December 20, 2001, in Administrative Case No. 387, is no longer required pursuant to the Commission's Order of March 29, 2004, amending the previous Order.

KENTUCKY UTILITIES COMPANY

**2020 ANNUAL RESOURCE ASSESSMENT FILING
PURSUANT TO APPENDIX G OF THE COMMISSION'S ORDER
DATED DECEMBER 20, 2001, IN ADMINISTRATIVE CASE NO. 387
AS AMENDED BY THE COMMISSION'S ORDER DATED MARCH 29, 2004
FILED MARCH 31, 2021**

ITEM NO. 10

The information originally requested in Item 10 of Appendix G of the Commission's Order dated December 20, 2001, in Administrative Case No. 387, is no longer required pursuant to the Commission's Order of March 29, 2004, amending the previous Order.

KENTUCKY UTILITIES COMPANY

**2020 ANNUAL RESOURCE ASSESSMENT FILING
PURSUANT TO APPENDIX G OF THE COMMISSION'S ORDER
DATED DECEMBER 20, 2001, IN ADMINISTRATIVE CASE NO. 387
AS AMENDED BY THE COMMISSION'S ORDER DATED MARCH 29, 2004
FILED MARCH 31, 2021**

ITEM NO. 11

RESPONDENT: Michael Sebourn

11. A list that identifies scheduled outages or retirements of generating capacity during the current year and the following four years.

Response:

The planned maintenance outage schedule for 2021 through 2025 is being provided pursuant to a Petition for Confidential Protection. The schedule is regularly modified based on actual operating conditions, forced outages, changes in the schedule required to meet environmental compliance regulations, fluctuations in wholesale prices, and other unforeseen events.

KU does not have any retirements scheduled in the current year or the following four years.

The entire attachment is
Confidential and
provided separately
under seal.

KENTUCKY UTILITIES COMPANY

**2020 ANNUAL RESOURCE ASSESSMENT FILING
PURSUANT TO APPENDIX G OF THE COMMISSION'S ORDER
DATED DECEMBER 20, 2001, IN ADMINISTRATIVE CASE NO. 387
AS AMENDED BY THE COMMISSION'S ORDER DATED MARCH 29, 2004
FILED MARCH 31, 2021**

ITEM NO. 12

RESPONDENT: Michael Sebourn

12. Identify all planned base load or peaking capacity additions to meet native load requirements over the next 10 years. Show the expected in-service date, size and site for all planned additions. Include additions planned by the utility, as well as those by affiliates, if constructed in Kentucky or intended to meet load in Kentucky.

Response:

The Companies jointly plan their generation portfolio. Based on the planned retirement of Mill Creek Unit 1 in 2024 and the assumed retirements of Mill Creek Unit 2 and E.W. Brown Unit 3 in 2028, the Companies anticipate a capacity and energy need in 2028. The Companies have issued a request for proposals for additional capacity and energy resources to meet this capacity and energy shortfall. The Companies will evaluate the energy and capacity benefits of these proposals along with self-build alternatives to determine an optimal future generation portfolio.

The Companies plan to purchase the energy output of a 100 MW solar facility in Hardin County, Kentucky that is currently in development and is anticipated to be in service by early 2023 (see Case No. 2020-00016). The project's development is ongoing with milestones to clear before completion. In Case No. 2020-00016, the Companies' were asked questions about their forecasted summer planning reserve margins. For illustrative purposes only, the expected energy output of the proposed 100 MW solar PPA at the time of the Companies' summer peak load was assumed to be 60% of its maximum output

KENTUCKY UTILITIES COMPANY

**2020 ANNUAL RESOURCE ASSESSMENT FILING
PURSUANT TO APPENDIX G OF THE COMMISSION'S ORDER
DATED DECEMBER 20, 2001, IN ADMINISTRATIVE CASE NO. 387
AS AMENDED BY THE COMMISSION'S ORDER DATED MARCH 29, 2004
FILED MARCH 31, 2021**

ITEM NO. 13**RESPONDENT: Ashley Vinson**

13. The following transmission energy data for the just completed calendar year and the forecast for the current year and the following four years:
- a. Total energy received from all interconnections and generation sources connected to the transmission system.
 - b. Total energy delivered to all interconnections on the transmission system.
 - c. Peak load capacity of the transmission system.
 - d. Peak demand for summer and winter seasons on the transmission system.

Response:

Data exists for 2020. The Company does not forecast this type of data; therefore, no forecast exists for 2021-2025.

- a. LG&E and KU operate as a single NERC Balancing Area that contains several generators not owned by LG&E and KU; the non-Company owned facilities are also included as sources below:

Tie Lines Received (MWH)	19,027,505
Net Generation-LG&E (MWH)	12,619,535
Net Generation-KU (MWH)	19,226,875
Net Received from OMU (MWH)	445,160
Net Generation-KMPA (MWH)	16,492
Net Generation-EKPC (MWH)	<u>81,813</u>
Total Sources (MWH)	51,417,380

- b. LG&E and KU operate as a single Balancing Area; the amount of energy delivered at the interconnections of the single Balancing Area was 17,226,300 MWH(s).

- c. There is no set number for peak load capacity for the transmission system. The system is built to support Network Service and firm Point-to-Point customers in accordance with the LG&E/KU Transmission Planning Guidelines. Actual transmission capacity available for Network Customers, import, export or thru flow will vary depending on which facilities (generation, load or transmission) in the interconnected transmission system of the eastern interconnect are connected and operated at any given time.

- d. The maximum summer peak transmission load for the combined LG&E/KU transmission system was 7,170 MW for the peak hour of 7/21/20 at 5PM.

The maximum winter peak transmission load for the combined LG&E/KU transmission system was 6,206 MW for the peak hour of 1/22/20 at 8AM.

KENTUCKY UTILITIES COMPANY

**2020 ANNUAL RESOURCE ASSESSMENT FILING
PURSUANT TO APPENDIX G OF THE COMMISSION'S ORDER
DATED DECEMBER 20, 2001, IN ADMINISTRATIVE CASE NO. 387
AS AMENDED BY THE COMMISSION'S ORDER DATED MARCH 29, 2004
FILED MARCH 31, 2021**

ITEM NO. 14

RESPONDENT: Delyn Kilpack

14. Identify all planned transmission capacity additions for the next 10 years. Include the expected in-service date, size and site for all planned additions and identify the transmission need each addition is intended to address.

Response:

The requested information is being provided pursuant to a Petition for Confidential Protection.

The entire attachment is
Confidential and
provided separately
under seal.

**Discussion Regarding the Consideration Given to Price Elasticity in the
Forecasted Demand, Energy and Reserve Margin Information
Provided with Annual Resource Assessment Filings
2021**

RESPONDENT: Tim Jones

Price elasticity of demand is a direct input into the Louisville Gas and Electric Company and Kentucky Utilities Company (collectively “the Companies”) Residential and General Service (small commercial) forecast models. These models use Itron’s Statistically Adjusted End Use (“SAE”) Models. The elasticity coefficients used in the SAE models are applicable to shorter-term forecasting (up to 10 years). Over the longer-term, the implied elasticity estimate increases (in absolute value) in the SAE models due to assumed improvements in the efficiencies and saturations of appliances and other equipment to appropriately adjust demand.

In developing the elasticity coefficients, the Companies have consulted multiple sources to better understand how customers respond to electricity prices. These sources include ITRON and available studies.¹ The Companies’ price elasticity of demand coefficients are consistent with the ranges cited in the studies. Sources do not indicate any recent change in customer response to electricity prices but the Companies continue to monitor new research and data. Specifically, EPRI research states that the “effect of including recent information covering a period of rising prices appears to be minimal.”

Currently, the Companies use an elasticity coefficient of -0.1 for the Residential forecast. Below, the residential price elasticity of demand is applied in a simple example to determine the impact on customer usage for a hypothetical customer, price, and price increase.

Inputs

Electricity Price: \$0.08/kWh

Monthly customer usage: 1,000 kWh

Price increase: 5%

Price Elasticity of demand: -0.1

Formula

(price elasticity of demand) = (% change in quantity demanded) / (% change in price)

Restated as:

(% change in quantity demanded) = (% change in price) x (price elasticity of demand)

¹ “Regional Differences in the Price-Elasticity of Demand for Energy” by M.A. Bernstein and J. Griffin, RAND Corporation for NREL (2006); “Price Responsiveness in the AEO2003 NEMS Residential and Commercial Buildings Sector Models” by S. Wade, Energy Information Administration (2005); “Price Elasticity of Demand for Electricity: A Primer and Synthesis” by B. Neenan, EPRI (2007) ; “Trends in Regional U.S. Electricity and Natural Gas Price Elasticity” by V. Niemeyer, EPRI (2010); “A Global Survey of Electricity Demand Elasticities” by C. Dahl was presented at the 34th IAEE International Conference: Institutions, Efficiency, and Evolving Energy Technologies in June 2011 at the Stockholm School of Economics in Sweden.

Results

Completing the equation based on the inputs above:

$$(\% \text{ change in quantity demanded}) = (.05) \times (-0.1) = -0.005 = -0.5\%$$

Therefore, the revised monthly customer usage is 0.5% less than 1,000 kWh, or 995 kWh per month.

The Companies currently use a price elasticity of demand of -0.15 for small commercial customers. The Companies' forecasts for Large Commercial and Industrial customers also consider how customers respond to energy prices, but these forecasts do not use the SAE models to incorporate explicit price elasticity of demand coefficients. Instead, the Companies' forecast the largest customers' energy and demand on an individual basis and use specific industry indices for others. Recognizing that customers may respond to price through efficiency measures or other operational changes, these individual forecasts and indices inherently reflect the expected changes in customers' energy use due to economic inputs, including the price of electricity. The Companies recognize that larger commercial and industrial customers may not display a smooth reduction in usage as prices rise. Over the longer-term, in extreme cases, some large energy intensive customers may even cease operations or relocate upon reaching certain energy price points.