COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION OF KENTUCKY

In the Matter of:

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

2021 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, 2022

VERIFICATION

COMMONWEALTH OF KENTUCKY)
)
COUNTY OF JEFFERSON)

The undersigned, **Joshua Boone**, being duly sworn, deposes and says that he is Manager – Transmission Strategy and Planning 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.

Joshua Boone

Subscribed and sworn to before me, a Notary Public in and before said County and State, this 25th day of March 2022.

Notary Public

Notary Public ID No. 603967

My Commission Expires:

July 11, 2022

VERIFICATION

COMMONWEALTH OF KENTUCKY)
)
COUNTY OF JEFFERSON)

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 24th day of March 2022.

Notary Public

Notary Public ID No. 603967

My Commission Expires:

July 11, 2022

VERIFICATION

COMMONWEALTH OF KENTUCKY)
)
COUNTY OF JEFFERSON)

The undersigned, **Michael S. Sebourn**, being duly sworn, deposes and says that he is Manager – Generation Planning 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.

Michael S. Sebourn

Michael S. Sebourn

Subscribed and sworn to before me, a Notary Public in and before said County and State, this 25th day of March 2022.

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 M. Vinson

Ashley M. Vinson

Subscribed and sworn to before me, a Notary Public in and before said County and State, this 15th day of March 2022.

Notary Public

Notary Public ID No. 603967

My Commission Expires:

July 11, 2022

KENTUCKY UTILITIES COMPANY

2021 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, 2022

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

2021 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, 2022

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

2021 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, 2022

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 2021 (MW)

	Actual			Normal Weather (Seasonal)	Off-System[1]		
Time of Monthly Native Peak	**Native Peak**	**Non-Firm**	**Firm**	**Native Peak**	**Firm**	**Non-Firm**	**Total**
1/29/2021 8:00	3,623	0	3,623	3,927	0	0	0
2/17/2021 8:00	3,828	0	3,828		0	575	575
3/3/2021 7:00	3,030	0	3,030		0	2	2
4/2/2021 6:00	2,759	0	2,759		0	2	2
5/25/2021 14:00	3,167	0	3,167		0	75	75
6/29/2021 15:00	3,456	0	3,456		0	101	101
7/28/2021 15:00	3,428	0	3,428		0	212	212
8/12/2021 14:00	3,586	0	3,586	3,698	0	101	101
9/14/2021 16:00	3,182	0	3,182		0	1	1
10/14/2021 14:00	2,787	0	2,787		0	0	0
11/23/2021 7:00	3,253	0	3,253		0	101	101
12/20/2021 8:00	3,114	0	3,114		0	0	0

[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

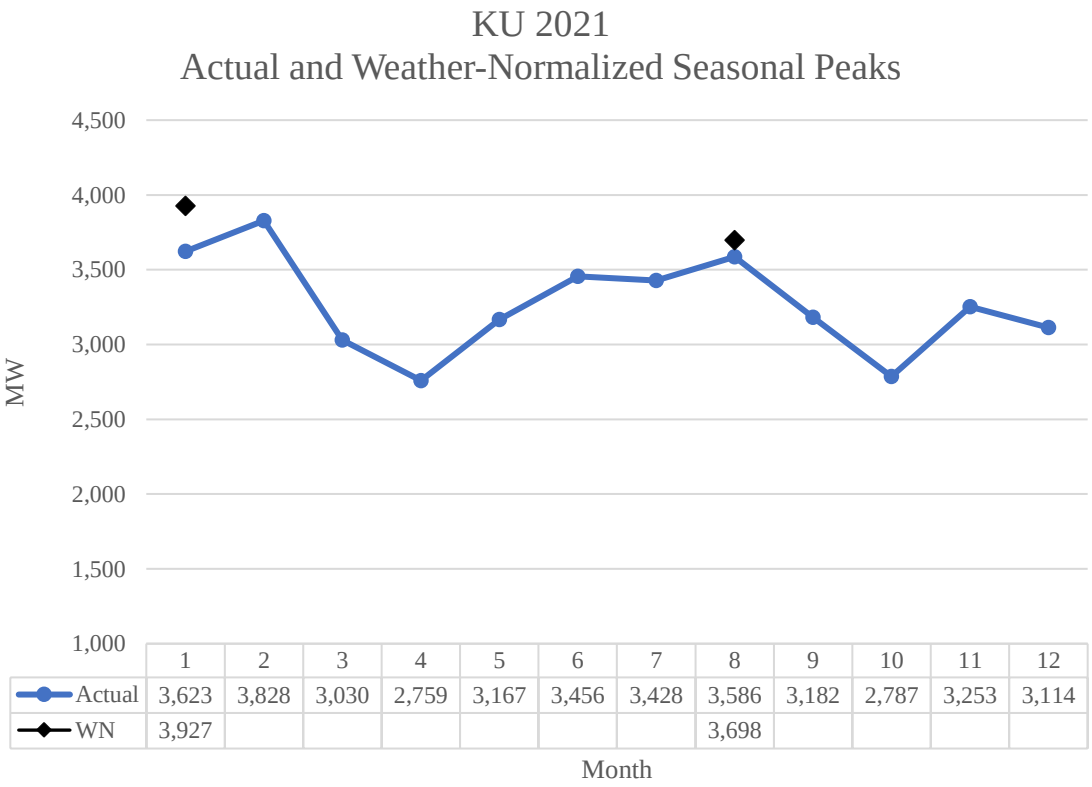
2021 ANNUAL RESOURCE ASSESSMENT FILING
PURSUANT TO APPENDIX G OF THE COMMISSION'S ORDER
DATED DECEMBER 20, 2001, IN ADMINISTRATIVE CASE NO. 387
AS AMENDED BY THE COMMISSION'S ORDER DATED MARCH 29, 2004
FILED MARCH 31, 2022

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:



	1	2	3	4	5	6	7	8	9	10	11	12
Actual	3,623	3,828	3,030	2,759	3,167	3,456	3,428	3,586	3,182	2,787	3,253	3,114
WN	3,927							3,698				

KENTUCKY UTILITIES COMPANY

2021 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, 2022

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

2021 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, 2022

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.

Table 6a – KU Demand and Energy Forecast

	2022	2023	2024	2025	2026
Base Case Energy Sales (GWh)	18,620	18,539	18,507	19,392	20,304
High Case Energy Sales (GWh)	19,135	19,111	19,136	20,068	21,009
Base Case Energy Requirements (GWh)	19,893	19,807	19,771	21,716	23,686
High Case Energy Requirements (GWh)	20,298	20,269	20,292	22,314	24,347
Base Case Native Peak Demand (MW, Winter)	4,042	4,036	4,015	4,168	4,249
High Case Native Peak Demand (MW, Winter)	4,124	4,130	4,121	4,294	4,388

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

	2022	2023	2024	2025	2026
Existing OSS	0	0	0	0	0
Wholesale OSS	138	140	143	112	72
Total OSS	138	140	143	112	72

KENTUCKY UTILITIES COMPANY

2021 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, 2022

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 2021 Integrated Resource Plan ("2021 IRP"), the Companies established an optimal summer reserve margin range of 17% to 24% and winter reserve margin range of 26% to 35%. The range provides an optimum level of reliability through various system operating conditions. The 2021 IRP was filed with the Commission in October 2021.[2]

A detailed explanation of the current target reserve margin is documented in the report titled, "2021 IRP Reserve Margin Analysis," included in Volume III of the Companies' 2021 IRP.

[2] *In re the Matter of: Electronic 2021 Joint Integrated Resource Plan of Louisville Gas and Electric Company and Kentucky Utilities Company* Case No. 2021-00393, filed on October 19, 2021.

KENTUCKY UTILITIES COMPANY

2021 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, 2022

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 Tables 8a and 8b for the combined Companies. These tables show for each peak season the total reserve margin, which includes all resources using an expected contribution at the time of peak, and the dispatchable reserve margin, which excludes non-dispatchable intermittent resources (solar and Ohio Falls run-of-river hydro). No reserve margin deficits are projected. The Companies will monitor load requirements and evaluate supply alternatives to address future capacity deficits.

Table 8a: Summer Peak Demand and Resource Summary (MW)

	2022	2023	2024	2025	2026
Gross Peak Load	6,522	6,500	6,485	6,594	6,678
Non-Dispatchable DSM	-294	-300	-305	-311	-311
Net Peak Load	6,229	6,201	6,179	6,283	6,367
Generation Resources	7,688	7,688	7,688	7,688	7,688
Curtailable Service Rider	127	127	127	127	127
Demand Conservation Program	61	60	58	56	55
Retirements/Additions					
Coal[3]	-300	-300	-300	-300	-300
Small-Frame SCCTs[4]	0	0	0	-47	-47
New Solar[5]	0	79	79	177	177
Total Supply	7,576	7,654	7,652	7,701	7,700
Total Dispatchable Resources	7,503	7,502	7,500	7,451	7,450
Total Resources Reserve Margin	1,347	1,453	1,473	1,418	1,333
Total Resources Reserve Margin	21.6%	23.4%	23.8%	22.6%	20.9%
Dispatchable Reserve Margin	1,274	1,301	1,321	1,168	1,083
Dispatchable Reserve Margin	20.4%	21.0%	21.4%	18.6%	17.0%

[3] The Companies assume that Mill Creek 1 and 2 cannot be operated simultaneously during the summer ozone season due to NO_x limits, which results in a reduction of available summer capacity through 2024. Mill Creek 1 is assumed to retire by the end of 2024.

[4] Haefling 1-2 and Paddy's Run 12 are assumed to retire in 2025.

[5] 100 MW of solar capacity is assumed to be added in 2023, and an additional 125 MW of solar capacity is assumed to be added in 2025. Capacity values reflect 78.6% expected contribution of solar to summer peak capacity and zero to winter peak.

Table 8b: Winter Peak Demand and Resource Summary (MW)

	2022	2023	2024	2025	2026
Net Peak Load	5,898	5,874	5,859	5,961	6,069
Generation Resources	7,973	7,973	7,973	7,973	7,973
Curtailable Service Rider	127	127	127	127	127
Demand Conservation Program	0	0	0	0	0
Retirements/Additions					
Coal[3]	0	0	0	-300	-300
Small-Frame SCCTs[4]	0	0	0	-55	-55
New Solar[5]	0	0	0	0	0
Total Supply	8,100	8,100	8,100	7,745	7,745
Total Dispatchable Resources	8,060	8,060	8,060	7,705	7,705
Total Resources Reserve Margin	2,202	2,226	2,241	1,784	1,676
Total Resources Reserve Margin	37.3%	37.9%	38.2%	29.9%	27.6%
Dispatchable Reserve Margin	2,162	2,186	2,201	1,744	1,636
Dispatchable Reserve Margin	36.7%	37.2%	37.6%	29.3%	27.0%

KENTUCKY UTILITIES COMPANY

2021 ANNUAL RESOURCE ASSESSMENT FILING
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DATED DECEMBER 20, 2001, IN ADMINISTRATIVE CASE NO. 387
AS AMENDED BY THE COMMISSION'S ORDER DATED MARCH 29, 2004
FILED MARCH 31, 2022

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

2021 ANNUAL RESOURCE ASSESSMENT FILING
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DATED DECEMBER 20, 2001, IN ADMINISTRATIVE CASE NO. 387
AS AMENDED BY THE COMMISSION'S ORDER DATED MARCH 29, 2004
FILED MARCH 31, 2022

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

2021 ANNUAL RESOURCE ASSESSMENT FILING
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DATED DECEMBER 20, 2001, IN ADMINISTRATIVE CASE NO. 387
AS AMENDED BY THE COMMISSION'S ORDER DATED MARCH 29, 2004
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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 2022 through 2026 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.

The only KU retirements assumed in the following four years are Haefling 1-2 in 2025.

The entire attachment is Confidential and provided separately under seal.

KENTUCKY UTILITIES COMPANY

2021 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
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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 do not currently have a firm plan for new capacity. In the 2021 Integrated Resource Plan ("IRP") and subsequent requests for information, the Companies identified a range of potential future capacity additions based on various scenarios for load, fuel prices, CO_2 emissions prices, and assumptions for future technology options. The planning process is constantly evolving and may be revised as conditions change and as new information becomes available. Before embarking on a particular course of action, the Companies will evaluate market-available alternatives for providing reliable energy while complying with all regulations in a least-cost manner, including the recently proposed Federal Implementation Plan to help meet the EPA's "good neighbor" requirements for reducing ozone-forming emissions of Nitrogen oxides. Such actions will be supported by specific analyses and will be subject to the appropriate regulatory approval processes.

The Companies plan to purchase the energy output of the following two solar facilities in Kentucky. Each project's development is ongoing with milestones to clear before completion.

- 100 MW in Hardin County anticipated to be in service in 2023.
- 125 MW in McCracken County anticipated to be in service in 2025.

KENTUCKY UTILITIES COMPANY

2021 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
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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 2021. The Company does not forecast this type of data; therefore, no forecast exists for 2022-2026.

a. LG&E and KU operate as a single NERC Balancing Area that contains several generators not owned by LG&E and KU, which are also included as sources below:

Tie Lines Received (MWH)	20,088,205
Net Generation-LG&E (MWH)	13,008,477
Net Generation-KU (MWH)	20,325,236
Net Generation-KMPA (MWH)	43,581
Net Generation-EKPC (MWH)	177,015
Total Sources (MWH)	53,642,514

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 18,159,445 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 long-term 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 interconnet are connected and operating at any given time.

d. The maximum summer peak transmission load for the combined LG&E/KU transmission system was 7,239 MW for the pak hour of 8/12/2021 at 4:00 p.m.

   The maximum winter peak transmission load for the combined LG&E/KU transmission system was 6,521 MW for the peak hour of 2/17/2021 at 9:00 a.m.

KENTUCKY UTILITIES COMPANY

2021 ANNUAL RESOURCE ASSESSMENT FILING
PURSUANT TO APPENDIX G OF THE COMMISSION'S ORDER
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FILED MARCH 31, 2022

ITEM NO. 14

RESPONDENT: Josh Boone

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
2022

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. While Itron remains the primary source of price elasticity coefficients, the Companies have also reviewed available studies to assess the reasonableness of the price elasticity coefficients used in the forecast models.[1] The Companies' price elasticity of demand coefficients are consistent with the ranges cited in the studies.

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] "Price Elasticity for Energy Use in Buildings in the United States", Energy Information Administration (2021); "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:
(% change in quantity demanded) = (.05) x (-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.