COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

ELECTRONIC 2019 INTEGRATED RESOURCE PLAN OF EAST KENTUCKY POWER COOPERATIVE, INC.	)))	CASE NO. 2019-00096

O R D E R

Pursuant to 807 KAR 5:058, Section 11(1), the Commission issued an Order on July 5, 2019, establishing a procedural schedule for the processing and review of the 2019 Integrated Resource Plan of East Kentucky Power Cooperative, Inc. By Order issued February 12, 2020, the Commission amended the procedural schedule, and scheduled a hearing in this matter. An informal conference and a formal hearing were conducted on July 27, 2020, and August 20, 2020, respectively. Commission regulation 807 KAR 5:058, Section 11(3), requires Commission Staff to develop a report summarizing its review and offering suggestions and recommendations to the utilities for subsequent filings. Attached as an Appendix to this Order is the Staff Report summarizing Commission Staff's review and offer of suggestions and recommendations as it relates to the 2019 Integrated Resource Plan of East Kentucky Power Cooperative, Inc. The Staff Report is being entered into the record of this matter pursuant to 807 KAR 5:058, Section 11(3).[1]

[1] The Staff Report can be accessed via the Commission's website at psc.ky.gov under "Utility Information-Industry Specific Info-Electric."

Having reviewed the record and being otherwise sufficiently advised, the Commission finds that East Kentucky Power Cooperative, Inc. (EKPC) and the intervenors to this matter should submit any comments to the Staff Report within ten days from the entry of this Order.

IT IS THEREFORE ORDERED that:

1. The Staff Report attached as an Appendix to this Order shall be entered into the record of this matter.

2. Any comments with respect to the Staff Report shall be filed within ten days from the date of the entry of this Order.

[REMAINDER OF PAGE INTENTIONALLY LEFT BLANK]

By the Commission

Vice Chairman Kent A. Chandler did not participate in the deliberations or decision concerning this case.

ENTERED

NOV 23 2020 rcs

KENTUCKY PUBLIC SERVICE COMMISSION

ATTEST:

Deputy Executive Director

APPENDIX

APPENDIX TO AN ORDER OF THE KENTUCKY PUBLIC SERVICE COMMISSION IN CASE NO. 2019-00096 DATED NOV 23 2020

FORTY-FIVE PAGES TO FOLLOW

Kentucky Public Service Commission

Staff Report on the

2019 Integrated Resource Plan

of East Kentucky Power Cooperative, Inc.

Case No. 2019-00096

November 2020

SECTION 1

INTRODUCTION

Promulgated in 1990 and amended in 1995 by the Kentucky Public Service Commission (Commission), 807 KAR 5:058 established an integrated resource planning (IRP) process that provides for regular review by the Commission Staff (Staff) of the long-range resource plans of the Commonwealth's six major jurisdictional electric utilities. The Commission's goal in establishing the IRP process was to ensure that all reasonable options for the future supply of electricity were being examined in order to provide ratepayers a reliable supply of electricity that was cost-effective.

East Kentucky Power Cooperative, Inc. (EKPC) filed its 2019 Integrated Resource Plan (IRP) on April 1, 2019. The IRP includes EKPC's plan for meeting its customers' electricity requirements for 2019–2033. EKPC, a generation and transmission cooperative, supplies nearly 100 percent of the power requirements of its 16 owner-member distribution cooperatives (OMDCs). The 16 owner-members served by EKPC are Big Sandy Rural Electric Cooperative Corporation (RECC), Blue Grass Energy Cooperative Corporation, Clark Energy Cooperative, Cumberland Valley Electric, Farmers RECC, Fleming-Mason Energy Cooperative, Grayson RECC, Inter-County Energy Cooperative Corporation, Jackson Energy Cooperative, Licking Valley RECC, Nolin RECC, Owen Electric Cooperative, Salt River Electric Cooperative Corporation, Shelby Energy Cooperative, South Kentucky RECC, and Taylor County RECC. Collectively, they provide service in 87 counties in central and eastern Kentucky.[2] EKPC serves primarily residential customers, which account for over 90 percent of its more than 588,000 retail customers.

EKPC owns and operates two coal-fired generating stations: Cooper Station and Spurlock Station.[3] It owns and operates gas-fired combustion turbines located at Smith Station in Clark County and Bluegrass Generation Station in Oldham County. It purchases hydropower from the Southeastern Power Administration (SEPA). EKPC also owns and operates roughly 16 megawatts (MW) of landfill gas generation as well as an 8.5 MW solar generation facility in Clark County. At the time the IRP was filed, EKPC's total winter capacity was approximately 3,241 MW.[4] EKPC's all-time peak demand of 3,507 MW occurred on February 20, 2015.[5]

---

[2] IRP at page 1.

[3] As of April 2016, all four units in place at Dale Station coal-fired generating station have been retired. The power block was scheduled to complete demolition by summer 2019. The substation will remain in place.

[4] IRP at page 142.

[5] EKPC's Response to Commission Staff's First Request for Information (Staff's First Request) (filed Mar. 16, 2020), Item 1b.

Since its most recent IRP, EKPC and its 16 owner-members have implemented a community solar project in order to offer its end users renewable solar energy. The facility has a capacity of 8.5 MW and consists of a 60-acre farm with 32,300 solar panels. The facility began operations in November 2017.[6] EKPC markets 35-year licenses under the Cooperative Solar program, offering its customers solar generation without the normal installation and maintenance requirements that would usually be present in a smaller home or office installation. In 2018, the facility produced 13,859 MWh.[7]

By Order dated July 5, 2019, a procedural schedule was established that provided for two rounds of data requests, an opportunity for Intervenors to file written comments, and an opportunity for EKPC to file a response to any Intervenor comments. Intervenors in this matter are the Attorney General of the Commonwealth of Kentucky, by and through the Office of Rate Intervention (Attorney General), and Nucor Steel Gallatin (Nucor). Neither the Attorney General nor Nucor filed comments.

This report provides a review and evaluation of EKPC's 2019 IRP in accordance with 807 KAR 5:058, Section 11(3), which requires Staff to issue a report summarizing its review of each IRP and make suggestions and recommendations to be considered by EKPC in future IRPs. Staff recognizes that resource planning is a changing and ongoing process. This review is designed to offer suggestions and recommendations to EKPC on how to improve its resource plan in the future. Specifically, the Staff's goals are to ensure that:

- All resource options are adequately and fairly evaluated;
- Critical data, assumptions, and methodologies for all aspects of the plan are adequately documented and are reasonable; and
- The report also includes an incremental component, noting any significant changes from EKPC's most recent IRP, which was filed in 2015.

EKPC stated that the objective of its IRP was to economically and reliably serve its Member Cooperatives while simultaneously mitigating financial and operational risks.[8] To meet this objective, EKPC identified the following near-term actions it would undertake:

- Continue to monitor economic and load growth conditions.
- Continue to develop and promote cost-effective Demand-Side Management (DSM) programs.

---

[6] IRP at page 69.

[7] *Id.* at page 11.

[8] *Id.* at page 5.

- Continue to evaluate winter peak energy and capacity needs and review against market and owned-generation options.

- Continue to maximize the operational and economic benefits realized by being a member of PJM.

- Work with federal and state stakeholders to ensure the economic viability of EKPCs existing and future resources to meet the challenges and opportunities in complying with current and proposed environmental regulations.

EKPC's total energy requirements are expected to increase by 1.4 percent per year from 2019-2033.[9] Winter peak demand is expected to increase by 0.6 percent and summer peak demand is expected to increase by 0.9 percent for the same period.[10] EKPC's annual load factor is projected to grow from 48.0 percent to 54.0 percent.[11] EKPC expects to have sufficient existing resources to meet its winter peak load for the next four years. In the 2024 time frame, EKPC plans to purchase additional resources to cover the deficiency between peak winter resources and peak winter demand. EKPC states that the additional resources could be provided by various resources, including PPAs or new generating resources. EKPC states that it will specifically target resources available in winter months, as it does not need additional summer resources.[12] EKPC puts forth that it will assess its options as the time of need draws closer and choose the most economical solution at that time.[13]

EKPC's adjusted winter peak is expected to increase from 3,258 to 3,585 MW from 2019 to 2033, for an annual growth rate of 0.6 percent.[14] Its adjusted summer peak is expected to increase from 2,341 to 2,685 MW over the same period, for a growth rate of 1.5 percent.[15] Its total energy requirements are projected to increase from 13,369,007 Megawatt-hours (MWh) in 2018 to 16,879,184 MWh in 2033, for an annual growth rate of 1.4 percent.[16]

---

[9] *Id.* at page 35.

[10] *Id.*

[11] *Id.*

[12] EKPC's Response to Staff's First Request (filed Mar. 16, 2020), Item 3.

[13] *Id.*

[14] IRP at page 37.

[15] *Id.*

[16] *Id.*

The IRP was developed based on a minimum reserve margin of 3.0 percent over EKPC's summer peak.[17] Through its existing DSM programs, EKPC expects a reduction in winter peak demand of approximately 26.3 MW by 2033.[18]

The remainder of this report is organized as follows:

- Section 2, Load Forecasting, reviews EKPC's projected load growth and load forecasting methodology.

- Section 3, Demand-Side Management, summarizes EKPC's evaluation of DSM opportunities.

- Section 4, Supply-Side Resource Assessment, focuses on supply resources available to meet EKPC's load requirements and environmental compliance planning.

- Section 5, Integration and Plan Optimization, discusses EKPC's overall assessment of supply-side and demand-side options and their integration into an overall resource plan.

The report contains a number of recommendations for EKPC's next IRP. The majority of Staff's recommendations are contained in Sections 2, 3, and 4.

It must be noted that departures from the filing schedule in 807 KAR 5:058 have caused overlaps of IRP filings among the six jurisdictional electric utilities that are required to submit an IRP. To help minimize future overlaps, in conjunction with changes in other utilities' IRP filing schedules, the filing date for EKPC's next IRP is April 1, 2021.

[17] *Id.* at pages 8 and 142.

[18] IRP Technical Appendix, Volume 2 (TAV2) at Table DSM-3.

SECTION 2

LOAD FORECASTING

This Section reviews and comments on the projected load growth of the Member Cooperatives' systems and EKPC's load forecasting methodology. EKPC prepares energy and peak demand forecasts every two years as required by the Rural Utilities Service (RUS). The load forecasts form the basis for determining the level of supply-side and demand-side resources required to meet the needs of the 16 owner-members. The forecast in this IRP was prepared pursuant to EKPC's 2018–2019 Load Forecast Work Plan. The forecast was approved by the EKPC Board of Directors in December 2018 and by RUS in February 2019.[19] EKPC and its owner-members use the 2018 forecast for long-term construction work plans, financial forecasting and planning, transmission and generation planning, demand response, and energy efficiency.[20]

FORECAST METHODOLOGY

EKPC's load forecast uses a regional service area model. EKPC begins by building seven regional territories based on the 16 owner-member distribution cooperative (OMDC) service territories and seven distinct regional economic models.[21] EKPC works with each OMDC to construct individual load forecasts. This approach allows EKPC to more closely align individual OMDC forecasts with their specific regional economic activity and outlook.

IHS Global Insight, Inc. (IHS) provides county level historical and forecasted economic data to EKPC, which then forms the basis for the seven individual regional forecasts of population, households, income, and employment. These variables are then used as inputs to the residential customer, small commercial customer, and class energy forecasts.[22] Data provided by IHS includes industry sector employment, unemployment, labor force participation, personal and real income, population and number of households.[23]

There are considerable differences between the regions within EKPC's territory, with each supporting differing economic and structural differences. For example, the East Region includes Bell, Breathitt, Clay, Estill, Floyd, Harlan, Jackson, Johnson, Knott, Knox, Laurel, Lee, Leslie, Letcher, Magoffin, Martin, Morgan, Owsley, Perry, Pike, Rockcastle,

---

[19] IRP at page 2 and 41; IRP Technical Appendix, Volume One (TAV1) at page 3.

[20] TAV1 at page 17.

[21] IRP at page 51. Each OMDC's share of a region is calculated by dividing its actual and forecasted residential customer count by the total number of households in the region. That share is then applied to all economic variables applicable to that OMDC.

[22] *Id.* at page 53-54.

[23] *Id.* at page 51.

Whitley, and Wolfe counties. The economic fallout from a declining coal industry has drastically impacted these counties. Over a 20-year forecast period, population is expected to decline by 34,000, and projected employment growth and household growth is essentially flat.[24] By contrast, the Central region, which includes Anderson, Bourbon, Clark, Fayette, Franklin, Harrison, Jessamine, Madison, Mercer, Scott and Woodford counties, is more urban and has greater employment opportunities for commercial and industrial sectors. Population, number of households, and employment are projected to have strong growth for this region.[25]

For the county level data, a geographic information system (GIS) was used to apportion data to each of the OMDC's service territories at the county level. Each respective county level data is summed up to the OMDC service territory level.[26] From here, individual forecasts are created for each owner-member.[27] Forecasts are made for the customer classes as defined by RUS Form 7, including residential, seasonal, small commercial, public buildings, large commercial, and street and highway lighting. Once class sales are determined, distribution losses are added to obtain total sales. EKPC's forecasts are the summation of the 16 OMDC forecasts plus transmission losses.[28]

KEY ASSUMPTIONS

Over the 15-year forecast period, EKPC anticipates a net 0.7 percent annual increase or an increase of about 56,000 residential retail customers. Regional households and employment are expected to grow at a 0.8 percent and 0.7 percent annual rate, respectively.[29] Normal weather is defined as covering the 20-year period 1998–2017. Weather data is collected from seven stations and, depending on the geographic location, applied to individual OMDC forecasts.[30] Included in the forecasts are projections of appliance saturation and efficiency trends, which EKCP obtains from Itron.[31] In addition, EKPC conducts residential surveys to gather OMDC-specific

[24] TAV1 at Table 4-2; EKPC's Response to Staff's First Request (filed Mar. 16, 2020), Item 6.

[25] *Id.* Table 4-4; EKPC's Response to Staff's First Request (filed Mar. 16, 2020), Item 6.

[26] *Id.* at page 23; EKPC's Response to Staff's First Request (filed Mar. 16 2020), Item 14b.

[27] *Id.* at page 17, Tables 4-1–4-7; EKPC's Response to Staff's First Request (filed Mar. 16, 2020), Item 6 includes brief discussions of regional forecast outcomes. The CD attachment in Item 6 includes Member Owner forecasts.

[28] *Id.* at pages 41–42. Each Member Owner works with EKPC to provide input and finalize its own final forecast. Once the forecast is finalized, each Member Owner's Board of Directors approves the forecast.

[29] IRP at page 42.

[30] *Id.* at pages 24–25 and 43.

[31] TAV1, Exhibit LF-1 Residential Statistically Adjusted End-Use (SAE) Spreadsheets – 2018 AEO Update. The 2018 update incorporates the latest U.S. Energy Information Administration (EIA) information on equipment efficiency trends; equipment and appliance saturation trends; structural indices; annual

information regarding electric appliance saturations, including heating and cooling appliances. The current forecast incorporates information from the 2018 End-Use Survey.[32] Wholesale electricity prices are taken from EKPC's 2015–2034 20-Year Financial Forecast. Annual energy prices are obtained by applying price elasticities to the sum of the wholesale prices and OMDC adders. Residential price elasticities range from (-0.20) to (-0.30) and commercial and industrial price elasticities range from (-0.05) to (-0.15).[33]

RESIDENTIAL CUSTOMER FORECAST

Once regional forecasts of population and households are complete, county share variables are applied to obtain each OMDC's share. The individual county shares are then summed for each OMDC and a regression equation is used to forecast OMDC residential customers. Since regression input variables can vary, each OMDC forecast is unique in that input variables can vary. Further, in some instances, regional employment or household income may also be used in the process.[34] In addition to IHS Global Insight, EKPC obtains data from each OMDC's RUS Form 7 and its own customer End-Use Survey, which contains appliance saturations and other demographic information.[35] Over the forecast period, the average number of residential customers is expected to increase from 509,573 in 2019 to 584,988 by 2038, with an annual growth rate of 0.7–0.8 percent.[36]

RESIDENTIAL ENERGY FORECAST

EKPC uses a combination of econometric and end-use modeling techniques to produce residential consumer and load forecasts. Taken together, the number of customers and energy sales are modeled based upon a combination of historical customer counts and energy sales, number of households, population density, employment, real gross county product, real total personal income, the Consumer Price Index (CPI), heating and cooling degree days, and autoregressive terms.[37]

Once the regional variables have been estimated and individual OMDC level data has been obtained, statistically adjusted end-use (SAE) techniques are used in conjunction with econometric modeling to forecast OMDC energy use per customer. Blending the techniques allows long-run, end-use trends to be incorporated into both the

---

heating, cooling, water heating and non-HVAC indices; and regional sales forecasts. Also see the discussion of selected trends at pages 2–21.

[32] *Id.* at page 24.

[33] IRP at 53; EKPC's Reponses to Staff's First Request (filed Mar. 16, 2020), Item 9.

[34] TAV1 at page 41.

[35] IRP at pages 41, 52 and 64.

[36] TAV1 at Table 5-2.

[37] IRP at pages 53-54.

long-run and short-run elasticities.[38] Energy use per customer is modeled as a function of Heating, Cooling, and Other Equipment (non-weather sensitive) variables.

The Heating variable is a function of heating degree days, heating equipment saturation and operating efficiency levels, as well as average number of billing cycle days each month, home thermal integrity and square footage, average household size, household income and energy prices.[39]

The Cooling variable is a function of cooling degree days, cooling equipment saturation and operating efficiency levels, average number of billing cycle days each month, home thermal integrity and square footage, average household size, household income and energy prices.[40]

The Other Equipment variable is a function of appliance and equipment saturation and efficiency levels, average number of billing cycle days each month, average household size, real income, and real prices.[41]

Residential energy sales account for about 55 percent of EKPC's total energy sales. Over the forecast period, Residential sales are projected to grow from 7,154,796 MWh in 2019 to 7,918,703 MWh in 2033 or about 0.7 percent annually.[42]

SMALL COMMERCIAL ENERGY FORECAST

Commercial and Industrial customers whose energy consumption is less than 1 MW are classified as Small Commercial. EKPC uses a combination of econometric and end-use modeling techniques to produce small commercial energy sales forecasts. As a whole, energy sales are modeled as functions of historical customer counts and energy sales, number of residential customers, households, population density, employment, real gross county product, real total personal income, the CPI, heating and cooling degree days, and autoregressive terms.[43]

Small Commercial sales account for about 16 percent of EKPC's total energy sales. Over the forecast period, Small Commercial customers are projected to grow from 34,318 in 2018 to 38,994 in 2033, or about 0.8 percent annually. Over the same period, energy sales are projected to grow from 1,958,436 MWh to 2,263,765 MWh, or about 0.97 percent annually.[44]

---

[38] TAV1 at Exhibit LF-1.

[39] *Id.*, Exhibit LF-1 at page 28.

[40] *Id.,* Exhibit LF-1 at page 32.

[41] *Id.*, Exhibit LF-1 at page 35.

[42] TAV1 at Table 6-2; IRP at Table 3-13.

[43] IRP at page 54.

[44] *Id.* at Table 3-14.

LARGE COMMERCIAL AND INDUSTRIAL ENERGY FORECAST

Large Commercial and Industrial energy sales are modeled as a function of the real gross county product and preliminary forecast results are finalized with OMDC input. OMDCs maintain regular contact with their Large Commercial and Industrial customers to gather information related to future expansion.[45] This customer class accounts for about 29 percent of EKPC's total energy sales. Over the forecast period, the amount of Large Commercial and Industrial customers is projected to grow from 152 in 2018 to 190 in 2033, or 1.5 percent annually. Energy sales are projected to increase from 3,398,144 MWh in 2018 to 5,542,559 MWh in 2033, or 3.3 percent annually.[46]

SEASONAL SALES FORECAST

Made up of seasonal vacation homes, camps, and weekend retreats, there is only one OMDC with seasonal sales, therefore seasonal sales account for a very small portion of overall sales.[47] Over the forecast period, seasonal sales customers are projected to grow from 151 in 2018 to 323 in 2033, or 5.2 percent annually. Seasonal sales are projected to grow from 503 MWh in 2018 to 1,044 MWh in 2033, or 5.0 percent annually.[48]

PUBLIC BUILDING SALES FORECAST

As of 2018, only two OMDCs reported these sales, which account for about 0.3 percent of EKPC's total energy sales.[49] Public building sales accounts are expected to grow from 1,176 in 2018 to 1,427 in 2033, or about 1.3 percent annually. Energy sales are projected to grow from 39,136 MWh in 2018 to 45,401 MWh in 2033, or about 1.0 percent annually.[50]

PUBLIC STREET AND LIGHTING SALES FORECAST

As of 2018, 11 OMDCs reported public street and lighting sales, which accounts for 0.8 percent of total EKPC energy sales.[51] Lighting accounts are projected to grow from 385 in 2018 to 410 in 2033, or 0.4 percent annually. Lighting sales are projected to increase from 8,912 MWh in 2018 to 9,890 MWh in 2033, or 0.7 percent annually.[52]

---

[45] *Id*. at page 54.

[46] EKPC's Response to Staff's First Request (filed Mar. 16, 2020), Item 11, Table 7-2.

[47] IRP at page 55.

[48] *Id.* at Table 3-16.

[49] *Id.* at page 55.

[50] EKPC's Response to Staff's First Request (filed Mar. 16, 2020), Item 12, Table 3-17.

[51] IRP at page 61.

[52] *Id.* at Table 3-18.

TOTAL SYSTEM ENERGY FORECAST

Totalizing the 16 owner-members' forecasts, Total Retail Sales over the 2018–2033 forecast period is expected to grow from 12,40,774 MWh in 2018 to 15,781,363 MWh in 2033, or about 1.59 percent annually. The addition of owner-members and EKPC office energy use, distribution losses (4.6 percent) and transmission losses (2.6 percent) yields EKPC's Total Requirements. Over the 2018–2033 forecast period, EKPC's Total Requirements are projected to grow from 13,369,007 MWh to 16,879,184 MWh, or about 1.56 percent annually.[53]

PEAK DEMAND FORECAST

Peak demand is forecasted for both summer and winter. Input assumptions are varied to produce both high and low consumption forecasts. For weather, the 90th and 10th percentile of a 15-year historical heating degree day (HDD) and cooling degree day (CDD) range is selected to create extreme weather observations. Electric price forecasts are obtained from CES Power Marketing and are modeled with a high range of 3.2 percent annual growth and with a low range annual growth of 1.1 percent. Base Residential Customer annual growth is estimated at 0.7 percent, and both high and low growth are estimated at 1.2 and 0.3 percent, respectively. Small Commercial customer growth is correlated with the Residential class. No additional changes were made for the Large Commercial and Industrial class.[54]

EKPC's Low Case represents a pessimistic economic view combined with mild weather. The High Case represents an optimistic economic view combined with severe weather. Modeling the extreme views places forecasting bounds around the Base Case forecast scenario.

Over the 2018-2033 forecast period, Low Case scenario results are as follows:

- Net Total Energy Requirements are projected to grow from 12,853,511 MWh to 15,182,711 MWh, or about 1.1 percent annually.

- Net Winter Peak is projected to grow from 3,210 MW to 3,325 MW, or about 0.24 percent annually.

- Net Summer Peak is projected to grow from 2,357 MW to 2,490 MW, or about 0.37 percent annually.

For the High Case scenario over the 2018–2033 forecast period, the results are as follows:

[53] TAV1 at Table 1-3; EKPC's Response to Staff's First (filed Mar. 16, 2020), Item 5d.

[54] IRP at pages 62-64. There are minimal differences between the number of degree days used in the 20 year range used in the Base Case forecasts and in the 15-year range used for the Peak forecasts; EKPC's Response to Staff's First Request (filed Mar. 16, 2020), Item 20.

- Net Total Energy Requirements are projected to grow from 13,978,835 MWh to 18,992,448 MWh, or about 2.1 percent annually.

- Net Winter Peak is expected to grow from 3,259 MW to 3,874 MW, or about 1.2 percent.

- Net Summer Peak is expected to grow from 2,369 MW to 2,901 MW, or about 1.4 percent.[55]

CHANGES FROM PREVIOUS FORECAST

Table 1 below highlights significant differences between the 2015 and 2019 IRP.

Table 1
IRP Forecast Comparison - 2015 IRP Versus 2019[56]

	Year	2015 IRP	2019 IRP	Difference	Percent Difference
Residential Sales, MWh	2019	7,455,700	7,154,796	-300,904	-4.04
	2024	7,914,171	7,333,909	-580,262	-7.33
	2029	8,376,465	7,662,936	-713,529	-8.52
Total Commercial and Industrial Sales, MWh	2019	5,742,629	5,608,873	-133,756	-2.33
	2024	6,319,657	7,160,454	840,797	13.30
	2029	6,884,718	7,515,453	630,735	9.16
Residential Customers	2019	511,581	509,573	-2,008	-0.39
	2024	536,435	529,427	-7,008	-1.31
	2029	561,948	550,018	-11,930	-2.12
Net Winter Peak, MW	2019	3,302	3,258	-44	-1.33
	2024	3,455	3,401	-54	-1.56
	2029	3,651	3,514	-137	-3.75
Net Summer Peak, MW	2019	2,456	2,341	-115	-4.68
	2024	2,665	2,483	-182	-6.83
	2029	2,885	2,595	-290	-10.05
Total Requirements, MWh	2019	14,147,514	13,735,980	-411,534	-2.91
	2024	15,290,328	15,555,697	265,369	1.74
	2029	16,454,469	16,292,394	-162,075	-0.98

Both the residential customer and residential energy forecasts are lower in the 2019 forecast compared to the 2015 forecast. Forecasts for residential customers decline anywhere from 0.4 in 2019 to 2 percent in 2029. Residential energy usage declines ranging from 4 percent in 2019 to 9 percent in 2029. EKPC attributes this decline to

[55] IRP at Table 3-19; TAV1 at Table 8-1.

[56] *Id.* at Table 1-2.

stagnant economic conditions in the Eastern region. The 2019 commercial and industrial energy usage forecast increases over the 2015 forecast, ranging from 13 percent in 2024 to 9 percent in 2029. This change can be attributed to the addition of a large industrial customer. However, the 2019 forecast for winter and summer peak and Total Energy Requirements are all lower than forecasted in the 2015 IRP. The winter peak ranges from 1 percent to 4 percent lower and the summer peak ranges from 5 to 10 percent lower. EKPC attributes this to increased energy efficiency (EE) adoption and standards. Overall, the Total Energy Requirements are 3 percent less in 2019, 2 percent greater in 2024 and 1 percent less by 2029.

INTERVENOR COMMENTS

Neither the Attorney General nor Nucor Steel Gallatin offered any comments regarding EKPC's forecasts.

RECOMMENDATIONS FROM THE 2015 IRP

- **EKPC should continue to report on how its actual energy and demand levels compare to its forecasted levels for the time periods between IRP filings.**

EKPC responded by providing a table and graphs illustrating differences between the forecasts. The current 2018 Total Energy Requirements forecast averages 6.0 percent lower than the 2014 forecast, though the growth rate of 1.4 percent is the same, while peak demands are about 3.0 percent lower.[57]

- **EKPC should continue to include a detailed analysis of how the impact of federal mandatory efficiency improvements for appliances are reflected in its demand forecasts as well as in the energy forecasts, along with the associated values, for its residential, commercial and industrial customer classes.**

EKPC responded that it is a member of Itron's Energy Forecasting Group and receives appliance efficiency data derived from the U.S. Energy Information Administration (EIA). This appliance-specific information is explicitly included in EKPC's models and impacts from efficiency trends are included in load forecasts.[58]

- **EKPC should continue to review the potential impact of new and pending environmental requirements, including carbon, and report how these requirements have been incorporated, along with their associated impacts, into its load forecasts and related risk analysis.**

[57] *Id.* at Table 1-2 and Figures 1-1, 1-2, and 1-3. The 1.4 percent total requirements growth rate pertains to the 2018-2038 forecast period. The 15-year forecast period (2018-2033) total requirements growth rate is 1.6 percent.

[58] *Id.* at 22; Exhibit LF-1.

EKCP provided a detailed description of potential and pending environmental regulations in Section 9 of the IRP. The potential production-cost impact of environmental regulations is incorporated into the long-range financial forecast, which is then incorporated into the load forecast model.[59]

Overall, EKPC's IRP addressed these recommendations and Staff is satisfied with and accepts the manner and method in which EKPC's load forecasting incorporated the recommendations set forth in the 2015 IRP.

<u>RECOMMENDATIONS REGARDING THE 2021 IRP</u>

- EKPC has appropriately sought to place forecast boundaries around its Base Case scenarios with its extreme Low Case and High Case scenarios, which, arguably, is the point of the sensitivity analysis. However, additional insights might be gained by varying fewer variables at an extreme level or combinations of low and high variables. For example, only weather varies from its base case assumptions or weather remains normal and economic conditions change. EKPC should conduct and report on additional sensitivity analyses to investigate alternate variations in input assumptions.

- EKPC should include the addition and loss of a major industrial load in its sensitivity analyses, as well as the possible effects of an extreme event, such as a pandemic, whose immediate impact may last more than one year.

- EKPC should discuss participation in regional economic development efforts, the extent to which it assists the owner-members in recruiting or retaining industrial customers, and the seemingly growing importance of being able to offer renewable energy to satisfy corporate sustainable energy goals as a facet of economic development efforts. In addition, the extent to which the existing industrial parks/development sites are certified and move-in ready should be discussed.

[59] *Id.*

SECTION 3

DEMAND-SIDE MANAGEMENT/ENERGY EFFICIENCY

INTRODUCTION

This section discusses the Demand-Side Management and Energy Efficiency (DSM-EE) aspects of the EKPC IRP. At the time of the IRP filing, EKPC also filed its most recent DSM application in Case No. 2019-00059,[60] in which EKPC proposed to continue, modify, or terminate certain DSM-EE programs. The Commission issued a Final Order in Case No. 2019-00059 on November 26, 2019, accepting the revised DSM-EE programs. This IRP models the DSM-EE impacts from Case No. 2019-00059.[61]

DSM-EE PROGRAMS CHANGES:

Due to changes in the cost-effectiveness of certain programs, the Commission approved modifications and elimination of select DSM programs in Case No. 2019-00059. Five DSM Programs were approved by the Commission to be eliminated: (1) DSM-4c, Heating Ventilation and Air Conditioning Duct Sealing Program; (2) DSM-5, Commercial & Industrial Advanced Lighting Program; (3) DSM-6, Industrial Compressed Air Program; (4) DSM-8, Appliance Recycling Program; and (5) DSM-9, ENERGY STAR® Appliances Program. The following six DSM programs were approved for modifications: (1) DSM-2, Touchstone Energy Home Program; (2) DSM-3a, Direct Load Control Program - Residential; (3) DSM-3b, Direct Load Control Program - Commercial; (4) DSM-4a, Button-up Weatherization Program; (5) DSM-4b, Heat Pump Retrofit Program; and (6) DSM-7, ENERGY STAR® Manufactured Home Program.[62]

DSM-EE PROGRAM COST-EFFECTIVENESS AND ENERGY SAVINGS:

In 2018, EKPC performed an extensive review of its DSM programs. This review included input from its DSM Steering Committee, a committee of EKPC and owner-member cooperative (owner-member) staff, and consultants with the purpose to reevaluate the cost-effectiveness and need for the existing DSM programs.[63] During this time, EKPC also updated its Energy Efficiency and Demand Response Potential Study (EE Study) by commissioning GDS Associates (GDS) to conduct an updated cost-

---

[60] *See* Case No. 2019-00059, *Demand-Side Management Filing of East Kentucky Power Cooperative, Inc.* (Ky. PSC Nov. 26, 2019) Final Order.

[61] EKPC's Response to Staff's First Request (filed Mar. 16, 2020), Item 26.

[62] *See* Case No. 2019-00059, *Demand-Side Management Filing of East Kentucky Power Cooperative, Inc.* (Ky. PSC Nov. 26, 2019).

[63] IRP at page 6.

effectiveness review for all possible DSM program measures.[64] In evaluating the cost-effectiveness of the DSM programs, EKPC instructed GDS to evaluate cost-effectiveness based upon the total resource cost measure and to utilize appropriate technical resource manuals from states and regions for energy savings and regional implementation costs. GDS also used EKPC's avoided energy and capacity cost in PJM Interconnection, LLC, as well as EKPC's owner-member End-Use Saturation Survey results. EKPC also retained a DSM programming expert to further evaluate the programs, refine GDS's results with updated EKPC specific costs and electricity savings, and assist in the proposed revisions.[65] The proposed discontinuation of the five DSM programs listed above and the proposed modification of the six DSM programs listed above were then approved by the Commission.[66]

In the IRP, EKPC stated that the DSM program modification results from Case No. 2019-00059 support the action of continuing to develop and promote cost-effective DSM in a period of declining avoided costs and budget restrictions.[67] For example, due to the change in avoided costs, the Button-Up Weatherization program was redesigned, so that incentives are given only on measures that continue to be cost-effective regardless of the decrease in avoided costs.

EKPC also discussed the need to continue evaluating the costs of demand-side programs along with the costs of energy and capacity in the PJM market. Such importance can be illustrated by the Direct Load Control program, which helps mitigate capacity purchase cost from PJM. EKPC stated it will continue to utilize cost-mitigating programs such as Direct Load Control as long as the programs are cost-effective.[68] EKPC also noted that changes in the operating environment since 2015 has reduced the cost-effectiveness of DSM programs and measures as the avoided energy and capacity costs are a great deal lower now, hence the recent DSM program revision. EKPC stated that the company benefits from the combined effect and plans to continue developing DSM programs to be cost-effective and adjustable based on changing regulations, costs, and circumstances.[69]

---

[64] *Id.* at page 81.

[65] Case No. 2019-00059, *East Kentucky Power Cooperative, Inc.* (filed Jan. 30, 2019) Tariff Filing at 2.

[66] Case No. 2019-00059, *East Kentucky Power Cooperative, Inc*. (Ky. PSC Nov. 26, 2019) Order at 7.

[67] EKPC's Response to Staff's First Request (filed Mar. 16, 2020), Item 27.

[68] EKPC's Response to Commission Staff's Second Request for Information (filed May 8, 2020), Item 16.

[69] IRP at pages 11–12.

EXISTING DSM PROGRAM DESCRIPTIONS:

EKPC's DSM program offerings are designed to meet both member preferences and resource planning objectives. EKPC analyzes DSM measures and programs using both qualitative and quantitative criteria, which include member acceptance, measure applicability, savings potential, and cost-effectiveness. The cost-effectiveness of DSM resources is analyzed using the Total Resource Cost (TRC) test from the California standard. EKPC evaluated 388 DSM measures for the 2019 IRP. These measures included 372 EE measures and 16 demand response (DR) programs.[70] The entire results of the GDS EE and DR Potential Study is included in Exhibit DSM-1 of the Technical Appendix, Volume 2.[71] EKPC states that all programs selected were cost-effective using the TRC test, except the EKPC Community Assistance Resources for Energy Savings (CARES) low-income program and the energy audit program. The 2019 IRP's DSM portfolio includes seven EE programs and two DR programs.[72] All DSM resources have been dedicated to the Residential Class. No nonresidential EE programs are proposed in this IRP.[73] The programs are as follows:[74]

1. Button-Up Weatherization Program
2. CARES Low-Income
3. Heat Pump Retrofit Program
4. Touchstone Energy Program
5. ENERGY STAR Manufactured Home Program
6. Energy Audit
7. Residential Efficient Lighting
8. Direct Load Control – Air Conditioners, Switches, and Bring Your Own Thermostat

INTERVENOR COMMENTS

Neither the Attorney General nor Nucor Steel Gallatin offered any comments regarding EKPC's forecasts.

RECOMMENDATIONS FROM THE 2015 IRP

The Staff Report on the 2015 EKPC IRP made seven recommendations regarding EKPC's DSM efforts. The recommendations and responses are as follows:

[70] TAV2 at page 2.

[71] *Id.* at page 3.

[72] *Id.*

[73] IRP at page 81.

[74] TAV2 at page 4, *See* Table 2-11 for a complete description of each program.

- **EKPC should continue to report on the work of its DSM Collaborative and provide the dates of all DSM Collaborative meetings that take place after the issuance of this report and prior to the filing of its next IRP**.

In 2015, EKPC and the stakeholders established a second DSM and Renewable Energy Collaborative (Collaborative 2.0) with the following participants:

- EKPC
- EKPC's 16 owner-members
- Kentuckians for the Commonwealth
- COAP, Inc. (Christian Outreach with Appalachian People, Inc.)
- Kentucky Association of Manufacturers
- Kentucky Environmental Foundation
- KIUC (Kentucky Industrial Utility Customers)
- MACED (Mountain Association for Community Economic Development)
- Next Step
- Nucor
- Office of the Attorney General

Collaborative 2.0 had four meetings; September 2015, February 2016, June 2017, and December 2018.[75] The initial meeting was a review of the prior Collaborative results and updates. During the second meeting, three subteams were created, which were; Residential DSM Programs, Commercial & Industrial DSM Programs, and Marketing DSM Programs. The three sub-teams met and reported back to the entire Collaborative 2.0 at the third meeting in June 2017.

EKPC noted that the subteam attendance and participation began to decline and that important factors to DSM programs, such as lower avoided energy and capacity costs, increased scrutiny from the Commission about cost-effectiveness, and the Clean Power Plan, were being disregarded. In response, a decision was made to halt Collaborative 2.0 and its mission to grow DSM programs while a complete evaluation of all DSM programs was completed by EKPC executive staff and the owner-member CEOs. GDS was hired to complete a potential study which resulted in the EE Study.[76] At the fourth Collaborative 2.0 meeting, which was held in December 2018, EKPC presented the cost-effective measures and the programs that it planned to request the Commission to change or discontinue and resulted in Case No. 2019-00059.[77]

Staff is satisfied with the information that EKPC has provided for this recommendation.

---

[75] *Id.*, Exhibit DSM-8 at pages 1–2. Exhibit DSM-8 contains the agendas for all Collaborative 2.0 meetings.

[76] *Id.* at page 2.

[77] IRP at page 24.

- **EKPC should continue to include all environmental costs, as they become known, in future benefit/cost analyses.**

EKPC states that they have provided all known environmental costs in the avoided costs it used to conduct benefit/cost analyses on the DSM resources for this IRP and Staff is satisfied with the information provided.

- **EKPC should include an update on bidding its peak savings from energy efficiency and other DSM programs into the PJM capacity markets.**

EKPC states that they have bid Demand Response (DR) capacity into the PJM market and provided Megawatt amounts for the six years including 2015 through 2021. In the PJM year of 20182019, PJM implemented a new market, Capacity Performance (CP). Because a concern arose in controlling Direct Load Control (DLC) switches for the required 12-hour timeframe, EKPC evaluated and chose not to bid the DLC switch capacity into the market.[78] EKPC goes on to say that DLC switches are still beneficial as the switches are managed by EKPC to minimize payments to the PJM market during the PJM five coincident peaks in the summer months.

Separately, EKPC stated that after evaluating the cost to measure and verify EE programs, the costs outweigh the benefits received from PJM. EKPC stated that while it isn't bidding EE peak demand savings into the PJM market, there is still a benefit as participation in EE programs lowers owner-member summer peak demand resulting in decreased annual capacity costs for EKPC from PJM.[79] Staff is satisfied with the information that is provided from EKPC in response to this recommendation.

- **EKPC should continue to work with its Member Cooperatives to further educate and encourage them and their customers about the importance of DSM, EE, and energy conservation**.

EKPC states that it is providing education to the owner-member service staff and their energy advisors with training sessions and educational meetings several times a year. A DSM Steering Committee which consists of owner-member representatives and EKPC staff was also established in order to provide program design and priority guidance. Staff is satisfied with the efforts undertaken to work with the Member Cooperatives in the areas of DSM, EE, and energy conservation.

- **EKPC should continue to fully involve all members of the DSM Collaborative to identify new cost-effective DSM programs, best practices, and opportunities for enhancement of its existing programs.**

[78] *Id.* at page 25.

[79] *Id.* at pages 25–26; TAV2, Exhibit DSM-9.

EKPC noted that Collaborative 2.0 continues to focus on best practices and open dialogue. EKPC noted that Collaborative 2.0 was halted in 2017 pending the results of cost-effectiveness evaluations and reviews by EKPC executive staff and the owner-member CEOs and the EE Study. Staff agrees that a break was necessary; however, EKPC should restart the collaborative and require member involvement.

- **EKPC should continue to work with stakeholders in developing EE reporting guidelines, standards, and templates**.

EKPC stated it is has developed reporting standards and templates and continues to refine these in order to stay responsive to the needs of stakeholders and market changes. Staff is satisfied that EKPC has been responsive to the needs of stakeholders and has continued to develop and refine reports with EE reporting standards as well as the capabilities of its DSM Tracking System.

- **EKPC should continue to report, by year, on its DSM programs' energy savings and peak demand reductions. EKPC should evaluate the Energy Star Appliances Program measures that may not be cost-effective based on updated appliance standards prior to the filing of its next IRP.**

Annual reporting has continued as well as DSM-EE program adaptations. Staff is satisfied with the Annual DSM reports on program savings and costs.

DISCUSSION AND FINDINGS:

A thorough examination of the DSM-EE programs was conducted in Case No. 2019-00059. It was noted in the final Order that the use of current data and assumptions for updated TRC scores as well as evaluation by EKPC and their Owner-Members illustrates a thorough examination of the DSM Programs. However, including the DSM costs in base rates is not transparent to the member-customer and, since all member systems pay the same, subsidization between the member systems may exist. EKPC was ordered to file testimony in its next base rate case supporting the value of the DSM programs to EKPC and to the reasons why DSM expenses should continue to be in base rates and not in a rider specific to each member system and subject to an annual true-up. EKPC should reference this study, if filed prior to its next IRP.

RECOMMENDATIONS REGARDING THE 2021 IRP:

- EKPC should continue to report, annually, on its DSM programs’ energy savings and peak demand deductions.

- EKPC should continue to scrutinize the results of each existing DSM program measure’s cost-effectiveness test and provide those results in future DSM cases, along with detailed support for future DSM program expansions and additions. EKPC should also be mindful of the increasing saturation of EE products, and be watchful for the opportunity to scale back on programs offering incentives for behavior that may be dictated by factors other than the incentives.

- The Commission recommends that EKPC continue the stakeholder process through the Collaborative and strive to include recommendations and inputs from the stakeholders. These meetings should be more than informational, and entail fluid dialog between all vested parties. Any changes to the DSM program must be discussed in full, including a transparent analysis of the cost and benefits inputs.

- As required by the IRP regulation, 807 KAR 5:058, Section 7(4)(d), EKPC should continue to define and improve procedures to evaluate, measure, and verify both actual costs and benefits of energy savings based on the actual dollar savings and energy savings.

- EKPC should continue to report on updates to bidding its peak savings from DSM programs into the PJM capacity markets.

SECTION 4

SUPPLY-SIDE AND DEMAND-SIDE RESOURCE ASSESSMENT

INTRODUCTION

This section summarizes, reviews, and comments on EKPC's evaluation of existing and future supply-side resources. In addition, it includes discussions on various aspects of EKPC's environmental compliance planning.

SUMMARY OF EXISTING CAPACITY

Currently, EKPC owns and operates coal, natural gas, fuel oil, landfill gas, and solar generation resources. Additionally, EKPC maintains firm rights to hydro generation with Southeastern Power Administration (SEPA). In total, EKPC has access to approximately 3,437MW of winter capacity, plus 170 MW from SEPA for a total of 3,607 MW.[80] Capacity is from the following sources:

- Coal-fired generation production from Cooper Station and Spurlock Station. Cooper Station includes two units with a combined generation capacity of 341 MW; Unit 1 entered production in 1965, and Unit 2 in 1969. Spurlock Station includes four units with a combined generation capacity of 1,346 MW; Unit 1 entered production in 1977, Unit 2 in 1981, Unit 3 in 2005, and Unit 4 in 2009.[81]

- Gas/fuel oil fired generation includes nine combustion turbine (CT) generating units at Smith Station, totaling 753 MW of summer capacity and 989 MW of winter capacity.[82] EKPC also owns and operates Bluegrass Station in Oldham County, which consists of three CT units with a total summer capacity of 501 MW and winter capacity of 567 MW.[83]

- The Cooperative Solar One facility in Winchester, Kentucky, which has a nameplate capacity of 8.5 MW.

- Six landfill gas generating facilities of various sizes, which contribute up to 16.1 MW of capacity.[84]

---

[80] IRP at page 67 and Table 4-2.

[81] *Id.* at pages 67-68.

[82] *Id.* at page 68 and Tables 4-3 and 4-4.

[83] *Id.* at page 68 and Table 4-6. Bluegrass Unit 3 was under contract to a third party and became available to EKPC in May 2019.

[84] *Id.* at page 69 and Tables 4-5 and 4-7.

EKPC also maintains a membership in the National Renewables Cooperative Organization (NRCO). NRCO evaluates renewable projects on behalf of its members, facilitating transmission constraint analysis, Renewable Energy Certificates (REC) market analysis, and engineering studies. This enables EKPC to better evaluate the efficacy of renewable generation projects, possible participation in projects, access aggregated information for renewable project pricing, and evaluate REC market prices without the added expense of dedicated staff. NRCO assisted EKPC in the RFP, contracting, and installation process for its Cooperative Solar One project.[85]

Over the last three years, EKPC's six existing landfill gas-to-energy (LFGTE) facilities have produced output ranging from 90,220 MW to 101,207 MW with a three-year average of 94,530 MW. EKPC works to continually improve LFGTE facility performance and is investigating additional LFGTE opportunities.[86] EKPC reported that one of its owner-members is pursuing hydro generation via a power purchase agreement. EKPC has a single cogeneration partner and purchased 2,847 MWh in 2018. This cogeneration partner is a small 200 kW poultry digester methane recovery cogeneration facility.[87] As a result of owner-member net metering programs, EKPC's system includes approximately 2,849 kW of solar photovoltaic (PV) capacity, as well as 18 kW of capacity from wind turbines.[88]

Table 2 below provides EKPC's projected resource capacity positions over the 2019-2033 forecast period. Note that the existing winter resources column reflects the addition of the Bluegrass Unit 3 (189 MW), which became available to EKPC in May 2019. Total Projected Resource Requirements is the sum of projected peak demand and required PJM reserve margins. Comparing projected capacity resources with total requirements yields projected capacity needs. As a load serving entity within PJM, EKPC's minimum required reserves are based upon its summer peak load plus 3 percent.[89] Centered on EKPC's summer peak demand, it requires between 70 and 80 MW of summer reserve capacity to satisfy its PJM reserve requirements. EKPC's winter peak demand clearly demonstrates that it is a winter peaking utility. Its winter capacity projected resource needs, 2019 notwithstanding, show an additional 21 MW capacity is needed by 2027 increasing to 129 MW by 2033. EKPC has an abundance of summer capacity throughout the forecast period ranging from 717 MW in 2019 to 390 MW by 2033. EKPC sells surplus capacity into PJM's capacity markets.

---

[85] *Id.* at pages 136–137.

[86] *Id.* at page 137.

[87] *Id.*

[88] *Id.* at pages 137–138.

[89] *Id.* at page 8.

Table 2
EKPC Projected Capacity Needs (MW)[90]

Year	Projected Peaks[2]		3% Reserves[1]		Total Requirements		Existing Resources		Capacity Needs	
	Win	Sum	Win	Sum	Win	Sum	Win	Sum	Win	Sum
2019	3,258	2,342	0	70	3,258	2,412	3,241	3,128	17.3	-716.6
2020	3,281	2,377	0	71	3,281	2,448	3,430	3,128	-149.6	-680.5
2021	3,323	2,425	0	73	3,323	2,498	3,430	3,128	-106.7	-630.2
2022	3,349	2,448	0	73	3,349	2,521	3,430	3,128	-81.5	-607.5
2023	3,373	2,457	0	74	3,373	2,531	3,430	3,128	-57.3	-596.9
2024	3,390	2,472	0	74	3,390	2,546	3,430	3,128	-40.6	-582.6
2025	3,404	2,492	0	75	3,404	2,567	3,430	3,128	-25.9	-560.9
2026	3,429	2,517	0	76	3,429	2,593	3,430	3,128	-1	-535.2
2027	3,451	2,528	0	76	3,451	2,604	3,430	3,128	21	-524.2
2028	3,483	2,558	0	77	3,483	2,635	3,430	3,128	53	-493.3
2029	3,494	2,575	0	77	3,494	2,652	3,430	3,128	64	-476.4
2030	3,509	2,600	0	78	3,509	2,678	3,430	3,128	79	-449.7
2031	3,517	2,616	0	78	3,517	2,694	3,430	3,128	87	-434.3
2032	3,543	2,638	0	79	3,543	2,717	3,430	3,128	113	-410.9
2033	3,559	2,658	0	80	3,559	2,738	3,430	3,128	129	-390.1

1. Reserve requirement updated to meet PJM Summer reserve requirement of 3%.
2. DSM Impacted load forecast.

SUMMARY OF SUPPLY-SIDE OPTIMIZATION AND MODELING

EKPC uses the RTSim model as its primary resource planning tool. Through Monte Carlo simulations, the RTSim production cost model simulates the hourly generation system operations to satisfy projected member system loads under various load conditions, market and fuel price uncertainties, forced outages, hourly unit generation and commitments, and power purchases and sales through the PJM energy market.[91]

[90] *Id.* at Table 8-6. Note that beginning with the year 2024, both the projected winter and summer peaks diverge (slightly lower) from the forecasted net winter and net summer Base Case peaks reported in IRP Table 3-19. Differences range from 11 MW in 2024 to 27 MW in 2033. At the August 20, 2020 Hearing (Hearing), Peak Demand forecasts in Table 3-19 include existing DSM programs only. In order to forecast future capacity needs, the Peak Demand forecasts in Table 8-6 reflect the addition of new future DSM programs and the exclusion of interruptible power. Hearing Video Transcript (HVT) of the August 20, 2020 Hearing, 09:25:41-09:28:52.

[91] *Id.* at page 135.

The RTSim Resource Optimizer, which automatically sets up and runs the RTSim production cost model, was utilized to optimize EKPC's resource plan using the same data as the production cost model simulations in order to find the least cost optimum resource plan. Additional resource alternatives offered into the model with optional in-service dates included a combustion turbine (100 MW), a natural gas combined cycle (300 MW), a solar generating facility (100 MW), two wind turbine facilities (100 MW), and three winter seasonal power purchase agreements (PPAs) (100 MW).[92] The model also uses a statistical load methodology to create additional load forecasts around the EKPC base load forecast to define high and low scenario ranges. Actual and forecasted market prices, natural gas and coal prices, and emissions costs are all correlated to the load data used in simulations[93] and the load data (including high and low loads) simulates various weather pattern scenarios.[94]

EKPC ran over 2,500 expansion plan simulations with 500 iterations in each simulation. Optimal expansion plans are selected based upon the net present value (NPV) of total production costs and annual fixed costs of future alternatives.[95] Of the plans simulated, the five lowest cost expansion plans are listed in Table 3 below.

[92] *Id.* at Table 8-2. At the August 20, 2020 Hearing, EKPC clarified that the two 100 MW wind purchases and the three 100 MW winter seasonal purchases represented identical discrete optional blocks for the model to select in order to satisfy future capacity needs. August 20, 2020 Hearing Video Transcript (HVT) at 09:46:27.

[93] EKPC used the base expectations forecast for market prices, coal prices, natural gas prices, and emissions costs (SO_2 and NO_x) and then a probability curve is applied to each base forecast to model uncertainty and simulate price variations over time. HVT at 09:32:00 and 09:48:50.

[94] IRP at page 135.

[95] *Id.* at pages 138–139.

Table 3
Top Cases with Specific Resource and In-Service Date[96]

Case 1	
100 MW Seasonal Purchase	1-1-2024
100 MW Seasonal Purchase	1-1-2029
Case 2	
100 MW Seasonal Purchase	1-1-2026
300 MW Intermediate Resource	1-1-2030
Case 3	
100 MW Seasonal Purchase	1-1-2023
100 MW Seasonal Purchase	1-1-2024
100 MW Seasonal Purchase	1-1-2032
100 MW Peaking Resource	1-1-2032
Case 4	
100 MW Seasonal Purchase	1-1-2024
100 MW Seasonal Purchase	1-1-2027
100 MW Seasonal Purchase	1-1-2030
100 MW Peaking Resource	1-1-2032
Case 5	
100 MW Seasonal Purchase	1-1-2025
100 MW Seasonal Purchase	1-1-2025
100 MW Peaking Resource	1-1-2033

Tables 2 and 4 imply that the optimal expansion plan is being driven by EKPC's need to maintain sufficient capacity to satisfy its winter peak demand. EKPC's optimal least-cost expansion plan is Case 1, where 100 MW of seasonal purchases are made beginning in 2024 and then an additional 100 MW seasonal purchases (200 MW cumulative total) are made beginning in 2029.[97]

[96] *Id.* at Tables 8-4.

[97] *Id.* at Table 1-4 at 20. The table lists the incremental Seasonal PPAs as 100 winter purchase call options. Based upon the Informal Conference held July 27, 2020, this seasonal purchase is considered to be generic and has not been identified.

Table 4
EKPC Projected Capacity Additions and Reserves (MW)[98]

Year	Seasonal PPA	Total Capacity		Total Requirements		Reserve Margin	
		Win	Sum	Win	Sum	Win	Sum
2019		3,241	3,128	3,258	2,412	-1%	34%
2020		3,430	3,128	3,281	2,448	5%	32%
2021		3,430	3,128	3,323	2,498	3%	29%
2022		3,430	3,128	3,349	2,521	2%	28%
2023		3,430	3,128	3,373	2,531	2%	27%
2024	100	3,530	3,128	3,390	2,546	4%	27%
2025		3,530	3,128	3,404	2,567	4%	26%
2026		3,530	3,128	3,429	2,593	3%	24%
2027		3,530	3,128	3,451	2,604	2%	24%
2028		3,530	3,128	3,483	2,635	1%	22%
2029	100	3,630	3,128	3,494	2,652	4%	21%
2030		3,630	3,128	3,509	2,678	3%	20%
2031		3,630	3,128	3,517	2,694	3%	20%
2032		3,630	3,128	3,543	2,717	2%	19%
2033		3,630	3,128	3,559	2,738	2%	18%

SUMMARY OF MAINTENANCE PLANS FOR EXISTING UNITS

EKPC has a formal maintenance planning process to keep its existing units operating in a safe and reliable manner, to comply with environmental regulations, and to maintain optimal unit performance and reliable service to owner-members.[99] This plan is reviewed and evaluated annually by various experts in order determine if new plans or revisions of existing plans are warranted. New plans are subject to a cost-benefit analyses, which take into account such factors as safety and regulatory requirements. Major projects must be Board approved.[100] EKPC provided a list of major projects at each of its generation stations for the period 2019-2023.[101]

[98] *Id.* at Tables 1-4, 8-3, and 8-6. Note that a comparison of summer total capacity and total requirements clearly demonstrates that EKPC has sufficient reserves to satisfy its PJM reserve margin requirements. However, the summer reserve margin calculations appear to overstate the forecasted reserve margin. The winter reserve margins are correct.

[99] *Id.* at page 115.

[100] *Id.* at pages 115–116.

[101] *Id.* at Tables 7-1, 7-2, 7-3, 7-4 and 7-5.

SUMMARY OF THE TRANSMISSION SYSTEM AND TRANSMISSION PLANNING

EKPC's transmission system is comprised of approximately 2,955 circuit miles at voltages ranging from 69 kV to 345 kV and 74 interconnection points with neighboring utilities.[102] To help ensure the adequacy and reliability of the transmission system, EKPC coordinates its activities with neighboring utilities and with PJM. Once EKPC has completed its own transmission planning activities, plans are submitted to PJM for review, approval, and inclusion in the Regional Transmission Expansion Plan (RTEP) process.[103] Similarly, projects identified by PJM are submitted to EKPC for incorporation into its own plans to ensure continuity. As a member of the Southeast Reliability Council (SERC), which is one of seven regional Electric Reliability Corporations, EKPC supplies data for and participates in load flow reliability studies relating to potential problems with the bulk transmission system. EKPC follows SERC guidelines related to generation and transmission planning, and operations.[104] In addition, EKPC participates in Available Transfer Capability studies that are performed by PJM, Independent Transmission Organizations, and Reliability Coordinators such as TVA.[105]

EKPC provided a list of transmission expansion and improvement projects completed over the three year period prior to the submission of the IRP. These projects included station modifications and upgrades, circuit switching and breaker additions, existing line construction and reconductoring and new line construction. Depending upon the size of line and power flows, reconductoring typically results in a reduction in system line loss of between 250,000 to 400,000 kWh per year.[106] In addition, EKPC provided a list of planned transmission projects during the 2019-2033 period.[107] These projects include the new construction or upgrading of existing transmission lines and substations, installation of new switching stations, upgrading transformers, and terminal facility upgrades. In order to enhance system reliability and efficiency, transmission plans are evaluated and updated annually using power flow analyses and reliability indicators.[108]

EKPC's transmission system planning and design is geared toward having the ability to import a minimum of 500 MW. Import studies indicate that EKPC's interfaces with its neighboring utilities and regions meets that criteria. EKPC's import capability with

[102] *Id.* at page 93.

[103] *Id.* at pages 94–95.

[104] *Id.* at pages 95–96.

[105] *Id.* at page 102.

[106] *Id.* at page 97.

[107] *Id.* at Tables 6-2, 6-3, 6-4, 6-5, and 6-7.

[108] *Id.* at page 98.

LG&E/KU ranges up to 850 MW and up to 450 MW with TVA depending upon the time and season. In 2018, EKPC imported up to 1,628 MW from PJM.[109]

SUMMARY OF THE DISTRIBUTION SYSTEM AND PLANNING

EKPC owns and operates the distribution substations connecting the transmission system to the 16 owner-members' distribution systems. EKPC works with its owner-members to monitor peak demand transformer loads and to identify potential problems. EKPC, in conjunction with its owner-members, uses a "one system" four-year planning horizon and cost basis to evaluate potential substation issues.[110] Over the previous 2015-2019 period, EKPC and its owner-members completed 21 projects ranging from constructing new substations to adding and upgrading transformers. Over the 2019-2022 period, EKPC anticipates upgrading an additional nine substations, adding new three new transformers, and constructing seven new substations.[111] Finally, EKPC and its owner-members continually work to improve power factors at the distribution level.[112]

SUMMARY OF COMPLIANCE PLANNING

In order to maintain a strategic plan, EKPC evaluates potential future rules, whether they be in draft, proposed, or finalized. The EPA annually releases a strategic plan. The most recent plan before the submission of EKPC's IRP, published in early 2018, sets forth goals such as: improving air quality, water quality, and preventing contamination. EKPC states that its goals are in alignment with the strategic plan published by the EPA.

EKPC is currently in compliance with various environmental rules and requirements, including the Clean Air Act (CAA) and its various amendments, as well as the Clean Water Act (CWA) and the Resource Conservation and Recovery Act (RCRA).[113]

CAA rules that EKPC is in compliance with are as follows:[114]

- New Source Performance Standards (NSPS)
- New Source Review (NSR)

---

[109] *Id.* at pages 101-102. In addition, Table 6-1 provides a listing of EKPC's import capabilities for each of its 74 interconnection points with neighboring utilities.

[110] *Id.* at page 103.

[111] *Id.* at page 104.

[112] *Id.* at page 105.

[113] *Id.* at page 147.

[114] *Id.*

- Title IV of the CAA
- Title V of the CAA
- Summer Ozone Program
- Clean Air Interstate Rule (CAIR)
- Cross-State Air Pollution Rule (CSAPR)
- National Ambient Air Quality Standards (NAAQS)
- Mercury Air Toxics Standards (MATS)
- Affordable Clean Energy Rule (ACE), formerly known as Clean Power Plan)

EKPC also is currently in compliance with the following CWA rules:[115]

- Section 316(a,b)
- Effluent Limitations Guidance (ELG)
- Waters of the US (WOTUS)

Finally, EKPC complies with the Coal Combustion Rule (CCR) of the RCRA.[116]

New Source Review (NSR) is currently under consideration for changes by Congress and the EPA. Shifting EPA NSR enforcement interpretations subjects the industry to additional costs. A potential change that EKPC supports is the inclusion of a bright line hourly emissions test, which evaluates increases in maximum hourly emissions based on a five-year lookback as opposed to the current actual-to-projected-actual emissions standard.[117] EKPC also supports changes such as adding a bright line definition for "routine maintenance, repair and replacement" exclusions. This would benefit EKPC by simplifying the process for determining which outage projects that could improve plant efficiency fall under such exclusions.[118] Another revision supported by EKPC to the NSR program would be to allow projects that improve unit efficiency.[119]

Mercury and Air Toxics Standards (MATS) is a rule that subjects mercury emissions to limits. Generating units are required to measure these emissions in order to demonstrate compliance. MATS compliance also includes limits on other hazardous air pollutants. Heavy metals such as mercury, arsenic, and chromium, as well as gases such as sulfur dioxide (SO_2), hydrogen fluoride (HF), and hydrogen chloride (HCl), in addition to particulate matter (PM) emissions are subject to this rule. Although there are

[115] *Id.*

[116] *Id.*

[117] *Id.* at page 149.

[118] *Id.* at page 150.

[119] *Id.*

revisions being considered, the limits and requirements of MATS are unlikely to change, and therefore would not change EKPC's compliance.[120]

EKPC upgraded pollution controls on Spurlock 1, Spurlock 2, and Cooper 2 as a part of NSR Consent Decrees. This allowed EKPC to avoid large amounts of additional capital investment to bring these units into compliance with MATS rules. Spurlock 3 and 4 are already in compliance and required no additional pollution control technology.[121]

EKPC is currently in compliance with CSAPR II (which updated the 2008 ozone NAAQS). The updated rule did not affect EKPC's NOx allowances for 2015 and 2016. Future reductions in NOx allowances for compliance with 2015 ozone NAAQS (referred to CSAPR III) are expected to be issued in the next few years. This should have minimal effect on most of EKPC's generation, as allowances are expected to follow the same methodology as that of CSAPR II, with allowances being reduced for non-attainment areas. The only generating location in a marginal non-attainment area is Bluegrass. EKPC has sufficient allowances issued under CSAPR II to operate in 2019 and expects to be able to continue operating as normal for the foreseeable future.[122]

The Regional Haze Rule, recently achieving review completion, targets best available retrofit technology (BART) controls for SO_2, NOx, and PM emissions. Exemption from BART review is difficult and nearly all coal-fired generation stations are subject to BART. As part of its Regional Haze compliance plans, EKPC installed SO_2, NOx and PM controls on Spurlock 1 and 2 as well as Cooper 2. These pollution controls bring the Spurlock and Cooper Stations into compliance with not only the Regional Haze rule, but also NSR CDs, MATS, CSAPR, and NAAQS. Additionally, EKPC's coal-fired generation fleet has been in compliance with BART since April 2017.[123]

EKPC states that the Clean Power Plan (CPP), stayed by the U.S. Supreme Court in 2016, would have had a significant negative impact on operations due to the stringent emissions reduction standards to be met by 2030. In order to comply with the rules, either coal-fired steam generating units would have to shut down, reductions of usage in coal-fired units, immediate construction of natural gas-fired baseload generation, or engaging in market purchases of emission allowances or rate credits would be required.[124] In March of 2017, an Executive Order was issued directing the EPA to review, suspend, revise, or rescind the CPP if appropriate. As of June 2019, the CPP was repealed and replaced with the Affordable Clean Energy rule (ACE).[125]

---

[120] *Id.*

[121] *Id.*

[122] *Id.* at pages 151–152.

[123] *Id.* at page 156.

[124] *Id.* at pages 156–157.

[125] www.epa.gov.

ACE was released in August of 2018. ACE seeks to better delineate the roles of the Federal and State governments in the implementation of environmental compliance rules. The ACE rule is meant to give states more authority in implementation. As of now, state implementation plans (SIP) are still in development stages.

Proposed revisions to the 111(b) rule and CO_2 New Source Performance Standards (NSPS) rule were released by the EPA in December of 2018. The purpose of the revision is to alter the EPA's previous finding that the best system of emissions reduction (BSER) for CO_2 is Carbon Capture and Sequestration (CCS). Instead, the proposed revision would establish BSER as generation units with the most efficient demonstrated steam cycle in combination with best operating practices.[126] New or modified coal units can be BSER complaint depending upon the heat input. The proposed rule does not change any limits for natural gas-fired units.[127]

The minimization of environmental impact due to impingement mortality (IM) and entrainment mortality (EM) is the primary goals of Section 316(b) of the CWA. Because both Spurlock and Cooper Stations hold Kentucky Pollutant Discharge Elimination System (KPDES) permits, have design intake capacities that withdraw more than 2 million gallons per day from waters of the United States (WOTUS), and utilize at least 25 percent for dedicated cooling purposes, each is subject to Section 316(b) requirements.[128] IM compliance is evaluated based on the baseline standard of modified traveling screens with fish returns. Several alternative compliance options exist, including 'essentially pre-approved' and 'streamlined' technology options. Best Technology Available (BTA) standards for EM are determined by the Director of the Division of Water.[129]

Currently, there is an expectation that Spurlock Station will need no additional controls for IM or EM to achieve compliance.[130] Spurlock Station employs both passive wedgewire screens with a maximum through-screen velocity of 0.5 fps, as well as a closed-cycle cooling system. These are likely to be considered BTA for IM. The closed-cycle recirculating cooling system has a maximum makeup water demand of 21.6 million gallons per day, falling significantly under the 125 MGD threshold, meaning that Spurlock Station is not subject to the rule's requirement for comprehensive entrainment studies, but is still subject to the Director's BTA determination. One factor that could potentially alter the expectation that no additional controls would be required at Spurlock Station is the designation of a critical habitat or changes to federally-listed threatened or endangered species. Two such listed species are present near Spurlock Station. EKPC

---

[126] IRP at page 159.

[127] *Id.*

[128] *Id.* at page 161.

[129] *Id.* at pages 161–163.

[130] *Id.* at page 165.

is unaware of any potential impacts to threatened or endangered species at this time. Additionally, there are no designated critical habitats in the Ohio River near Spurlock Station.[131]

At Cooper Station, through-screen velocities are under 0.5 fps, and are likely to be considered BTA for IM as a pre-approved technology. EKPC only needs to demonstrate that through-screen velocity does not exceed this threshold under various conditions for compliance. There are no federally-listed threatened or endangered species known to live in Lake Cumberland near Cooper Station. Although Cooper Station's design capacity of 223 million gallons per day (MGD) could subject Cooper Station to an entrainment study requirement, a low capacity factor for Unit 1, the operation of only a single pump during low winter water temperatures, and utilization of the Unit 2 cooling towers prior to 2013 have resulted in an actual intake flow of less than 100 MGD for the three years prior to the submission of EKPC's 2019 IRP.[132] It is EKPC's goal to closely monitor Cooper Station's intake in order to avoid being subject to the rule requiring extensive entrainment BTA reports, and will evaluate potential costs of periodic or seasonal usage of the Unit 2 cooling towers as a compliance option. Even if Cooper Station is able to maintain an actual intake flow (AIF) of under the 125 MGD threshold, it is still subject to the BTA determination by the Director of the Division of Water.[133]

The final ELG rule was finalized on November 3, 2015. However, in 2017, the EPA issued another finalized rule postponing the compliance dates for FGD wastewater and bottom ash transport water requirements. Compliance with the rule is not expected to be required before 2023.[134]

The Department of the Army and the EPA are currently reviewing and considering revisions to the definition of WOTUS, as set out by the 2015 Clean Water Act Rule. Kentucky utilizes the pre-2015 definition for WOTUS, however, because EKPC is a borrower from RUS, the National Environmental Policy Act (NEPA) process is applicable to EKPC capital projects.[135]

EKPC facilities are in compliance with the Coal Combustible Residuals (CCR) Rule. Spurlock Station has three regulated units, while the Cooper and Smith Stations each have one. Dale Station is not subject to this rule, as Dale Station did not generate any electricity after October 19, 2015. EKPC continues to go forward with their Public

[131] *Id.*

[132] *Id.* at pages 167–168.

[133] *Id.* at page 169.

[134] *Id.* at page 171.

[135] *Id.* at pages 172–173.

Service Commission approved compliance plan to close the Spurlock Station surface impoundment by removal.[136]

CHANGES FROM THE 2015 IRP

In terms of generation resources, there have been several significant changes from the 2015 IRP. All four Dale Station units have been retired. Units 3 and 4 were retired in April 2016. The power block is slated to be completely demolished by summer 2019. Three Siemens 501FD-2 CTs were purchased at the Bluegrass Generation Station in 2015. These units have a summer rating of 167 MW and a winter rating of 189 MW. All three units became available to EKPC in May 2019. Finally, EKPC and its 16 owner-members implemented a plan to construct an 8.5 MW solar facility that will make renewable energy available with 25-year leases to the system's retail members. In 2018, the facility produced 13,859 MWh.[137]

Table 5 below provides a comparison of differences in EKPC's 2015 and 2019 expansion plans. The 400 MW forecasted capacity needed in the 2015 IRP during the 2015-2017 period was supplied with the purchase of Bluegrass Generating Station. The total capacity of Bluegrass Generating Station was more than the 400 MW needed, which in turn mitigates the additional capacity needs identified in the 2019 IRP.

[136] *Id.* at page 176.

[137] *Id.* at page 11.

Table 5
EKPC Projected Major Capacity Additions[138]

2015 IRP Capacity Available January 1 Winter Season Capacity				2019 IRP Capacity Available January 1 Winter Season Capacity			
Year	Baseload Capacity	Peaking/ Intermediate Capacity (MW)	Cumulative Capacity Additions	Year	Baseload Capacity	Peaking/ Intermediate Capacity (MW)	Cumulative Capacity Additions
2015				2015			
2016		150 Seasonal Purchase	150	2016			
2017		250 Seasonal Purchase	400	2017			
2018			400	2018			
2019			400	2019			
2020			400	2020			
2021			400	2021			
2022			400	2022			
2023			400	2023			
2024			400	2024		100 Win purchase call option	100
2025			400	2025			100
2026		50 Renewable PPA	450	2026			100
2027			450	2027			100
2028		50 Renewable PPA	500	2028			100
2029		50 Renewable PPA	550	2029		100 Win purchase call option	200
2030			550	2030			200
2031			550	2031			200
2032			550	2032			200
2033			550	2033			200

[138] *Id.* at Table 1-4.

INTERVENOR COMMENTS

Neither the Attorney General nor Nucor Steel Gallatin offered any comments regarding EKPC's forecasts.

RECOMMENDATIONS FROM THE 2015 IRP

In addressing its review of EKPC's 2015 IRP, Staff noted that EKPC should discuss various circumstances surrounding the planning and operation of EKPC's system. These discussions include transmission disputes, environmental compliance measures, transmission loss, and nonutility renewable and co-generation.

- **Discuss in detail the terms and outcome of the FERC decision concerning the transmission dispute between LG&E/KU and EKPC has on the delivery of the excess Bluegrass power.**

EKPC responded by briefly explaining the case and that FERC ruled in LG&E/KU's favor. It explained that it had not purchased any long term transmission service from LG&E/KU under the Network Integration Transmission Services (NITS) tariff, but that it monitors the load levels continuously and purchases daily transmission service when necessary.[139]

- **Provide discussion regarding completion of the duct-reroute connecting the Cooper 1 discharge stream to Cooper 2's air quality control system.**

EKPC responded by describing the project and that it came in under budget and was completed in November 2015. The project allowed Cooper 1 to be compliant with the Mercury and Air Toxics Standards and the Regional Haze rule's Best Available Retrofit Technology State Implementation Plan.[140]

- **Discuss the pending/ongoing plant and facility modifications required to meet the current Clean Air Act, Clean Water Act, Clean Power Plan and future environmental legislation and regulations.**

EKPC provided a detailed discussion of pending and current environmental regulations in Section 9. It went on to explain that the Clean Power Plan had been stayed by the U.S. Supreme Court and that the EPA had proposed an alternative, the Affordable Clean Energy Rule (ACE) and that the Kentucky will develop its own State Implementation Plan (SIP) to meet the ACE requirements. EKPC's plan to comply with the ACE rule in the IRP is tentative and its compliance strategy will be finalized once the ACE rule and SIPs are finalized.[141]

---

[139] *Id.* at pages 27–28.

[140] *Id.* at pages 28–29.

[141] *Id.* at page 29.

- **Report on the ongoing SEPA construction and its effects on EKPC's ability to schedule hydro power.**

EKPC provided an update on the projects. The Wolf Dam project was completed in 2013 and the Center Hill project is schedule to be completed by late 2019. EKPC schedules power based on availability; currently 70 MW from Laurel Dam and up to 87 MW from the Cumberland System subject to availability. Most, if not all of the major renovation projects, are projected to be completed in 2020.[142]

- **EKPC should provide further analysis of observed lower than expected transmission loss values for 2012 and 2013, and a more detailed explanation of the cause, especially if those values continue to be lower than typical or change without a seemingly reasonable cause in recent years.**

EKPC responded by explaining that lower system losses are the result of significantly more power purchases from PJM and that has changed the power flows over its transmission system. The establishment of three new interconnection points with neighboring utilities have also contributed to lower system losses.

- **EKPC should continue to discuss the existence, and promotion of any cogeneration within its members' service territories and any focused consideration given to it.**

EKPC responded by explaining that it is working with one facility on a 200 kW project and that there is only one other contracted cogenerator on the system. In addition, there are two solar facilities less than 100 kW each and utilize the cogeneration/small power producer tariff.[143]

- **EKPC should continue to provide discussion of any distributed generation and the impact of such generation on its system and its members' systems.**

EKPC responded that one OMDC installed a 2 MW natural gas reciprocating generator in 2016 and another installed a 300 kW solar photovoltaic system in 2018.[144]

- **EKPC should continue to discuss the existence, type, unit number and promotion of any Green Power utilized on its system and/or its members' systems.**

---

[142] *Id.* at page 30.

[143] *Id.* at page 31.

[144] *Id.* at page 32.

EKPC reported that, as a result of its Demand Side and Renewable Energy Collaborative, an 8.5 MW solar facility began operation in November 2017 and produced 13,859 MWh in 2018. Retail members can purchase 25-year licenses for renewable solar energy from the facility.[145]

- **EKPC should continue to list and describe the net-metering equipment and system types installed in its members' service territories and the impact on its system.**

EKPC reported that there are 348 net-metered installations across its owner-members' service territories with a combined 2,876 kW installed capacity, including 18 kW of wind generation. EKPC surveys its owner-members annually for updates to the number and type of net-metered systems.[146]

- **EKPC shall continue to provide a complete discussion of compliance actions and plans relating to current and pending environmental regulations in its future resource planning.**

EKPC responded that an extensive discussion of this topic was included in the IRP Section 9.[147]

- **EKPC shall continue to provide details of how uncertainty has been accounted for in the modeling of future projected loads and the supply and transmission provisions anticipated to meet those loads.**

EKPC included detailed responses in IRP Sections 6 and 8. EKPC currently evaluates transmission system performance using two load forecast probability scenarios, a 50/50 and 10/90 (10 percent chance the forecasted load is exceeded/90 percent chance it is not). The transmission system is currently designed to the 50/50 probability level though EKPC has begun simulating 10/90 contingencies and is working to implement transmission improvements. In addition, the RTSim production cost model was used to simulate the hourly operation of the generation system.[148]

- **EKPC shall provide details of types and locations of any non-transmission alternatives and technologies considered and/or modeled or utilized on its system and/or its members' systems, if not included in previous discussions.**

---

[145] *Id.*

[146] *Id.* at pages 32–33.

[147] *Id.* at page 33.

[148] *Id.* at pages 33–34.

EKPC responded that these discussions were provided in previous discussions in the IRP report.[149] Staff notes that the IRP included discussions of efficiency gains in appliances and housing, generation technology alternatives, DSM, renewables, net metering, and cogeneration.

Overall, EKPC's IRP addressed these recommendations and Staff is satisfied with and accepts the manner and method in which EKPC's load forecasting incorporated the recommendations set forth in the 2015 IRP.

<u>PUBLIC COMMENTS</u>

The Southern Renewable Energy Association (SREA) filed public comments and recommendations regarding EKPC's Supply-Side modeling and forecasts.

- SREA argued that EKPC should publish its projected cost data and that EKPC's use of levelized cost of energy (LCOE) data from 2016 overstates the relative cost of renewable energy. SERA stated that input data from the National Renewable Energy Laboratory (NREL) data is also overstated as it does not account for federal wind energy production tax credits or federal investment tax credits for solar energy. SREA argues that internal utility assumptions regarding self-ownership tend to double count financing costs. SREA recommends benchmarking IRP LCOEs with NREL LCOEs, and other publicly available utility data. SERA contends what such benchmarking will also provide valuable insight toward PPAs.[150]

- SREA argues that it is unclear whether EKPC included federal tax credits in its production cost modeling and notes how wind energy developers could benefit from production tax credits. In addition, SERA describes solar energy Investment Tax Credits (ITCs) and explains how these could benefit project developers.

- SREA argues that EKPC's capacity planning is deficient in that the capacity planning methodology contains a bias. Arguing that capacity planning models fail to properly consider low-cost renewable energy, when the utility is in a capacity deficit situation, even if renewable energy capacity costs are less than avoided cost, capacity only models may still not select it. Also, SERA believes that EKPC did not adequately support the cost assumptions used for its market-based power purchase agreements[151]

- SREA argues that in addition to capacity-based planning, EKPC should add energy-based planning options. Also, hedging opportunities may not be adequately captured in current modeling practices.

---

[149] *Id.* at page 34.

[150] Comments of the Southern Renewable Energy Association (SREA Comments) (filed June 8, 2020) at page 2.

[151] *Id.* at pages 8–9.

- SREA commended EKPC for its Collaborative 2.0 membership and recommended that it expands the membership to include renewable energy interests.[152]

- SREA argues that even though EKPC utilizes the services of NRCO, it did not appear to have used the most current information.

SREA included the following set of recommendations regarding EKPC's next IRP.[153]

- EKPC should move away from capacity-only or capacity-focused resource planning.

- EKPC should allow renewable energy to directly compete against existing generation units.

- The National Renewable Energy Lab's Annual Technology Baseline (NREL ATB) should be used for all renewable energy resource cost and performance assumptions.

- Energy storage resources should be allowed to access multiple revenue streams, including but not limited to frequency control, voltage regulation, energy arbitrage, peaking and other value stacks.

- Cost projections for renewable energy and energy storage should continually decline over time, while performance projections should continually increase.

- Federal tax credits, including the PTC and ITC, should be incorporated for renewable energy and energy storage projects in relevant years.

- Levelized cost of energy benchmarks (in $/MWh values) should be provided for all energy resources. LCOE values should be like Lazard Associates' and NREL ATB values.

- Significant procurement of renewable energy and energy storage should occur across all portfolios.

- Large customers should be allowed to directly procure renewable energy resources.

- EKPC should incorporate data from NRCO renewable energy RFPs into IRP planning.

---

[152] *Id.* at page 9.

[153] *Id.* at page 10.

- An RFP should be issued for renewable energy resources to gather updated market information.

- EKPC should expand the Collaborative 2.0 membership to include utility-scale renewable energy development.

<u>RECOMMENDATIONS REGARDING THE 2021 IRP</u>

- EKPC should continue to stay abreast of changes in Federal regulations and rule changes within PJM that have or could impact EKPC's operations and participation in PJM markets and services. In its next IRP, EKPC should report on any changes at the federal level and at PJM that have or could potentially affect EKPC since the last IRP filing and how it has or plans to respond.

- EKPC should continue to stay abreast of Federal Energy Regulatory Commission (FERC) Orders. In its next IRP, EKPC should discuss the impact of recent FERC Orders regarding battery storage and distributed energy resources.

- EKPC should provide greater transparency in and discussion of its sources of data, and how that data is used and manipulated to introduce uncertainty into the model.

- EKPC should provide greater support for and discussion of the rationale of its choices of alternative assumptions (such as different weather assumptions in the demand and supply-side forecasts), constraints, and decision parameters programed into the RTSim production cost and optimization models. As one example, Table 8-2 on page 136 presents nine resource options offered into the RTSim production cost model. There should be a more robust detailed discussion as to why these particular options were chosen (such as cost, performance attributes, technology development, current and expected market characteristics) and why specifically other optional resources were rejected. In addition, EKPC should provide more explicit explanations for what environmental cost elements and uncertainties are included in the models. EKPC should include the potential effects of carbon regulation and how that could affect fuel and emission prices on the supply-side and ultimately the price of electricity on the load forecast.

- EKPC should provide more robust and detailed explanations of the modeling results between the demand side and supply-side modeling. For example, as brought out in the Hearing, the differences between the peak load demand forecasts in Table 3-19 and those used as supply-side inputs in Table 8-6, are well reasoned, but not obvious. In addition, there should be more discussion of specific steps taken by the models to ultimately obtain a preferred least cost plan, the interactions between the RTSim models, and tying results listed in tables to discussions more closely.

- If not addressed above, EKPC should provide more detailed explanations of the renewable energy resource options offered into the RTSim models. Any available production tax credit, investment tax credit, financing, or any other incentive (current or expiring) should be included appropriately and explained in the model.[154]

- There are multiple pending merchant solar facilities being considered for construction and interconnection with EKPC's transmission system. EKPC should consider and discuss both the short and long-term effects of the output from the facilities on: (1) any changes in the demand for energy (and capacity if applicable) within its service territory; (2) possible changes in interest in or the expansion of the solar share program; (3) any effects on EKPC's and OMDCs' transmission and distribution systems brought out through interconnection studies; and (4) how the sustainability goals of large customers affects EKPC's transmission and generation planning, if at all.

- EKPC should continue to provide short descriptions of federal and state environmental rules and requirements that apply to it. Additionally, EKPC should clearly distinguish between: (1) rules and requirements with which EKPC is already in compliance; (2) expected changes to rules and requirements that would have a material effect on EKPC's operations and how its operations would be affected; and (3) rules and requirements with which EKPC is not yet in compliance.

[154] At the Hearing, EKPC clarified that as a nontaxable entity, it is not eligible to take advantage of renewable tax credits and incentives. However, it was able to take advantage of incentives through its power purchases from entities that are able to take advantage of incentives. When the Solar Farm One project was built, EKPC was able to realize tax incentive by taking advantage of Kentucky Renewable Energy Bonds. HVT at 10:13:55.

SECTION 5

INTEGRATION AND PLAN OPTIMIZATION

The final step in the IRP process is to integrate supply-side and demand-side options to achieve an optimal resource plan. This section will discuss the integration process and the resulting EKPC plan. EKPC noted that it strives to actively manage its current and future asset portfolio with the objective of delivering reliable, affordable, and sustainable energy from a diversified set of sources while meeting the regulatory landscape. EKPC maintained that it cannot meet this goal as a stand-alone entity, but must actively work with other electric utilities, businesses, regulators, and lawmakers to achieve a diversified, cost minimizing portfolio of energy resources.[155] EKPC further averred that the acquisition of future supply-side resources requires the evaluation of not only a cash flow basis, but also present worth of revenue requirement basis and additionally, should be acquired via an RFP process.[156]

INTEGRATION AND MODELING

A detailed forecast is developed by EKPC on a biennial basis. The most recent forecast, used in EKPC's 2019 IRP, was approved by both EKPC's Board of Directors and RUS. The initial step in integration is the determination of the load requirement. As noted previously, the load forecast is developed internally and updated for this IRP analysis. Updates include changes in market and fuel prices as well as changes in DSM alternatives and DSM cost-effectiveness to more accurately represent planning conditions. DSM alternatives are analyzed using the standard California tests. Load projections are then modified based on this evaluation.[157]

For the purpose of supply-side modeling and optimization, EKPC primarily utilizes RTSim from Simtec, Inc.[158] This model calculates the hour-by-hour operation of the generation system. The output includes hourly unit generation and commitment as well as market power purchases and sales, including economy and day-ahead transactions in the PJM energy market. Generating inputs model expected outages with Monte Carlo simulations of forced outages, unit ramp rates, and unit startup characteristics so to capture the statistical variations of unit forced outages, deratings, and uncertainties in load, market prices, and fuel prices.[159] EKCP inputs the single set of load data, obtained from the EKPC Load Forecast, which allows the model to estimate four additional high

[155] IRP at page 133.

[156] *Id.*

[157] *Id.* at pages 133-134.

[158] *Id.* at page 135.

[159] *Id.*

and low range load projections around the base forecast.[160] In order to represent realistic weather patterns, the model then extracts load data representing a set of days as well as correlated market prices, fuel prices and emission costs, and assembles the hourly load over 500 iterations.[161]

To create the resource plan, EKPC utilizes RTSim's Resource Optimizer, which automatically sets up and utilizes RTSim production cost data and then runs iterations of potential resource plans to determine the optimal plan. This production cost data is utilized in coordination with the Resource Optimizer to consider various resource alternatives such as CTs, CCs, solar, wind, and seasonal PPAs.

EKPC PROJECTED CAPACITY ADDITIONS AND RESERVES

The Resource Optimizer is able to simulate thousands of combinations of potential resources with the goal of determining the lowest-cost plans when paired with the current resource portfolio. These lowest-cost plans are estimated from the NPV of total production cost and annual fixed costs of future alternatives. EKCP stated that for this IRP, the Resource Optimizer evaluated 2,500 unique expansion plans, each with five iterations that varied load, fuel and market prices, and forced outages.[162] Model results indicated projected capacity needs in 2024 and 2029 to meet the winter reserve margins.[163] Of the five most promising estimated resource plans, the Resource Optimizer selected EKPC's Case 1 to be most cost-effective.[164] Case 1 calls for 100 MW of seasonal PPA wind beginning in 2024 and an additional 100 MW of seasonal PPA wind in 2029.

DISCUSSION OF REASONABLENESS

EKPC specified that the simulation was robust and integrated risk analysis through the variations of high and low load, which in turn simulates various weather patterns and is correlated to market and natural gas prices.[165] EKPC also noted that it currently does and will continue to work with federal and state stakeholders to ensure environmental issues are met with both existing and future resources. Furthermore, the current modeling employed by EKPC simulates environmental concerns.

Staff agrees that the RTSim is a model that allows for many iterations on the demand and supply-sides. Through the quantity of iterations and load needs, EKPC

---

[160] *Id.*

[161] *Id.*

[162] *Id*. at page 139.

[163] *Id*. at Table 8-6.

[164] *Id.* at Table 8-4.

[165] *Id*. at page 139.

continues to recognize and plan for the changing economic and regulatory landscape. However, EKPC needs to continue analyzing the market as transmission constraints, merchant plants, and political issues will continue to change and hence impact both supply-side and demand-side resources. Additionally, issues stemming from coal production and increasingly competitive renewable resources to changes affecting the PJM markets can impact EKPC from both a supply and demand side. EKPC's winter reserves margins are projected to be minute through the forecast period, and since a forecast can quickly become outdated, EKCP should still continue evolving its modeling.

*L Allyson Honaker
Goss Samford, PLLC
2365 Harrodsburg Road, Suite B325
Lexington, KENTUCKY 40504

*East Kentucky Power Cooperative, Inc.
4775 Lexington Road
P. O. Box 707
Winchester, KY 40392-0707

*David S Samford
Goss Samford, PLLC
2365 Harrodsburg Road, Suite B325
Lexington, KENTUCKY 40504

*Jody M Kyler Cohn
Boehm, Kurtz & Lowry
36 East Seventh Street
Suite 1510
Cincinnati, OHIO 45202

*Larry Cook
Assistant Attorney General
Office of the Attorney General Office of Rate
700 Capitol Avenue
Suite 20
Frankfort, KENTUCKY 40601-8204

*J. Michael West
Office of the Attorney General Office of Rate
700 Capitol Avenue
Suite 20
Frankfort, KENTUCKY 40601-8204

*Honorable Michael L Kurtz
Attorney at Law
Boehm, Kurtz & Lowry
36 East Seventh Street
Suite 1510
Cincinnati, OHIO 45202

*Patrick Woods
East Kentucky Power Cooperative, Inc.
P. O. Box 707
Winchester, KY 40392-0707