COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

THE 2015 INTEGRATED RESOURCE PLAN OF EAST KENTUCKY POWER COOPERATIVE, INC.	))	CASE NO. 2015-00134

ORDER

The Commission initiated this proceeding for its Staff to conduct a review of the 2015 Integrated Resource Plan ("IRP") filed by East Kentucky Power Cooperative, Inc. ("EKPC") pursuant to 807 KAR 5:058. Attached in the Appendix to this Order is the report summarizing Commission Staff's review of the IRP ("Staff Report"). This report is being entered into the record of this case pursuant to 807 KAR 5:058, Section 11(3).

Based on the evidence of record, the Commission finds that the Staff Report represents the final substantive action in this matter.[1] The final administrative action will be an Order closing the case and removing it from the Commission's docket. That Order will be issued after the period for comments on the Staff Report has expired.

IT IS THEREFORE ORDERED that:

1. The Staff Report on EKPC's 2015 IRP represents the final substantive action in this matter.

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

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

3. An Order closing this case and removing it from the Commission's docket shall be issued after the period for comments on the Staff Report has expired.

By the Commission

ENTERED
APR 13 2016
KENTUCKY PUBLIC
SERVICE COMMISSION

ATTEST:

Aaron D. Greenwell
Acting Executive Director

APPENDIX

APPENDIX TO AN ORDER OF THE KENTUCKY PUBLIC SERVICE COMMISSION IN CASE NO. 2015-00134 DATED APR 13 2016

Kentucky Public Service Commission

Staff Report on the

2015 Integrated Resource Plan

of East Kentucky Power Cooperative, Inc.

Case No. 2015-00134

April 2016

SECTION 1

INTRODUCTION

807 KAR 5:058 was promulgated in 1990 to establish an integrated resource planning process to provide for review of the long-range resource plans of Kentucky's six major jurisdictional electric utilities by the Public Service Commission Staff ("Staff"). The Commission's goal was to ensure that all reasonable options for the future supply of electricity were being examined and pursued, and that ratepayers were being provided a reliable supply of electricity at the lowest possible cost.

East Kentucky Power Cooperative, Inc. ("EKPC") filed its 2015 Integrated Resource Plan ("IRP") on April 21, 2015. The IRP includes EKPC's plan for meeting its customers' electricity requirements for the period 2015-2029. EKPC, a generation and transmission cooperative, supplies nearly 100 percent of the power requirements of its 16 member distribution cooperatives ("Member Cooperatives"). The 16 Member Cooperatives are: Big Sandy 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. They serve primarily residential customers, which account for over 90 percent of their more than 525,000 retail customers.

EKPC owns and operates three coal-fired generating stations: Dale, Cooper, and Spurlock stations. It owns and operates nine gas-fired combustion turbines located at Smith Station. It purchases hydropower from the Southeastern Power Administration ("SEPA"). EKPC also owns and operates roughly 16 megawatts ("MW") of landfill gas generation. At the time the IRP was filed, EKPC's total winter capacity, including the SEPA hydropower, was approximately 3,276 MW.[1]

On December 1, 2015, the Commission approved EKPC's acquisition of Bluegrass Generating Station ("Bluegrass") located in La Grange, Kentucky. Bluegrass is composed of three simple-cycle combustion turbine generating units, each with a winter rating of 198 MW. This acquisition provided EKPC with an initial additional 396 MW of winter capacity from Units 1 and 2.[2] Upon expiration of the tolling agreement that was assigned to EKPC as part of that acquisition, EKPC will have an additional 198 MW of winter capacity from Unit 3 beginning April 30, 2019, bringing its total winter

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[1] IRP at 169.

[2] *See* Case No. 2015-00267, *Application of East Kentucky Power Cooperative, Inc. for Approval of the Acquisition of Existing Combustion Turbine Facilities from Bluegrass Generation Company, LLC at the Bluegrass Generating Station in Lagrange, Oldham County, Kentucky and for Approval of the Assumption of Certain Evidences of Indebtedness* (Ky. PSC Dec. 1, 2015).

capacity to 3,520 MW.[3] EKPC's all-time peak demand of 3,507 MW occurred on February 20, 2015.[4]

On June 26, 2015, an Order was issued establishing a procedural schedule for this proceeding. The schedule allowed two rounds of data requests to EKPC, written comments by intervenors and reply comments by EKPC. Intervenors in this matter are the Attorney General of the Commonwealth of Kentucky, by and through his Office of Rate Intervention ("AG") and Nucor Steel Gallatin ("Nucor"). The AG and Nucor did not submit data requests; nor did they file comments. EKPC responded to three rounds of data requests from Staff.

This report provides a review and evaluation of EKPC's 2015 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, ongoing process. This review is designed to offer suggestions and recommendations to EKPC on how to improve its resource plan in the future. Specifically, 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 2012.

EKPC stated that the objective of its IRP was to economically and reliably serve its Member Cooperatives while simultaneously mitigating financial and operational risks.[5] To meet this objective, EKPC identified the following near-term actions it would undertake:

- Continue to monitor economic and load conditions;
- Continue to develop and promote its demand-side management ("DSM") programs;
- Continuously compare purchased power agreements ("PPA") costs against other power supply alternatives identified in the Request for Proposals ("RFP") process;
- Continue to maximize the operational and economic benefits by being a member of PJM Interconnection. L.L.C. ("PJM");

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[3] EKPC's Response to Commission Staff's Third Request for Information ("Staff's Third Request"), Item 5.

[4] IRP at 2.

[5] *Id.* at 5.

- Work with federal and state stakeholders to ensure the economic vitality of EKPC's existing and future resources to meet the challenges and opportunities in complying with current and proposed environmental regulations.[6]

EKPC's total energy requirements are expected to increase by 1.4 percent per year from 2015-2034.[7] Winter peak demand is expected to increase by 1.0 percent and summer peak demand is expected to increase by 1.5 percent for the same period.[8] EKPC's annual load factor is projected to grow from 48 percent to 51 percent, which reflects the historical average.[9] With the acquisition of Bluegrass, EKPC does not plan on adding any additional resources to serve projected load until 2026.[10]

EKPC's adjusted winter peak is expected to increase from 3,207 to 3,651 MW from 2015 to 2029, for an annual growth rate of 1.0 percent.[11] Its adjusted summer peak is expected to increase from 2,334 to 2,885 MW over the same period, for a growth rate of 1.5 percent.[12] Its total energy requirements are projected to increase from 13,368,393 Megawatt-hours ("MWh") in 2015 to 16,454,469 MWh in 2029, for an annual growth rate of 1.4 percent.[13]

The IRP was developed based on a minimum reserve margin of 3.0 percent over EKPC's summer peak.[14] Through its existing DSM programs, EKPC expects a reduction in winter peak demand of approximately 238.6 MW by 2029.[15] If all of the new DSM programs are implemented, EKPC forecasts an incremental potential winter peak reduction of 137.4 MW by 2029.[16]

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[6] *Id.*

[7] *Id.* at 35.

[8] *Id.*

[9] *Id.*

[10] EKPC's Response to Staff's Third Request, Item 5.

[11] IRP at 37.

[12] *Id.*

[13] IRP at 36 and 40.

[14] *Id.* at 174. EKPC does not currently have a reserve requirement for the winter peak season. *See* EKPC's Response to Commission Staff's First Request ("Staff's First Request"), Item 39.b.

[15] *See Integrated Resource Plan Technical Appendix, Volume 2, Demand Side Management* ("DSM App."), at DSM-16.

[16] *Id.* at DSM-17.

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, Staff recommends to the Commission that the filing date for EKPC's next IRP be scheduled for April 1, 2019.

SECTION 2

LOAD FORECASTING

This section reviews and comments on the projected load growth on the Member Cooperatives' systems and EKPC's load forecasting methodology. EKPC prepares energy and peak demand forecasts as required by its primary lender, the Rural Utilities Service ("RUS"), which is part of the United States Department of Agriculture. These forecasts are the starting point in the planning process employed by EKPC in determining the level of supply-side and demand-side resources that will be required to meet the needs of the customers of its 16 Member Cooperatives. The forecast in EKPC's 2015 IRP was approved by its Board of Directors in November 2014 and by RUS in March 2015. EKPC obtains much of the data used in developing its forecast from IHS Global Insight, Inc. ("Global"), a consulting firm with utility industry expertise.[17]

REGIONAL SERVICE AREAS

In the Member Cooperatives' service areas, electricity is the primary source for water heating and space heating. Roughly 86 percent of all homes served by EKPC's Member Cooperatives have electric water heating while approximately 63 percent have electric space heating.

EKPC combines the service areas of its Member Cooperatives into seven regions for purposes of forecasting economic activity. The economies of the regions are quite varied. The Lexington and Louisville areas have a significant amount of manufacturing while the Cincinnati area has large numbers of retail trade and service jobs. Eastern and southeastern areas rely heavily on mining while tourism accounts for a significant part of the economy in the southern and southwestern areas. All areas experienced declines due to the recession that began in 2008 and have yet to fully recover.[18]

ASSUMPTIONS

The key forecast assumptions contained in the IRP and used in developing the forecasts for the 16 Member Cooperatives and EKPC included:

1. Residential customers are projected to increase by nearly 70,000 over the 15-year forecast period (2015-2029) or approximately 0.9 percent annually;
2. Member Cooperatives' service areas will experience modest economic growth; the number of regional households is projected to grow at an average annual

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[17] EKPC's forecast is based on Global's March 1, 2014 county-level economic forecasts. *See Integrated Resource Plan Technical Appendix, Volume 1, Load Forecast* ("Load Forecast App.") at 16.

[18] IRP at 46.

growth rate of 0.5 percent; employment is projected to grow at an average annual rate of 0.2 percent during the forecast period.

3. Approximately 79 percent of new households will have electric heat; 89 percent of new households will have electric water heating; nearly all new homes will have electric air conditioning, (either room-sized units or central air);

4. Naturally occurring appliance efficiency improvements will decrease retail residential sales;

5. Residential customer growth and local area economic activity will be the major determinants of small commercial growth; and

6. The forecasted load growth is based on normal weather as defined by the National Oceanic and Atmospheric Administration's ("NOAA") 30-year normals.[19]

FORECASTING METHODOLOGY

EKPC and its Member Cooperatives, working together, prepare the individual load forecasts for each cooperative. EKPC then sums the Members Cooperatives' forecasts to determine its own forecast. Several factors are given consideration in preparing the forecasts, including national, regional, and local economic performance; appliance saturations and efficiencies; population and housing trends; service area industrial development; the price of electricity and its effects on customers' responses; household income; and weather. The final forecast reflects analyses of historical data as supplemented by the judgment and experience of Member Cooperative management and EKPC staff. Both low-case and high-case forecasts are prepared in recognition of the uncertainty associated with long-term forecasting. EKPC uses the load forecast in areas such as demand-side management analysis, marketing analysis, transmission planning, power supply planning, and financial forecasting.

EKPC subscribes to Global, which collects historical county-level data for many economic variables, develops forecasting models based on the data, and provides the results to EKPC. EKPC combines Global's county-level projections into regional forecasts of economic activity for the seven regions into which it has grouped its Members Cooperatives' service areas.[20] Its forecasting methodology, with energy use dependent upon variables such as regional employment, personal income, regional population, and weather, is comparable to the methodologies seen in other utilities' IRPs.

Regional forecasts for population, employment, and income are developed and used as inputs to customer and energy forecasts for residential and small commercial customer classes. Energy sales to these classes are forecast with regression analysis, using variables such as electric price, economic activity, and regional population growth.

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[19] *Id.* at 25.

[20] *Id.* at 59.

The number of residential customers is projected using regression analysis. In all seven regions into which EKPC's Members Cooperatives' service areas are combined, several electric utilities provide service. The portion of the customers in a region served by an EKPC Member Cooperative is modeled in a "share" variable. Population "share," regional households, and household "share" are used in a regression analysis to produce a forecast of residential customers for each member system.

The number of small commercial customers is also projected using regression analysis of various regional economic data, along with the residential customer forecast. Variables include real electric prices and economic activity.

Large commercial and industrial loads are forecast by the Member Cooperatives and EKPC. The Member Cooperatives project loads of existing customers while EKPC forecasts new load based on historical development, the presence of industrial parks, and the service territory's economy.

EKPC forecasts seasonal peak demands by summing monthly energy usage for the different customer classes and applying load factors for those classes.[21] Residential energy use components are heating, cooling, water heating, and other. Using historical load factors, demand is calculated for each component and summed to derive the residential portion of the total seasonal peak demands. The small and large commercial customer class and the industrial customer class load factors are applied to energy usage for each of those classes to obtain their contributions to the system's total seasonal peak demands.

RESIDENTIAL ENERGY FORECAST

For over 30 years, EKPC has conducted residential customer surveys to gather data on appliance saturation and other factors affecting electricity demand. It also captures appliance efficiencies resulting from government standards based on data from the federal Energy Information Administration Energy Outlook for the East South Central region of the country, which includes Kentucky. The customer survey results are used to understand end-use customers' electricity consumption and project future appliance saturations. Analyses and forecasts of appliance saturation and appliance usage are performed using econometric models.

As a member of Itron's Energy Forecasting Group, EKPC receives electric appliance efficiency projections based on information from the U.S. Energy Information Administration ("EIA"). Projections used in EKPC's load forecast are from Itron's "2013

[21] In addition to the three major customer classifications (residential, small commercial, and large commercial and industrial) EKPC forecasts for three very small classes (sales to government buildings, seasonal sales, and street lighting sales). Together these small classes account for less than one-half of one percent of EKPC's sales. Energy sales for the three small classes combined are projected to increase from 48,290 MWh in 2014 to 57,232 MWh in 2029.

Residential Statistically Adjusted End-use (SAE) Spreadsheets" and incorporate data from EIA's "Annual Energy Outlook 2013."[22]

In 2013, there were 489,630 residential customers on the EKPC system and that number is projected to increase to 561,948 in 2029, which reflects an average annual growth rate of 0.8 percent.[23] In 2013, residential customers accounted for 58.1 percent of total energy sales at the EKPC system level. That percentage is projected to be 54.7 percent in 2029.[24] Monthly residential customers and monthly residential energy sales are modeled as a function of several economic variables where appropriate by EKPC. Those variables include:

a. Customer and energy sales history
b. Households
c. Population density
d. Employment
e. Real gross county product
f. Real total personal income
g. Consumer price index
h. Heating degree days
i. Cooling degree days
j. Autoregressive terms, which account for historical error for some months[25]

RESIDENTIAL SALES FORECAST RESULTS

Recognizing the incremental impacts of existing energy efficiency ("EE") programs and based on the expectation that naturally occurring appliance efficiency improvements will decrease retail residential sales, EKPC forecasts that residential energy sales growth will decline over the forecast period. According to EKPC, the annual growth rate will average 1.2 percent early in the forecast period and decline to 1.0 percent by the end of the forecast period.[26] Use per customer is expected to remain relatively constant over the forecasted period due to the economy, increasing appliance efficiencies, and rising retail electricity prices. Residential sales, which were 6,905,017 MWh in 2013, are projected to increase to 8,376,465 MWh by 2029 the last year of the forecast period. This reflects an average annual growth rate of 1.0 percent.[27] Monthly

[22] Load Forecast App. at 17.

[23] IRP at 64.

[24] Load Forecast App. at 45.

[25] *Id.* at 62.

[26] *Id.* at 64.

[27] *Id.*

use per customer is projected to increase slightly over the forecast period, from 1,218 kWh in 2014 to 1,242 kWh in 2029.[28]

SMALL COMMERCIAL ENERGY FORECAST

The small commercial customer class consists of commercial and industrial accounts with peak demands less than 1 MW. Those customers with peak demands equal to or greater than 1 MW are classified as large commercial and industrial. Most commercial customers fall within the small commercial class. There were 33,392 such customers on EKPC's system in 2013. That number is projected to increase to 40,923 by 2029, which represents an average annual growth rate of 1.1 percent.[29] In 2013, small commercial customers accounted for 16.1 percent of total energy sales on the EKPC system. Sales to small commercial customers are projected to account for 17.1 percent of total energy sales by 2029.[30] Monthly small commercial customers and monthly small commercial energy sales are modeled as a function of several economic variables where appropriate by EKPC. Those variables include:

a. Customer and energy sales history
b. Residential customer counts
c. Households
d. Population density
e. Employment
f. Real gross county product
g. Real total personal income
h. Consumer price index
i. Heating degree days
j. Cooling degree days
k. Autoregressive terms, which account for historical error for some months[31]

EKPC forecasts class sales by member system through regression analysis of historical data. Regressions for the small commercial class typically include customers as a function of residential customers, unemployment rate, and various other economic variables. The sales regression typically includes customers, electric prices, and other economic measures as explanatory variables.

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[28] *Id.*

[29] *Id.* at 65.

[30] *Id.* at 47.

[31] *Id.* at 62.

SMALL COMMERCIAL SALES FORECAST RESULTS

The small commercial class was impacted significantly by the 2008 economic downturn. EKPC's member systems serve a number of the satellite industries that produce items for Toyota Manufacturing of Kentucky and due to the automotive industry decline they were negatively impacted. Small commercial sales, which were 1,917,729 MWh in 2013, are projected to grow to 2,627,461 MWh in 2029. This represents an average annual growth rate of approximately 1.6 percent.[32] Annual use per customer is projected to grow at a slower rate, from 58 MWh in 2013 to 64 MWh in 2029, for an annual rate of 0.6 percent.

LARGE COMMERCIAL AND INDUSTRIAL ENERGY FORECAST

There were 135 large commercial and industrial customers on EKPC's system in 2013. Due to the weaker economy caused by the economic recession that began in 2008, the number of such customers had declined from 2009 to 2011. However, it has rebounded somewhat since 2011 and EKPC projects the number of large commercial and industrial customers to increase at an average rate of approximately 1.3 percent annually, growing to 160, by the year 2029.[33] In 2013, large commercial and industrial customers accounted for 25.4 percent of total energy sales on the EKPC system. Sales to these customers are projected to be 27.8 percent of total energy sales in 2029.[34]

Member Cooperatives are in frequent contact with their large commercial and industrial customers. They also communicate frequently with local industrial development groups. Such contacts help maintain the cooperatives' awareness of their current customers' production and facility expansion plans as well as the status of potential new customers.

LARGE COMMERCIAL AND INDUSTRIAL SALES FORECAST RESULTS

Large commercial and industrial sales, which were 3,017,925 MWh in 2013, are projected to grow to 4,257,257 MWh in 2029.[35] This level of growth represents an average annual growth rate of 1.5 percent. Average annual usage per customer is projected to increase from 22,355 MWh in 2013 to 26,608 MWH in 2029, which reflects an average growth rate of 0.2 percent.[36]

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[32] *Id*. at 65.

[33] *Id.* at 66.

[34] *Id*. at 48.

[35] *Id.*

[36] *Id.*

TOTAL SYSTEM ENERGY FORECAST

EKPC's 2013 total system energy requirements, including office use by it and its Member Cooperatives, and transmission and distribution losses were 12,644,590 MWh. For its total system, EKPC forecasts its total energy requirements to be 16,454,469 MWh in 2029, the last year of the forecast period, which reflects an average annual growth of approximately 1.4 percent.[37]

PEAK DEMAND FORECASTS

EKPC develops two peak demand forecasts: one for its winter peak demand and one for its summer peak demand. Peak forecasting is intended to closely reflect the relationship of weather to peak load. EKPC is today, and has been historically, a winter peaking system.

The data used to forecast seasonal peak demands includes:

1. Residential contribution to peak demand is based on energy use for water heating, air conditioning, space heating, and residual loads. Load factors for each use are applied and peak demands are summed to build the seasonal class peak demand;

2. Small and large commercial contributions to seasonal peaks are based on aggregate class demands;

3. Normal weather is assumed for the forecast period; and

4. Transmission and distribution losses are reflected in the model.

As adjusted after recognizing DSM impacts, EKPC's 2013-2014 winter and 2014 summer peak demands were 3,313 MW and 2,088 MW, respectively.[38] EKPC forecasts its base case peak demand, after DSM, to increase as shown below:

Winter Season		Summer	
2023-2024	3,418 MW	2024	2,665 MW
2028-2029	3,651 MW[39]	2029	2,885 MW[40]

These projected increases reflect an average annual growth rate of 1.0 percent in EKPC's winter peak and 1.5 percent in its summer peak. In addition to its base-case

[37] *Id.* at 37 and 40.

[38] *Id.* at 38–39.

[39] *Id.* at 38.

[40] *Id.* at 39.

forecast, EKPC develops low-case forecasts based on more pessimistic assumptions and high-case forecasts based on more optimistic assumptions. To develop low-case and high-case forecasts, EKPC adjusted several of the variables in its base-case forecast. Those include weather, electric price, residential customers, and small and large commercial energy usage. Adjusting variables such as these, EKPC developed alternative forecasts to its base-case forecast:

Low Case - Pessimistic economic assumptions with mild weather – lowest loads;

Base Case - Most probable economic assumptions with normal weather; and

High Case – optimistic economic assumptions with severe weather – highest loads.

EKPC's unadjusted peak demand in the winter of 2013-2014 was 3,425 MW.[41] Its forecasted winter peak demands (unadjusted) for the 2028-2029 winter under these cases are as follows:

Low Case - 3,188 MW
Base Case - 3,724 MW
High Case - 4,246 MW[42]

EKPC's unadjusted summer peak in 2014 was 2,192 MW.[43] Using the same variations in assumptions as for its winter peak demand, it developed summer peak demands in 2029 as follows:

Low-Case - 2,471 MW
Base-Case - 2,986 MW
High-Case - 3,399 MW[44]

EKPC also applied these variations in assumptions to its base total energy forecast and developed a low-case and high-case total energy forecast. For calendar year 2029, the results are as follows:

Low-Case - 13,757,899 MWh
Base-Case - 16,454,469 MWh
High-Case - 18,752,071 MWh[45]

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[41] *Id.* at 37.

[42] *Id.* at 72.

[43] *Id.* at 37.

[44] *Id.* at 72.

[45] *Id.*

CHANGES FROM PREVIOUS FORECAST

EKPC's total energy requirements are projected to increase from 12,644,590 MWh in 2013 to 16,454,469 MWh in 2029, an average annual increase of 1.4 percent. EKPC's winter peak demand is expected to increase from 3,425 MW in 2013-2014 to 3,724 MW in 2028-2029, an average annual increase of 0.9 percent. Its summer peak demand is expected to increase from 2,192 MW to 2,986 MW over the same period, an average annual increase of 1.5 percent. In 2013, there were 489,630 residential customers on the EKPC system and that number is projected to increase to 561,948 in 2029, which reflects an average annual growth rate of 0.8 percent.

These projections have changed somewhat since EKPC's last forecast, which was used in its previous (2012) IRP. The growth rate of residential customers in the current forecast is 0.8 percent, compared to 1.4 percent in the previous forecast. In the previous forecast, its total energy requirements reflected an average annual growth rate of 1.5 percent, compared to the rate of 1.4 percent in its current forecast. Its winter peak demand was projected to grow at a rate of 1.5 percent compared to the 0.9 percent growth rate it now projects. Its summer peak demand was expected to grow at a rate of 1.4 percent compared to the 1.5 percent growth rate in its current forecast. According to EKPC, the changes reflect slower customer growth but some moderate economic growth, compared to the previous forecast. It indicated that member systems in the eastern part of its system continued to struggle due to economic conditions, but that others were experiencing new commercial and industrial growth.

INTERVENOR COMMENTS

There were no comments filed on EKPC's 2015 IRP by either the AG or Nucor.

DISCUSSION OF REASONABLENESS

Staff is generally satisfied with EKPC's load forecasting approach, which is both thorough and well documented. Some of the major factors reflected in the forecast are: (1) nearly 60 percent of EKPC's member-system retail sales are to the residential class; (2) the average number of residential customers served by EKPC is expected to increase approximately 0.8 percent annually over the forecast period; (3) the impacts of the 2008 downturn in the economy are beginning to subside in some of the areas EKPC's Member Cooperatives serve; and, generally, (4) growth rates are lower than they were pre-2008.

The total forecasting model and its results are reasonable, as were EKPC's responses regarding the forecasts. Staff concludes that EKPC provided an adequate load forecast.

RECOMMENDATIONS FROM THE 2012 IRP LOAD FORECASTING SECTION

Staff's recommendations in the Load Forecasting Section of its report on EKPC's 2012 IRP were as follows:

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

- 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 and its energy forecasts, along with the associated values, for its residential, commercial, and industrial customer classes.

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

- EKPC should discuss and report separately the impact on demand and energy forecasts of any projected increases in electricity prices to ultimate customers in its next IRP. The price elasticity of the demand for electricity should be fully examined, discussed and a sensitivity analysis performed.

- EKPC should provide detailed support for the climate data used to determine normal weather. This should include but not be limited to the length of time chosen (i.e. 30 years or another period), the weather stations providing the data, a description of EKPC's efforts to attain the most current data available, and evidence showing that its methodology represents a reliable predictor of future weather for IRP purposes.

EKPC reported on how its actual energy and demand levels compared to its forecasted levels (pages 52-53 of the 2015 IRP). Staff will repeat this recommendation for EKPC's next IRP.

The recommendation regarding a detailed analysis of the impacts of federal mandatory efficiency improvements for appliances is reflected in EKPC's demand and energy forecasts for its residential, commercial and industrial customer classes is discussed in general throughout the IRP (See EKPC's IRP pages 22, 43, and 60). Staff is continuing this recommendation for EKPC's next IRP.

Regarding a detailed analysis of the potential impacts of future environmental requirements and an explanation of how these potential impacts are incorporated into its present forecasts, EKPC discussed this on page 23 of its IRP. It discussed how the cost estimates of compliance options are included in its long range financial forecast and in future wholesale rate predictions, with the rate forecasts then included as inputs into its load forecast model. EKPC included discussion of environmental requirements it

was reviewing in Section 9.0 of the IRP at pages 179-208. Staff is continuing this recommendation for the next IRP.

EKPC reported on the impact of increases in the price of electricity on its demand and energy forecasts and had a study to estimate the price elasticity of demand performed. This was discussed on page 24 of the IRP and the study was included as Exhibit LF-1 of the Load Forecast App.

To provide support for the climate data used to determine normal weather EKPC performed analyses using 15, 20, and 30 years of data for the period ended March 2014, compared to the NOAA normals published for the 30-year period 1981-2010. It determined that the comparison of actual to forecasted results based on the 30-year NOAA normals were reasonable and provided acceptable results, therefore, it had no basis to change from using the 30-year NOAA normals. See page 25 of the IRP.

RECOMMENDATIONS REGARDING THE 2015 IRP LOAD FORECASTING SECTION

Based on its review of the data included in the record of this case, Staff has the following recommendations for EKPC's next IRP filing in the load forecasting area.

- 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 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 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.

SECTION 3

DEMAND-SIDE MANAGEMENT

INTRODUCTION

This section addresses the DSM//EE portion of EKPC's 2015 IRP. Since the issuance of the Staff report addressing EKPC's 2012 IRP in September 2013, EKPC has increased its focus on its DSM/EE portfolio. EKPC implemented a new DSM/EE Program Tracking System from Direct Technology. EKPC states that this system supports more efficient and comprehensive data collection, program administration, and reporting capabilities.[46] EKPC also expanded three existing DSM programs to offer incentives based on the amount of energy savings, added three new DSM programs, and as of the date of the 2015 IRP, has proposed a new DSM program, Low Income with Community Action Program.[47]

For this IRP, EKPC stated that it had fine-tuned its DSM/EE modeling projections in an effort to narrow the gap between its theoretical and actual peak demand and energy savings. EKPC went on to say that it had enhanced its planning capabilities by having an EE potential savings study ("EE Potential Study") performed by GDS Associates, Inc. ("GDS"). EKPC further stated that it has set a goal of achieving an equivalent of one percent of annual retail sales in new DSM/EE annual kWh saving by year 2020, with a ramp-up period of six years, from 2015 to 2020. EKPC states that it is currently producing 0.2 percent of annual retail sales in new DSM annual kWh.[48]

EKPC uses a steering committee consisting of Member Cooperative CEOs, Member Cooperative employees, EKPC employees, and EKPC senior management to develop the programs and program implementation. The EKPC Demand-Side Management and Renewable Energy Collaborative ("DSM Collaborative") is composed of EKPC, the 16 Member Cooperatives, the Sierra Club, the Kentucky Environmental Foundation, and the Kentuckians for the Commonwealth. The DSM Collaborative produced two annual reports that included recommendations from the collaborative members.[49]

EKPC continues to develop and promote DSM programs. EKPC states it desires to develop reasonable and economic DSM programs. Given the voluntary nature of EKPC's DSM programs, participation in these programs by retail customers will ultimately determine the amount of energy savings and capacity that is avoided. EKPC confirms that it uses the California cost/benefit tests to economically justify its DSM

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[46] IRP at 12.

[47] *Id*. at 12–13.

[48] *Id*. at 17–18.

[49] *Id*. at 26–27 and DSM App., Exhibit DSM-9.

programs. Among other things, the California tests compare the cost of DSM programs to the avoided costs of capacity and energy. EKPC states it continues to pursue DSM programs that pass the Total Resource Cost ("TRC") tests, meaning that the programs, based on the cost-benefit analysis, are cost-effective. EKPC states that its power supply plans will need to be adjusted according to the actual amount of DSM realized. EKPC avers that it has kept its power supply plans flexible, which should help facilitate any DSM implementation. EKPC further states that it plans to make purchases to cover peaking power supply requirements. EKPC goes on to state that these purchases should allow for the maximum amount of DSM to be developed, while not placing the EKPC power supply system at risk.[50]

In this IRP, EKPC stated it sponsored an EE Potential Study[51] performed by GDS. The project scope included a detailed EE potential study for residential and commercial/industrial customers. EKPC also stated that with an increased focus on DSM programs, it had procured and implemented a new DSM Program Tracking System provided by Direct Technology. EKPC contends the system supports efficient and more comprehensive data collection, program administration, and reporting capabilities.[52]

EKPC also stated three existing EE programs were expanded to offer multiple rebates levels based on the amount of energy savings. The following programs changed from offering one rebate to offering three rebate levels:[53]

- Button-up Weatherization
- Heat Pump Retrofit
- Touchstone Energy Home - New home construction

EKPC further stated that new DSM programs have been added to the DSM program portfolio:[54]

- Appliance Recycling Program[55] which offers a $50 incentive per working and recycled refrigerator and/or freezer.

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[50] IRP at 6.

[51] DSM App., Exhibit DSM-1, East Kentucky Power Cooperative Energy Efficiency Potential, GDS Associates, Inc., dated March 25, 2015.

[52] IRP at 12.

[53] *Id*. at 12–13.

[54] IRP at 13.

[55] Case No. 2014-00363, *Tariff Filing of East Kentucky Power Cooperative, Inc. for Approval of a New Demand-Side Management Program for Energy Star Appliances and for Appliance Recycling* (Ky. PSC Dec. 16, 2014).

• Energy Star Appliance Program[56] offers rebates ranging from $50 - $300 for seven different Energy Star qualified appliance types.

• Energy Star Manufactured Home[57] incentivizes the manufactured home factories to upgrade new homes from HUD standards to Energy Star standards.

The following program tariff is being filed contemporaneously with this IRP:

• Low Income with Community Action Program[58] leverages the Community Action Agencies of Kentucky to provide additional funding to improve the EE of low income housing.

2015 IRP DSM VERSUS 2012 IRP DSM

EKPC states that in the 2012 IRP, the DSM/EE projections were based on a technical feasibility analysis. At that time, EKPC noted that these projections would need to be refined to better match what could be achieved year by year. For the 2015 IRP, EKPC stated it had fine-tuned its DSM/EE modeling projections to narrow the gap between its theoretical and actual peak demand and energy savings. EKPC further stated it has significantly enhanced its DSM/EE planning capabilities by undertaking a comprehensive study of EE savings potential. This is from the study performed by GDS.[59]

EKPC claims it has set a goal of achieving the equivalent of one percent of annual retail sales in new DSM/EE annual kWh savings each year. EKPC further claims the findings from the Potential Study show that this goal is achievable in the medium and long term. EKPC, however, states the levels of activity and spending far outstrip current performance and budgeting. EKPC reports that it is currently achieving 0.2 percent of annual retail sales in new DSM/EE annual kWh. To narrow this gap, EKPC stated it has established a ramp-up period of six years (2015-2020) during which time its plan is to steadily increase the investment in DSM/EE resources so that the goal of 1.0 percent of annual retail savings by the year 2020 may be achieved. EKPC claims participation projections reflect this steady increase in the years 2015-2020, then leveling off at participation levels that consistently achieve the 1.0 percent goal thereafter (from 2020-2029).[60]

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[56] *Id.*

[57] Case No. 2014-00359, *Tariff Filing of East Kentucky Power Cooperative, Inc. for Approval of a New Demand-Side Management Program Energy Star Manufactured Home Program* (Ky. PSC Jan. 6, 2015).

[58] TFS2015-00295, (Ky. PSC June 3, 2015).

[59] IRP at 17.

[60] *Id.* at 17–18.

EKPC compared the forecast DSM/EE impact projections from the 2012 IRP with the 2015 IRP. In the 2012 IRP, the projected DSM/EE impact by 2026 on energy requirements was 875,526 MWh, the impact on winter peak was 490 MW, and the impact on summer peak was 452 MW. For the 2015 IRP, the projected DSM/EE impact by 2026 on energy requirements is 923,237 MWh, the impact on winter peak is 344 MW, and the impact on summer peak is 341 MW. EKPC further forecasted the projected DSM/EE impact by 2029 on energy requirements is 1,086,303 MWh, the impact on winter peak is 383 MW, and the impact on summer peak is 367 MW.[61]

ENERGY EFFICIENCY POTENTIAL REPORT

As part of the 2015 IRP, EKPC commissioned GDS to perform an EE Potential Study. As part of the EE Potential Study, GDS looked three types of potentials: technical, economic, and achievable. The three types of potential are defined as follows:[62]

> Technical potential is the theoretical maximum amount of energy use that could be displaced by efficiency, disregarding all non-engineering constraints such as cost-effectiveness and the willingness of end-users to adopt the efficiency measures.
>
> Economic potential refers to the subset of the technical potential that is economically cost-effective as compared to conventional supply-side energy resources
>
> Achievable potential is the amount of energy use that efficiency can realistically be expected to displace assuming different market penetration scenarios for cost effective EE measures.

The purpose of the EE Potential Study is to provide a foundation for the continuation of EKPC's EE programs and to determine the remaining opportunities for cost-effective EE savings. The EE Potential Study presents results of the technical, economic, and achievable potential for electric efficiency measures for the ten-year period from January 1, 2015 to December 31, 2024.[63]

The EE Potential Study looked at 407 EE measures in the residential, commercial, and industrial sectors combined. The EE Potential Study concluded that EKPC's achievable potential for electric savings based on the TRC in 2024 is 8.5 percent of the forecast MWH sales for 2024.[64]

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[61] *Id.* at 19.

[62] DSM App., Exhibit DSM-1 at 1.

[63] *Id.* at 2.

[64] *Id.* at 3.

The EE Potential Study looked at 134 EE measures for the residential sector.[65] Of the 134 residential EE measures, EKPC stated that they evaluated 54 of the residential EE measures.[66] The eight end-use residential maximum achievable potential energy savings by 2024 are appliances; electronics; lighting; water heating; heating, ventilation, and air conditioning ("HVAC") envelope; HVAC equipment; new construction; and other. The top three end-use residential maximum achievable potential energy savings by 2024 are HVAC equipment, HVAC envelope, and lighting.[67]

The top 10 residential electric savings measures in the maximum achievable scenario are pre-paid energy display monitor, complete weatherization package, smart thermostat, ductless mini-split heat pump ("HP"), second refrigerator turn-in, specialty compact fluorescent light ("CFL") bulbs, specialty light-emitting diode ("LED") bulbs, dual fuel HP, efficient set top box, and HP (replacing electric furnace and 14 SEER air conditioning). The total estimated MWh savings for these measures is 419,494,602.[68]

The EE Potential Study also looked at 79 EE measures for the commercial sector;[69] however, EKPC states it looked at 82 commercial EE measures.[70] The 10 end-use commercial achievable potential energy savings by 2024 are lighting, space cooling, space heating, ventilation, motors, water heating, cooking, refrigeration, office equipment, and compressed air. The total potential achievable electric savings by end-use in 2024 is 196,736 MWh.[71]

The top 10 commercial electric savings measures in the achievable scenario by 2024 are occupancy sensor; low bay LED blub; outdoor LED bulb; variable frequency drives, 11 to 50 horsepower; CFL bulb high wattage; high bay LED bulb; glass door refrigerator; high performance T8 light fixture; high bay 6 or 8 lamp T8 very high output; and CFL hard wired fixture. The measure with the highest potential achievable savings is the occupancy sensor. The estimated achievable savings by 2024 is 106,788,551 kWh.[72]

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[65] *Id.* at 38.

[66] DSM App. at DSM-2.

[67] *Id.* Exhibit DSM-1 at 44.

[68] *Id.* at 62.

[69] *Id.* at 66.

[70] DSM App. at DSM-2

[71] *Id.* Exhibit DSM-1, Table 7-6 at 71.

[72] *Id.* Table 7-11 at 77.

Finally, the EE Potential Study also looked at 194 unique EE measures for the industrial sector.[73] EKPC states that it looked at 66 industrial measures.[74] The top 12 industrial electric end-use savings measures in the achievable scenario by 2024 are machine drive, lighting, ventilation, HVAC controls, process cooling, process heat, space cooling, office equipment, space heat, other, water heat, and envelope. The largest end-use savings measure is machine drives.[75] The estimated achievable savings by 2024 is 283,812 MWh.[76]

EXISTING DSM PROGRAM DESCRIPTIONS[77]

EKPC identified fourteen existing residential or commercial/industrial DSM programs in the 2015 IRP. The program descriptions, as identified by EKPC, are as follows:

1. Button-Up Weatherization Program –- The program offers an incentive for reducing the heat loss of a home. The retail member may qualify for this incentive by improving insulation, installing higher efficiency windows and doors, or by reducing the air leakage of their home. This program is available in all service territories served by EKPC. The program targets older single-family, multi-family, or manufactured dwelling.

2. Heat Pump Retrofit Program – This program provides incentives for residential customers to replace their existing resistance heat source with a high efficiency heat pump. The program targets retail members who currently heat their home with a resistance heat source. The program is targeted to site built homes, manufactured homes, and multi-family dwellings. Eligibility requirements are:

- Incentive only applies when homeowner's primary source of heat is an electric resistance heat furnace, ceiling cable heat, or baseboard heat.
- Existing heat source must be at least 2 years old.
- New manufactured homes are eligible for the incentive.
- Air-Conditioning, Heating, and Refrigeration Institute [78] ratings may range as follows: Seasonal Energy Efficiency Ratio ("SEER")[79] minimum 13; Heating Seasonal Performance Factor ("HSPF")[80] minimum 7.5.

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[73] Id. Exhibit DSM-1 at 79.

[74] *Id*. at DSM-2.

[75] *Id*. Exhibit DSM-1 at 86–87.

[76] *Id*. at 87–89.

[77] *Id*. Exhibit DSM-5.

[78] http://www.ahrinet.org/site/1/Home

[79] http://www.horizonservicesinc.com/reference/tips-articles/ratings-explained

[80] *Id*.

3. Direct Load Control of Residential Air Conditioners and Water Heaters Program – The program encourages the reduction in growth of peak demand, enabling EKPC to utilize its system more efficiently, manage market purchases, and defer the construction of new generation. Participating customers receive an annual bill credit incentive. The program is available to residential customers in the service territories of EKPC Member Cooperatives and includes the control of water heaters, air conditioners and heat pumps, and pool pumps.

4. Residential Efficient Lighting with Retailers Program – The purpose of this program is to transform the market for residential lighting by facilitating a shift in consumer purchasing decisions for the market baseline efficiency to higher efficiency lighting products. The program is designed to enter into a partnership with the retail establishments that provide residential lighting products in our service territory. EKPC will sponsor aggressive marketing and promotion activities designed to educate the customer, and will establish and nurture partnerships with key retailers including the development of point of sale marketing materials. It is expected that retailers will develop their own marketing as well as sponsor local advertising initiatives. EKPC will underwrite certain discounts and incentives for CFL and LED bulbs that are sold to residential members of EKPC Member Cooperatives according to agreements and procedures established between EKPC and the retailers.

5. Touchstone Energy Home Program – This program is designed to provide guidance during the building process to guarantee a home that is 15-20 percent more efficient than the standard Kentucky built home. The standard built new home in rural Kentucky typically receives a score of 100 on the Home Energy Rating System ("HERS") Index. A HERS Index Score of 100 means the home is built to only moderate levels of efficiency- generally the 2004 International Energy Conservation Code.[81] To qualify as a Touchstone Energy Home under EKPC's program, the participating single-family home must be located in the service territory of a participating Member Cooperative and must meet the program guidelines following one of the three available paths of approval. Multi-family dwellings pre-approved by EKPC may be eligible.

6. Energy Star Manufactured Home Program – This program is designed for end-use cooperative members of EKPC's Member Cooperatives who purchase an energy efficient manufactured home. EKPC will accomplish this by providing manufactured home producers with an incentive to manufacture and install new Energy Star certified manufactured homes. To be eligible for the incentive, new manufactured homes must meet the following criteria:

- United States Environmental Protection Agency ("EPA") and Systems Building Research Alliance ("SBRA") guidelines as an ENERGY STAR® Manufactured Home.

[81] https://www.iccsafe.org/cs/codes/Documents/2006-07cycle/FAA/IECC.pdf

- Primary source of heat must be a heat pump 13 SEER & 7.5 HSPF or higher as required by SBRA.
- Home must be all electric.
- Home must be installed by the manufacturer on lines served by one of EKPC's 16 Member Cooperatives.

7. HVAC Duct Sealing Program – This program offers blower door tests to evaluate and identify costly duct-leaking and an incentive to seal leaking ductwork. The program is designed to reduce dust losses to 10 percent or less, and duct loss measurement requires the use of a blower door test and the blower door subtraction method and/or duct blaster. This program is targeted to single-family homes using electric furnaces or electric heat pumps. Eligibility requirements are:

- Limited to homes that have centrally ducted heating systems in unconditioned areas, using only electricity as a fuel source.
- Duct system must be 2 years old or older.
- Initial duct leakage must test above 10 percent of the fan's rated capacity.
- Contractor or Co-op Representative are required to conduct a "pre" and "post" blower door test to verify reductions.
- Duct leakage per system must be reduced to below 10 percent of the fan's rated capacity (assuming 400cfm per ton, ex. 2 ton system= 800cfm, thus duct leakage must be reduced to 80cfm or less). If duct system cannot be reduced to 10 percent of the fan's rated capacity, contractor is expected to provide a detailed justification.
- All joints in the duct system must be sealed with foil tape and mastic. Foil tape alone does not qualify as properly sealing the duct system.
- For homes that have two separately ducted heat systems, each system will qualify independently for the incentive.

8. Low Income with Community Action Program or Community Assistance Resources for Energy Savings ("CARES") – The CARES program provides an incentive to enhance the weatherization and EE services provided to the end-use member of the 16 Member Cooperatives of EKPC by the Kentucky Community Action Agency ("CAA") network, a not-for-profit community action agency. EKPC provides an incentive through the Member Cooperative to the CAA on behalf of the end-use member. The CARES program has two primary objectives: (1) EKPC's incentive will enable the CAA to accomplish additional EE improvements in each home and (2) the additional incentive from EKPC will assist the CAA in weatherizing more homes. The homeowner qualifications are the following:

- A participant must be an end-use member of one of EKPC's 16 Member Cooperatives.
- A participant must qualify for weatherization and EE services according to the guidelines of the Weatherization Assistance Program administered by the local CAA. Household income cannot exceed the designated poverty guidelines administered by the CAA.

- A participant must dwell in either a Heat Pump-Eligible Home or a Heat Pump-Ineligible Home. For purposes of this tariff:

> A Heat Pump-Eligible Home is a single family or multi-family individually metered residential dwelling that utilizes electricity as the primary source of heat or that switches from wood as its primary source of heat to an electric furnace; and
>
> A Heat Pump-ineligible Home is a single family or multi-family individually metered residential dwelling that does not utilize electricity as the primary source of heat but cools the home with central or window unit air conditioners. Each Heat Pump-Ineligible home must also have an electric water heater and use an average of 500 kWh monthly from November to March.

9. Energy Star Appliances Program – This program offers an incentive or rebate for reducing the energy consumed by household appliances. The end-use member may qualify for this incentive by purchasing an Energy Star qualifying appliance that is listed in this tariff, such as refrigerators/freezers, dishwashers, clothes washers, heat pump waters heaters, and air conditioners and heat pumps.

This program targets new single or multi-family homes, existing single or multi-family homes, or manufactured homes purchasing Energy Star appliances. Eligibility requirements are detailed below and are available at each participating Member Cooperative's office and website.

- Product must be certified by EPA as an Energy Star Appliance. Eligible models can be found on www.energystar.gov.
- Product must be purchased after November 3, 2014.
- Rebate application must be completed and original receipt or copy must be provided for verification.
- Receipt must include the following information:
  1. Retailer's name;
  2. Itemized listing of product(s), including description(s), manufacturer(s), model number(s), or other identifying information. The receipt information must match the product information from the rebate application;
  3. Purchase price and proof that full payment was made;
  4. Purchase date and date of delivery or installment (if installed by a contractor); and
  5. For new construction, a Member Cooperative energy advisor ("energy advisor") may enter the rebate application on behalf of the end-use member. For an application entered by the energy advisor with the application must be accompanied by a picture of the appliance model number and serial number. Rebate

applications for new constructions, without a receipt, will only be accepted through an energy advisor.

10. Appliance Recycling Program – This program offers an incentive for the removal and recycling of old energy-inefficient refrigerators and freezers resulting in lower energy consumption at the participating residences. The program targets existing single-family, multi-family, and manufactured homes that currently have old energy-inefficient refrigerators or freezers. The residential end-use member may be eligible for this incentive by offering an existing refrigerator or freezer, subject to detailed eligibility requirements, to be picked-up and recycled. Eligibility requirements are:

- Must be a residential end-use member of an EKPC Member Cooperative.
- End-use member must own the appliance(s) being turned in for recycling.
- End-use member must be eligible for the incentive - maximum 2 qualifying units per metered account per calendar year.
- Appliance must be between 7.75 and 30 cubic feet.
- Appliance must be plugged in, operational, working, and cooling when collection team arrives.
- Appliance must be empty and have a clear path for removal.
- Appliance must be picked up from the service address on the end-use member's billing account.

11. Commercial Advanced Lighting Program – This program is an EE program that encourages commercial customers to install high efficiency lamps and ballasts in their facilities. To qualify for this program the customer must be on a retail commercial rate. The commercial customer must have been in operations for at least two years prior to January 1, 2011, and be current on its power bill payment to the Member Cooperative. No empty buildings, inactive warehouses, or inactive storage areas shall qualify. The commercial or industrial customer must be open or have its normal lighting load on for at least 50 hours per week. Retrofits of parking lot lighting, provided on photocell control, are eligible.

12. Industrial Compressed Air Program – This program is designed to reduce electricity consumption through a comprehensive approach to efficient production and delivery of compressed air in industrial facilities. This program includes (1) training of plant staff; (2) a detailed system assessment of the plant's compressed air system including written findings and recommendations; and (3) incentives for capital-intensive improvements. EKPC states it will conduct an ultrasonic compressed air leakage audit and provide the results of the audit to the customer. To qualify, customers must be on a retail industrial rate and must be a manufacturing operation with a compressed air system that is turned on during all the operating hours of the facility to qualify. The customer must have been in operations for at least two years prior to January 1, 2011, and be current on its power bill payment to the Member Cooperative.

13. Large Interruptible Program – The objective of this program is to reduce peak through implementing a special interruptible contract with EKPC's largest retail

customer. EKPC stated that it and one of its Member Cooperatives have entered into a long-term agreement that provides certain demand credits to the large retail customer in return for the right to interrupt load on a 10-minute or 90-minute notice.

14. Other Interruptible Program – This program offers incentives to large commercial and industrial customers in return for allowing the utility to interrupt their load. The customer must sign a contract for a special interruptible rate. EKPC stated that customers are notified that a power interruption is to begin at a specified time. EKPC further stated that the customer then reduces their load to a pre-determined firm level. In return for allowing the utility to interrupt this load, the customers are given a monthly credit on their demand charge for all demand above the firm capacity requirements. The credit amount varies, depending on the length of the notice required and the maximum number of hours per year that the load can be interrupted. EKPC states that this program is available to existing large commercial or industrial facilities in the service territory of a participating EKPC Member Cooperative. It is most suitable for customers who can reschedule operations quickly or who own emergency generators. EKPC further stated that to qualify, a customer must have at least 250 kW of load that is interruptible, have the ability to interrupt that load with notice ranging from 10 minutes to one hour, and be willing to interrupt that load for up to 12 hours per interruption in the summer (six hours in the winter), with a maximum of 200-400 hours of interruption per year.

NEW DSM PROGRAM DESCRIPTIONS[82]

EKPC identified eleven new programs that appear to be cost-effective. These programs are currently in the planning stage. The programs are being designed based on the results of the EE Potential Study that showed potential exists for the measures targeted by these programs.

1. Consumer Electronics Program – This program is designed to work cooperatively with retailers, such as big box retail stores and consumer electronics stores, to increase the penetration of Energy Star qualified televisions, desktop computers, and set top boxes. This program will be available for any residential customer who is purchasing one of the qualified consumer electronics products.

2. Residential Exterior Lighting Program – This program is intended to transform the market for residential exterior lighting by facilitating a shift in consumer purchasing decisions from market baseline efficiency to higher efficiency lighting products. The program is to provide incentives to residential retail members who purchase efficient CFL bulbs and LED exterior lighting products. This program is designed to operate as an add-on component to the Residential Lighting program. The program will include partnering with retail firms that provide residential lighting products in our service territory. EKPC intends to underwrite certain discounts and incentives for CFL and LED light bulbs that are sold to residential members of Member Cooperatives.

[82] DSM App., Exhibit DSM-6.

3. Residential Water Heater Conservation Program – This program is designed to offer direct installation of water heater conservation members to reduce the electricity consumption in participating homes. EKPC states it will enlist the services of one or more qualified contractors to install low-flow showerheads and water heater pipe wrap at homes with electric hot water heaters. The service will be offered at no charge to the participating end use customer. EKPC further states that the program will underwrite the cost of any needed repairs associated with the installation of these measures. The program is designed to reach residential customers who currently heat their domestic hot water with electricity.

4. Smart Thermostat Program – This program is designed to provide incentives to residential retail members to install qualified smart thermostats. Field studies have shown that many programmable thermostats are not actually programmed, because of usability and design problems. They are too complicated for many consumers. Smart thermostats do not require the homeowner to program the device in order for savings to occur. Instead, smart thermostats are learning thermostats that adapt the schedule of thermostat settings based on the daily routine in the home. Well-designed impact evaluations have demonstrated that smart thermostats saved customers about 10-12 percent on their heating bills and 15 percent on their cooling bills. The program is designed to reach residential customers who heat their homes with electricity.

5. Home Energy Information Program – This program uses information on home energy usage to help customers manage their energy use and save energy. The program is designed to offer two kinds of information delivery: the home energy display-monitor, and the home energy report. EKPC Member Cooperatives have experience using a display monitor with their pre-pay programs, and the results show significant energy savings. The second approach is to provide the customer with regular reports that compare their energy use to the energy use of similar households. This reports approach combines customer-specific energy usage data with demographics and housing data to produce specific, targeted recommendations to motivate the customer to install EE measures and save electricity. EKPC plans to conduct evaluation, measurement, and verification activities to verify the savings level and savings persistence for this program during the first three years of implementation. The program will be available for all residential customers but initial marketing efforts will be directed toward households with higher than average electricity usage.

6. Commercial & Industrial Demand Response Program – This is a demand response program designed to provide incentives to large customers to reduce their electricity demands on the grid, with short notice (less than 24 hours), for short periods of time, in response to short term conditions external to the customer facility. Typically, those conditions will be either an excessively high price or a shortage of available power. Participants are reimbursed for the cost of the smart meter needed, and receive an annual incentive of $30 per kW offered. The program is designed for customers with peak demands above 50 kW.

7. Industrial Process Efficiency Program – This program provides financial and engineering resources to industrial customers to save electricity in their industrial processes. Incentives are structured as a standard offer payment per first year kWh with partial payment upon approval of the engineering proposal, and final payment on verified savings. The program as designed includes an audit, a feasibility study, proposal review and approval, and savings verification. The emphasis will be on electric supply system improvements, sensors and controls, and energy information systems for process heating, cooling, and refrigeration. The program is designed for industrial customers who have process loads that represent a significant share of their electricity consumption.

8. Industrial Machine Drives Program – This program is designed to improve the efficiency of machine drive equipment in the industrial sector. Incentives will be provided for compressed air system management, pump system efficiency improvements, motor system optimization, electric supply system improvements, sensors & controls, and other machine drive improvements. This program is designed to improve machine drive efficiency for the industrial market. The incentive is available to any existing commercial or industrial facility in the service territory of a participating EKPC Member Cooperative. The facility must have been in service for two years.

9. Direct Load Control for Commercial AC Program – The objective of the program is to reduce peak demand and energy usage through the installation of load control switches on commercial air conditioners ("AC"). Peak demand reduction is accomplished by cycling equipment on and off according to a predetermined control strategy. Central AC units are cycled on and off. The typical control duration is four hours. Participating customers receive an annual bill credit incentive. EKPC plans to rely on a third party administrator to provide enrollment, installation, service calls, and measurement and verification services. EKPC plans to offer an incentive of $40 per year for each commercial AC being controlled by a switch. This recognizes the load contribution of the commercial facility. The AC incentive will consist of $10 per month bill credits during four hot weather months.

EKPC stated its goal was to enroll 6,000 commercial customers over the next five years. EKPC also stated that the participation goal represents a cumulative penetration of 20 percent of the current eligible market of commercial facilities with central AC. The primary program targets are commercial customers with central AC (including heat pumps). EKPC further stated the incentive is available to any commercial retail member of a participating EKPC Member Cooperative who has a qualifying central AC.

10. Commercial & Industrial Equipment Rebate Program – This program promotes high efficiency cooling, ventilation, HVAC controls & sensors, refrigeration, and water heating equipment and other efficiency measures for these end uses. There will be standard rebates for prescriptive measures, and a standard offer of cents per kWh for custom measures. Custom measures will require upfront approval and back-

end verification for full payment. The incentive is available to any existing commercial or industrial facility in the service territory of one of EKPC's Member Cooperatives.

11. Commercial New Construction Program – This program promotes integrated design, commissioning, and more advanced technologies in commercial new construction. Electricity savings are realized across a number of end-uses, with the majority occurring from lighting, cooling, and heating. It is anticipated that new K-12 schools would be served by this program. This program is designed to serve the commercial new construction and major renovation market, including the K-12 schools market.

DISCUSSION OF REASONABLENESS / RESPONSE TO 2012 RECOMMENDATIONS

The Staff Report on the 2012 EKPC IRP made nine recommendations regarding EKPC's DSM efforts. The recommendations and responses are as follows:

1. EKPC should fine tune its DSM/EE modeling projections in its next IRP in order to close the gap between its theoretical and actual peak demand and energy savings.[83]

For this 2015 IRP, EKPC stated that it has fine-tuned its DSM/EE modeling projects to narrow the gap between its theoretical and actual peak demand and energy savings. EKPC states that it has set the goal of achieving the equivalent of 1.0 percent of its annual retail sales in new DSM/EE annual kWh savings each year. EKPC contends that the findings from the EE Potential Study show that this goal may be achievable in the medium- and long-term. EKPC further states however that the levels of activity and spending far outstrip current performance and budgeting. In fact, EKPC contends that it is currently producing 0.2 percent of annual retail sales in new DSM/EE annual kWh.[84]

EKPC states that in order to narrow this gap, it has established a ramp-up period of six years (2015-2020) during which time it plans to steadily increase its investment in DSM resources so that the goal of 1.0 percent of annual retail savings by the year 2020 can be attained. EKPC further states that participation projections reflect this steady increase in the years 2015-2020, then leveling off at participation levels that consistently achieve the 1.0 percent goal thereafter(from 2020-2029).[85]

2. EKPC should report on the work of its DSM/EE Collaborative and provide the dates of all Collaborative meetings that take place after the issuance of this report and prior to the filing of its next IRP.[86]

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[83] IRP at 26.

[84] *Id.*

[85] *Id.*

[86] *Id.*

EKPC states the DSM and Renewable Energy Collaborative ("Collaborative") was a joint project of EKPC, its 16 Member Cooperatives, the Sierra Club, the Kentucky Environmental Foundation, and Kentuckians for the Commonwealth. EKPC states that this group met quarterly over the two-year period that it was in existence (March 2011 – April 2013) to evaluate and recommend actions for EKPC to expand deployment of renewable energy and demand-side management, and to promote collaboration among participants in the implementation of those ideas.[87]

EKPC reports that the Collaborative produced two annual reports which provided the dates of the Collaborative meetings; summarized those meetings; and presented reports and recommendations from the work groups. The annual reports are provided as Exhibit DSM-9 in Technical Appendix - Demand Side Management to this IRP.[88]

3. EKPC should include all environmental costs, as they become known, in future benefit/cost analyses.[89]

EKPC states it has included all known environmental costs in the avoided costs it used to conduct benefit/cost analyses on DSM/EE resources for this plan.[90]

4. EKPC should continue studying the PJM capacity markets for economic opportunities related to its DSM/EE programs and participate at the earliest, most practical time.[91]

EKPC states it studies the PJM capacity markets for opportunities related to its DSM and EE programs. EKPC is currently participating in the capacity auction with its demand response resources. EKPC states that it is not yet bidding DSM/EE programs into the capacity market, although it will continue to study that opportunity. Based on history, EKPC has concluded that its EE programs cannot bear the cost of the evaluation, measurement and verification ("EM&V") rigor needed to meet PJM's standards.[92]

EKPC believes that there is great uncertainty at the present time regarding whether and how demand side resources will participate in the PJM capacity markets in the future. EKPC also believes this uncertainty stems from the May 2014 DC Circuit Court of Appeals ruling (the "EPSA" decision) on Federal Energy Regulatory Commission ("FERC") jurisdiction over demand response ("DR"). EKPC states that in

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[87] *Id.*

[88] *Id.* at 26–27.

[89] *Id.* at 27.

[90] *Id.*

[91] *Id.*

[92] *Id.*

the May 2014 ruling, the DC Circuit Court of Appeals vacated FERC Order 745, which set compensation rates for DR in wholesale energy markets.[93] EKPC further believes the ruling also called into question FERC's jurisdiction to regulate the participation of retail energy customers in wholesale capacity markets.[94]

EKPC reports that soon after the Appeals Court decision, FirstEnergy filed a complaint with FERC, arguing that the decision applies with equal force to capacity markets, and demanding that it force PJM to unwind its May 2014 Base Residual Auction to exclude the 11,000 or so megawatts of DR that won bids for the 2017/2018 season. EKPC further reports that in January 2015, the U.S. Solicitor General, on behalf of the FERC, filed a Supreme Court challenge to the lower court ruling. EKPC believes there are several scenarios that could develop based on how the Supreme Court proceeds. EKPC reports that PJM has filed a stop-gap plan to attempt to cope with the uncertainty. EKPC reports that this proposal would allow DR to participate in the May 2015 Base Residual Auction for capacity markets in the event the Supreme Court declines to hear the appeal. EKPC believes it is likely that there will be significant changes to the manner in which DR resources participate in the PJM wholesale markets. EKPC states it will continue to monitor developments and direct its future participation accordingly.[95]

5. EKPC should include an update on bidding its peak savings from DSM/EE into the PJM capacity markets.[96]

EKPC responded that it bid 83.3 MW of DR capacity in 2013/2014 and 128.2 MW of DR capacity in 2014/2015 into PJM.[97]

6. EKPC should work with its Member Cooperatives to further educate and encourage them and their customers about the importance of DSM/EE and energy conservation.[98]

EKPC stated it conducts multiple meetings per year with the member services staff of the Member Cooperatives, and that it also conducts multiple training sessions

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[93] In January 2016, the U.S. Supreme Court reversed the DC Circuit and upheld FERC Order 745. Because the Supreme Court's decision came after EKPC filed its IRP, EKPC's comments questioning FERC's jurisdiction to regulate participation of retail energy customers in wholesale capacity markets may no longer be valid. *See FERC v. Electric Power Supply Assoc.*, 577 U.S. ___, 136 S.Ct. 760, 193 L.Ed. 2d 661 (Jan. 25, 2016).

[94] IRP at 27.

[95] *Id.* at 27–28.

[96] *Id.* at 28.

[97] *Id.*

[98] *Id.*

each year with the energy advisors from the Member Cooperatives. EKPC further stated it launched three new DSM programs for 2014 and it had multiple training sessions with Member Cooperative staff educating them on how these programs work.[99]

7. EKPC should 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.[100]

EKPC states that the DSM Collaborative focused on identifying new programs and best practices and enhancing existing programs. It states that the DSM Collaborative members provided valuable suggestions for new program ideas and EKPC enhanced and changed programs based on their advice. EKPC gave an example of expanding the Envirowatts[101] program and it received tariff approval in 2014 to add in wind, solar, and hydro resources in addition to landfill gas.[102] [103]

EKPC states that Collaborative members encouraged it to move ahead with its low-income program and its Energy Star appliances program. EKPC further states the Collaborative recommended EKPC continue to promote the How$martKY on-bill financing program[104] in partnership with the Mountain Association for Community Economic Development.[105]

8. EKPC should continue to work with stakeholders in developing energy-efficiency reporting guidelines, standards, and templates.[106]

EKPC stated it has developed EE reporting standards and templates by working with stakeholders. EKPC states that this work set the stage for EKPC to set up its new DSM Tracking System, which became operational in 2014.[107]

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[99] *Id*. at 28–29.

[100] *Id*. at 29.

[101] EKPC Tariff, P.S.C. KY No. 34, First Revised Sheet No. 20, Section H, Wholesale Renewable Energy Program (Ky. PSC Aug. 18, 2014).

[102] *Id.*

[103] IRP at 29.

[104] Five Member Cooperatives are participating in this program: Big Sandy RECC; Fleming-Mason Energy Cooperative, Inc.; Grayson Rural Electric Cooperative Corporation; Jackson Energy Cooperative Corporation; and Farmers Rural Electric Cooperative Corporation.

[105] IRP at 29.

[106] *Id.*

[107] *Id.*

9. EKPC should report, by year, on its DSM programs' energy savings and peak demand reductions.[108]

EKPC reports it produces an annual report on DSM/EE program savings that is submitted to the Public Service Commission and that the 2013 annual report was provided to the PSC in April of 2014.[109] EKPC also states it held an informal conference with the Commission to review the report.[110] The 2014 annual report was filed as a response to a request for information.[111]

Based on EKPC's response to each of the nine recommendations made by Staff in its report on the 2012 IRP, Staff notes that it is satisfied that EKPC has addressed each of those nine recommendations in this proceeding.

EPA CLEAN POWER PLAN

As the Commission has stated in several orders, it believes that conservation and DSM/EE become more important and cost-effective, given expectations that more constraints will be placed upon coal-based generation. The Commission notes that on August 3, 2015, the EPA announced, under Section 111 (d) of the Clean Air Act, its Clean Power Plan ("CPP") to reduce carbon emissions from existing power plants.[112] The CPP includes three building blocks to guide states in developing cost-effective, long-term strategies to reduce carbon dioxide emissions.

While DSM/EE is not part of the building blocks in the EPA's CPP, DSMEE can still be used by the states to meet its targets/goals. As part of the CPP, the EPA has created a Clean Energy Incentive Program to provide opportunities for investments in renewable energy and DSM/EE that is to deliver results in 2020 and/or 2021.

Although EKPC has a number of DSM/EE programs in place, Staff encourages EKPC and all other electric energy providers, to continue to enhance their efforts to offer cost-effective DSM/EE programs.

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[108] *Id.*

[109] IRP at 29 and DSM App., Exhibit DSM-2.

[110] IRP at 29–30.

[111] EKPC's Response to Staff's First Request, Item 11, at 4-28.

[112] Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. 64661-65120 (Oct. 23, 2015). On Feb. 9, 2016, the U.S. Supreme Court stayed implementation of the CPP pending judicial review. *West Va. v. EPA,* 577 U.S. No. 15A773 (Feb. 9, 2016). The U.S. Court of Appeals for the District of Columbia Circuit will hear oral arguments on June 2, 2016 in an expedited consideration of a consolidated challenge to the CPP. *West Va. v. EPA*, Case No. 15-1363 (D.C. Cir. Jan. 21, 2016).

RECOMMENDATIONS

EKPC's current and possible future DSM programs continue to represent a major effort to increase its achievable peak reductions and energy savings. These efforts should continue to assist EKPC in avoiding a substantial capacity deficiency as well as providing economic opportunities for EKPC, its customers, and other stakeholders.

Following are Staff's recommendations:

- 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;

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

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

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

- 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.

SECTION 4

SUPPLY-SIDE RESOURCES AND ENVIRONMENTAL COMPLIANCE

INTRODUCTION

This section summarizes, reviews, and comments on EKPC's evaluation of existing and future supply-side resources. It also includes discussion on various aspects of EKPC's environmental compliance planning.

EXISTING CAPACITY

EKPC, at the time of filing this IRP, owned 35 generating units located at nine sites with a combined 2,671 MW of summer capacity.[113] The generating fuel sources include natural and landfill gas along with coal. Shortly after the filing of this case, EKPC notified the Commission of its intent to acquire through a facility purchase three natural gas-fired simple cycle combustion turbines, to assist it in meeting its winter load, located in Oldham County. In December 2015, the Commission approved EKPC's application for the purchase of the existing generating facilities of Bluegrass Generation Company, LLC, located in Oldham County, Kentucky.[114] The addition of three natural gas-fired simple cycle combustion turbines added 594 MW of capacity to EKPC's generation portfolio.[115]

EKPC's first power plants were coal-fired plants built at the Dale Station in Clark County. Units 1 and 2, rated at 23 MWs each, were constructed in 1954. The next two plants, each rated at 75 MWs, began operation in 1957 and 1960. Since the last IRP, EKPC retired the first two units in April 2015 and Units 3 and 4 are scheduled for retirement in April 2016.[116]

In 1965 EKPC constructed a 116 MW unit at the Cooper Station near Somerset, Kentucky and followed it four years later with construction of a 225 MW unit. Both of these plants are conventional coal-fired generating units. Unit 2 was retrofitted in 2012 with pollution control equipment to comply with the Mercury and Air Toxics Standards ("MATS") rule. EKPC also studied least-cost alternatives to bring Unit 1 in compliance with the MATS rule. After extensive analysis, EKPC determined that the Unit 2 pollution control equipment was robust enough to meet air emission regulations for the combined

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[113] As a member of PJM, EKPC plans its capacity resources based upon its obligation coincident to PJM's regional peak summer load and reports capacity as summer capacity.

[114] *See* Case No. 2015-00267, *East Kentucky Power Cooperative, Inc.* (Ky. PSC Dec. 1, 2015).

[115] 198 MW output from Unit 3 is committed to Louisville Gas &Electric Company and Kentucky Utilities Company ("LG&E/KU") through April 30, 2019, when it will transfer the EKPC system.

[116] IRP at 81, Table 8.(3)(b(1-11)-1).

Unit 1 and Unit 2 plant effluents. A duct reroute for Unit 1, which allows its effluent to flow through Unit 2's air quality control system, is currently underway and will be operational before April 2016.[117]

In 1977, EKPC constructed a 300 MW unit at the Spurlock Station on the Ohio River banks near Maysville, Kentucky. Four years later it constructed a 510 MW unit. The two plants burn pulverized coal and utilize flue gas desulfurization ("FGD") technology for pollution control. The final two coal-fired plants were constructed at the Spurlock Station in 2005 and 2009, respectively. Each of these units utilize fluidized bed-boiler technology and are rated at 268 MW each.[118]

As a tangent, steam that is generated by Spurlock Units 1 and 2 is used by the adjacent International Paper Corporation ("IPC") facility in its recycling operation. The IPC plant is operable 99.1 percent of the time and has an expected 29 MW steam load.[119]

EKPC has nine peaking gas/fuel-oil combustion turbines located in Clark County at the J.K. Smith site. The three ABB GT 111N2 combustion turbines individually have 110 MW summer and 142 MW winter ratings. The four GE 7EA combustion turbines each have a 73 MW summer and 100 MW winter rating. Finally, the two LMS 100 turbines separately have a 76 MW summer and a 101 MW winter rating.[120] In addition, EKPC owns and operates five landfill gas facilities, with 14.4 MW of combined capacity.[121]

The following table lists EKPC's existing operating facilities along with the total number of units at each facility, the primary and secondary fuel types, and the total capacity at each site.

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[117] IRP at 79.

[118] *Id.* at 79–80.

[119] *Id.* at 80.

[120] *Id.*

[121] *Id.*

EKPC EXISTING OPERATING CAPACITY[122]

FACILITY	UNIT	FUEL – PRIMARY	FUEL – SECONDARY	CAPACITY (MW)
COOPER	1	COAL		116
	2	COAL		225
DALE	3*	COAL		74
	4*	COAL		75
SMITH	1	NATURAL GAS	FUEL OIL	110
	2	NATURAL GAS	FUEL OIL	110
	3	NATURAL GAS	FUEL OIL	110
	4	NATURAL GAS	FUEL OIL	73
	5	NATURAL GAS	FUEL OIL	73
	6	NATURAL GAS	FUEL OIL	73
	7	NATURAL GAS	FUEL OIL	73
	9	NATURAL GAS	FUEL OIL	76
	10	NATURAL GAS	FUEL OIL	76
SPURLOCK	1	COAL		300
	2	COAL		510
	3	COAL		268
	4	COAL		268
BLUEGRASS	1	NATURAL GAS		198
	2	NATURAL GAS		198
	3**	NATURAL GAS		198
FIVE PLANTS		LANDFILL GAS		14.4

* Scheduled to retire by April 15, 2016
** Power available to EKPC May 1, 2019[123]

EKPC has a long term purchase agreement in place with SEPA for power generated in the Cumberland System; comprised of the Laurel, Wolfe Creek, and Center Hill hydro plants. In 2007, EKPC was notified by the Corps of Engineers of seepage issues at the above mentioned system, affecting all but the Laurel Dam. Currently, the Wolfe Creek Dam has been repaired and is functioning normally while work is projected through spring 2018 on the Center Hill Dam. The dam repairs have limited EKPC's current SEPA power allotment to 157 of the traditionally scheduled 170 MWs. EKPC and SEPA anticipate a return to normal allocations in mid-2018.[124]

In the 2015 IRP, EKPC's projected 2026 capacity needs dropped 400 MWs compared to its 2012 IRP projections.

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[122] *Id.* at 79–85.

[123] The cost to EKPC for the delivery of excess power from Bluegrass above EKPC's load on LG&E/KU's transmission network is currently under dispute at FERC. *See* Case No. 2015-00267, *East Kentucky Power Cooperative, Inc.* (Ky. PSC Dec. 1, 2015) Order at 16–17.

[124] *Id.* at 34–34a.

As a result of becoming a PJM member in 2013, EKPC's projected future needs are based on summer peak loads. While this holds true for the PJM requirement, EKPC has an obligation to economically meet its members' winter peak load.[125] Prior to joining PJM in 2013, EKPC was already short on capacity to meet its winter load. EKPC assumed, based on historical price duration curves and PJM market operations, that upon joining PJM, it could rely on PJM's capacity markets to economically supply this capacity shortage. The uncharacteristically cold temperatures in January 2014 and February 2015 changed the cost and availability of energy in PJM markets significantly and permanently, driving EKPC's need to develop a hedging position.[126] EKPC decided with the economic variability of the PJM markets, that its Member Cooperatives were better served if EKPC secured an energy hedge.

EKPC's power plan objective is to develop an economic, reliable plan, while simultaneously mitigating operational and financial risks.[127] A recommended plan of action for EKPC is to compare PPA costs against other power supply alternatives identified in its RFP process. In the summer of 2014, EKPC refreshed a July 2012 released RFP and evaluated the updated responses.[128] As a result, in the winter of 2014-2015, EKPC purchased 200 MWs through a third party PPA. The PPA provided immediate relief from market prices for EKPC, yet EKPC preferred a more permanent solution. After much internal and external consulting analysis, EKPC purchased Bluegrass as a direct result of this process.[129]

EKPC's projected capacity additions and reserve needs for 2015–2029 are shown in the table below. Included in the projected capacity are 170 MWs from SEPA, the impact of existing and new DSM programs, and the addition of Bluegrass.[130]

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[125] *Id.* at 20.

[126] *Id.* at 30.

[127] *Id.* at 5.

[128] *Id.* at 30.

[129] EKPC's Response to Commission Staff's Second Request for Information ("Staff's Second Request"), Item 4.

[130] EKPC's Response to Staff's Third Request, Item 5.

Projected Capacity (MWs)

Year	Other Cap.	Peaking/Int. Capacity		Total Capacity		3% Reserves		Reserve Margin %	
		Win	Sum	Win	Sum	Win	Sum	Win	Sum
2015				3276	2922	0	70	2	22
2016		396	330	3572	3002	0	70	11	24
2017				3322	3002	0	71	3	23
2018				3322	3002	0	72	2	22
2019			165	3322	3167	0	72	2	28
2020		198		3520	3167	0	73	8	27
2021				3520	3167	0	74	8	25
2022				3520	3167	0	74	8	24
2023				3520	3167	0	75	7	23
2024				3520	3167	0	76	7	21
2025				3520	3167	0	77	6	20
2026	50			3570	3217	0	78	7	20
2027				3570	3217	0	79	6	18
2028	50			3620	3267	0	80	7	19
2029	50			3670	3317	0	81	7	19

EKPC's generation expansion plan includes no additions during the planning period.[131]

RELIABILITY CRITERIA AND RESERVE MARGIN

EKPC's mission is to provide reliable, affordable energy and services to its 16 Member Cooperatives. EKPC is a member of the Southeastern Reliability Corporation ("SERC").[132] As a member it takes advantage of SERC's ability to resolve reliability issues, act as a liaison for disputes, administer a regional compliance and enforcement program, and establish reliability standards.

To provide reliable service, EKPC requires a margin of power above the projected peak demand. This reserve margin is necessary to account for operational reserves plus uncertainties in the projected load and weather fluctuations. Historically, EKPC planned capacity to meet its winter peak load plus a 12 percent reserve margin. Currently, as a member of PJM, EKPC plans its capacity resource requirements as

[131] IRP at 125.

[132] IRP at 2. SERC serves as a regional entity with delegated authority from the North American Reliability Corporation ("NERC") for the purpose of proposing and enforcing reliability standards in all of portions of 16 central and southeastern states.

defined by PJM's summer peak plus its ability to economically meet its own winter load projections.[133] PJM reserve requirements are based on a contribution to PJM's summer system peak, and due largely to load diversity, EKPC will be required to maintain a planning reserve requirement of slightly less than three percent of EKPC's summer load which equates to reserving roughly 70 MWs during the summer season only.

NERC requires that utilities have swift access to sufficient power to overcome the loss of a generation source. The power can be self-supplied or as is more common, available through a Regional Transmission Organization ("RTO") or in partnership with neighboring utilities. EKPC will rely upon PJM for this service.

SUPPLY-SIDE EVALUATION

EKPC evaluates power supply options as demand evolves, reviewing among other things the reliability and cost of the source. In assessing future resources, needs are evaluated on a present worth of revenue requirement and a cash-flow basis.

EKPC selected the RTSim model from SimTec, Inc. to develop its resource plan.[134] The model replicates EKPC's system and supplies projected customer loads using a statistical range of inputs created from actual EKPC load forecasts. With the EKPC system loaded in the model, it runs more than five hundred input iterations during the statistical load simulations.[135]

RTSim's Resource Optimizer is then used to determine EKPC's ideal plan. The Resource Optimizer uses alternative resource plans to determine the best plan. The optimizer examines data from the production cost model simulation, using future units as resource alternatives. Since the basic RTSim model is used by the optimizer, the same data and detailed analysis used in the initial runs are used in the optimized run, the difference being that future units are set as resource alternatives and are given a potential future commercial operation date. The future units include combined cycle peaking and intermediate units, unit power purchases, peaking combustion turbines, and market power purchases.[136] The resource optimizer can simulate thousands of potential resource combinations to determine the least cost plans. The optimizer selects the lowest cost plans from the present value of total production cost and annual fixed costs of future alternatives. Plans are then tailored to meet certain criteria, and the present value of each plan is compared to remaining at status quo.

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[133] IRP at 174.

[134] *Id.* at 164

[135] *Id.* at 165.

[136] *Id.* at 166.

In the 2015 IRP, EKPC simulated 2,500 expansion plans, each with five iterations. The iterations varied fuels, forced outages, loads, and market prices to come up with the five lowest cost plans, which were reviewed alongside recent experience to determine each plan's feasibility.[137]

Resource Optimizer Plan Summary (MWs) [138]

Year	Type	Plan 1	Plan 2	Plan 3	Plan 4	Plan 5	FINAL MW
2015	Seasonal				100		
2016	Base Seasonal	150	200	200	100	100 200	**150**
2017	Base Seasonal	250	50	100	100 50		**250**
2018	RE PPA Seasonal		50	50		50	
2019	Seasonal		100				
2020	RE PPA Seasonal			50 100			
2021	RE PPA			50	50	100	
2022							
2023							
2024							
2025	Base				50	50	
2026	RE PPA	50	50				**50**
2027	RE PPA				50		
2028	RE PPA	50	50			50	**50**
2029	RE PPA	50	50	50	50		**50**

The above five plans were reviewed and the result is a robust simulation of a variety of load and market conditions. Risk analysis is incorporated into the simulation.[139] EKPC's generation expansion plan does not include new additions during the planning period.

ENVIRONMENTAL COMPLIANCE

EKPC stated it has reviewed current and pending environmental regulations extensively in its report and discusses the potential CPP which regulates a maximum CO_2 emissions rate. EKPC states that it is reviewing all of its options to meet this rate. Kentucky has the option to develop its own State Implementation Plan ("SIP") to meet

[137] *Id.* at 170.

[138] *Id.* at 172, Table 8.(5)(a)-2.

[139] *Id.* at 173.

any final CPP rule.[140] EKPC did not propose anything in this IRP that would be in conflict with the CPP implementation; however, EKPC cannot establish that its power supply plan, as submitted, will fully comply with the CPP when finalized.[141]

In accordance with KRS 278.020(1), KRS 278.183, and 807 KAR 5:001, Sections 14 and 15, EKPC filed for a Certificate of Public Convenience and Necessity ("CPCN") on August 21, 2013, requesting authorization to reroute selected combustion gas ducting at the J.S. Cooper Generating Station and recover the costs through its environmental surcharge mechanism.[142] The purpose of the project was to allow both Cooper Unit 1 and Unit 2 off-gases to flow through the larger and newer Unit 2's Air Quality Control System, which enabled both units to meet certain air emission regulations. The construction took place during 2015 so that the April 2016 deadline for MATS compliance would be met. The project's estimated cost was $15 million plus annual operating and maintenance cost of $2.6 million.[143]

EKPC states that it is currently in compliance with the rules of the Clean Air Act amendments of 1990. Included in its compliance are the National Ambient Air Quality Standards ("NAAQS") which covers limits for emissions of sulfur dioxide ("SO_2"),nitrogen dioxide ("NO_2"), carbon monoxide, ozone, particulate matter of both larger particles ("PM") and fine particles of 2.5 microns or less , and lead. EKPC is also in compliance with the more recent Cross State Air Pollution Rule ("CSAPR"). In addition, EKPC meets the requirements of Title IV covering pollutants contributing to Acid Rain, Title V covering operating permit requirements and the federally-enforceable SIP Summer Ozone program. The last two items are specifically noted due to, and contained in, the September 27, 2007 settled action and Consent Decree ("CD") entered into between the United States and EKPC.[144]

The 15-year period covered by this IRP may generate additional environmental rules under existing or future requirements; however, EKPC anticipates its continued ability to comply with any of these. Such additions include the Green House Gas ("GHG") Tailoring Rule revisions to the New Source Review ("NSR"), CSAPR, MATS,

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[140] The U.S. Supreme Court stayed implementation of the CPP pending judicial review. *See* supra note 113.

[141] *Id.* at 31–32.

[142] *Id.* at 12 and Case No. 2013-00259, *Application of East Kentucky Power Cooperative, Inc. for a Certificate of Convenience and Public Necessity for Alteration of Certain Equipment at the Cooper Station and Approval of a Compliance Plan Amendment for Environmental Surcharge Cost Recovery* (Ky. PSC Feb. 20, 2014).

[143] IRP at 12.

[144] *Id.* at 179.

revised NAAQS rules, the Clean Air Visibility rule to protect pristine areas and National Parks, and the CPP requirements.[145]

MATS became the name of the Electric Generating Unit Maximum Achievable Control Technology rule when the EPA finalized the rule December 16, 2011, and made compliance effective as of the spring of 2015. Under MATS, emissions of Hazardous Air Pollutants ("HAP"), such as, mercury, arsenic, chromium, nickel, hydrogen chloride gas and hydrogen fluoride gas are addressed, quantified, and reduced. MATS lets sources control surrogate emissions as an indication of controlling HAP metals and HAP acid gases. Heavy metallic air pollutants are represented by PM emission limits since such metals form particulates in boiler exhaust gas. HCL and SO_2 are surrogates for all other acid gases as they are managed by the same controls. Under MATS mercury emissions from units must be measured and limited directly to show compliance.[146] EKPC has received a MATS compliance extension of an additional year from KY DAQ for William C. Dale Units 3 and 4 and the Cooper Station Units 1 and 2. Testing is a continuous part of an extensive effort by EKPC to ensure that its units comply with MATS. NSR CD compliance pollution control upgrades on Spurlock 1 and 2 and Cooper 2 allow EKPC's units to be ahead of most EGUs for MATS compliance. EKPC's newest units, Spurlock 3 and 4 incorporate the Best Available Control Technology ("BACT") and most likely meet the MATS limits without any additional controls.[147]

Under CSAPR, the EPA requires the District of Columbia, Kentucky, and 26 states to reduce power plant emissions that travel to and affect other states' air quality, particularly ozone and fine particle air pollution. "CSAPR requires significant reductions in SO_2 and nitrogen oxides (NO_x) emissions that cross state lines. These pollutants react in the atmosphere to form fine particles and ground-level ozone and are transported long distances, making it difficult for other states to achieve the National Ambient Air Quality Standards."[148]

GHGs are classified as a single pollutant under NSR and are an aggregate of CO_2, N_2O, SF_6, CH_4, HFCs, and PFCs into a combined CO_2 equivalent (CO_{2e}).[149] All EKPC capital projects are analyzed for the possible need of NSR permitting; however, GHG emission increases by themselves will not trigger NSR permitting requirements.[150]

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[145] *Id.* at 180.

[146] *Id.* at 181.

[147] *Id.*

[148] *Id.* at 181–182.

[149] *Id.* at 182.

[150] *Id.* at 183.

Because of the location, coal fired generation units in Kentucky are classified as meeting safe attainment levels for metallic lead in the air. EKPC states that the existing controls on its coal generation fleet, new controls and compliance strategies it has adopted to comply with MATS and CSAPR will ensure compliance with any future NAAQS requirements.[151]

The Regional Haze Rule initiated a once-per-decade review of the Clean Air Visibility rule in order to protect pristine areas and National Parks and tests Best Available Retrofit Technology ("BART") controls for SO_2, NO_x, and PM Emissions on large emitters put into operation between 1962 and 1977. A BART assessment includes an evaluation of SO_2 controls and post-combustion NO_x controls. EKPC's Cooper Units 1 and 2 are the only units targeted under BART scrutiny. EKPC submitted Regional Haze compliance plans to the Cabinet for inclusion in the Commonwealth plan forwarded to the EPA, most likely to become part of the Kentucky State Implementation Plan. SO_2, NO_x and PM controls have been installed on Cooper 2 in order to comply with the NSR CD, the Regional Haze rule, MATS, CSAPR and NAAQS requirements. In its Regional Haze compliance plan EKPC intends to install parallel controls on Cooper 1 which will be accomplished through the Cooper Duct Re-route project.[152]

The CPP for existing electric generating units ("EGU") proposed by the EPA sets out CO_2 emissions rate goals for each state in lbs/net MWh. The goals begin with an interim rate of 1844 lbs/net MWh to be met over a ten year averaging period from 2020 to 2029, and then with a final rate starting in 2030 of 1763 lbs/net MWh.[153] The EPA is in the process of changing with these proposed regulations from calculation of emission rates based on gross EGU output in current regulations to net EGU output in the CPP. CO_2 emissions rate goals are more difficult to meet, and more punitive for the Spurlock station which has 154 MWs of auxiliary power, 45 percent being used for pollution controls. The EPA recognizes that there is no technology available to reduce CO_2 emissions from coal fired power plants; rather the EPA has determined that the best system of emissions reduction ("BSER") for CO_2 emissions from EGUs relies on two basic approaches, made up of four "Building Blocks." The two approaches are (1) reducing carbon intensity from individual coal burning EGUs and (2) reducing CO_2 emissions rates by state and the utilization of coal, and forcing increased use of alternative fuels and renewable energy sources. The original four proposed Building

[151] *Id.* at 187.

[152] *Id.* at 188.

[153] *Id.* at 190.

Blocks are given below; however, only the first three are included in the final version of the CPP, currently under Federal Court stay.[154]

1. Improving boiler efficiency by six percent;

2. Shifting electricity generation from existing baseload coal to existing NGCC with a target of 70 percent capacity factor from existing NGCC;

3. Shifting generation to low or zero carbon generation, completing all nuclear generation under construction, preventing the planned retirement of existing nuclear generation and increasing renewable energy (RE) generation; and

4. Increasing demand-side EE measures with a target of 1.5 percent in annual energy savings.

The EPA then applies these factors to 2012 state-level data to calculate the interim and the final lbs/netMWHr CO_2 emissions rate goals. Most of the CO_2 emission rate goals are calculated by shifting generation from existing coal fired plants to existing natural gas fueled combined-cycle plants, utilizing new RE generation and by applying aggressive efficiency projects.[155]

In addition to the CAA requirements that EGUs must meet, there are a couple other new EPA rules that have to be addressed and met, the Clean Water Act ("CWA") Section 316(b) rule and the Disposal of Coal Combustion Residuals from Electric Utilities rule. The CWA 316(b) rule sets requirements that must be met by cooling water intake structures ("CWIS") and establishes the Best Technology Available ("BTA") in order to minimize the environmental impacts from aquatic organism mortality due to impingement and entrainment. Impingement mortality ("IM") of aquatic organisms occurs at the cooling water intake structure, typically against the water debris screens. Entrainment mortality ("EM") results when organisms die from the effects of mechanical, thermal, and chemical stresses present in the cooling water from pumps, condenser heat transferal and biocide use.[156]

EKPC asserts that Cooper, Dale and Spurlock Stations all have cooling water intakes that are required to meet CWA Section 316(b) since each one (1) holds a Kentucky Pollutant Discharge Elimination System ("KPDES") permit, (2) has a water

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[154] *West Va. v. EPA,* 577 U.S. No. 15A773 (Feb. 9, 2016) (granting stay of CPP pending appellate review in U.S. Court of Appeals for the District of Columbia Circuit and disposition of a petition for writ of certiorari, if such writ is sought). The U.S. Court of Appeals for the District of Columbia Circuit will hear oral arguments on June 2, 2016 in an expedited consideration of a consolidated challenge to the CPP. *West Va. v. EPA*, Case No. 15-1363 (D.C. Cir. Jan. 21, 2016).

[155] *Id.* at 189–190.

[156] *Id.* at 190–191.

intake capacity of more than 2 million gallons per day ("MGD"), and (3) withdraws at least 25 percent of the intake water for cooling. The EPA does not note a single or individual technology that is the BTA to lessen EM. The final rule therefore contains a national BTA standard for addressing EM that establishes a process where the state permitting authority, in Kentucky it is the Division of Water, determines EM mitigation requirements that are site specific.[157]

Several compliance alternatives applicable to Kentucky are given by the EPA to meet, or partially meet, its IM performance standard. These are: closed-cycle recirculating systems, design and/or actual through-screen velocity of ≤ 0.5 feet per second ("fps"), modified intake traveling screens with fish returns, appropriate technologies and/or operational measures, and numeric impingement mortality performance standard compliance. The "EPA does not anticipate that retrofit to closed-cycle cooling will be justified to mitigate IM alone. Each of these compliance alternatives has specific information submittal and monitoring requirements."[158]

The Spurlock Station should meet 316(b) requirements, according to EKPC, since its cooling system consists of four evaporative mechanical draft cooling towers having a combined 21.6 MGD makeup water requirement from the Ohio River. The station's CWIS consists of submerged passive intake screens and strainers having 1/8 inch circumferential slots. The two intakes, each have a capacity of 14,050 gallons per minute and a maximum through-slot flow velocity of 0.5 fps.[159] However, there are other factors which may impact the station's 316(b) approval status, such as the possibility of the presence of federally listed endangered mussel species in the Ohio River. Another concern is any detrimental effects to a critical habitat, but no critical habitat designations are known to be in the adjacent segment of the Ohio River near Spurlock Station.[160] The final BTA for minimizing adverse environmental impact are determinations for IM and EM by the Division of Water in the KPDES renewal permit to be issued in approximately 2021.[161]

The Cooper Station cooling system used for both Units 1 and 2 consists of a once through cooling system and an 8-cell cooling tower retrofitted to Unit 2 in 2007. Unit 1's once through intake has a capacity of 89.2 MGD and Unit 2's once through intake has a capacity of 118.9 MGD for a total of approximately 208 MGD. Its dual pipe system consists of two conventional moving screens and a fish return. The estimated through screen velocities at flow are 0.34 and 0.45 fps respectively, when using once-through cooling only, but when using Unit 2's cooling tower its through-screen velocity

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[157] *Id.* at 191.

[158] *Id.* at 191–192.

[159] *Id.* at 194.

[160] *Id.* at 195.

[161] *Id.* at 196.

drops to an estimated 0.012 fps.[162] With a minimum wetted screen depth of 30 feet it is thought by EKPC that entrapment of organisms and IM are likely avoided, and Lake Cumberland has no known federally-listed threatened or endangered species; therefore, with monitored flow reduction the station may not have to submit required entrainment BTA reports for its pre-approved technologies even though its design capacity exceeds the rule's 125 MGD in Actual Intake Flows ("AIF").[163] If AIF is shown to be greater than 125 MGD, then a two-year entrainment characterization study will be implemented by EKPC.[164]

The proposed effluent limitation guidelines ("ELGs") for steam electric power generating units were published by EPA on June 7, 2013. ELGs should provide BAT requirements that are economically achievable for existing units in the proposed EPA rules. Wastewater treatment options are designated that were being considered for various wastewater streams coming from coal-fired power plants. These include flue gas desulfurization and mercury control wastewater, fly ash and bottom ash transport water, CCR landfill leachate, non-chemical cleaning wastes. Four combinations of treatment options and their effluent limitation standards have been proposed by the EPA.[165] It is expected that any new wastewater controls required to meet the new ELGs would need to be operational within eight years from the effective date of the final rule.[166]

Spurlock Station wastewaters are from ash transport, ash pond overflow, coal pile runoff, cooling tower and FGD scrubber blowdown, metal cleaning wastes, and storm water. Clarifier solids, pretreatment area wastewater, material handling storage pond effluent and boiler bottom ash water are all discharged into the ash pond. It appears that FGD wastewater would be subject to mercury, arsenic, and selenium effluent limitations under the EPA proposal. Also, EKPC states that it would likely need to construct a chemical precipitation treatment unit, and possibly an additional biological treatment plant to meet the proposed permit limits. EKPC indicates a chemical wastewater treatment system may also be required to meet future water quality effluent limitations in a renewed KPDES Permit for Spurlock Station to treat the metal cleaning discharge into its ash pond. That facility currently provides dry handling of its fly ash; however, treatment of bottom ash transport water could possibly remain and be authorized under the final rule. If the EPA requires dry handling of bottom ash, the

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[162] *Id.* at 196–197.

[163] *Id.* at 198. AIF is the defined as the average rate of pumping by the facility over the last three years. AIF may account for days with zero flow. Five years after the effective date of the rule, the previous five years of record is used in calculating AIF, noted at 192.

[164] *Id.* at 200.

[165] *Id.* at 203.

[166] *Id.*

current ash pond could no longer be used for the bottom ash disposal.[167] No significant operational changes are expected by EKPC in order to comply with the EPA's proposed requirements for CCR leachate. However, it is unknown whether any changes in operational methods would be necessary in complying with final ELGs for non-chemical metal cleaning wastes.[168]

Cooper Station currently utilizes dry fly and bottom ash handling, so no impacts are expected from the final ELGs according to EKPC. Also, Cooper Station utilizes impoundment sedimentation for CCR leachate treatment from the landfill, so further impacts are not expected from the ELGs unless more severe requirements are finalized. Cooper Station does not operate a wet FGD, but non-chemical metal cleaning waste could be impacted, as that waste stream is discharged to the coal pile runoff pond and then treated in a chemical treatment plant.[169] Since none of the units at Dale Station will likely be operated beyond April 2016, any compliance issues under the ELGs for handling of fly and bottom ash would be after station operation cessation.[170]

Forecasts for coal fired facilities are uncertain, as well as, for any future investment decisions made by EKPC. There is uncertainty concerning any unfinalized rules, such as, the CCR, ELGs and the NAAQS. EKPC states that it is ready and prepared to achieve environmental compliance when the EPA and Cabinet requirements materialize and are certain for Kentucky power plants.[171]

GENERATION EFFICIENCY IMPROVEMENT

In the years since 1987, EKPC states that it has managed its maintenance and operation planning and implementation under a formal program designated Maintaining Electrical and Generating Equipment Reliability ("MEAGER").[172] This plan reviews various plant subsystems and operational data and history to ensure affordable, reliable, and safe power generation in the future, especially during each planning period of five years. Each major proposed project receives cost analysis and justification which include timing, and benefits such as safety and regulatory requirements prior to approval and implementation.[173] Generation projects scheduled under the MEAGER program are summarized in tables covering nineteen pages of the IRP.

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[167] *Id.* at 204.

[168] *Id.* at 205.

[169] *Id.*

[170] *Id.* at 206.

[171] *Id.* at 208.

[172] *Id.* at 141.

[173] *Id.* at 141–142.

The current MEAGER Program planning covers projects from 2015 through 2019. EKPC states that since the prolonged functioning of its power plants depends on both routine maintenance and the systematic review of current operations, conditions, and requirements that affect the EKPC power plants' continued and future operation, such planning is not only needed, but required "to ensure the economic viability of its existing resources to meet the challenges and opportunities surrounding climate change."[174] At the time of the IRP submittal there was a number of capital construction projects noted for addressing compliance issues; however, there were no environmental issue related maintenance projects indicated by EKPC for the period of 2015 through 2019.[175]

TRANSMISSION

EKPC's transmission system covers much of the eastern two-thirds of Kentucky and consists of 2,938 miles of line with voltages from 69kV to 345 kV, and interconnects with neighboring utilities at 73 points. EKPC states its system is designed to provide adequate capacity in order to deliver electric generation to its 16 Member Cooperatives to meet the needs of their customers. The EKPC planning and design criteria requires meeting projected customer load demands during normal conditions and even during events such as possible simultaneous outages of a transmission facility and a generating unit at peak load conditions anytime throughout the year. Transmission interconnections and joint planning with neighboring utilities improves the system and provides generation outlet capability, external generation resource access when needed and provides load support in specific local areas according to EKPC.[176] Recent examples given of such interconnections are the establishment of two new 69 kV interconnections on the Goldbug-Wofford and the South Anderson-Bonds Mill with LG&E/KU, and another with Duke Energy Ohio-Kentucky at the Hebron substation, all since its last IRP submittal.[177]

EKPC joined PJM on June 1, 2013; PJM coordinates the movement of wholesale electricity in 13 states and the District of Columbia, managing "the high-voltage electricity grid to ensure reliability for more than 61 million people. EKPC states that PJM's long-term regional planning process provides a broad, interstate perspective that identifies the most effective and cost-efficient improvements to the grid to ensure reliability and economic benefits on a system wide basis."[178]

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[174] *Id.* at 141.

[175] *Id.* at 157, Table 8.(2)(a)-17.

[176] *Id.* at 118–119.

[177] *Id.* at 119. EKPC's Response to Staff's Second Request, Item 12.c.

[178] IRP at 119.

Between 2012 and 2014, EKPC indicated the implementation of various transmission projects, as summarized in the following list:

- Thirteen transmission substation modifications are shown below:
  - Three breaker replacements at 345 kV;
  - Two circuit switcher replacements at 161 kV;
  - One circuit switcher replacement at 138 kV;
  - One breaker addition at 138 kV;
  - Three breaker additions at 69 kV;
  - Two station rebuilds; and
  - And One 69 kV station upgrade.

- Forty-two miles of new transmission line construction that includes:
  - 41.9 miles of 69kV line; and
  - 0.10 miles of 138kV line.
- Construction of two 69 kV Switching Stations.
- Re-conductoring and rebuilding 25 miles of existing line with larger, lower impedance, and higher capacity conductor.

- Adding a total of 57.1 MVAR in three new 69 kV capacitor banks.[179]

EKPC asserted that new transmission line construction and upgrading of conductor projects generally result in increased system capacity and a reduction of system losses. These projects typically increase a current line's capacity by 50% to 225%, depending on the size and type of replacement conductor used. In addition, when installing a larger conductor, less voltage drop is a result which defers the need for additional new facility construction necessary to provide voltage support for an area's load growth.[180] With the addition of transmission capacitor banks, the existing transmission system is better utilized and any need for new power lines and/or substations is delayed and the energized capacitor banks can also provide some transmission system loss reductions.[181]

EKPC's 2015 to 2033 expansion plans include a combination of new transmission lines, substations, upgrades to existing transmission lines and generation resources that provide an adequate and reliable system for the existing and forecasted customer load requirements. Annual expansion plans are developed and updated for EKPC's transmission system. Power flow analysis and reliability indices are also used to predict system problem areas and various alternatives are formulated and analyzed in order to mitigate these problems. Needed transmission expansion projects providing reasonable cost reliability and adequacy solutions are incorporated into the EKPC

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[179] *Id.* at 121.

[180] *Id.*

[181] *Id.* at 122.

expansion plan according to its assessment. All EKPC planning processes are ongoing and change as conditions warrant.[182]

Stated improvements that are planned for the EKPC transmission system from 2015 to 2019 are summarized in the following list:

- Approximately thirteen miles of new 69 kV line construction
- High-temperature upgrades of thirty-three individual 69-kV lines totaling 151 miles
- High-temperature upgrades of three different 138-kV lines of 21 total miles
- Adding a new 161 kV, 81.6 MVAR capacitor bank and two new 69-kV capacitor banks for 32.6 MVARs total
- Increasing a 69-kV capacitor bank to 20.4 MVARs from 10.8 MVARs
- Closing and energizing a 69-kV line that was normally open and de-energized
- Adding two 69-kV circuit breakers to provide for a new 69-kV interconnection
- Re-conductoring and rebuilding approximately 38 miles of 69 kV line

EKPC indicates that sometimes upgrades, designed to increase the operating temperature of a transmission line, are undertaken rather than resorting to the more expensive option of line conductor replacement.[183]

Projects beyond the initial four years of planning are more conceptual according to EKPC, and are much more likely to change, be cancelled, or replaced with another project. In the 15-year expansion plan, there is approximately 25 miles of new 69 kV line construction, 79 miles of re-conductoring and rebuilding, 191 miles of conductor high temperature upgrading, and end point changes affecting another 11 lines. In addition, a transmission substation upgrade is included in the planning and the installation of more than a total of 292 MVARs of new transmission capacitor capability.[184]

EKPC's states that its transmission system is designed to import a minimum of 500 MW from north and south external areas. Studies show that EKPC's import capability from LG&E/KU is from 750 MW to 1000+ MW, depending on the time and period. EKPC imported as much as 1425 MW from PJM in 2014, illustrating its import capability, at least, during winter peak conditions. In addition, the import capability from TVA ranges from 850 MW to over 1000 MW, again depending on the period.[185]

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[182] *Id.*

[183] *Id.* at 123.

[184] *Id.* at 124.

[185] *Id.* at 126.

EKPC states that it assesses its transmission system under extreme weather conditions annually. When evaluating its system performance under a 50/50 contingency analysis, the system has to perform and ensure that it will provide adequately at its load level, even with a component or facility out of service, such as a transmission line and/or generator, no contingency analysis is performed using a 90/10 probability forecast. An extreme weather event is considered an equivalent of a contingency, and therefore, the system is not designed for a transmission or generator outage in conjunction with an extreme weather event, although higher load scenarios are evaluated to determine if local reliability issues are present. Two thermal constraints have been indicated on the EKPC transmission system under extreme summer weather conditions, but not during winter weather situations. The projects listed below are scheduled by EKPC to address summer thermal constraints:

- An upgrade on the 750 MCM copper bus at Dale Station associated with the Smith-Dale 138 KV line
- Upgrading of the 750 MCM jumper associated with the Summer Shade 161 KV to 69 KV Transformer

No other voltage limitations are indicated or anticipated during either summer or winter as long as all transmission and generation facilities remain in service.[186]

DISTRIBUTION

From 2012 until 2014, EKPC indicates delivery points were improved by constructing new substations, as well as, upgrading existing substations, in order to meet increasing customer demand, enhance reliability and improve system efficiency. The various distribution projects are summarized as follows:

- Construction of a new 7 MVA, and a new 14 MVA substation
- Construction of three new 20 MVA, and three new 25 MVA substations
- The addition of two new 20 MVA distribution transformers at existing stations
- Upgrades to seven existing distribution substations increasing them to 20 MVA
- And an upgrade of an existing distribution substation increasing it to 25 MVA

The existing distribution system is noted as enhanced when new injection points are added to it, generally providing energy loss improvements and increased voltage support to the system. Existing distribution facilities can be improved with substation transformer additions and upgrades, which improve utilization and increase system capacity without the cost of building new facilities. EKPC says such additions and upgrades reduce system impedance at the substation, improve voltage drop and reduce

[186] *Id.* at 126–127.

losses. "In addition to the substation improvements discussed above, EKPC also worked with its Member Cooperatives on various power factor improvement projects at the distribution level to increase available substation capacity, defer transmission construction projects, and reduce system losses."[187]

EKPC distribution substation improvements planned for the years 2015 through 2019 are summarized in the following items:

- The addition of six 20 MVA substations
- Installation of three new 20 MVA distribution transformers within existing substations
- Upgrading an existing distribution substation to 14 MVA, the upgrading of seven existing substations to 20 MVA, and the upgrading of three existing substations to 25 MVA

All of these substation enhancements are stated as improving the EKPC system efficiency and its utilization.[188]

RENEWABLES

EKPC is a member of the National Renewables Cooperative Organization ("NRCO"). NRCO provides EKPC with information regarding current renewable developments, Renewable Energy Credit market analysis, and renewable engineering information and studies. This industry related material provides EKPC the expertise to plan without having to expand its staff. As a member of NRCO, EKPC receives benefits from the organizations knowledge of the renewable industry and its various network contacts. For instance, EKPC has used this connection to NRCO to research possible local wind project opportunities that will augment its generation expansion plan.[189]

EKPC's current generating portfolio contains several different renewable energy sources. It takes advantage of hydro, solar, and landfill gas and is involved in researching and securing the use of out-of-state wind, yet at this time has not found any cost-effective wind projects to meet its generation expansion needs.[190]

As discussed earlier in this chapter, EKPC has a long-term arrangement in place with SEPA for hydropower located in the Cumberland System. Water seepage issues discovered by the Corps of Engineers at two of the three dams in the system have limited EKPC's ability to schedule its full allotment of power since 2007. The Corp of

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[187] *Id.* at 128.

[188] *Id.* at 129.

[189] *Id.* at 167.

[190] *Id.*

Engineers anticipates construction work to be completed by mid-2018, which will return the full SEPA power allotment back to EKPC.

A lock and dam system along the Kentucky River is located within the EKPC Member Cooperative service territories. Discussions have been held with developers having rights to develop hydro-electric generation facilities at these locations. EKPC states that typically any evaluations of electric power production potential at such locations illustrate that they are not viable economically as energy production facilities presently.[191]

At the time of the filing in this case, there were five landfill gas-to-energy (LFGTE) facilities in the EKPC system. With the recent addition of the Glasgow facility in Barren County, there are six LFGTE sites.[192] EKPC endeavors to improve the performance at each location while looking for further LFGTE opportunities at other sites within the EKPC service territory.[193]

LFGTE Locations	Capacity (MW)
Boone County	3.2
Laurel County	3.2
Greenup County	2.4
Hardin County	2.4
Pendleton County	3.2
Glasgow Landfill	1.0

	Existing LFGTE Facility Output (MWh)
2011	94,571
2012	95,243
2013	98,300

COGENERATION, NET METERING, AND DISTRIBUTED GENERATION

EKPC has a cogeneration tariff on file with the Commission that allows qualifying facilities to sell excess power back to EKPC, or any of its Member Cooperatives, at published rates. There is currently an operating facility which is a waste-wood-to-energy service in Taylor County. EKPC has committed to purchase excess energy

[191] *Id.*

[192] Case No. 2014-00292, *In the matter of: Application of East Kentucky Power Cooperative, Inc. for an Order Declaring the Glasgow Landfill Gas to Energy Project to be an Extension in the Ordinary Course of Business and a Joint Application of Farmers Rural Electric Cooperative Corporation and East Kentucky Power Cooperative, Inc. for Approval to Enter Into a Ten Year Purchased Power Agreement and Approval of a Special Contract* (Ky. PSC Apr. 2, 2015)

[193] *Id.*

produced at the facility by the 5 MW steam-turbine generator. Through its tariff, it purchased 2,208 MWh in 2013 and 1,102 in 2014.[194]

As stated previously, in 2013 EKPC purchased 2,208 MWh under contract with a long-serving cogeneration facility. However, there are barriers to adding new combined heat and power projects, such as, the large capital investment necessary, which is difficult for many companies to make. Such large investments typically have long payback periods that are too long by the host's business standards and expectations, and these projects are often unrelated to the host companies' experience and its area of business. EKPC is presently working with a rural facility planning to generate approximately 200 kW initially from a poultry waste digester and methane recovery plant. No other combined heat and power or cogeneration projects are known or planned by EKPC within its service territory.

EKPC and its sixteen member cooperatives, are investigating financing of small, 30 kW and above, solar photovoltaic projects in order to provide renewable solar energy to customers within their cooperative's service territories. Participation of customers through EKPC's EnviroWatts program or possibly other tariff options are under investigation.

There are approximately 300 kW of solar photovoltaic installations within the service territory of EKPC, and these facilities utilize their member cooperatives' net metering provisions and tariffs. The number of these installations continues to grow as prices for solar photovoltaic equipment and components continue to decrease. Also, there are presently a few small wind turbine installations within the member cooperatives' distribution systems that are utilizing net metering tariff provisions. These combined wind installations account for approximately 17 kW.

Over the next several years, nonutility cogeneration of energy is anticipated to remain at a level of around 3,500 MWh per year, or less. The load reduction attributed to net metering by customers of the EKPC member cooperatives should remain at or below 500 MWh per year over the next several years. EKPC's Amendment 3 of its Wholesale Power Contract allows owner-members to provide for some of their load from sources outside the Wholesale Power Contract. EKPC's exposure from the Amendment 3 resources is stated as a maximum of 5 percent of its rolling three year peak load. Under Board Policy 305, the EKPC Board of Directors must approve third party supply arrangements of its member cooperatives. There are six projects with a total of almost 10 MW currently under third party supply arrangements.[195]

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[194] EKPC's Response to Staff's First Request, Item 33.

[195] IRP at 167–168. EKPC's Response to Staff's First Request, Items 32 and 33.

	Non-Utility Generating Sources	
Location	**Facility**	**Capacity (MW)**
McKee	NG Engine/Generator	1.0
Irvine	LFGTE	1.6
Burgin	Hydro	2.0
Campbellsville	Wood-Waste-to-Steam	5.0

EKPC further states that it is difficult to quantify the amount of energy in the net metering process as the majority of net metering installations are put in place to offset individual customer's energy usage. As such, the quantity of energy the net metering facilities contribute to the system is not metered. Further, the net metering installations take place at the Member Cooperative level and EKPC does not regularly have access to this detailed account information. EKPC did request this information from its sixteen Member Cooperatives so that a running count of participants and a total capacity value could be determined. The reported information contains 171 net-meting installations throughout EKPC's territory, with Big Sandy RECC being the only member coop without participation. The net metering figures provided account for 1,175 kW of capacity, including 1,154 kW of solar and 21 kW small wind.[196]

OTHER NON-UTILITY SOURCES

EKPC does not explicitly discuss non-utility sources in its resource assessment and acquisition plan, except to note that it does not purchase power from non-utility sources.[197]

COMPLIANCE PLANNING

EKPC intends to cooperate with Federal and State stakeholders to ensure the economic viability of existing and future resources to meet climate change challenges and opportunities. EKPC's priority is to use all its assets in order to deliver affordable and reliable energy from appropriate and diversified fuel sources. EKPC plans to carefully manage its asset portfolio and pursue supply resource diversity, including DSM/EE programs, market-based opportunities and climate change regulation and/or legislation risks. EKPC contemplates continued research and education into the related issues and opportunities as the various subject options develop.[198]

INTERVENOR COMMENTS

The AG and Nucor were granted intervention. They were the only intervenors to this IRP, but neither were active participants in the case.

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[196] EKPC's Response to Staff's Second Request, Item 15.

[197] IRP at 176, Table 8.(3)(d).

[198] *Id.* at 175.

RESPONSES TO THE 2012 IRP RECOMMENDATIONS FOR SUPPLY-SIDE RESOURCES AND ENVIRONMENTAL COMPLIANCE

In its report on the 2012 Integrated Resource Plan of EKPC, Staff summarized its review and offered the following suggestions, topics of interest, and recommendations concerning Supply-Side Resources and Environmental Compliance to be considered in EKPC's subsequent filing, as shown below according to 807 KAR 5:058, Section 11(4).

- Discuss and provide analysis with regard to EKPC's 12 percent planning reserve margin and its effects on its capacity expansion plans as they relate to the slightly less than 3 percent reserve margin required by PJM.

EKPC stated that when it joined PJM its winter generating capacity was less than its winter peak load plus an acceptable 12% reserve margin, but it had sufficient capacity to cover its summer peak load plus the PJM required 3% reserve. EKPC believed that the PJM energy market would appropriately serve its winter energy shortage in a reliable and an economic manner. However, the polar vortex occurring in January 2014 and again in February 2015 significantly and permanently changed the PJM energy market. So, EKPC decided it needed to secure additional energy sources to meet its winter load and purchased 200MW with third party PPAs for the 2014-15 winter peak load season. EKPC will have to continue covering its winter peak load with its own generation or firm PPAs, whichever is the most economical. EKPC states it is currently negotiating with a third party for a long term solution to meeting its winter capacity requirements.[199]

- Continue to pursue cost-effective opportunities and provide information concerning cogeneration, renewables, and exploration of stranded gas opportunities.

"EKPC concurs with the Staff's recommendation and has provided more details in Section 8.0 on this topic."[200]

- Discuss the effect joining PJM has had on the LG&E/KU transmission line contract and the included interconnections.

EKPC and LG&E/KU have an interconnection agreement that establishes the terms and conditions for existing and future transmission interconnections between the companies' systems. EKPC's 2013 membership in PJM did not have any significant impact on the agreement and no substantive changes have been made to the interconnection agreement as a result of the PJM membership. EKPC and LG&E/KU continue to coordinate, plan and operate their systems as was done prior to the integration into PJM; however, PJM's requirements for system planning and operations are given priority and must be adhered to by EKPC. Therefore, EKPC must consider

[199] *Id.* at 30. As discussed earlier, EKPC's acquisition of Bluegrass after the filing of the IRP provided a long term solution for meeting most of its winter capacity requirements.

[200] *Id.*

the PJM requirements while coordinating their activities with LG&E/KU, but complying with those requirements has not substantially changed any activity or coordination with LG&E/KU.[201]

- Discuss the pending/ongoing plant modifications required to meet EPA or other environmental legislation. Further, EKPC included no CO_2 costs in the supply side evaluation and did not specifically address CO_2 issues in its compliance planning. Although EKPC provided what it believed was appropriate rationale for not doing so, the Staff believes that EKPC should have made some attempt to evaluate the impact of potential CO_2 rules. Staff views the exclusion of CO_2 from the IRP as a shortcoming and therefore recommends that EKPC provide a complete discussion of compliance actions and plans relating to current and pending environmental regulations within the next resource plan.

In Section 9.0 of this IRP, EKPC provided a reasonable review and discussion of current and pending environmental regulations, including the potential CPP and its CO_2 regulation. That proposal does not indicate a charge or tax on CO_2, but rather an emissions limit on CO_2. EKPC states it is considering all of its options, but the CPP was not a finalized rule, and the Commonwealth of Kentucky may develop its own State Implementation Plan to meet any final rule. EKPC did not propose anything in its long term planning that would be in opposition to the CPP implementation; however, EKPC cannot be certain that its power supply plan fully complies with the rule when finalized.[202]

- Summarize, and include in EKPC's next IRP filing, the information in the annual PJM transition reports filed as a result of Case No. 2012-00169 and inform the Commission of its effects on EKPC's reliable production of power.

EKPC has identified its costs and benefits from its entry into PJM on June 1, 2013 through March 31, 2014, which was the last date included prior to this IRP's required filing date. Later on EKPC has offered full 12 month views, but even those 12 month views typically will not be coincident with PJM's operating year. EKPC has provided redacted administrative and transmission costs based on their general ledger accounting entries of actual out of pocket costs. EKPC utilized detailed modeling of its production costs and simulated what its stand-alone operations would have cost, and compared those results to the actual costs from operating within PJM. EKPC modeled actual loads, prices, and generating unit availability, as well as, estimated transmission availability from outside resources, similar to their methodology utilized in the study completed in EKPC's request to the Commission for approval to join PJM. Of course, the difference is that now the PJM costs are actually known instead of being estimated. Capacity Benefits are based on the actual Reliability Pricing Model ("RPM") results and are shown on monthly PJM invoices. The Avoided Point-to-Point ("PTP") Transmission

[201] *Id.* at 31.

[202] *Id.* at 31–32.

Charges are based on the EKPC contract with PJM to purchase 400 MW of transmission purchase, but does not include charges for actual energy transactions. These costs and benefits were estimated on a ten year Net Present Value basis, based on the actual ten month operational period from June 1, 2013 through March 31, 2014.[203]

The 2012 case order directs EKPC to provide projections of future benefits and costs based on recent PJM capacity auction results. EKPC used known cost and benefit data to project the future benefits and costs; however, the net benefits for 2016/2017 diminished some due to the lower than anticipated value of that period's capacity market. The 2017/2018 Base Residual Auction provided a clearing price of $120/MW-Day; which was closer to the original assumptions that were made. Additionally, the Trade Benefits for the first year have been greater than projected, and the market indicates that trend is continuing. EKPC believes there will continue to be great benefit from its operations in PJM, possibly even better than reported in its first annual report in 2014.[204]

- Report on the ongoing SEPA construction and its effects on EKPC's hydropower.

In February 2007, EKPC was notified of seepage at the Wolf Creek and Center Hill Dams on the Cumberland System by the Corps of Engineers. Because of the potential failure of these dams, emergency changes were made in operations which significantly changed the availability of power from that system. As a result, EKPC was unable to typically utilize power from the run of river production as scheduled by the Corps under the constraints of the emergency operations. The Corps pursued major projects to alleviate the issues at the two dams, and the construction at Wolf Creek was essentially completed in the spring of 2013, which currently is operating under normal conditions. The Center Hill construction project is in progress and has an estimated completion of mid-2018. With Wolf Creek operation normal, SEPA has restored the scheduling of capacity from the Cumberland System as of July, 2014. However, with the loss of some storage capacity at the Center Hill Dam and those operational constraints, EKPC cannot schedule its fully allocated capacity as was available prior to 2007. The repair projects did not affect the Laurel Dam and EKPC continues scheduling its 70MW. Therefore, EKPC is able to currently schedule 87MW maximum of the total 100MW Cumberland System capacity available prior to 2007. However, maintenance or operational issues could further affect and reduce the current 87MW. EKPC provides SEPA a dispatch schedule based on a prior SEPA weekly declaration of available capacity. It is anticipated that the above schedule of operations will continue until the spring of 2018 when the Center Hill seepage project will be completed and normal operations can be restored.[205]

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[203] *Id.* at 32.

[204] *Id.* at 34.

[205] *Id.* at 34–34a.

RECOMMENDATIONS FOR SUPPLY-SIDE RESOURCES AND ENVIRONMENTAL COMPLIANCE BASED ON EKPC'S 2015 IRP

- Discuss in detail the terms and outcome the FERC decision concerning the transmission dispute between LG&E/KU and EKPC has on the delivery of the excess Bluegrass power.
- Provide discussion regarding completion of the duct-reroute connecting the Cooper 1 discharge stream to Cooper 2's air quality control system.
- 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.
- Report on the ongoing SEPA construction and its effects on EKPC's ability to schedule hydro power.
- 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 should continue to discuss the existence, and promotion of any cogeneration within its members' service territories and any focused consideration given to it.

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

- 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.

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

- 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 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 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.

SECTION 5

INTEGRATION AND PLAN OPTIMIZATION

The final step in the IRP process is to integrate supply-side and demand-side options to achieve the optimal resource plan. This section will discuss the integration process and the resulting EKPC plan.

THE INTEGRATION PROCESS

As in the development of the 2012 IRP resource plan, EKPC used the RTSim production cost model developed by SimTec, Inc. to analyze possible expansion plans. The RTSim model calculates hour-by-hour operation of the generating system, including unit hourly generation and commitment and power purchases and sales, including economy and day ahead transactions in the PJM energy market, and daily and monthly options.[206] The model also uses a Monte Carlo simulation to capture statistical variations of unit forced outages and deratings, load uncertainty, market price uncertainty, and fuel price uncertainty.[207]

For the analysis in this IRP the RTSim model used a statistical load methodology based on load data from the EKPC load forecast. A range of distributions created four additional loads around the forecast load to define the high and low ranges of the loads to be examined. Actual and forecasted market prices, natural gas prices, coal prices, and emissions costs are correlated to the load data used. 500 iterations were used in the model simulations performed by EKPC.[208]

In its integration process, EKPC developed load forecasts with the impacts of both existing and new DSM programs reflected in the forecast. In winter and summer, the new DSM programs resulted in peak demand reductions of more than 137 MW by the end of the 15-year forecast period compared to the forecasted peak demands without the new DSM programs included.[209]

RTSim's Resource Optimizer was used by EKPC to perform the optimization of its resource plan. The Resource Optimizer runs the production cost model to perform simulations of a large number of potential resource plans to determine the optimal plan. Future resources to be considered are set up with several potential operation dates. Annualized fixed capital costs and variable costs associated with a particular resource are included in the analyses. Resources included in the analysis included two different

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[206] *Id.* at 164–165.

[207] *Id.* at 165.

[208] *Id.* at 165.

[209] DSM App., Table DSM-6 at DSM-17.

peaking, gas-fired technologies; two intermediate/peaking gas-fired technologies; five power purchases from the market and four emission free power purchase options.

PLAN OPTIMIZATION

The Resource Optimizer simulates potential new resources in operation with the system's existing resources in order to determine the optimum expansion plan. In the development of this IRP, EKPC had the Resource Optimizer simulate 2,500 different expansion plans with five iterations of each plan for the 15-year period 2015-2029. Each of the iterations varies inputs such as loads, fuel prices, market prices, and forced outages. The results of the Resource Optimizer runs produced the five lowest-cost plans, which were the plans included in the IRP.[210]

In the original optimization plan, each of the five lowest-cost plans included some combination of peaking power and PPA emission free additions, with variations on the timing and size of the additions.[211] Through the planning period, EKPC's total anticipated capacity additions over the 15-year was 550 MW with 150 MW of peaking /intermediated capacity added in 2016 and 250 MW of peaking/intermediate capacity in 2017. The other capacity is composed of 50 MW of renewable PPA each year in 2026, 2028 and 2029.

Due to the Commission's approval of EKPC's proposed acquisition of Bluegrass on December 1, 2015, which added 396 MW of capacity in 2016 and 198 MW of capacity in 2020, the Company will not need additional capacity until 2026.[212] In 2026, 2028 and 2029, EKPC plans on adding a renewable PPA of 50 MW in each of those years.[213] With the anticipation of increasing market prices for capacity and energy, DSM will become more cost-effective, possibly decreasing or eliminating the need for additional capacity in the latter years of the planning period.

DISCUSSION OF REASONABLENESS

EKPC's integration process reflects the recognition of DSM impacts on the need for future capacity additions. It captures the effects of changing environmental rules as well. Staff commends EKPC for its efforts to acquire Bluegrass at a very reasonable cost and procuring long term capacity that will aid in avoiding the risks associated with procuring capacity and energy from the market.

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[210] IRP at 171.

[211] *Id.* The plans with the annual PPA and emission free PPAs were the three highest-cost plans.

[212] EKPC's Response to Staff's Third Request, Item 5.

[213] *Id.* and IRP at 169.

Commission Staff is generally satisfied with how EKPC has addressed the changes that are being faced by electric utilities in the current environment. The Staff believes that EKPC's overall integration and optimization process is generally thorough and well-documented. The Staff concludes that the process is reasonable and has produced reasonable results in this IRP and has no further recommendation for EKPC's next IRP beyond those included in Sections 2, 3, and 4 of this report.

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