COMMONWEALTH OF KENTUCKY
BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

THE 2006 INTEGRATED RESOURCE PLAN OF EAST KENTUCKY POWER COOPERATIVE, INC.	)))	Case No. 2006-00471

ATTORNEY GENERAL'S COMMENTS

Comes now the Attorney General of the Commonwealth of Kentucky, by and through his Office of Rate Intervention, and tenders the following comments regarding The Integrated Resource Plan ["IRP"] of Eastern Kentucky Power Cooperative ["EKPC"].

Summary

The Attorney General's review of EKPC's IRP and supporting documentation has revealed that the cooperative's resource planning process needs improvement in four major areas.

First, EKPC needs to improve its process of identifying and screening supply side options. This IRP indicates that EKPC considered only three baseload and two peaking alternatives. EKPC needs to provide more details on supply side resource assessment and resource optimization.

Second, EKPC needs to treat DSM options in a methodically consistent manner as it treats supply side resources. All options, supply-side and demand-side, should be part of the optimization process.

Third, EKPC needs to conduct sensitivity and risk analyses that are wider in scope so as to evaluate resource plan sensitivity to DSM, environmental and other regulations, allowance and construction cost changes. It needs to show how the results of these sensitivities are factored into the choice of its final resource plan.

Fourth, EKPC needs to incorporate transmission options more thoroughly into the resource planning process.

Introduction

EKPC filed the instant IRP and various attachments with the Commission on October 20, 2006. EKPC subsequently responded to two sets of data requests from Commission staff, and to a set of 48 data requests posed by the Attorney General. This analysis is based on the foregoing material, on the literature relating to IRPs, and on the analysts' background understanding of the IRP process.

EKPC has a number of unique characteristics that distinguish it from the other electric utilities that serve Kentucky. First, it is a generation and transmission ("G&T") cooperative, not an investor-owned utility. No retail customer using EKPC's power has the option to purchase electricity from any entity other than one of EKPC's 16 member cooperatives.

EKPC is also relatively self-contained. It imports relatively little power (about 10% of total energy) and exports even less. It reports that it cannot obtain firm transmission capacity from either the MISO or PJM regional transmission system operators during its peak periods. With a peak load of about 2700 MW,

EKPC is relatively small by the standards of investor-owned utilities and smaller yet by the standards of regional transmission systems. Finally, EKPC is a winter-peaking utility surrounded by largely summer-peaking generation and transmission systems.

All of these characteristics increase the importance of EKPC's integrated resource planning. The absence of competitive power at the retail level means that there are no market forces at work to exert pressure on EKPC to produce the lowest cost, most reliable power possible. The assurance of low cost power must come from the resource planning process. EKPC's small, self-contained nature means that it must rely on its own resources to meet its customers' demands to a much greater degree than utilities that are part of much larger generation and transmission systems. Finally, EKPC's winter peaking could provide the opportunity to avoid building to its own peak and instead build to the peak of surrounding utilities, provided enough transmission capacity could be secured.

The Concept of Integrated Resource Planning

Integrated resource planning arose from the realization that there were more ways to respond to rising demand for electric energy than just building more power plants. In lieu of increasing electric supply, it might be possible to reduce demand through aggressive load control, economic incentives for conservation, or the substitution of more efficient energy-consuming appliances for existing ones. Improved transmission capability might provide the opportunity to use existing regional generation resources more efficiently.

This realization led to the creation of a mode of planning that sought to allow for the integration of all forms of generation, demand-side management and transmission enhancement in the planning process. No one means of responding to load growth was to be given precedence over another. Fairly elaborate analytical procedures were developed to evaluate the economic, environmental and social merits of a wide range of alternative solutions to the challenge of increased demand and energy consumption.

EKPC has not taken full advantage of the concept of integrated resource planning. EKPC's resource planning is segmented, not integrated. Specifically, EKPC evaluates generation alternatives separately from Demand Side Management ("DSM") alternatives, and DSM programs separately from transmission alternatives. There is no mechanism for comparing directly supply-side, demand-side and transmission-side solutions. This absence is inconsistent with the concept of integrated resource planning.

Even within these segmented analyses, it is apparent that EKPC has not always explored the broadest range of alternatives. The most extensive search for alternatives is found in the DSM segment, where EKPC has evaluated 93 different DSM strategies. The least extensive analysis is in the transmission area. The IRP does not address the feasibility of transmission upgrades to secure more firm capacity from surrounding generation resources to meet EKPC's winter peak. In between is the supply-side segment, where EKPC performs a computerized optimization analysis of five different generation technologies, three baseload and two peaking. While the optimization model is highly sophisticated, it is given only a

very limited number of alternative resources to evaluate. Most of the "optimization" consists of rearranging the timing of the introduction of pre-determined plant additions according to differing assumptions as to load growth, fuel costs, seasonal energy consumption and the like.

The remainder of these comments will address the specific segments of the IRP: load forecasting, supply-side considerations, demand-side programs and transmission upgrades.

Load Forecasting

EKPC conducts end-use surveys of its residential customers every three years. These surveys provide estimates of the penetration of various appliances, and particularly the trends in that penetration. From these surveys, EKPC is able to forecast energy consumption by appliance type for the residential class. EKPC apparently has data on the contribution of the respective appliances to system peak loads. In this regard, EKPC's load forecasting is superior to some forecasts that apply a single load factor to each category of residential user.

The greatest failing of the load forecast is the absence of any recognition of energy and demand reductions that may result from the implementation of new DSM programs or the expansion of existing programs. EKPC states that it does not incorporate DSM savings until they are realized. Yet the prospective reduction in peak load from the prospective DSM savings approximately equals the capacity of one of the new peaker plants that EKPC is planning. DSM could therefore have a material impact on EKPC's supply side planning.

Nor is it true that the DSM savings are purely speculative. EKPC reports that eight of the 18 new DSM programs are being implemented and a ninth and most promising program, direct load control, is in the demonstration phase.

This failure to anticipate any future DSM savings ensures that these programs are not integrated into the overall resource planning. It is in direct contradiction of the basic principles of integrated resource planning.

A careful study of Section 7 of the IRP reveals the following additional problems with EKPC's load forecasting:

- In the table at the bottom of page 7-1, EKPC states that it does not have heating vs. non-heating customer counts. Since EKPC is a winter peaking utility, this could be a serious problem. EKPC reports on page 7-6 that "about 54 percent" of all homes in its service area have electric heat. If this figure is only an estimate, then EKPC's peak load forecast could be impaired.

- Page 7.2 shows recorded and weather-normalized energy requirements for five years, 2001 through 2005. In every year the weather-normalized energy is greater than the actual requirements. This phenomenon suggests a possible bias in the weather normalization toward overstating total energy needs. It should be noted, however, that this same bias does not appear in the table of weather-normalized vs. actual peak loads on the next page.

- Page 7-3 shows actual peaks and, separately, the peak demands for which EKPC has firm commitment. The differences between these two sets of figures is presumably the contribution to peak represented by interruptible customers. The fact that all the actual peaks are higher than the firm load peaks raises the question of whether interruptible customers are in fact being interrupted when the system approaches its peak load.

- The charts on page 7-6 indicate that the growth in both energy and peak load will moderate with the passage of time. EKPC states that this assumption reflects the belief of Global Insights that household formation will decline in the coming two decades. This assumption requires careful

analysis because if is incorrect, EKPC could face growth in demand and energy that exceeds its expectations.

- On page 7-14, EKPC reports that commercial peak loads are based on load factors applied to commercial energy consumption. In general, this practice of applying load factors to energy usage without considering the makeup of that usage is questionable. If the makeup changes, as for instance an increase in commercial electric heating, the peak load could grow faster than the energy consumed.

- On page 7-16, EKPC states that large new commercial loads are estimated using a regression model. In response no. 16 to the Attorney General's data requests, EKPC states that the dependent variable for this regression is the number of industrial customers and the independent variable is total employment. From the standpoint of load forecasting, it would seem that a better dependent variable would be total industrial energy sales. That is because it is possible that there might be a non-linear relationship between employment and industrial load.

Supply-side Resources

1. Production

EKPC has included a limited number of supply-side resources in the optimization model used to develop the IRP. The only resources it has included are:

- Circulating Fluidized Bed (CFB),
- Subcritical Pulverized Coal,
- Unit Power Purchase,
- Combustion Turbines (CT) and
- Combustion Turbines with Steam Injection (CT-STIG).

EKPC has not evaluated all possible supply-side resource technologies. A reasonable supply-side resource identification process includes review of generation technology information from trade journals, vendor brochures, power engineering magazines, and energy and environmental research organizations.

Information on resource alternatives such as cogeneration projects and purchased power options is gathered by talking to project developers and industry peers. As a result of this process a number of conventional, emerging and purchased power options are identified. This ensures that a sufficiently wide array of supply alternatives is considered so that potentially attractive choices are not excluded.

Next, the supply technologies identified should be screened to eliminate those resources that are inferior based on commercial and technical status, capital and operating costs, regulatory risks and environmental considerations. The IRP does not define or discuss this process in detail. On page 8-12 of its IRP, EKPC lists the supply resources included in the optimization model, without explaining how it identified all possible supply side options, the process used to evaluate independent power producer (IPP) options, and the screening process used to select supply resources. Attorney General's Request 16, dated 2/7/07 is pertinent in this respect:

> **Request 16.** "Ref page 8-12: Please describe the process supporting the selection of the plants shown in Table 8.(2)(c). What was the basis for the selection of these particular units? Did EKPC solicit any bids for merchant power? How did the projected capital costs of the other power supply resources compare with the costs of the units selected?"
>
> **Response 16.** "EKPC considered technologies that were mature or potentially could be mature within the near future. The estimated capital costs of resources in the subject table were thought to be reasonable and achievable at the time the IRP was developed. EKPC did not have a credible estimate of the capital cost of IGCC, for example, and therefore did not include it in the optimization.

> EKPC does not solicit bids for the purpose of developing an IRP. However, EKPC did receive an updated power purchase proposal from a bidder in the 2004 RFP. The resources included serve as proxies for baseload, intermediate, and peaking capacity, and their selection by the optimization model helps identify the need for and timing of those types of capacity. EKPC uses the RFP process to evaluate and select specific resources to add to the system"

EKPC indicates that technology maturity and capital costs are the reasons for selecting the five supply resources depicted in Table 8.(2)(c). There is no description of the wide array of technologies that it could have identified and considered. EKPC does mention some other supply resources on page 8-12 of the IRP such as supercritical pulverized coal, Integrated Gasification Combined Cycle (IGCC) and renewable resources hydro, wind and landfill gas to energy. However, no convincing reason is given for excluding these resources except lack of current evaluation and credible capital costs. There is no mention of other options such as combined cycle, atmospheric fluidized bed, diesel generators, pressurized fluidized bed, geothermal, biomass, solar, cogeneration etc. If capital costs were the determinant for technology selection, were there no other baseload technologies in the $2000/kW range that EKPC could have considered?

Even within the very limited five production alternatives, EKPC appears to prefer the circulating fluidized bed technology for baseload capacity additions. On page 8-12 of its IRP, EKPC mentions utilizing this technology currently to take advantage of lower quality, lower cost coals and postponing the evaluation of other technologies in the future. In Table 8.(5)(a), EKPC presents a summary of the top five plans resulting from the resource optimization process in the IRP.

The baseload resource options picked by each of these five plans are all 278 MW CFB units. Not one of these plans picks purchased power or Subcritical Pulverized Coal as baseload options, even though these were included as resource alternatives in the optimization model.

Hence, EKPC starts with a very limited list of technologies that it wants to consider, eliminates a number of them without a proper screening process and is left with only five technologies to include in the resource optimization process. EKPC fails to examine a broad range of supply alternatives leading to the possibility that potentially attractive options are not considered and chosen in the optimization process.

EKPC reports that the capital costs used in the 2006 IRP are based on EKPC's most current estimates for Spurlock 4, Smith CFB 1, Smith CT 8-12, and IPP proposals, the result of the 2004 RFP. However, these units are not even part of the resource optimization process for the 2006 RFP. EKPC's resource needs until 2011 will be met by the foregoing supply resources, and the Resource Optimizer is run only for the time period 2012 through 2022 and then only for five supply options.

It appears that the capital costs of Smith CFB 1, IPP proposals and Smith CTs are used as approximations for the same technologies in EKPC's optimization model. Yet these costs are sensitive to changes in construction time periods. EKPC has already stated that the generation construction plans and schedules have changed due to Warren RECC declining to join EKPC. Smith CTs

10-12 have been shifted to the 2012 to 2014 time period, the 2015 baseload unit is shifted to 2017, and the 2019 baseload unit is shifted to 2023. Hence, it is important to test the resource plan against the sensitivity to costs of future baseload and peaking units.

2. Transmission

Another problem with the IRP is its light treatment of transmission upgrades as an alternative to generation additions. EKPC has provided a description of planned transmission facilities including voltage, location and miles of line. However, there is not much analysis of transmission investments related to resource planning. AG Request 41 questions EKPC on transmission constraints and their effect on utility resource choices. The response to this request reveals the cooperative's lack of extensive planning to address transmission bottlenecks.

> **Request 41.** "Please describe EKPC's capability to import power from surrounding grids. Identify the transmission constraints both within and outside of EKPC's own system."
>
> **Response 41.** "EKPC has imported from external systems up to 350 MW during the most recent summer season and up to 1000 MW during recent winter seasons. The majority of limitations that restrict import capability occur during the summer season. Non-firm transactions are commonly curtailed during the summer season due to transmission system congestion. Firm transmission service must be obtained to provide assurance that power can be imported when needed. Firm transmission service is generally not available from the systems north of EKPC (the Midwest ISO and PJM Pool). Therefore, EKPC has recently secured some firm transmission service from the TVA system to allow the ability to import power when desired.

> ...The ability to import power is substantially influenced by many factors in the region, such as specific generation dispatch, transmission contingencies, load level, and magnitude of regional transfers...

EKPC has two construction projects in progress that will mitigate some of these constraints. First, EKPC is constructing a 138 kV line from the Cranston Substation to the Rowan County Substation. This line will provide some additional import capability, and in particular will relieve the constraints on EON's Goddard_Rodburn 138 kV line. Second, EKPC is constructing a new 345 kV line from the J.K. Smith Substation to a new substation named North Clark. This line will also provide some additional import capability, and will in particular relieve the loading issues on the Avon 345-138 kV transformer.

Thus, EKPC has addressed some of the transmission constraints, but several bottlenecks remain within EKPC and in neighboring systems that could limit EKPC's ability to import power. EKPC has not explained whether and how it plans to remove these constraints. The cooperative has not conducted transmission investment planning that affects its ability to import power and increases the cooperative's resource choices. EKPC has also not analyzed the loss reduction opportunities on its transmission system. It has not identified the reasons for these losses and the methods to reduce these losses. Addressing these losses could reduce the need for capacity additions on EKPC's system and should be part of its planning process.

This issue comes up at page 8-65 in the IRP where EKPC discusses its reserve margin study. EKPC notes that it is shifting from building to meet the summer peak to building to meet the winter peak. In the past, EKPC has built to meet the summer peak, which is considerably lower than the system's winter peak. That was because surrounding utilities peaked in the summer and had capacity available in EKPC's winter peak season.

This condition continues. Specifically, the combined summer peak of Kentucky Utilities and Louisville Gas & Electric was 18.6 percent higher than their winter peak in 2005. By 2019 this disparity is predicted to increase to 19.6 percent.[1] The reason EKPC must now build to the winter peak appears to be the constraints on import transmission capacity. It would appear that relief of these constraints should be an important element in EKPC's long-range planning, yet it is not mentioned anywhere in the IRP.

3. Other Issues

Other problems with the supply-side resource analysis are as follows:

- Even though EKPC is monitoring the potential for carbon dioxide regulation, it did not consider it in its planning process. It is becoming increasingly evident that some sort of carbon emissions control program is likely in the offing, either a carbon tax or a cap and trade regime similar to that applicable to SO_2 and NO_x. EKPC should perform sensitivity analyses based on these impending programs. This will help the cooperative evaluate the relative attractiveness of different resource plans based on carbon emission levels and related resource plan costs.

[1] K.P.S.C. Staff report on KU and LG&E 2005 IRP, February 2006, page 7.

- At page 8-4, the IRP states that the Dale Station is near to a natural gas pipeline and could switch fuels, thereby reducing its SO_2 emissions. Apparently, this option was dismissed, but no explanation is provided.

- Integrated Gasification Combined Cycle technology was not considered because it has been built with federal incentives and may not be cost effective. Since EKPC is testing the viability of supply-side resources one to two decades into the future, it seems overly conservative to dismiss a potentially promising technology because it is now new and not fully proven.

Demand-Side Programs

Standing alone, EKPC's analysis of demand-side programs is the most thorough study of alternatives in the IRP. EKPC examined 93 DSM measures through a qualitative scoring process using four standards, where each scored on a scale of 1 to 5. It subjected the 34 measures that passed this qualitative test to a quantitative analysis that culled the list to 18 new measures. Collectively, these new measures could reduce EKPC's winter peak by 94 MW and its summer peak by 115 MW in the coming ten years. The reduction in energy requirements could amount to 135,000 MWh per year.[2] DSM therefore represents a significant potential resource.

The central problem with the DSM analysis is that it is a stand-alone study. DSM is not integrated with supply side options in the resource optimization process. Hence, the treatment of DSM resources was not analytically consistent with the treatment of supply resources. No sensitivity analysis was performed for various levels of DSM to find out if an aggressive

[2] Pages 8-50 and 8-51.

DSM approach could eliminate the need for supply options. EKPC did not consider DSM as an environmental compliance option. AG Request 34 is pertinent in this respect:

> **Request 34.** "Ref. page 8-70: EKPC is considering fuel switching, emission control equipment, repowering and retirement as environmental compliance options. Is EKPC considering other options such as power purchases, clean coal technologies, DSM for compliance purposes?"
>
> **Response 34.** Power purchases and re-powering with circulating fluidized bed ("CFB") technology were among the options considered in the evaluation for Cooper Station in Response No. 33. CFB is one of the cleanest coal burning technologies available today. DSM has not been explicitly studied as a compliance option." (Emphasis supplied)

EKPC's new DSM programs were not included in the resource optimization process or sensitivity analysis and not considered as compliance options. Load changes for these programs have not been accounted for in the Load Forecast to determine EKPC Projected Capacity Needs (Table 8.(4)(a)1.-5., 7.-11.). Hence EKPC does not incorporate DSM into the planning process and misses opportunities to fully realize the benefits of DSM.

Sensitivity and Risk Analysis

Sensitivity analysis is beneficial for resource planning because the base forecasts of load growth and fuel prices are only projections and best estimates of what could happen. EKPC needs to study the impact on the resource plan of variations in the forecast of load and fuel prices. It then needs to review and factor these sensitivities into the final resource planning process.

EKPC conducted a sensitivity and risk analysis and simulated a variety of load, market prices and natural gas prices in the resource optimization process. However, EKPC did not provide the results from this analysis. In other words,

EKPC did not show the sensitivity of the selected resource plan to changes in load growth or coal and natural gas prices.

The resource optimization process used by EKPC evaluated 3500 expansion plans to determine the lowest cost plans. EKPC presents a summary of the five lowest cost plans resulting from the resource optimization process in Table 8.(5)(a) and the model outputs of those plans in Figures 8.(5)(a)1.-5. However, there are no tables or model outputs that show the least cost plans resulting from low load growth, high load growth, alternate coal costs or different natural gas costs assumptions.

Hence, it is difficult to see how the selection of supply side resources is affected by changes in load growth or fuel prices. Does low load growth lead to a delay in capacity additions? Would it lead to less expensive peaking units replacing baseload options? If the load growth is high, would EKPC have to consider short lead time capacity options or capacity available in other systems to meet customer requirements? Would it need to address any transmission bottlenecks? Would changes in fuel prices lead to a significantly different resource plan?

It is also unclear how EKPC has factored the results of these sensitivities into the choice of its final resource plan. There is no discussion of the impact of load and fuel price uncertainty on the IRP or how future capacity decisions would be influenced by the results of these uncertainties.

In addition to load growth and fuel prices EKPC should also test the IRP for sensitivity to allowance costs. EKPC included the cost of emission allowances in the resource optimization process. The cooperative explained the inclusion of these costs in AG Request 29:

> **Request 29.** "Ref: page 8-52: How were environmental impacts included in the selection of supply side resources?"
>
> **Response 29.** "The cost of SO2 allowances was factored into the analysis. Projected allowance prices are used to calculate emission dispatch adders that affect dispatch of units. The greater the SO2 emissions from a unit, the greater the dispatch adder and the more the unit is impacted by having a higher dispatch cost. The comparison of plans in the Resource Optimizer includes the cost of SO2 allowances..."

Since sulfur dioxide emissions increase generation costs based on the value of SO2 allowances, EKPC needs to study the impact of changing allowance prices on its IRP. It should look at low and high projected allowance prices and the impact of these uncertainties on future capacity decisions.

Conclusion

The Attorney General's review of EKPC's IRP and supporting documentation has revealed that the cooperative's resource planning process needs improvement in four major areas.

First, EKPC needs to improve its process of identifying and screening supply side options. This IRP indicates that EKPC considered only three baseload and two peaking alternatives. EKPC needs to provide more details on supply side resource assessment and resource optimization.

Second, EKPC needs to treat DSM options in a methodically consistent manner as it treats supply side resources. All options, supply-side and demand-side, should be part of the optimization process.

Third, EKPC needs to conduct sensitivity and risk analyses that are wider in scope so as to evaluate resource plan sensitivity to DSM, environmental and other regulations, allowance and construction cost changes. It needs to show the effect of variations in load growth; DSM; regulations; fuel, allowance and construction cost changes on the selection of resource additions. EKPC also needs to describe how it factors the impact of these uncertainties into the resource plan.

Fourth, EKPC needs to incorporate transmission options more thoroughly into resource planning process.

Respectfully submitted,
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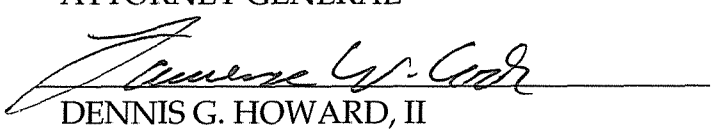

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