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November 20, 2007

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PUBLIC SERVICE
COMMISSION

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HAND DELIVERED

Beth O' Donnell
Executive Director
Public Service Commission
211 Sower Boulevard
Frankfort KY 40601-8294

RE: P.S.C. Case No. 2007-00300

Dear Ms. O'Donnell:

Please find enclosed and accept for filing the original and seven copies of Kentucky Power Company's Responses to the Staff's Data Requests.

A copy of the Responses is being served on the persons on the attached service list.

Very truly yours,

Mark R. Overstreet

cc: Persons on attached service list

KE057:KE193:16280:1:FRANKFORT

<u>**SERVICE LIST**</u>

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COMMONWEALTH OF KENTUCKY

BEFORE THE

PUBLIC SERVICE COMMISSION OF KENTUCKY

IN THE MATTER OF:

CONSIDERATION OF THE REQUIREMENTS	)	
OF THE FEDERAL ENERGY POLICY ACT OF	)	
2005 REGARDING THE FUEL SOURCES AND	)	**CASE NO. 2007-00300**
FOSSIL FUEL GENERATION EFFICIENCY	)	

KENTUCKY POWER COMPANY

RESPONSES TO COMMISSION STAFF'S FIRST SET OF DATA REQUESTS

November 20, 2007

Kentucky Power Company

REQUEST

Provide the following for each unit

a. What was the heat rate (Btu/kWh) at the time of initial operation (both name plate and actual experience)?

b. What is the heat rate today?

c. Identify the actions that the company has taken that have impacted heat rate and identify whether the actions have had a positive (by lowering the heat rate) or negative impact (by increasing the heat rate).

RESPONSE

a. The initial guarantee (Nameplate) for each unit and the actual tested heat rates are as shown in the Table 1 on attached Page 2 of 3. Since the guarantees are expressed as turbine cycle heat rates, the net unit heat rates shown were derived from them using the original design data shown in the note after the table. The net unit heat rates are single point heat rates at specific operating conditions. They cannot be compared to an operating heat rate, which encompasses a period of time and the entire operating range of the unit. Table 1 also contains the operating heat rate for the first full year of operation for comparison to the current heat rate, except that for Big Sandy 1, 1969 is the first year of available data.

b. The heat rate for September 2007 YTD is also shown in Table 1.

c. Design changes taken by Kentucky Power Company that have had a positive impact (by lowering the heat rate) or negative impact (by increasing the heat rate) are shown in Table 1c on the attached page 3 of 3.

WITNESS: Errol K Wagner

TABLE 1

	Year of Initial Operation	Initial Guarantee*	Initial Performance Test*	Operating Heat Rate, 1st full year of operation**	Operating Heat Rate September 2007 YTD
Big Sandy 1	1962	8873	8713	9078	10182
Big Sandy 2	1969	8524	8463	9340	9388

* Turbine cycle heat rate converted to a net unit heat rate using:
Big Sandy 1 aux power = 3.60% and steam generator efficiency = 90.25%
Big Sandy 2 aux power = 3.02% and steam generator efficiency = 90.26%

** Big Sandy 1 is from 1969 which is the first year of data available
Big Sandy 2 is from 1970

TABLE 1c

		Big Sandy Unit #
Increased Heat Rate		
	Replaced Cyclone Type Separators with Electrostatic Precipitator	Unit 1
	Partial Electrostatic Precipitator Upgrade (remainder scheduled)	Unit 1
	Installed Low NOx Burners	Unit 1
	Overfire Air (Larger FD Fan)	Unit 1
	Upgraded Precipitator	Unit 2
	Installed Low NOx Burners	Unit 2
	SCR Added	Unit 2
	FGD (Planned)	Unit 2
Decreased Heat Rate		
	HP Turbine Replacement and New IP/SFLP Turbine Internals (Planned for 2008)	Unit 1
	On-Line Performance Monitor	Unit 1
	Evaporator replaced by Reverse Osmosis Filter	Unit 1&2
	Cooling Tower fill Replacement and Upgrade	Unit 1
	ADSP HP and 1st RH Turbine	Unit 2
	On-Line Performance Monitor	Unit 2

Kentucky Power Company

REQUEST

What is the average system-wide heat rate?

RESPONSE

The average KPCo system-wide heat rate for September 2007 YTD is 9565 Btu/kWh.

The average AEP System-wide heat rate for the 52 AEP operated units of this type (coal-fired) for September 2007 YTD is 9923 Btu/kWh.

WITNESS: Errol K Wagner

Kentucky Power Company

REQUEST

What technologies are available for increasing the efficiency by lowering the heat rate of installed fossil fuel generation? What are the costs and benefits associated with these technologies?

RESPONSE

Table 3 on the attached page lists some of the technologies that are available for increasing the efficiency by lowering the heat rate of installed fossil fuel generation. These are not applicable to every unit.

For many of the technologies the value of the improvement will not offset the cost. Replacing a component for other reasons reduces the cost of the heat rate improvement option to the differential cost which is more likely to be offset by the benefits. The magnitude of the heat rate improvement and cost are very much dependent on the unit size, age, and other unit specifics. Therefore, the cost and improvement are shown as a typical range or simply High, Medium or Low.

WITNESS: *Errol K Wagner*

TABLE 3

Technology			
Turbine / Generator		Cost	Approximate Heat Rate Improvement Btu/kWh
	Advanced Design Blading – HP	High	0.7 – 1.0%
	Advanced Design Blading – IP	High	0.3 – 0.4%
	Advanced Design Blading – LP w/o LSB	High	0.45 – 0.55%
	Advanced Design Blading – LSB	High	0.7 – 1.3%
	Longer LSB – reduced Losses	High	1.0 – 1.6%
	Flexible Turbine Seals - reduced Losses	Medium	Low
	Reduced Pressure Drop Turbine Valves	High	~0.1%
	Replace Rotating Exciter with Static – reduced losses	High	~0.08%
	Reduced Loss GSU Transformer	High	Low
Steam Generator			
	High Efficiency Air Heater Baskets	Medium	0.2 – 0.5%
	Flexible Air Heater Seals – reduced leakage	Low	0.1 – 0.2%
Cycle / I&C			
	Advanced Design Condenser - Air Removal Improvement	High	~2%
	Replace Evaporators with Reverse Osmosis Filters	High	Low
	Control System Modernization	High	Low
	Variable Speed Motors for Large Pumps & Fans	High	0.1 – 0.2%
	SO3 Dew Point Monitor	Low	Low
	On-line Performance Monitor	Low	~1%
	Thermal Imaging and Acoustic Instrumentation to find Steam and Air Leakage	Low	~1%

Kentucky Power Company

REQUEST

What is a reasonable goal for heat rate improvement (lessening the heat rate) over a 10-year planning horizon for individual generating units and the company's fleet of fossil fuel generation?

RESPONSE

There are three categories of actions that can result in heat rate improvement. the first are operational changes. These usually entail changes in a plant's culture that produce small improvements that are realized over a long time.

Equipment related improvements involving maintenance practices and completion of deferred work can yield large improvements within a short time of implementation.

Each of these changes should be considered separately in establishing a goal for heat rate improvement.

Improvements in heat rate related to design changes are not properly considered in establishing a goal for heat rate improvement. These changes result in a one-time change that does nothing to improve the operation of a unit and may mask poor operation.

The heat rate goals must be expressed in terms of deviation from a baseline that takes into account seasonal and loading effects. Uncertainty of the measurement must be considered. The swings in the saw tooth curve that results from measurement uncertainty may be larger in magnitude than the goal itself. The goal might be best expressed in terms of an average or trend to lessen the impact of measurement uncertainty. For a large fleet, a smaller variation is observed but it is still needs to be addressed in a similar manner.

The goal is highly dependent on the starting point. If the unit is well run and relatively new or updated, there may be little or no room for improvement. A poorly run older unit, on the other hand, can make significant improvements relatively easily. For a unit like Big Sandy 2, performing at a level reasonably close to its baseline, the goal may be to simply hold that level of performance. For a unit performing far off its baseline due to equipment issues, like Big Sandy 1, the goal would be to significantly reduce controllable deviation in the first few years, come to an ideal level over the next few years and maintain that level for the remaining years. To illustrate, the planned Big Sandy 1 HP Turbine/IP and SFLP internals replacement will, by itself, provide a recovery of about half of Big Sandy 1's deviation even if the improvements resulting from the improved design are ignored.

A small fleet like KPCo behaves similarly to an individual unit. When setting goals, the "fleet" should be treated like a unit. For large fleets such as AEP, the goal is less sensitive to individual units and can be based on an average rate of improvement for the ten year period keeping in mind that the fleet's baseline is limiting.

WITNESS: Errol K Wagner

Kentucky Power Company

REQUEST

Although the Integrated Resource Planning and Certificate of Public Convenience and Necessity processes allow for consideration of generation efficiency initially, is there any Commission mandated process that provides for continued consideration of generation efficiency?

RESPONSE

In addition to 807 KAR 5:058 Integrated Resource Planning and 807 KAR 5:001 Certificate of Pubic Convenience and Necessity processes, generation efficiency could be considered by the Commission on a continuing basis through its review of fuel costs as part of the six-month and two-year fuel adjustment clause proceedings, 807 KAR 5:056; as part of any general rate case pursuant to KRS 278.190; and as part of a management and operation audit pursuant to KRS 278.255(2).

WITNESS: **Errol K Wagner**

Kentucky Power Company

REQUEST

How does the company consider generation efficiency on an ongoing basis after the initial operation of a generating unity? Are annual or periodic studies performed? Explain in detail.

RESPONSE

The performance of a unit is closely monitored in a continuous integrated program at three organizational levels; plant, region and central. Within these levels, operators, engineers and managers monitor generation efficiency through the use of tools, aids, reports, communications, and training appropriate to the user.

Studies are done on an ad hoc rather than a periodic basis to address problems identified through the monitoring program. An example is a unit assessment performed by engineers from other plants in the region to identify heat rate issues. There are some periodic reviews of unit performance such as the BSP Region monthly Region Manager (VPs and Directors) "huddles." These meetings with the plant managers cover various issues including a review of heat rate. The SVP of Fossil & Hydro holds similar meetings with his staff.

Heat rate is part of the Generation Incentive Compensation Plan. The plan's target is based on a three-year average deviation of the actual heat rate from a baseline heat rate. The baseline heat rate is a calculation of heat rate based on load, circulating water temperature and start-ups and assumes the original installed performance of equipment. Thus the deviation provides a way to consistently express thermal performance independent of seasonal and dispatch influence. The ICP target therefore requires the plant to improve some aspect of the unit's efficiency to offset normal year-to-year deterioration just to break even.

The following paragraphs provide a detailed description on how AEP's program works.

Each plant has a Heat Rate Champion (HRC). The HRC serves as the point of contact for all heat rate issues in the plant as well as acting as a champion for heat rate improvement for heat rate initiatives in the plant. An on-line performance monitor assists operators and engineers to operate the unit efficiently. Operator training is offered through AEP's Simulator Learning Center (SLC) with specific courses offered in Supercritical Heat Rate and Subcritical Heat Rate. Efficient operation is embedded in every other aspect of the instruction the learning center offers.

Each region also has a HRC whose main purpose is to communicate with, assist and coordinate the plant HRCs in his region. At the region level, engineers can remotely view the on-line performance monitor in addition to receiving data from the Heat Rate Deviation Report (HRDR), AEP's Generating Availability Data System (GADS) and each plant's process improvement data acquisition system. The HRDR identifies equipment deviations from baseline on a monthly basis and calculates heat rate and cost impacts. This information is formatted specifically for its principal users; engineering and all levels of management. It is available to any AEP employee through the AEP Intranet. Also available to all employees through the AEP Intranet is heat rate and related data from AEP's internal GADS system. Specialized heat rate related training at this level is provided by the Generation Performance Team (GPT) as described below.

At the heart of AEP's Integrated Performance Monitoring Program are Engineering Services and the GPT where centralized support and oversight is provided. The 13-member GPT is made up of Plant Managers, Plant Production Superintendents and Region Engineers. The team leader represents the performance group in Engineering Services. The GPT oversees the integration of the parts and pieces of the program as well as initiating development of new tools and reports. HRDR is one of the tools whose development was initiated by the team. The development of an automated Performance Test Program is currently under way with a two-plant pilot ready to start after the first of the year. The GPT also plays a major role in communication of best practices and training. The GPT sponsors annual forums to discuss heat rate issues, but more importantly to encourage inter-plant communications and sharing of information. The team also sponsors a quarterly newsletter, the *"Heat Rate Monitor"* whose main purpose is to share a success story. A package of graphs containing system level information, trends and Heat Rate ICP status is widely distributed monthly.

The GPT mostly deals with corporate culture and operational issues such as training, operating improvements and helping the plants to identify and resolve heat rate problems. Equipment upgrades are not part of its charter, but are investigated and justified by the Equipment Specialty Sections in Engineering Services. These groups are responsible for working with equipment vendors to remain current with the latest efficiency improving technology and evaluate the technology as a stand-alone improvement or as part of a replacement.

The approach described above was initiated with the GPT's formation in December 2003. The approach has been highly successful to date, raising heat rate awareness several orders of magnitude and stopping a trend of increasing deviations from baseline.

WITNESS: Errol K Wagner