EAST KENTUCKY POWER COOPERATIVE



November 20, 2007

HAND DELIVERED

Ms. Elizabeth O'Donnell
Executive Director
Public Service Commission
211 Sower Boulevard
Frankfort, KY 40602

Re: PSC Administrative Case No. 2007-00300

Dear Ms. O'Donnell:

Please find enclosed for filing with the Commission in the above-referenced case an original and seven copies of the Responses of East Kentucky Power Cooperative, Inc. to the Commission Staff's First Data Request, dated November 9, 2007.

Very truly yours,

Charles A. Lile
Corporate Counsel

Enclosures

Cc: Parties of Record

4775 Lexington Road 40391
P.O. Box 707, Winchester,
Kentucky 40392-0707

Tel. (859) 744-4812
Fax: (859) 744-6008
http://www.ekpc.coop

**COMMONWEALTH OF KENTUCKY**

**BEFORE THE PUBLIC SERVICE COMMISSION**

**IN THE MATTER OF:**

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

**CERTIFICATE**

**STATE OF KENTUCKY** )
)
**COUNTY OF CLARK** )

William A. Bosta, being duly sworn, states that he has supervised the preparation of the responses of East Kentucky Power Cooperative, Inc. to the Public Service Commission Staff First Data Requests in the above-referenced case dated November 9, 2007, and that the matters and things set forth therein are true and accurate to the best of his knowledge, information and belief, formed after reasonable inquiry.

William A. Bosta

Subscribed and sworn before me on this 16th day of November, 2007.

Regay D. Duffin
Notary Public

My Commission expires: December 8, 2009

COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

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

# RESPONSES TO COMMISSION STAFF'S FIRST DATA REQUEST TO EAST KENTUCKY POWER COOPERATIVE, INC. DATED NOVEMBER 9, 2007

**EAST KENTUCKY POWER COOPERATIVE, INC.**

**PSC CASE NO. 2007-00300**

**COMMISSIONS STAFF'S FIRST DATA REQUEST DATED 11/09/07**

East Kentucky Power Cooperative, Inc. (EKPC) hereby submits responses to the Commission Staff's First Data Request dated November 9, 2007. Each response with its associated supportive reference materials is individually tabbed.

**EAST KENTUCKY POWER COOPERATIVE, INC.**
**PSC CASE NO. 2007-00300**
**FUEL SOURCES AND FOSSIL FUEL GENERATION EFFICIENCY**

**COMMISSION STAFF'S FIRST DATA REQUEST DATED 11/09/07**
**REQUEST 1**
**RESPONSIBLE PERSON:** **Jeffrey M. Brandt**
**COMPANY:** **East Kentucky Power Cooperative, Inc.**

**Request 1.** Provide the following for each unit.

**Request 1a.** What was the heat rate (Btu/kWh) at the time of initial operation (both name plate and actual experience)?

**Response 1a.** The Initial Performance numbers in the following table were developed from Original Equipment Manufacturers' Guarantees and performance testing when original equipment was installed. The Initial Performance numbers should be considered steady-state operating numbers and are considered to be an optimum heat rate measurement. There is no specific heat rate associated with the nameplate rating.

The Net Heat Rate information shown in the chart includes starts, shut downs, maintenance outage power usage, and cyclic operation of units (load following).

| Unit | Initial Performance Heat Rate | Net Heat Rate |
|---|---|---|
| Dale 1 | 11,610 | 12,283* |
| Dale 2 | 11,610 | 12,384* |
| Dale 3 | 10,588 | 11,374* |
| Dale 4 | 10,400 | 11,321* |
| Cooper 1 | 9,718 | 9,986** |
| Cooper 2 | 9,624 | 10,072** |

| Unit | Initial Performance Heat Rate | Net Heat Rate |
|---|---|---|
| Spurlock 1 | 9,428 | 10,651 |
| Spurlock 2 | 9,438 | 9,838* |
| Gilbert 3 | 9,574 | 9,758 |
| Smith CT 1 | 10,437 | 12,635 |
| Smith CT 2 | 10,437 | 12,189 |
| Smith CT 3 | 10,437 | 12,796 |
| Smith CT 4 | 10,607 | 12,246 |
| Smith CT 5 | 10,607 | 11,968 |
| Smith CT 6 | 10,607 | 11,446 |
| Smith CT 7 | 10,607 | 11,697 |

*After New Equipment Installed
Dale 1 & 2 Turbine Generators were replaced in 1998
Dale 3 & 4 Turbines were replaced in 1998 & 1997 respectively
Spurlock 2 Turbine was upgraded in 1993.
**Currently available data (1981)

**Request 1b.** What is the heat rate today?

**Response 1b.** The following Net Heat Rate information is 2006 actual data which includes starts, shut downs, maintenance outage power usage, and cyclic operation of units (load following). Yearly performance is dependant on over-all operation of the unit and can be greatly affected by load following and capacity factor. For example, steam units can see a 10% difference between heat rates over the operating range of the unit and load following can have an even greater effect on heat rate performance.

| Unit | 2006 Net Heat Rate |
|---|---|
| Dale 1 | 12,179 |
| Dale 2 | 11,981 |
| Dale 3 | 11,735 |
| Dale 4 | 11,602 |
| Cooper 1 | 10,181 |
| Cooper 2 | 10,306 |
| Spurlock 1 | 10,129 |
| Spurlock 2 | 9,942 |
| Gilbert 3 | 9,696 |
| Smith CT 1 | 15,610 |
| Smith CT 2 | 16,195 |
| Smith CT 3 | 15,639 |
| Smith CT 4 | 12,921 |
| Smith CT 5 | 12,381 |
| Smith CT 6 | 11,774 |
| Smith CT 7 | 11,915 |

**Request 1c.** 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 1c.**

Dale 1

| | |
|---|---|
| New Turbine Generator | Positive |
| Distributed Control System (DCS) | Positive |
| Volumetric Coal Feeders | Positive to Neutral |
| Low NOx Burners | Negative |
| Electrostatic Precipitator (ESP) Controls | Positive |

| | |
|---|---|
| Dale 2 | |
| New Turbine Generator | Positive |
| DCS | Positive |
| Volumetric Coal Feeders | Positive to Neutral |
| Low NOx Burners | Negative |
| ESP Controls Upgrade | Positive |
| Dale 3 | |
| New Turbine | Positive |
| DCS | Positive |
| Gravemetric Coal Feeders | Positive to Neutral |
| Low NOx Burners | Negative |
| ESP Controls Upgrade | Positive |
| Dale 4 | |
| Balance Draft Conversion | Negative to Neutral |
| New Turbine | Positive |
| DCS | Positive |
| Gravemetric Coal Feeders | Positive to Neutral |
| Low NOx Burners | Negative |
| ESP Controls Upgrade | Positive |
| Cooper 1 | |
| Balance Draft Conversion | Negative to Neutral |
| DCS | Positive |
| Gravemetric Coal Feeders | Positive to Neutral |
| Low NOx Burners | Negative |
| Dynamic Classifiers | Positive to Neutral |
| ESP Controls Upgrade | Positive |
| Cooper 2 | |
| Balance Draft Conversion | Negative to Neutral |
| DCS | Positive |
| Gravemetric Coal Feeders | Positive to Neutral |
| Low NOx Burners | Negative |
| Dynamic Classifiers | Positive to Neutral |
| ESP Controls Upgrade | Positive |

| | |
|---|---|
| Spurlock 1 | |
| Steam Path Upgrade | Positive |
| Selective Catalytic Control (SCR ) | Negative |
| ESP | Negative to neutral |
| DSC | Positive |
| Dynamic Classifiers | Positive to neutral |
| Fan Replacement | Positive to neutral |
| Low NOx Burners | Negative |
| Wet Flue Gas Desulfurization (WFGD) | Negative |
| | |
| Spurlock 2 | |
| Steam Path Upgrade | Positive |
| SCR | Negative |
| DSC | Positive |
| Dynamic Classifiers | Positive to neutral |
| Low NOx Burners | Negative |
| ID Fans | Positive to neutral |
| Low NOx Burners | Negative |
| WFGD | Negative |
| ESP Controls Upgrade | Positive |

**EAST KENTUCKY POWER COOPERATIVE, INC.**
**PSC CASE NO. 2007-00300**
**FUEL SOURCES AND FOSSIL FUEL GENERATION EFFICIENCY**

**COMMISSION STAFF'S FIRST DATA REQUEST DATED 11/09/07**
**REQUEST 2**
**RESPONSIBLE PERSON:** **Jeffrey M. Brandt**
**COMPANY:** **East Kentucky Power Cooperative, Inc.**

**Request 2.** What is the average system-wide heat rate?

**Response 2.** For 2006 the average system-wide net heat rate was 10,234 Btu/kWh.

**EAST KENTUCKY POWER COOPERATIVE, INC.**
**PSC CASE NO. 2007-00300**
**FUEL SOURCES AND FOSSIL FUEL GENERATION EFFICIENCY**

**COMMISSION STAFF'S FIRST DATA REQUEST DATED 11/09/07**
**REQUEST 3**
**RESPONSIBLE PERSON:** **Jeffrey M. Brandt**
**COMPANY:** **East Kentucky Power Cooperative, Inc.**

**Request 3.** 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 3.** New aero-derivative turbine blades are available for steam turbines. EKPC has performed this upgrade on its largest steam units, Spurlock 1 & 2. This project cost approximately $22M in 1995 and increased efficiency of the Unit 1 steam turbine by 5% at rated steam flow and the Unit 2 steam turbine by 10% at rated steam flow.

Advances in steam seal packing systems on steam turbines can improve efficiency of the unit. EKPC has performed this work on Spurlock 1 & 2 steam turbines.

Higher efficiency motors, pumps, and fans are becoming more readily available. An economic evaluation of added cost versus decreased operating costs is performed when replacing older equipment.

Neural Network (NN) is an optimization technique whereby a control system "learns" the best settings to improve efficiency and reduce emissions.

The new control systems tend to allow the operator to control the units in a more economical, and therefore, more efficient manner. Spurlock's control system upgrade included performance software that allows the operator to monitor performance parameters, which in turn allows for more economical operation of the units.

The control change-outs that EKPC has performed on its steam units have cost up to $2M. The cost is highly dependent on the style of controls being replaced and the original design of the plant. Generally, heat rate improvement is not the reason for control change-outs. EKPC elected, in most cases, to change out controls based on availability of spare parts for older systems, installation of new equipment, and major additions of pollution control equipment requiring newer control system technology.

**EAST KENTUCKY POWER COOPERATIVE, INC.**
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**COMMISSION STAFF'S FIRST DATA REQUEST DATED 11/09/07**
**REQUEST 4**
**RESPONSIBLE PERSON:** **Jeffrey M. Brandt**
**COMPANY:** **East Kentucky Power Cooperative, Inc.**

**Request 4.** 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 4.** The goal for heat rate improvement is highly dependent upon on the age of the generating unit, the technological improvements already implemented, the existing and proposed pollution control equipment and, for the system, the mix of the system generating units. As indicated in the response to item 1 (c) and item 4 herein, EKPC has implemented a number of technologies to reduce heat rates on its exiting steam fleet. These technologies include computerized controls, improved burner designs, better gas cleaning systems, and higher performance turbines.

EKPC is considering several methods to improve heat rates over the next ten years. These include:

- Operating steam units at higher steam temperatures and pressures. This could be a possibility for EKPC for increasing unit efficiency. This would require somewhat extensive upgrades on existing equipment but could be considered as part of a CO2 strategy.

- Repowering. Repowering incorporates new power generating technology into an existing plant, while using much of the existing power plant facility, and typically increases plant capacity. EKPC is currently studying repowering options at two of its plants. Repowering leverages the intrinsic value of existing sites, which are already permitted and have an established infrastructure such as electrical transmission lines and fuel access. Some repowering options can increase capacity by 25 to 30 percent and improve plant efficiency by 5 to 13 percent.

- Power plant retrofit. Power plants are traditionally renovated after about 30 years of production. These renovations may take the form of a retrofit, which would increase the capacity of the power plant using traditional technology, or the renovation may include a more extensive repowering process, in which higher efficiency, cleaner coal technologies are installed in the existing plant.

At this time, EKPC is in the process of evaluating specific heat rate goals and has not established targets. Ultimately, the least cost option that satisfies regulatory constraints will determine the choice that EKPC makes.

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**COMMISSION STAFF'S FIRST DATA REQUEST DATED 11/09/07**
**REQUEST 5**
**RESPONSIBLE PERSON:** **William A. Bosta**
**COMPANY:** **East Kentucky Power Cooperative, Inc.**

**Request 5.** 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 5.** Yes. As indicated in EKPC's comments filed in this proceeding on September 28, 2007, the Commission's Fuel Adjustment Clause (FAC) regulations, under 807 KAR 5:056, offers the opportunity for consideration of on-going generation efficiency and is an existing regulatory process that encourages efficient generation.

**EAST KENTUCKY POWER COOPERATIVE, INC.**
**PSC NO. 2007-00300**
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**COMMISSION STAFF'S FIRST DATA REQUEST DATED 11/09/07**
**REQUEST 6**
**RESPONSIBLE PERSON:** **Jeffrey M. Brandt**
**COMPANY:** **East Kentucky Power Cooperative, Inc.**

**Request 6.** How does the company consider generation efficiency on an ongoing basis after the initial operation of a generating unit? Are annual or periodic studies performed? Explain in detail.

**Response 6.** Performance is measured on all EKPC generating units and reported monthly to the RUS. This monthly operating performance is compared to a calculated expected value. Use of a digital control system allows operators to monitor unit performance parameters in real-time and correct performance issues. EKPC's larger steam units have this capability.

For the steam units, EKPC performs annual unit capability tests. For the combustion turbines, EKPC performs Continuous Capability Validation Tests during the summer and winter peaks. This is a two-hour test at base load that provides heat rate information as well as proof of unit capability.

On EKPC's larger steam units, periodic performance tests are performed to check turbine cycle heat rate and boiler efficiency. These tests are performed at three or four load points. The boiler efficiency is measured by heat loss method at mid load and valves

wide open. Air Preheater Leakage tests are also routinely performed before maintenance outages.