BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In Re: Petition for Determination of Need for Levy Units 1 and 2 Nuclear Power Plants.	Docket No: 080148-EI
	Submitted for Filing: March 11, 2008

TESTIMONY OF JOHN SIPHERS ON BEHALF OF PROGRESS ENERGY FLORIDA

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IN RE: PETITION ON BEHALF OF PROGRESS ENERGY FLORIDA, INC. FOR NUCLEAR NEED

FPSC DOCKET NO. _______

DIRECT TESTIMONY OF JOHN SIPHERS

I. INTRODUCTION AND QUALIFICATIONS

Q. Please state your name and business address.

A. My name is John Siphers. My business address is 410 South Wilmington Street, Raleigh, North Carolina, 27601.

Q. Please tell us how you are employed and describe your background.

A. I am employed by Progress Energy as the Manager-Nuclear Fuel Management & Safety Analysis Section. I have held this position for two years. My responsibilities include negotiating and managing the uranium mining, conversion, enrichment, and nuclear fuel fabrication contracts for both Progress Energy Carolinas, Inc. ("PEC") and Progress Energy Florida, Inc. ("PEF"). I am responsible for making sure the PEC and PEF nuclear generation power plants have sufficient nuclear fuel, on time, and at a reasonable cost. I will also be responsible for obtaining the nuclear fuel for the additional, new generation nuclear power plants planned by both PEC and PEF. This includes Levy Units 1 and 2. I have a Bachelor's degree in Nuclear Engineering from N.C. State University, and have over 25 years of experience in nuclear fuel operation, design, and procurement.

II. PURPOSE AND SUMMARY OF TESTIMONY

Q. What is the purpose of your testimony?

A. In support of the Company's petition for a determination of need for Levy Units 1 and 2, I will explain the nuclear fuel requirements for Levy Units 1 and 2. I will describe the components of and the process for producing nuclear fuel. I will also explain the costs of nuclear fuel. I will further put the current nuclear fuel cost in historical context, explain what we expect to happen to the future cost, and explain how we manage nuclear fuel costs. I will also explain how changes in the cost of nuclear fuel impacts customers relative to other fuels used to produce energy on PEF's system. Likewise, I will explain how nuclear fuel use helps insulate nuclear fuel costs from market volatility typically experienced by other, fossil fuels. Finally, I will explain the process for and cost of storing spent nuclear fuel. In sum, I will provide support that nuclear fuel has historically been and is expected to be in the future the most stable fuel in terms of fuel cost to the customer with a significantly lower total fuel cost for the energy produced than fossil fuels.

Q. Are you sponsoring any sections of the Company's Need Study, Exhibit No. ___ (JBC-1)?

A. Yes, I am sponsoring the nuclear fuel and nuclear fuel forecast section, which explains the nuclear fuel components, the current price of nuclear fuel for Levy Units 1 and 2, and the nuclear fuel price forecast for Levy Units 1 and 2.

Q. Are you sponsoring any exhibits to your testimony?

A. Yes, I am sponsoring the following exhibits to my testimony:

- Exhibit No. ___ (JS-1), the 2007 nuclear fuel burn cost components;
- Exhibit No. ___ (JS-2), the chart of the historical and current uranium market in $/lb of U308;
- Exhibit No. ___ (JS-3), an average burn cost fuel comparison on a $/mmBtu cost basis from 2002 to 2010 for nuclear fuel, coal, natural gas, and oil; and
- Exhibit No. ___ (JS-4), the Company's nuclear fuel forecast through 2036 in terms of the burn cost in mills/kWhe.

Each of these exhibits was prepared under my direction, and each is accurate.

Q. Please summarize your testimony.

A. Uranium used for nuclear fuel is a relatively abundant natural mineral. There is, therefore, sufficient raw material for additional nuclear reactors like Levy Units 1 and 2. Likewise, the production capacity to mill, process, enrich, and fabricate uranium into nuclear fuel assemblies used in nuclear reactors like Levy Units 1 and 2 will also expand to meet future demand. Nuclear fuel costs have increased compared to the historically depressed prices we have seen in the past but they are expected to stabilize in the future. The Company's nuclear fuel forecast represents this expectation, and is a reasonable forecast of future nuclear fuel costs based on the Company's expertise and judgment. Nuclear fuel is and will be less volatile and more stable than other, fossil fuels. It will cost less relative to fossil fuels too, making nuclear fuel generation an attractive economic alternative for PEF and its customers in the future.

III. NUCLEAR FUEL COMPONENTS AND COST

Q. What are the components of nuclear fuel that will be used by Levy Units 1 and 2?

A. Nuclear fuel begins with uranium, which must be mined from the ground using various mining techniques. This raw uranium ore is then milled near the mine to produce an oxide called U308. Another industry term for U308 is "yellowcake." Uranium is found in many locations worldwide. Progress Energy currently contracts for uranium mined in the United States, Canada, Australia, Kazakhstan, Uzbekistan and Namibia. Uranium is a common mineral so there is little risk that there will be insufficient uranium to meet current and future nuclear energy production needs. Currently, however, there are limited open uranium mines due to historically depressed uranium prices. As uranium prices rise, which recently occurred, expansions of existing mines and the development of new mines are expected to meet demand.

The next step is the chemical conversion of the U308 to UF6, which reaches a gaseous state when heated. Any impurities are removed during this chemical process and the process of converting the UF6 to a gas is necessary for the next step in production. This step is the enrichment process. Existing and next generation reactors use uranium with a higher percentage of the U-235 isotope than is found in nature. Natural uranium contains 0.711 percent U-235, while Levy Units 1 and 2 will need a range of approximately 3 percent to 5 percent U-235, which is typical of existing nuclear power reactors too. The enrichment process raises the UF6 from 0.711 percent U-235 to 3 percent to 5 percent U-235.

The final step is to take the enriched UF6, change it to a powder, press and sinter the powder into ceramic pellets, feed the pellets into tubes in a pre-set order with inert elements, seal the tubes (sometimes called "rods") and bundle them together into fuel assemblies. This is the fabrication process. Once the fuel assemblies are complete, they are shipped to the nuclear power plant site for insertion into the nuclear reactor.

Q. How do the components of nuclear fuel contribute to its total cost?

A. There is a cost for each component of the nuclear fuel that is ultimately placed into the nuclear reactor. The total cost of nuclear fuel to the customer will likely include a fee called the high level waste fee and various labor and other miscellaneous costs. The representative percentage of each of these costs in the total fuel burn cost to the customer in 2007 is shown in Exhibit No. ___ (JS-1) to my testimony. As you can see, the cost of the uranium enrichment, followed by the cost of the yellowcake, the fabrication, and the waste fees, account for the greatest percentage expense of the total nuclear fuel cost. The remaining costs, including the conversion costs, are relatively minor in relation to the total fuel cost. Recently, we have seen changes in this fuel burn cost mix, with the yellowcake cost increasing as a component of the total fuel burn cost because, as I mentioned before, the cost of uranium increased.

Q. What caused the recent increase in uranium prices?

A. Currently, the supply of uranium and demand for it are not in balance and, as a result, uranium prices have increased in the short-term market. A number of factors contribute to this short-term price increase. While uranium is an abundant mineral, uranium mines are not, so there are a limited number of current suppliers for the number of potential purchasers. Further, governments can quickly influence the market price by, for example, increasing investment in building or dismantling nuclear powered vessels or nuclear weapons. The uranium market has fewer suppliers and purchasers when compared to other commodities, so imbalances can be expected where there will be periods of uranium shortages as well as periods of oversupply. In other words, the uranium market is subject to "booms" and "busts."

Over the last two decades, uranium prices have been depressed, which is one reason supply is more restricted now, but there have been periods of similar price escalations, such as in the late 1970's when new nuclear plant orders drove up uranium prices. This is graphically demonstrated in Exhibit No. ___ (JS-2), which tracks the uranium price in $/lb U308 from 1969 to 2007. As shown in Exhibit No. ___ (JS-2), immediately after the end of new plant orders in the late 1970's, uranium prices returned to and below historic price levels. A similar period where new plant orders are being announced is occurring now. Consistent with the return to lower prices in the 1980's, we expect that future uranium prices will stabilize, however the need for new mine development will likely result in prices higher than those we have seen in recent years. Our uranium price forecast incorporates this expectation.

Q. Why do you believe uranium prices will fall to more moderate levels in the future?

A. Recent price spikes cannot be sustained for long periods of time. During short-term price spikes purchasers will refrain from making purchases unless absolutely necessary, preferring to rely on uranium inventories already in the production pipeline. In fact, we have already seen some moderation in the uranium price from its highest levels in early 2007. Additionally, uranium price increases at these levels will spur the expansion of existing mines or the development of new mines, thus, increasing the production of yellowcake. The lead time for existing uranium mines to expand or suppliers to open new mines should coincide with or occur before commercial operation of the next generation of nuclear power plants. As a result, uranium production is expected to meet demand in the future, when Levy Units 1 and 2 come on-line. In fact, uranium production may exceed demand in that time frame if all of the planned nuclear generation is not built.

Q. What is the impact of uranium price increases on customers?

A. Since mined uranium is a component of the nuclear fuel burn cost that customers pay, if the uranium price increases then the cost to the customer increases. Likewise, if uranium conversion, enrichment, and fabrication costs increase along with uranium price increases, the total nuclear fuel burn cost will increase, and customers will pay more. This is true with current uranium price increases and it will be true for such price increases, or increases in the other nuclear fuel cost components, in the future, should they occur. Such increases from the customer perspective are relative, however.

The cost of nuclear fuel on a comparable basis to fossil fuels is still much lower, even with the recent uranium price increases. As demonstrated by Exhibit No. ___ (JS-3), the average yearly $/mmBtu cost of nuclear fuel to the customer is lower than any fossil fuel alternative, even with the uranium price increases, which are evident in the period from 2008 to 2010. These price increases show up in this time period because there is a lag time between when the uranium is purchased and when it is used in the next refueling outage, due to the time necessary to go through the conversion, enrichment, and fabrication process, and then be placed in line for re-fueling. Nuclear fuel generation is still an attractive economic alternative on a $/mmBtu for customers to other fossil fuel generation, and it will be in the future too, when Levy Units 1 and 2 achieve commercial operation.

Q. Are there any other cost benefits from using nuclear fuel as opposed to fossil fuels that customers receive?

A. Yes. After the initial fuel core is installed in a nuclear reactor, about 30 percent to 40 percent of the nuclear fuel assemblies are replaced during re-fueling outages which take place every eighteen (18) to twenty-four (24) months. Fossil fuel generation, on the other hand, requires constant to near constant re-fueling. Fossil fuels are also subject to wider and more frequent price fluctuations than those experienced with nuclear fuel. As a result, customers are exposed to more frequent and volatile fluctuations in fossil fuel market prices in part because fossil fuels need to be regularly purchased to produce energy from fossil fuel generation plants. Nuclear fuel generation helps insulate customers from such frequent and volatile price fluctuations in the fossil fuel markets by providing greater price stability and reliability.

IV. NUCLEAR FUEL SUPPLY FOR LEVY UNITS 1 AND 2

Q. When will the Company need the nuclear fuel for Levy Units 1 and 2?

A. PEF will likely contract for the uranium supply several years before the units are operational to ensure there is a supply of uranium for the nuclear fuel for the units. As utilities, like PEF, with plans for the construction of nuclear reactors pursue such contract negotiations, the expansion of existing mines or development of new mines will occur.

Q. Will there be sufficient conversion, enrichment, and fabrication capacity in the future to process the uranium into nuclear fuel?

A. Yes. Conversion, enrichment, and fabrication capacity will track uranium production, therefore, there should be sufficient capacity in time to meet the needs for Levy Units 1 and 2. Uranium enrichment is currently supplied to U.S. utilities by several companies around the world, each with current projects in place to expand capacity. Likewise, uranium conversion, enrichment, and fabrication capacity is expected to expand to meet demand, in fact the fabrication facilities have some excess capacity at this time. Additional future capacity for these fuel components will require relatively straightforward factory expansions or additions; modest price increases in these components may be necessary to provide the capital needed for this expansion, but there should not be a price spike in these components similar to that recently seen in the uranium market.

Q. Will the Company take steps to manage the nuclear fuel cost for Levy Units 1 and 2?

A. Yes. The Company competitively bids uranium and other nuclear fuel component services but will purchase uranium or services from a sole service provider when the arrangement is economically beneficial to customers. Typically, the Company has four to six uranium suppliers at any given point, and the Company will rely on spot purchases when market conditions warrant such purchases. The Company also attempts to develop a contract portfolio with various term lengths and pricing provisions to attempt to capture low prices while minimizing exposure to short term price volatility. All of these contract procurement and management techniques and efforts will also be used in purchasing nuclear fuel for Levy Units 1 and 2.

Q. What about the disposal of spent nuclear fuel, how will that be handled for Levy Units 1 and 2?

A. During re-fueling of Levy Units 1 and 2, when a third of the nuclear fuel assemblies are replaced, the spent fuel will be stored for several years in a spent fuel pool, consistent with Nuclear Regulatory Commission ("NRC") requirements and current practice. This storage is necessary to sufficiently cool the spent fuel after it has been removed from the reactor. Thereafter, the spent fuel will be either stored on-site in proven, environmentally sound dry cask storage, or disposed of or reprocessed by the Department of Energy ("DOE"). While PEF does not yet have a contract with DOE for spent fuel disposal from Levy Units 1 and 2, the Nuclear Waste Policy Act of 1982 establishes that the responsibility for the disposal of spent fuel lies with the Federal Government.

IV. NUCLEAR FUEL COST FORECAST

Q. What is the Company's nuclear fuel cost forecast?

A. The Company's nuclear fuel forecast through 2036 in terms of the burn cost in mills/kWhe is included in Exhibit No. ___ (JS-4) to my testimony. This fuel forecast reflects the Company's best estimate of the reasonable, future nuclear fuel costs using industry-recognized forecast methods.

Q. Please describe how you prepared the nuclear fuel forecast.

A. To project the costs of the components of the nuclear fuel assemblies, the Company procures forecasts from market consultants who study the supply and demand of the nuclear fuel market worldwide. The Company reviews these projections and may make revisions based on its own knowledge gained from recent procurements and interactions with suppliers. This market cost forecast is input to models of current and expected contract terms in order to arrive at the Company's expected costs each year for uranium, conversion, enrichment, and fabrication services. These cost projections are combined with projections of the amount of nuclear fuel needed for each operating cycle to obtain a total cost for the nuclear fuel loaded into the core.

For the AP-1000 plants planned for Levy Units 1 and 2, detailed projections have already been developed by Westinghouse, the plant supplier. Following the determination of the total fuel cost, the fuel cost to be amortized and charged to the customer is calculated by determining the amount of energy produced by each fuel assembly on an annual basis. With the addition of an estimated 1 mill per kWh spent fuel disposal fee, this forms the basis of our estimated fuel cost from Levy Units 1 and 2.

Q. Has the Company developed a low and high nuclear fuel forecast?

A. No, it has not. As I have explained, the Company's nuclear fuel forecast represents the Company's best estimate of the future costs of all components that make up the total nuclear fuel cost to the customer based on the Company's current and future contracts, the Company's analysis of market information from a variety of sources and consultants, and the Company's experience and judgment. We believe that our nuclear fuel forecast is, as a result, the most reasonable projection of future nuclear fuel costs. Further, because the total nuclear fuel cost to the customer has been historically and is expected to be less volatile and more stable than costs from other fossil fuel resources available to the Company, there is little need for alternative fuel forecasts to what we believe is the reasonable, future projection of nuclear fuel costs.

Q. Does this conclude your testimony?

A. Yes.

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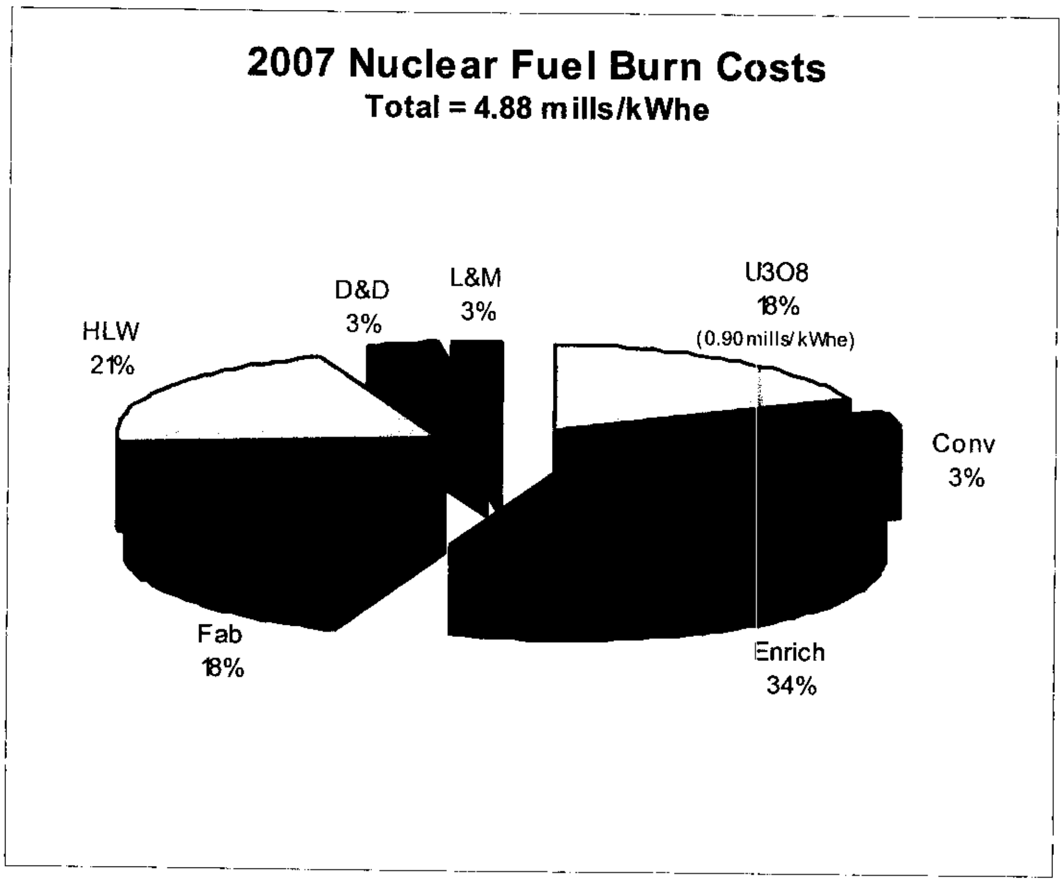
Exhibit No. _ (JS-1)



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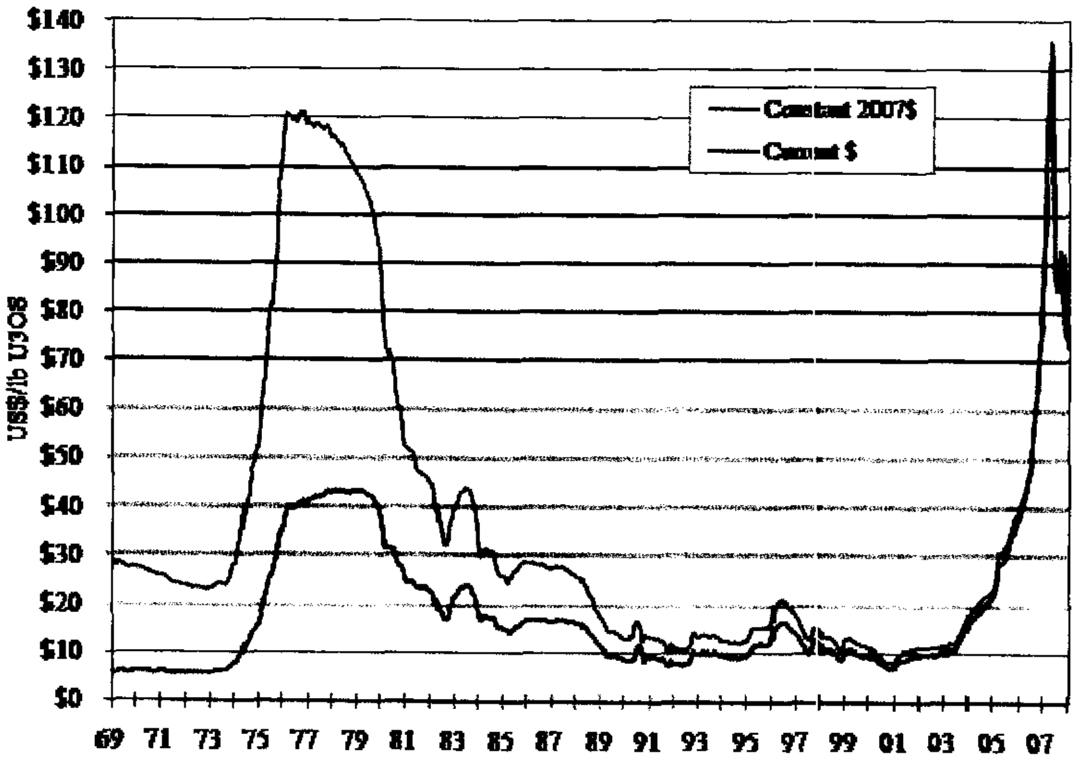
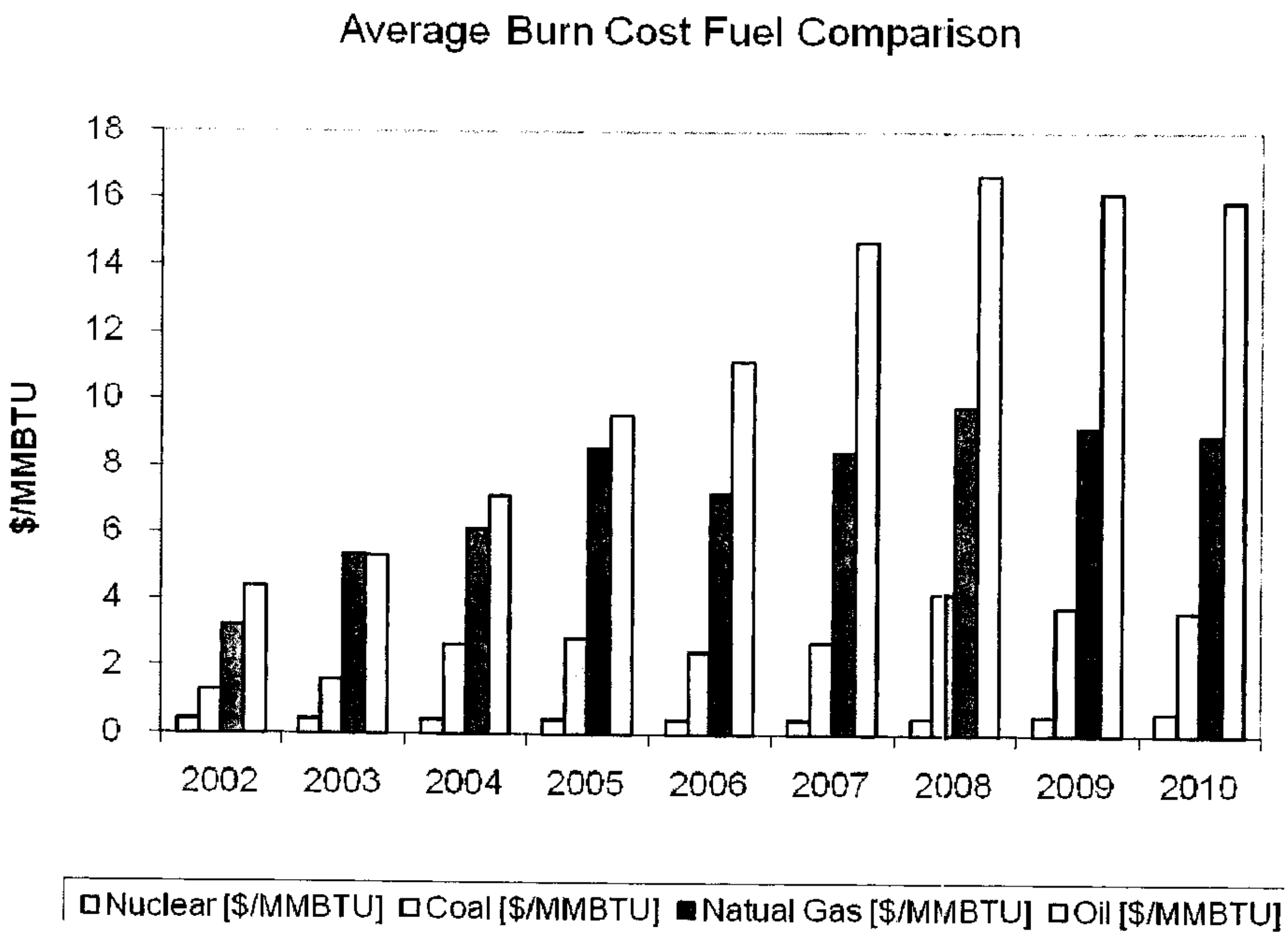


Source: 1969-1986 Nuexco Exchange Value, 1987-Present Ux U3O8 Price.


Average Burn Cost Fuel Comparison
$/MMBTU
18
16
14
12
10
8
6
4
2
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
Nuclear [$/MMBTU]
Coal [$/MMBTU]
Natual Gas [$/MMBTU]
Oil [$/MMBTU]

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