BEFORE THE
FLORIDA PUBLIC SERVICE COMMISSION

DOCKET NO. 07_____-EI
FLORIDA POWER & LIGHT COMPANY

IN RE: FLORIDA POWER & LIGHT COMPANY'S PETITION TO DETERMINE NEED FOR TURKEY POINT NUCLEAR UNITS 6 AND 7 ELECTRICAL POWER PLANT

DIRECT TESTIMONY & EXHIBITS OF:

CLAUDE A. VILLARD

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

FLORIDA POWER & LIGHT COMPANY

DIRECT TESTIMONY OF CLAUDE A. VILLARD

DOCKET NO. 07 ______ - EI

OCTOBER 16, 2007

Q. **Please state your name and business address.**

A. My name is Claude A. Villard. My business address is 700 Universe Boulevard, Juno Beach, Florida, 33408.

Q. **By whom are you employed and what is your position?**

A. I am employed by Florida Power & Light (FPL or the Company) as Director, Nuclear Fuels.

Q. **Please describe your duties and responsibilities in that position.**

A. I am responsible for procurement, contract administration, reactor core design, fuel performance, accident analysis, and certain spent fuel storage matters for FPL's nuclear power plants.

Q. **Please describe your educational background and professional experience.**

A. I received a Bachelor of Science Degree in Nuclear Engineering from Lowell Technological Institute in 1974, and a Master Degree in Nuclear Engineering from the University of Lowell in 1976. I have more than 30 years experience in various technical and commercial aspects of the nuclear fuel cycle. I have also previously worked for a nuclear steam supply system vendor and two electric utilities that owned and operated nuclear power plants with varying levels of responsibility. In my career, I have performed and managed a variety of fuel-related activities, including fuel supply strategy studies, market analyses, and price forecasts.

Q. Are you sponsoring any exhibits in this case?

A. Yes. I am sponsoring Exhibits CAV-1 through CAV-6, which are attached to my direct testimony.

Exhibit CAV-1	Description of Nuclear Fuel Cycle
Exhibit CAV-2	Uranium Past and Projected Prices
Exhibit CAV-3	Conversion Services Projected Prices
Exhibit CAV-4	Enrichment Services Projected Prices
Exhibit CAV-5	Fabrication Services Projected Prices
Exhibit CAV-6	Annual Nuclear Fuel Expense Projection

Q. Are you sponsoring any sections of the Need Study in this proceeding?

A. Yes. I am sponsoring sections V.A.2.a, V.A.2.b and V.A.2.c (parts iv and vi) and I am co-sponsoring Appendix E of the Need Study.

PURPOSE AND SUMMARY OF TESTIMONY

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to describe the steps required to build nuclear fuel for delivery to a reactor, provide background information on the nuclear fuel industry, assess the availability of future supplies for each of these steps, and provide fuel price projections relating to the proposed new nuclear project. I will provide the reference nuclear fuel costs used in FPL's analysis, discuss how nuclear fuel supply interruption would have a minimal impact on nuclear generation and how nuclear operation may help to support the electrical grid, in case of supply interruption for other fuels. Finally, I will discuss how FPL would address spent fuel storage and alternatives in view of the delays in the U.S. Department of Energy's (DOE) spent fuel disposal performance.

Q. Please summarize your testimony.

A. Nuclear fuel costs have historically been stable and significantly lower than fossil fuels. Although the nuclear fuel markets are currently in transition and prices are currently relatively high, I expect the markets to return to fundamentals with sufficient supplies to address the nuclear fuel needs for Turkey Points 6 & 7 at reasonable and stable prices. In addition, because the cost per MWh for nuclear fuel is much lower than for fossil fuels, the impact on customers' bills if nuclear fuel prices change by a certain percentage is much smaller than if fossil fuel prices change by that same percentage.

Nuclear plants are also less vulnerable to supply disruption than fossil plants, especially those that are gas-fired. Because nuclear plants are refueled at lengthy intervals (typically 18 months or more) rather than continuously as is the case for fossil plants, nuclear plants have long periods of operation where the immediate availability of additional fuel supply is not an issue. Moreover, nuclear plants are capable of continuing operation beyond the planned refueling date, in case of disruption from nuclear or fossil fuels supply chains.

Finally, FPL is confident that there will be viable, economic alternatives available for the storage of spent nuclear fuel at Turkey Point 6 & 7 regardless of when the DOE fulfills its statutory and contractual obligations to take delivery of spent nuclear fuel for disposal.

PROCUREMENT OF NUCLEAR FUEL

Q. Please provide an overview of the fabrication process for nuclear fuel.

A. As shown on Exhibit CAV-1, four separate steps are required before nuclear fuel can be used in a commercial nuclear power reactor.

Uranium is produced in many countries such as Canada, Australia, Khazakhstan, and the United States. During the first step, uranium is mined from the ground using techniques such as open pit mine, underground mining, in-situ leaching operations, or production as a by-product from other mining operations, such as gold, copper or phosphate rocks. The product from this first step is the raw uranium delivered as an oxide, U3O8 (sometimes referred to as yellowcake).

During the second step, the U3O8 is chemically converted into UF6 which, when heated, changes into a gaseous state. This second step further removes any chemical impurities and serves as preparation for the third step, which requires uranium to be in a gaseous state.

The third step is called enrichment. Natural uranium contains 0.711% of uranium at an atomic mass of 235 (U-235) and 99.289% of uranium at an atomic mass of 238 (U-238). Similar to current reactors, the next generation of nuclear power reactors will use uranium with a higher percentage of up to five percent (5%) of U-235 atoms. Because natural uranium does not contain a sufficient amount of U-235, the third step increases the percentage amount of U-235 from 0.711% to a level specified when designing the reactor core (typically in a range from approximately 3% to as high as 5%). The output of this enrichment process is enriched uranium in the form of UF6.

During the last step, fuel fabrication, the enriched UF6 is changed to a UO2 powder, pressed into pellets, and fed into tubes, which are sealed and bundled together into fuel assemblies. These fuel assemblies are then delivered to the plant site for insertion in a reactor.

Like other utilities, FPL has purchased raw uranium and the other components of the nuclear fuel cycle separately from numerous suppliers from different countries.

Q. What do you expect the availability and price for raw uranium to be in the future?

A. Exhibit CAV-2 provides the most recent price projections for raw uranium. These projections are the result of FPL's analysis based on inputs from nuclear fuel market expert firms. The current supply of natural uranium in the market is tight, which has caused a short-term increase in the current spot market. These higher market prices have motivated additional production expected to come on line over the next few years, which should bring uranium prices back to a level consistent with market fundamentals. The higher demand scenario is due to an optimistic projection of construction of new nuclear units. Although uranium is available, uranium suppliers have not yet committed to support this higher demand, because there are no firm orders for new units. However, because the lead time to bring on line new mining production is similar to or shorter than the lead time for new nuclear units, I expect the higher demand to be met with higher uranium production in the future.

Q. What do you expect the availability and price for conversion services to be in the future?

A. Exhibit CAV-3 shows the current price projections for conversion services. Just like raw uranium, an increase in demand for conversion would result from the need to supply new nuclear units. As with additional raw uranium production, FPL expects expansion beyond current supply to track firm commitments to building new nuclear units. Capacity expansion of conversion services can be handled within the lead time for constructing a new nuclear unit. Therefore, FPL also expects sufficient supply with long term prices following cost fundamentals.

Q. What do you expect the availability and price for enrichment services to be in the future?

A. With no new production capacity, and if the current restrictions on imports of enrichment services from Russia and France continue, the current tight market supply for economically produced enrichment services will continue. A high projection of new nuclear unit construction shows a shortage of enrichment services, starting in 2010. However, there are a number of new facilities coming on-line in that time frame and FPL expects the current restrictions to be lifted, at least partially if not totally. In addition, as with supply for the other steps of the nuclear fuel cycle, expansion of future capacity is feasible within the lead time for constructing new nuclear units. Exhibit CAV-4 shows the price projections for enrichment services. As discussed before, the shortfall in supply is more a reflection of the reluctance to add capacity until receipt of firm commitments to build nuclear units. The current price in the reference case (i.e., $140 per Separative Work Unit (SWU) which is the unit used to measure work done to increase (enrich) the amount of U-235 in natural uranium from 0.711 percent by weight (w/o) to as high as 5.0 w/o) is expected to continue with only normal escalation throughout the period of analysis, as shown on Exhibit CAV-4.

Q. What do you expect the availability and price for nuclear fuel fabrication services to be in the future?

A. Because the nuclear fuel fabrication process is highly regulated by the Nuclear Regulatory Commission (NRC), not all production facilities can qualify as fuel suppliers to nuclear reactors in the U.S. Nonetheless, the supply for the U.S. market is expected to be sufficient to meet U.S. demand for the foreseeable future. Exhibit CAV-5 shows relatively stable fuel fabrication prices for the foreseeable future and supply can also be expanded to meet higher demand.

Q. Can you summarize your expectations for future nuclear fuel supply and stability for future nuclear fuel costs?

A. In summary, I expect the market to return to fundamentals and to be sufficiently supplied to address the needs for new nuclear units. Nuclear fuels costs have historically been stable, and we expect that stability to be preserved in the future. In addition, because the cost per MWh for nuclear fuel is much lower than for fossil fuels, the impact on customers' bills if nuclear fuel prices change by a certain percentage is much smaller than if fossil fuel prices change by that same percentage. Therefore, increasing the nuclear component of FPL's generation mix should help to reduce the exposure of FPL and its customers to cost impacts from fluctuations in the fuel markets.

Q. Please describe how you calculated the nuclear fuel costs that are used for FPL's economic analysis of the proposed new nuclear generating units, Turkey Point 6 & 7.

A. The reference nuclear fuel cost projections utilized in the analyses accompanying this need petition are provided in Exhibit CAV-6. The reference case was calculated using the "reference price" scenarios for each of the steps used to fabricate nuclear fuels. The calculation for this fuel cost projection was performed consistent with the method currently used for FPL's Fuel Clause filings, including the assumption of a fuel lease and the assumption of refueling outages every 18 months. The costs for each step to fabricate the nuclear fuels are added and capitalized to come up with the total costs of the fresh fuel to be loaded at each refueling (capitalized acquisition costs). The capitalized acquisition cost for each group of fresh fuel assemblies are then amortized over the energy produced by each group of fuel assemblies, and carrying costs are also added on the total unrecovered costs to come up with the total fuel costs to be charged to customers. FPL also adds 1 mill per kilowatt hour net to reflect payment to DOE for spent fuel disposal. Because price forecasts did not extend to 2060, FPL continued to escalate these price projections at 2.5% per annum through that year from 2020, the last year from which price forecast was available.

Q **Are there special cost considerations that will apply to the first fuel core for Turkey Point 6 & 7?**

A. Yes. It takes longer to manufacture and deliver a complete first core when compared to the typical one-third of the core loaded at the end of each 18 month cycle. Therefore, FPL has assumed about two years to build the first cores for each unit, compared to the typical one year for the processing of one-third of a reactor core. In addition, some of the fuel loaded in the first core would not be efficiently utilized. Compared to the typical three cycles (18 to 24 months each) of residence in a reactor core, some of the first core fuel will be discharged at the end of the first cycle and others at the end of the second cycle. This added cost for the first core is reflected in Exhibit CAV-10, which shows a higher cost in the first years of operation.

Q. **Would these units help mitigate the impact of a supply interruption either in nuclear fuels or other fuels?**

A. Nuclear units do not require continuous refueling but rather operate without any need to refuel for intervals of 18 months or longer between their refueling outages. Therefore, fuel-supply disruptions would have a different impact on nuclear units' operation than they would on fossil units. In addition, the practice in the nuclear industry has been and continues to be, to schedule deliveries of fuel assemblies no later than two months prior to a refueling outage. This allows plant personnel sufficient time to stage the fuel ahead of the outage and provides sufficient contingency in case of supply disruption during the fabrication process.

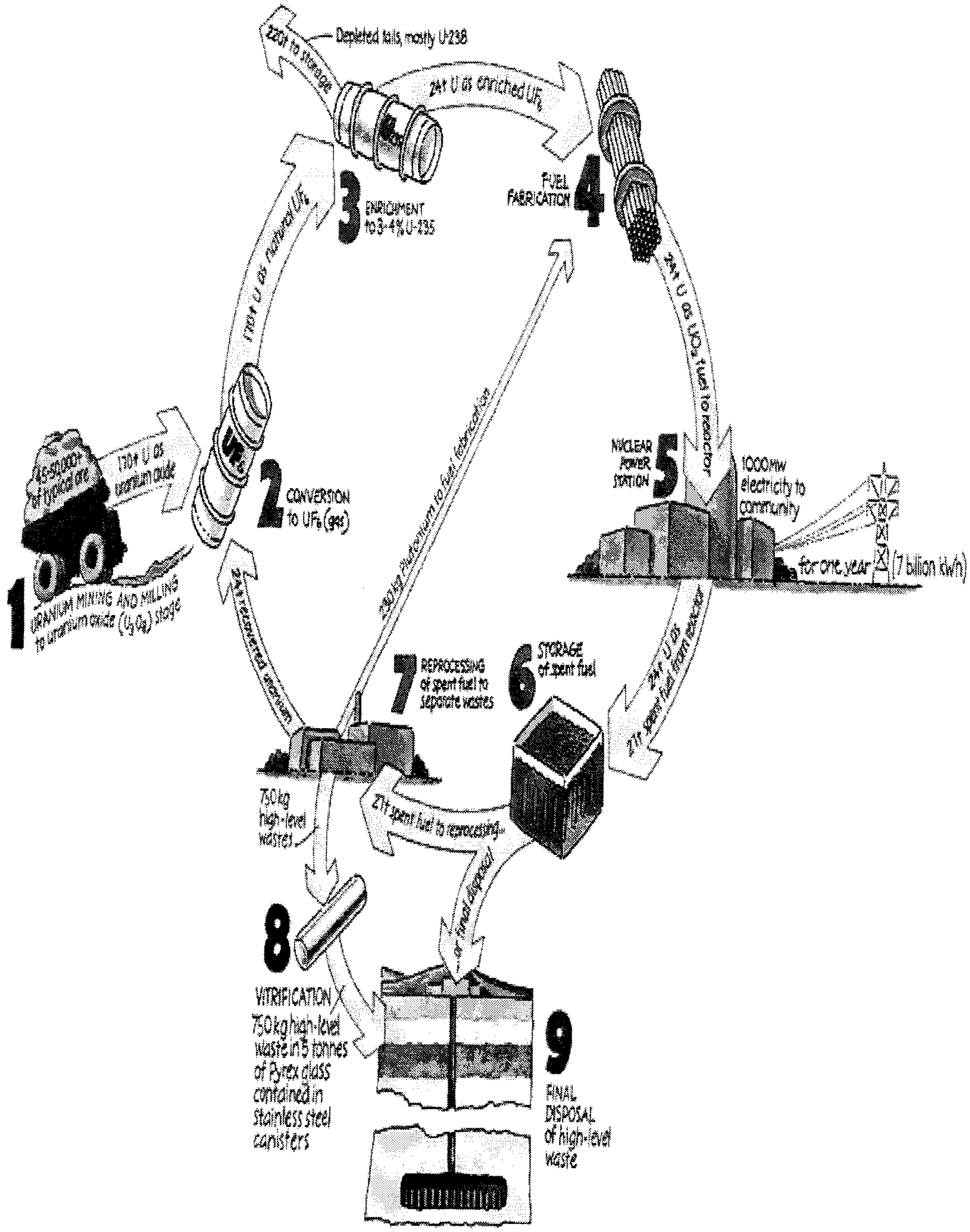
Furthermore, nuclear units have the capability to continue power production beyond the scheduled end of fuel life. This is done by slightly reducing core temperature either by changing the inlet temperature of the coolant returning to the reactor core or reducing power level over time. Although power production is reduced during that period, the rate of power reduction is typically between 0.3% to 1.2% on the average per day, depending on the specific nuclear units. In case of supply disruption, either in nuclear fuel or other fuels, a nuclear unit can continue to provide power for an extended time beyond its initially scheduled outage.

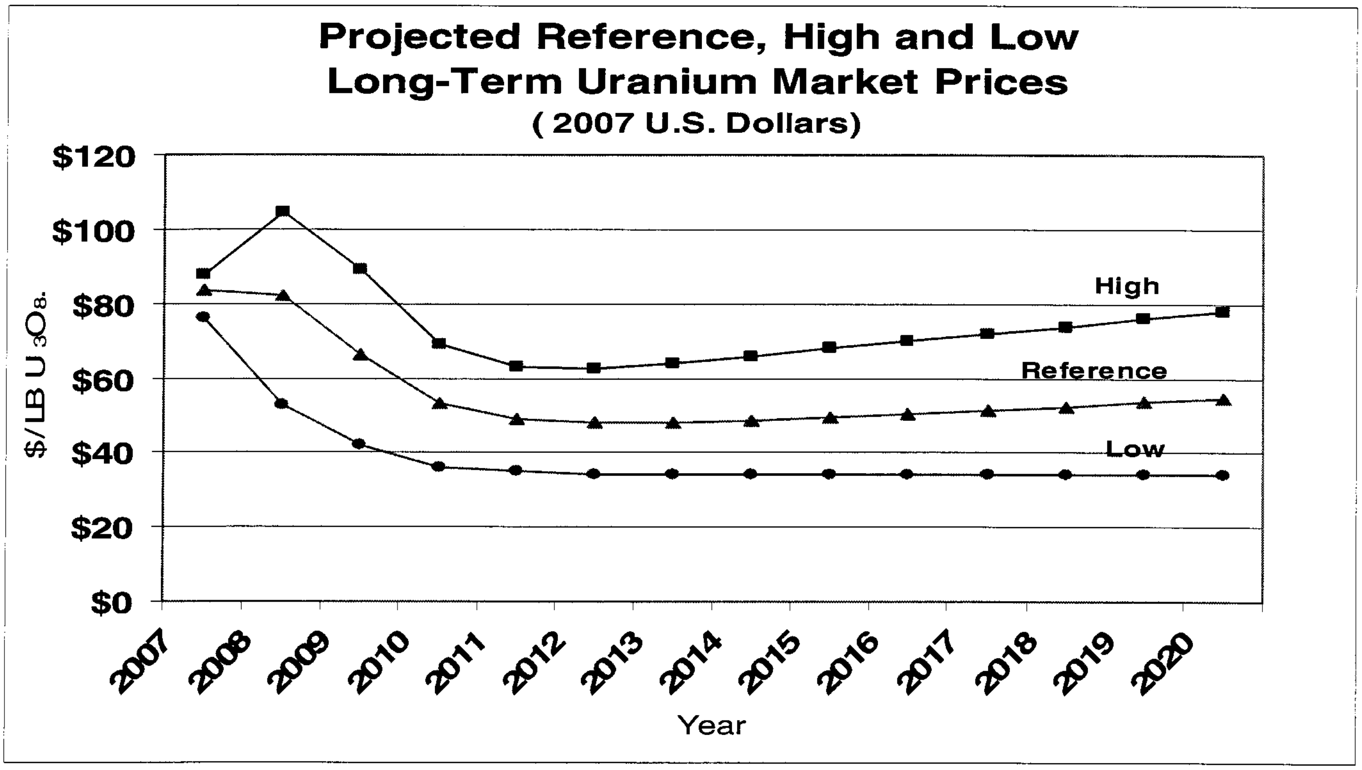
Q. **How does FPL intend to address storage of spent nuclear fuel, in view of the delays in DOE's performance in the disposal of spent nuclear fuel?**

A. The spent fuel pool capacity in new nuclear plant designs is for over 10 years of storage. This meets the needs for initial cool-down of the spent fuel after it has been removed from the reactor. Thereafter, the fuel will either be disposed of by the DOE, as it is statutorily and contractually obligated to do, or stored on-site in one of the proven safe and environmentally sound on-site storage options, such as dry cask storage.

Q. **Does this conclude your testimony?**

A. Yes.


Depleted tails, mostly U-238
220t to storage
24t U as enriched UF6
3 ENRICHMENT to 3-4% U-235
FUEL FABRICATION 4
130t U as natural UF6
24t U as UO2 fuel to reactor
45-50,000t of typical ore
130t U as uranium oxide
2 CONVERSION to UF6 (gas)
NUCLEAR POWER STATION 5
1000MW electricity to community
for one year (7 billion kWh)
1 URANIUM MINING AND MILLING to uranium oxide (U3O8) stage
230kg plutonium to fuel fabrication
24t recovered uranium
7 REPROCESSING of spent fuel to separate wastes
6 STORAGE of spent fuel
24t U as 27t spent fuel from reactor
750kg high-level wastes
27t spent fuel to reprocessing...
... or final disposal
8
VITRIFICATION
750kg high-level waste in 5 tonnes of Pyrex glass contained in stainless steel canisters
9
FINAL DISPOSAL of high-level waste


Projected Reference, High and Low
Long-Term Uranium Market Prices
(2007 U.S. Dollars)
$120
$100
$80
$60
$40
$20
$0
$/LB U 3O8.
High
Reference
Low
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
Year

Source: FPL

Year	Base Price of 2007 U.S. Dollars			U.S. GDP IPD Escalated Price		
	Low	*Reference*	*High*	*Low*	*Reference*	*High*
2007	11.00	12.25	13.50	11.00	12.25	13.50
2008	10.50	12.00	13.50	10.76	12.30	13.84
2009	10.25	11.75	13.75	10.77	12.34	14.45
2010	10.00	11.75	14.00	10.77	12.65	15.08
2011	10.00	12.00	14.25	11.04	13.25	15.73
2012	10.00	12.25	14.50	11.31	13.86	16.41
2013	10.25	12.50	14.75	11.89	14.50	17.11
2014	10.50	13.00	15.00	12.48	15.45	17.83
2015	10.75	13.25	15.25	13.10	16.14	18.58
2016	11.00	13.50	15.50	13.74	16.86	19.36
2017	11.25	13.75	15.50	14.40	17.60	19.84
2018	11.50	14.00	15.75	15.09	18.37	20.67
2019	11.50	14.00	15.75	15.47	18.83	21.18
2020	11.50	14.00	16.00	15.85	19.30	22.06

Source: FPL

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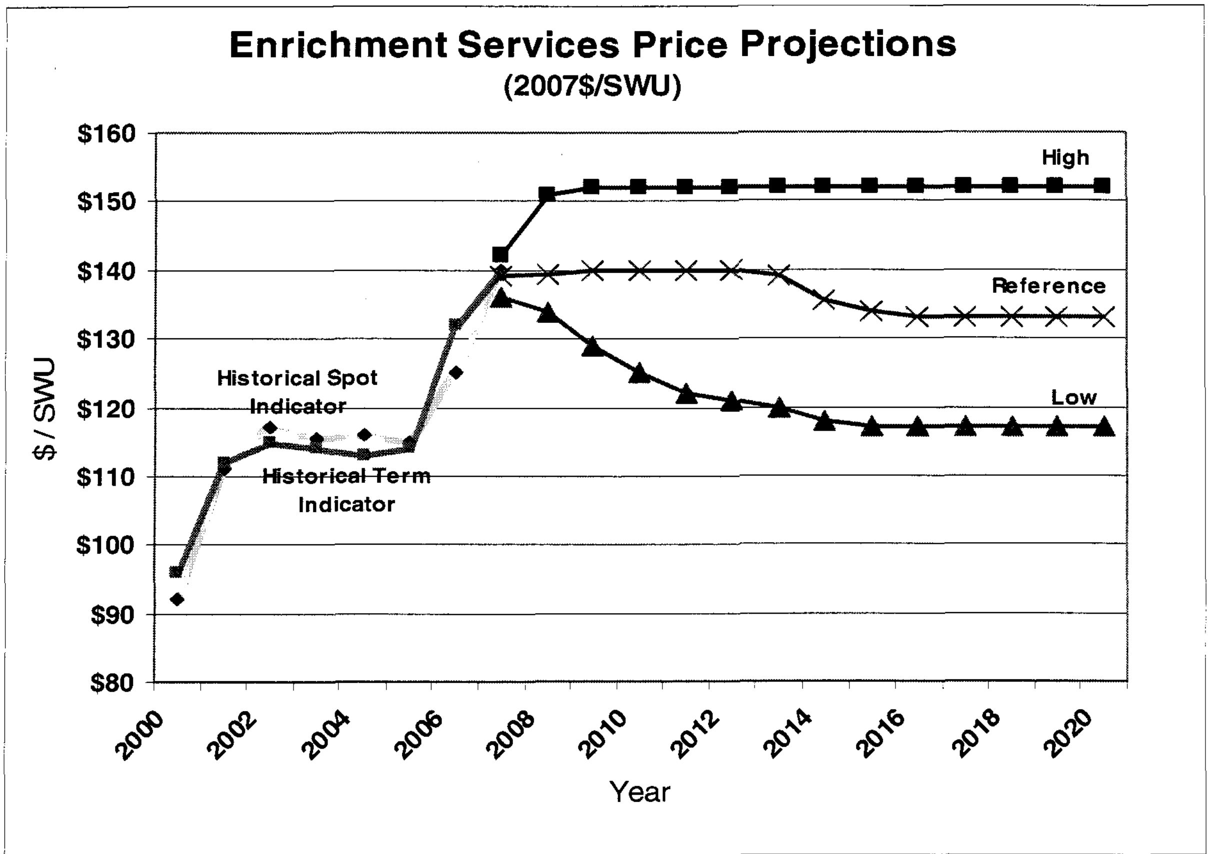
Enrichment Services Projected Prices
Exhibit CAV-4, Page 1 of 1



Source: FPL

SWU: Separative work units, units of services needed to increase the % of U235 from 0.711 w/o in natural uranium to the level needed for civilian reactors (up to 5 w/o).

Year	PWR		BWR	
	Base Price (2007 Dollars)	*Escalated Price (Current Dollars)*	*Base Price (2007 Dollars)*	*Escalated Price (Current Dollars)*
2007	207	207	276	276
2008	207	212	276	282
2009	207	216	276	289
2010	207	221	276	295
2011	207	226	276	302
2012	207	231	276	308
2013	207	237	276	315
2014	207	242	276	323
2015	207	247	276	330
2016	207	253	276	337
2017	207	259	276	345
2018	207	264	276	353
2019	207	270	276	360
2020	207	276	276	369

Source: FPL

PWR = Pressurized Water Reactor
BWR = Boiling Water Reactor

NEW PLANT DETERMINATION
Annual Nuclear Fuel Expense Projection
(includes spent fuel disposal)

REFERENCE PRICE

	UNIT 1		UNIT 2	
	cents/ MBTU	mills/ KwHe	cents/ MBTU	mills/ KwHe
2018	87.19	9.10	0.00	0.00
2019	86.72	9.05	0.00	0.00
2020	95.65	9.98	87.19	9.10
2021	104.09	10.86	86.72	9.05
2022	103.62	10.81	95.65	9.98
2023	98.24	10.25	104.09	10.86
2024	100.69	10.51	103.62	10.81
2025	103.21	10.77	98.24	10.25
2026	105.79	11.04	100.69	10.51
2027	108.43	11.32	103.21	10.77
2028	111.15	11.60	105.79	11.04
2029	113.92	11.89	108.43	11.32
2030	116.77	12.19	111.15	11.60
2031	119.69	12.49	113.92	11.89
2032	122.68	12.80	116.77	12.19
2033	125.75	13.12	119.69	12.49
2034	128.89	13.45	122.68	12.80
2035	132.12	13.79	125.75	13.12
2036	135.42	14.13	128.89	13.45
2037	138.81	14.49	132.12	13.79
2038	142.28	14.85	135.42	14.13
2039	145.83	15.22	138.81	14.49
2040	149.48	15.60	142.28	14.85
2041	153.22	15.99	145.83	15.22
2042	157.05	16.39	149.48	15.60
2043	160.97	16.80	153.22	15.99
2044	165.00	17.22	157.05	16.39
2045	169.12	17.65	160.97	16.80
2046	173.35	18.09	165.00	17.22
2047	177.68	18.54	169.12	17.65
2048	182.12	19.01	173.35	18.09
2049	186.68	19.48	177.68	18.54
2050	191.34	19.97	182.12	19.01
2051	196.13	20.47	186.68	19.48
2052	201.03	20.98	191.34	19.97
2053	206.06	21.51	196.13	20.47
2054	211.21	22.04	201.03	20.98
2055	216.49	22.59	206.06	21.51
2056	221.90	23.16	211.21	22.04
2057	227.45	23.74	216.49	22.59
2058	233.14	24.33	221.90	23.16
2059	238.96	24.94	227.45	23.74
2060	244.94	25.56	233.14	24.33