Comparison of Fuel Utilization by Florida Power & Light to Gas Utilization by CHP

Advantek Consulting, Inc.
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Florida Power & Light (FPL) generates from several plants into a fully interconnected grid, so it is difficult or impossible to determine the fuel mix for a specific user[1]. However, the closest generator to the site is *Sanford*, a 1080 MW gas/oil fueled plant (approximately 70% gas / 30% fuel oil #6 by MW capacity)[2].

FPL's usage of natural gas as a percent of total fuel energy rose from 24.8% in 2001 to 35.5% in 2003. Use of natural gas in FPL's fuel mix is anticipated to rise to over 60% by 2012 as new generating plants come on line. Over the next ten years, the anticipated use of natural gas will account for an average of 50.2% of delivered electricity [2].

> *The trend in recent years has been a steady increase in the amount of natural gas that is used by FPL to provide electricity due, in part, to the introduction of highly efficient and cost-effective combined cycle generating units.*
>
> *As demand for natural gas in Florida grows, it is anticipated that the Florida Gas Transmission (FGT) pipeline system will be augmented/expanded. This anticipated expansion of FGT's pipeline, combined with the new Gulfstream pipeline and potential sources of non-domestic/international natural gas (such as off-shore suppliers), should result in sufficient gas for FPL's continued needs.*

The anticipated average annual gas consumption by FPL of 435,137,000 Mcf over ten years will be used to generate 60,573,000 MWh per year. This is heat rate of 7,722 Btuh per kW and an overall generating efficiency of 44.2%.

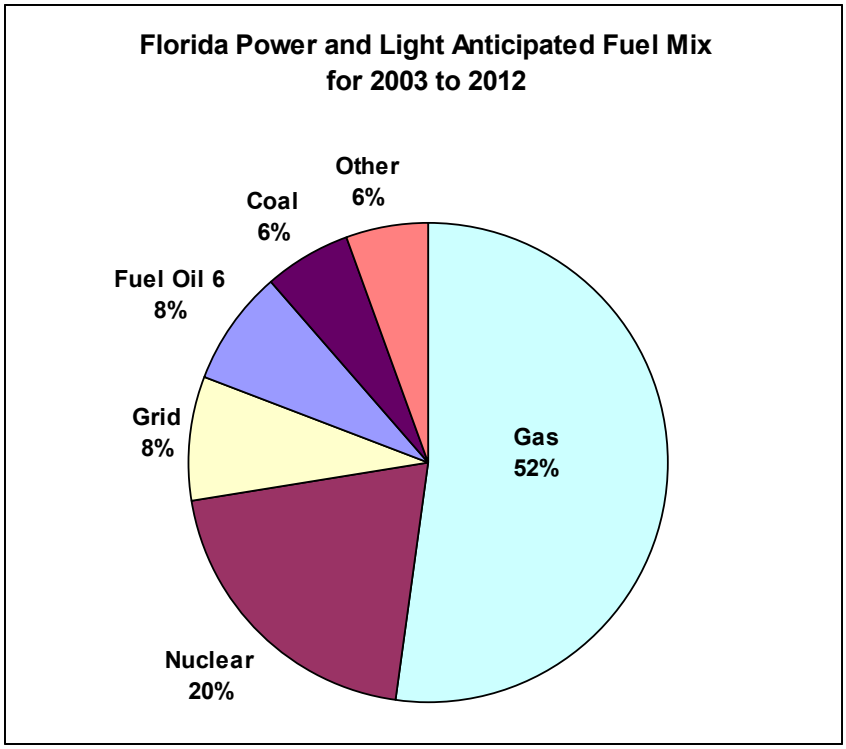
In comparison, the net annual natural gas consumption by a Mid-Florida CHP system (based on the Capstone 60) would be 2,623 Mcf used to generate 525 MWh. This is a heat rate of 5,375 Btuh per kW and an overall efficiency of 63.5%, taking into account the portion of generator waste heat that is utilized.

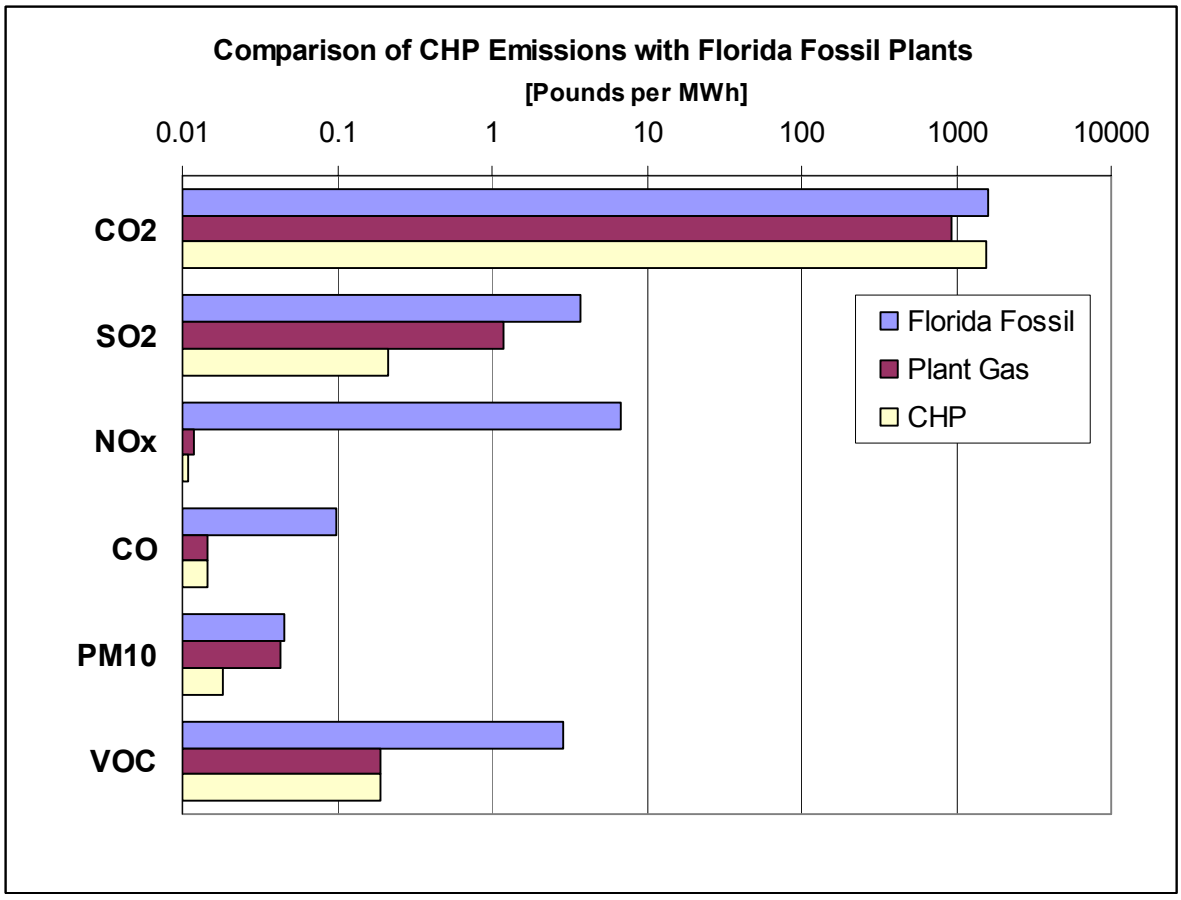
In the Mid-Florida CHP system, the generator waste heat would be utilized to power a heat-driven chiller. The chiller would offset the consumption of electricity by the existing electric chillers at the facility. However, since the heat-driven chiller is less energy efficient than electric chillers (2.9 kW/Ton versus 0.68 kW/Ton), an effective heat rate can be calculated by taking credit for the offset electricity instead of the available waste heat. This is 8,290 Btuh per kW for which the effective system efficiency is 41.1%.

Overall, the system would offset 776 MWh of electric usage and consume 5,984 Mcf of gas at the site. The electric savings would offset 2,798 Mcf of fuel usage by FPL's plants, for a net gas consumption of 3,186 Mcf and a gas-generated electric offset of 390 MWh. Based on the reported FPL fuel mix [2], the coal/oil-generated offset would be 232 MWh and the nuclear-generated offset would be 155 MWh. Since emissions per MWh from a CHP microturbine are less than the average emissions from FPL's plants, there would be a net reduction in emissions of 16,950 pounds of pollutants per year, as detailed in the table below.

[1] Conversation with Ed Anderson, Florida Power & Light, July 8 2003.
[2] FPL Ten Year Power Plant Site Plan 2003-2012, April 2003

Anticipated Emissions Reductions due to CHP Project [Pounds per Year]	
CO_2	13,908
SO_2	1,585
NO_x	804
CO	624
PM_{10}	19
VOC	6
Total	16,947





FPL's Fuel Mix

The trend in recent years has been a steady increase in the amount of natural gas that is used by FPL to provide electricity due, in part, to the introduction of highly efficient and cost-effective combined cycle generating units. Although this planning document reflects a continuation of this trend, FPL's proposed capacity additions for the years 2008 through 2012 present a plan that is subject to change. FPL's future resource planning work will increasingly focus on identifying and evaluating alternatives that would maintain/enhance FPL's long-term fuel diversity. These fuel diversity-enhancing alternatives may include: extending and/or expanding existing solid/fuel-based power purchases, the construction of, and the purchase of power from, new solid fuel-based (coal and petroleum coke) facilities; obtaining access to diversified sources of natural gas such as from suppliers of natural gas from international production areas; and preserving FPL's ability to utilize fuel oil at is existing units. The feasibility and cost-effectiveness of these, and possibly other, alternatives will be analyzed in future planning cycles.

FPL's current use of various fuels to supply energy to customers, plus a projection of this "fuel mix" through 2012 based on the resource plan presented in this document, is presented in Schedules 5, 6.1, and 6.2.

FPL's natural gas price forecast assumes that domestic demand for natural gas will grow throughout the planning horizon, primarily due to increased requirements for electric generation. Domestic natural gas production will increase as new and improved drilling technology and seismic information will reduce the cost of finding, developing, and producing natural gas fields. The rate of increase in domestic natural gas production is assumed to be slower than that of demand nationally, with the balance being supplied by increased Canadian and liquefied natural gas (LNG) imports. As demand for natural gas in Florida grows, it is anticipated that the Florida Gas Transmission (FGT) pipeline system will be augmented/expanded. This anticipated expansion of FGT's pipeline, combined with the new Gulfstream pipeline and potential sources of non-domestic/international natural gas (such as off-shore suppliers), should result in sufficient gas for FPL's continued needs.

Schedule 6
Fuel Requirements 1/

	Fuel Requirements	Units	Actual 2/ 2001	2002	Forecasted 2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
(1)	Nuclear	Trillion BTU	269	276	251	251	255	251	250	255	250	249	254	251
(2)	Coal	1,000 TON	3,078	3,070	3,823	3,717	3,703	3,701	3,701	3,685	3,832	3,631	3,634	3,636
(3)	Residual (FO6)- Total	1,000 BBL	40,995	29,791	28,180	31,431	24,819	22,042	19,464	14,692	10,399	7,823	8,310	8,904
(4)	Steam	1,000 BBL	40,995	29,791	28,180	31,431	24,819	22,042	19,464	14,692	10,399	7,823	8,310	8,904
(5)	Distillate (FO2)- Total	1,000 BBL	351	473	911	109	28	44	22	5	2	0	1	0
(6)	CC	1,000 BBL	75	29	772	10	0	0	0	0	0	0	0	0
(7)	CT	1,000 BBL	308	444	139	99	28	44	22	5	2	0	1	0
(8)	Steam	1,000 BBL	0	0	0	0	0	0	0	0	0	0	0	0
(9)	Natural Gas -Total	1,000 MCF	212,958	288,112	276,757	292,979	341,174	388,315	417,293	452,382	492,761	528,380	543,930	568,789
(10)	Steam	1,000 MCF	79,157	78,017	33,537	38,373	31,538	27,994	26,358	20,758	16,191	13,015	12,937	11,865
(11)	CC	1,000 MCF	109,778	195,109	240,319	251,320	308,827	359,448	390,419	430,914	476,108	515,042	530,473	556,537
(12)	CT	1,000 MCF	24,022	12,985	2,901	3,285	810	873	516	710	462	323	521	387

1/ Reflects fuel requirements for FPL only.
2/ Source: A Schedules.

Schedule 6.2
Energy % by Fuel Type

	Energy Source	Units	Actual 1/ 2001	2002	Forecasted 2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
(1)	Annual Energy Interchange 2/	%	7.8	9.9	10.1	9.7	9.2	8.8	8.8	8.3	7.8	7.8	7.5	7.4
(2)	Nuclear	%	24.5	24.3	22.6	21.8	21.8	20.8	20.1	20.1	19.3	18.8	18.8	18.9
(3)	Coal	%	6.4	5.7	6.9	6.5	6.3	6.1	6.0	5.8	5.7	5.6	5.5	5.4
(4)	Residual (FO6) -Total	%	26.2	18.0	17.2	18.5	14.2	12.3	10.6	7.9	5.5	4.0	4.2	3.4
(5)	Steam	%	26.2	18.0	17.2	18.5	14.2	12.3	10.6	7.9	5.5	4.0	4.2	3.4
(6)	Distillate (FO2) -Total	%	0.2	0.2	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(7)	CC	%	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(8)	CT	%	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(9)	Steam	%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(10)	Natural Gas -Total	%	24.9	33.1	35.5	38.1	41.7	46.3	48.9	52.3	56.3	58.3	59.9	61.0
(11)	Steam	%	7.7	7.2	3.0	3.9	2.8	2.3	2.1	1.8	1.2	1.0	0.9	0.9
(12)	CC	%	15.1	24.9	32.9	32.5	39.0	43.9	46.8	50.8	55.1	58.3	59.0	60.7
(13)	CT	%	2.1	1.0	0.3	0.9	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0
(14)	Other 3/	%	10.1	8.8	7.1	7.5	7.0	5.9	5.8	5.5	5.3	4.8	4.1	3.8
			100	100	100	100	100	100	100	100	100	100	100	100

1/ Source: A Schedules.

2/ The projected figures are based on estimated energy purchases from SJRPP and the Southern Companies.

3/ Represents a forecast of energy expected to be purchased from Qualifying Facilities, Independent Power Producers, etc.

Schedule 6.1
Energy Sources

	Energy Sources	Units	Actual 1/ 2001	2002	Forecasted 2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
(1)	Annual Energy Interchange 2/	GWH	7,701	10,287	10,701	10,590	10,398	10,255	10,208	10,088	9,634	9,601	9,561	9,641
(2)	Nuclear	GWH	24,070	25,295	23,870	23,848	24,280	23,889	23,786	24,331	23,795	23,688	24,173	23,924
(3)	Coal	GWH	6,287	5,977	7,287	7,102	7,073	7,088	7,072	7,044	7,013	7,006	7,018	7,018
(4)	Residual(FO6) -Total	GWH	25,802	18,708	18,133	20,224	16,014	14,221	12,570	9,516	6,734	5,068	5,378	4,489
(5)	Steam	GWH	25,802	18,708	18,133	20,224	16,014	14,221	12,570	9,516	6,734	5,068	5,378	4,489
(6)	Distillate(FO2) -Total	GWH	163	188	664	52	13	20	10	2	1	0	1	0
(7)	CC	GWH	41	18	598	7	0	0	0	0	0	0	0	0
(8)	CT	GWH	122	170	66	45	13	20	10	2	1	0	1	0
(9)	Steam	GWH	0	0	0	0	0	0	0	0	0	0	0	0
(10)	Natural Gas -Total	GWH	24,498	34,541	37,516	39,533	46,912	53,644	57,995	63,242	68,359	74,634	76,921	80,520
(11)	Steam	GWH	7,588	7,549	3,132	3,588	2,949	2,616	2,488	1,943	1,520	1,225	1,214	1,117
(12)	CC	GWH	14,849	25,988	34,117	35,646	43,890	50,952	55,422	61,235	67,798	73,380	75,659	79,367
(13)	CT	GWH	2,060	1,006	267	299	73	78	48	85	42	30	48	35
(14)	Other 3/	GWH	9,905	9,202	7,529	8,178	7,878	6,885	8,889	8,675	8,580	5,814	5,279	5,152
	Net Energy For Load 4/	GWH	98,404	104,199	105,700	109,525	112,585	115,942	118,490	120,899	123,115	125,811	128,327	130,724

1/ Source: A Schedules

2/ The projected figures are based on estimated energy purchases from SJRPP and the Southern Companies.

3/ Represents a forecst of energy expected to be purchased from Qualifying Facilities, Independent Power Producers, etc.

4/ Net Energy For Load is also shown in Column 19 on Schedule 2.3.