NON-UTILITY GENERATION OF ELECTRICITY IN LOUISIANA

November 1998

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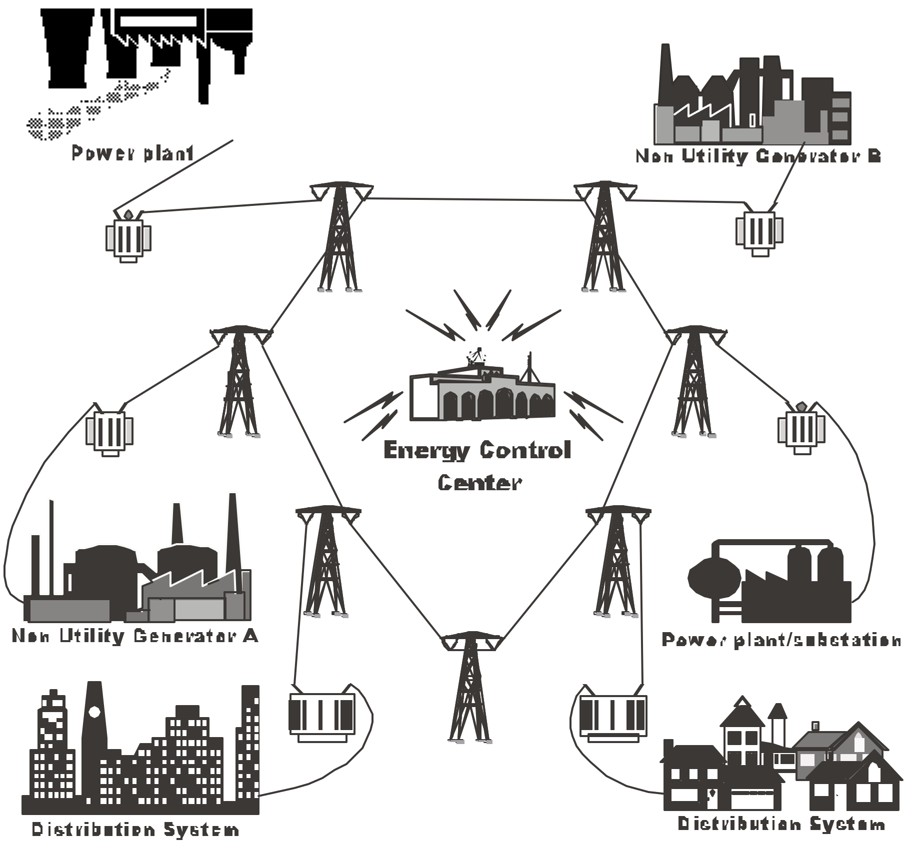

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INTRODUCTION

This report is a continuation of a series produced since the late 1980s by the Technology Assessment Division of the Louisiana Department of Natural Resources (DNR). These reports document the growing potential in Louisiana for non utility generators (NUGs) who operate standalone facilities which do not cogenerate steam. Some of these new NUG facilities produce only electricity and, along with new and existing cogenerating NUGs, may sell power directly to the ultimate consumers.

These noncogenerating NUGs, as well as new and existing industrial cogenerating NUGS, are expected to operate in a new and evolving electricity market brought about by recent regulatory rules changes. In such a market, there would be real competition in electric generation accompanied by open, fairly priced, and informed access to transmission services. Clearly, the arrival of such fundamental changes in the electricity marketplace would affect the entire electric industry including non utility generators, electric utilities, and electric customers. Of importance to Louisiana, this new market is likely to affect the natural gas market as well.

Previous reports in this series focused primarily on the presentation of data regarding electricity sales in Louisiana by NUGs who are “Qualified Facilities” (QFs). Qualified facilities are NUGs who qualify under the federal Public Utilities Regulatory Policy Act (PURPA) of 1978 to sell electricity to the public utilities. Only limited information was given on NUG QFs who sold no electricity to utilities, or on NUGs who were not QFs.

Non Utility Generation in Louisiana - Past and Present

The first part of this report provides a brief history of non-utility generation in Louisiana, both before and after PURPA. This section then addresses the historical data on both generation and sales by the electric utilities as well as by all NUGs (QFs selling to utilities, QFs not selling to utilities, and NUGs who are not QFs). Some of the topics addressed in the presentation of Louisiana NUG historical data are:

- ♦ Description of the growth of NUGs in Louisiana prior to PURPA.
- ♦ Regulatory and operational bases for the non utility generation marketplace as it currently exists.
- ♦ Presentation of data on Louisiana electric utility electricity generation capacity, actual generation, capacity utilization, and sales to ultimate consumers.
- ♦ Presentation of data on Louisiana non utility electricity generation capacity, estimated generation, estimated capacity utilization, and reported sales to utilities.
- ♦ Comparison of data for both the electric utilities and NUGs with emphasis on activity in the industrial sector.
- ♦ Presentation of NUG electricity sales data by purchasing utility and individual NUG on a monthly basis for the last decade.

Non Utility Generation in Louisiana - The Future

The next section of this report addresses new and evolving circumstances and issues regarding non-utility production, delivery, and sale of electricity. As a consequence of the Energy Policy Act (EPACT) of 1992 and the resulting Federal Energy Regulatory Commission (FERC) final Orders 888 and 889 (April 1996), a new competitive electricity market will evolve and will be different from anything observed in the past. The evolution of this new electricity market will significantly affect the electric utilities, the NUGs, and all electricity consumers as well as all producers of natural gas (see page 49), both in Louisiana and nationally.

Regarding the new electricity marketplace, the following issues and concepts are presented and discussed:

- The factors and circumstances which created an environment in which non utilities could successfully compete with existing electric utilities.
- The regulatory basis for the introduction of competition.
- The operational bases which, in a realistic sense, may affect both the effectiveness and the onset timing of such competition.
- Things difficult to predict about the future of competition in the electricity market.

Summary

In summary, the following can be said of non utility generation in Louisiana:

- Because the type of process plant historically locating in Louisiana typically required large amounts of both electricity and process steam, these plants often chose to meet their own energy needs internally through cogeneration. The result has been that, for more than half of this century, non utility generation has provided a significant proportion of the electricity generated in this state. Of the 76,127 million KWH generated in Louisiana in 1996, non utility generation accounted for 17,484 million KWH or approximately 23% of total electricity produced.
- In spite of the intent of the Public Utilities Regulatory Policies Act (PURPA) of 1978 to promote sales of cogenerated electricity by non utility generators, sales of non utility generated power are minuscule in Louisiana compared to generation levels of either the state's electric utilities or the state's non utility generators themselves. NUG 1996 sales of electricity generated in Louisiana were 378.2 million KWH. This figure represents 2.17% of estimated NUG generation in the state, 0.64% of electric utility generation in the state, and only 0.5% of the total electricity generated in Louisiana for that year. Reasons for this lack of NUG sales lie in the PURPA limitation of sales only to the utility serving the NUG and in the purchase price levels for NUG power required by both PURPA and existing Louisiana electric utility regulations.
- Because of lack of competition, there are two separate systems of electric generation and pricing in Louisiana today. One system, operated by the NUGs, was developed in a competitive market and produced electricity at an average unit cost of.4.3 cents per KWH

in 1996. The second system, operated by the electric utilities, was developed under governmental utility regulation and produced electricity at an average sales price of 6.1 cents per KWH in 1996. The difference in average electricity cost of about 2 cents per KWH makes clear the capacity of NUGs to compete in any open market for electricity generation.

The federal Energy Policy Act (EPACT) of 1992 and resulting final Orders 888 and 889 by the Federal Energy Regulatory Commission (FERC) intend the creation of a genuinely competitive market in electric generation as well as fair and open access by all generators to transmission. In the absence of absolute regulatory protection under such competition, the electric utilities are faced with serious adverse financial effects. They will be forced to abandon inefficient generating facilities. The term now used to describe such effects is "stranded cost." As a result, at all governmental levels, there will undoubtedly be a great deal of political and regulatory conflict over both the degree of actual competition allowed as well as the timing of its onset. The utilities will attempt to lock in current regulated prices as well as stretch out the effects of NUG competition, both of which protect utility "stranded costs."

The only certain outcome in this process is that the new market for electricity will affect electric utilities, NUGs, electric consumers, and other parties in ways not experienced in the past. Of particular importance in Louisiana is the likelihood that this new market could have substantial effects on the natural gas industry as well as the electric industry. All interested parties participating in the electricity market **C** the utilities, industrial, residential, and commercial electricity consumers, as well as generation fuel producers (e.g., natural gas) **C** would be well served by continuing to update their data and information as this new unregulated electricity market evolves.

SECTION I
NON UTILITY GENERATION IN LOUISIANA BEFORE 1997

PART A - NON UTILITY GENERATION IN LOUISIANA THROUGH THE END OF THE 1970s

In Louisiana, non utility generation (NUG) has operated on a scale which is significant when compared to total generation levels of the electric utilities for much of this century. This is entirely different from non utility generation structure in most other states. Process industrial operations in Louisiana were non utility generators (NUGs), meeting their own energy needs through cogeneration (the joint production of both electricity and steam), for nearly 50 years prior to the passage of the federal Public Utilities Regulatory Policy Act (PURPA) in 1978.

There are two reasons for this early growth of cogeneration in Louisiana:

1. The operation of most production processes in plants typical of the state's industrial structure such as refineries, chemical plants, and paper mills requires both electricity and steam in large quantities. And,
2. Joint production of electricity and steam is more energy efficient than the separate production of electricity and steam.

A very large base of NUG generating capacity and electric power production grew during this pre-PURPA phase of non utility generation in Louisiana, almost all of which was cogeneration based.

Initially the electrical generation equipment used by the industrial NUGs in Louisiana was of the same technology as that used by the electric utilities. Generators were steam turbine driven with the needed steam being created by steam generators (boilers). In Louisiana, these boilers were fired almost exclusively by natural gas. But, in the late 1960s that situation changed due to the introduction of more efficient technology. The industrial NUGs began installing generators driven by combustion turbines (literally jet engines) exhausting to waste heat recovery boilers. This system, known as combined cycle combustion turbine (normally shortened to combined cycle) had lower initial costs and used less fuel per unit of electricity generated (refer to Appendix A). Combined cycle technology was installed by the industrial NUGs not only to meet new electricity and steam load but also to replace existing, less efficient, steam turbine systems.

Prior to PURPA, all industrial self generated electricity was consumed in manufacturing activities onsite for each NUG. There were no non utility generation sales of electricity either to the electric utilities or to third parties. Neither was there the possibility of an industrial company transmitting electricity outside its own plantsite even to an adjacent plant due to laws limiting such activity to regulated utilities.

PART B - NON UTILITY GENERATOR OPERATION FROM PURPA (1978) TO THE PRESENT

The Public Utilities Regulatory Policies Act became law as part of a package of energy legislation enacted by the federal government in 1978. PURPA, as the law is known, along with companion legislation changed the NUG electrical sales situation.

PURPA had as one major purpose, the conservation of energy. Cogeneration was a favored generation methodology under this law because it is energy efficient. Unfortunately, neither PURPA nor its companion legislation made any distinction between the efficiency of different generation processes or cogeneration processes producing the same split of electricity and steam (e.g., boiler/ steam turbine operation vs. combustion turbine operation; see Appendix A, “ Prime Movers”).

PURPA required the electric utilities to buy power from NUGs meeting certain criteria. NUGs meeting those criteria were designated as “qualified facilities” (QFs). Cogeneration as a favored generation methodology, then, became a major criterion for obtaining QF status. As a result, most Louisiana NUGs receiving qualified facility (QF) status under the 1978 law were existing industrial cogenerators. New QFs coming on line after PURPA were also industrial cogenerators.

PURPA has opened the door to external sales by QF NUGs, but not completely. Louisiana’s large base of cogenerating industrial NUGs continues to operate on substantially the same basis after PURPA as before, consuming most of the electricity they produce. Reasons for this include limitations on potential consumers of NUG electricity, a complete lack of NUG access to transmission, low prices available from electric utilities to NUGs in Louisiana, and difficulties in operating standalone (no associated steam host or consumer) cogeneration facilities.

Problem - A Single Buyer (Monopsony) of NUG Electricity

First, under PURPA, sales of electricity are limited to one customer - the electric utility in whose service area the QF is located. Third party or ultimate consumer sales by NUGs are not possible under this law.

Problem - No NUG Access to Transmission

Even if third party sales could be made by NUGs, delivery of the electricity is not possible. First, there are regulatory difficulties. In Louisiana, were a NUG to deliver electricity to a third party - even across a mutual fence line with that third party, that NUG would become a regulated utility under state law. This legal burden has not been acceptable to the NUGs since their primary product is not electricity. In Louisiana, this legal situation produces some unusualresults. Adjacent plants are allowed to move energy in the form of steam across their mutual fence to one another, but are not allowed to move energy in the form of electricity.

Further, transmission of electric power by a NUG over utility lines (wheeling) to any party other than the serving utility, on either a wholesale or retail basis, was and is either legally or operationally impossible in Louisiana. The electric utilities control transmission and are not legally required to transport NUG electricity.

Also precluded under Louisiana regulations are cases of "self wheeling" — transmission of electricity by a company from one of its own facilities to another of its own facilities, nearby, but non-contiguous. Electric utility lines cannot be used for reasons given in the paragraph above. In addition, the potential "self wheeling" company is likely to find it impossible to procure right-of-way (create a single site) to build its own transmission lines. In virtually every case, all possible pathways for transmission between non-contiguous sites would require crossing electric utility right-of-way. Historically, the utilities would not voluntarily allow this crossing and cannot be forced to do so. NUGs lack the power of eminent domain (ability to force sale of private property based on public need).

Problem - Low Prices Paid for NUG Electricity in Louisiana

Low sales to electric utilities by Louisiana QFs were and still are caused by the low price which the utilities offered for such power. PURPA requires that mandated purchases of QF power by the electric utilities be priced at the utility's avoided cost at the time of the sale. That cost is the incremental cost to the utility during that period of time to internally produce one more unit of electricity.

Since the advent of PURPA, Louisiana electric utilities have had a surplus of generating capacity. No new electric utility units are planned in the near future. This means that electric utility avoided cost in Louisiana has no capital component. That component represents the cost of needed new generation capacity which can be avoided by the utility by purchasing power from a QF. For Louisiana QFs, then, price received for electric power is the incremental fuel cost to the utility during each hour of the QF sale to the utility.

Problem - Difficulties of Standalone NUG Operations

A final limitation mitigating against standalone NUG facilities in Louisiana has been the de facto necessity for such facilities to be cogenerators. For a standalone cogenerating NUG, the coproduction of both electricity and steam implies the need to successfully sell both steam and electricity. Accomplishing sales of both is administratively difficult and, if nothing else, is crippled by transport limits on high quality steam. Only one NUG cogeneration operation in Louisiana, Nelson Industrial Steam Company (NISCO), operates as a standalone facility, selling almost all of its electricity and steam production outside of NISCO plant limits. Operation of this facility is, however, a special case. NISCO is jointly owned by Entergy Gulf States, Inc., and three industrial partners.

PART C - LOUISIANA ELECTRIC UTILITY DATA

Data in this report on generator capacity, generation of electricity, consumption of electricity, and pricing of electricity for both the electric utilities and the NUGs in Louisiana came from a number of sources. Among these were: previous editions of this Louisiana Department of Natural Resources report, the Energy Information Agency (EIA) of the U.S. Department of Energy (DOE), the Edison Electric Institute (EEI), and the electric utilities serving Louisiana.

Generation of Electricity by Louisiana Electric Utilities

Tables 1, 2, and 3 and Figure 1 present information on the generating capacity, electric generation, and capacity use for all utilities serving Louisiana in 1995 - 1997. The data are presented for the prime mover types used to generate electricity by the state's electric utilities. These include natural gas, petroleum, coal, and nuclear fired steam turbines and natural gas fired combustion turbines.

The data on electric utility combustion turbines may not be compatible with data on NUG combustion turbines (see Appendix A, Part I). Electric utility combustion turbine generating systems are typically simple cycle operations; only the "jet engine" section is used to provide power to the generator with waste heat exhausted to the atmosphere rather than to a waste heat recovery boiler. This differs from the combined cycle combustion turbine operation used by most cogenerating NUGs. Electric utilities use simple cycle combustion turbines because they may be started up and placed into service very quickly to provide peaking or emergency power.

For Louisiana electric utilities, the number of generators and electric generating capacity remained unchanged from 1995 to 1997 at 109 generators and a little more than 17,000 megawatts (MW). However, actual generation of electricity and use of capacity decreased from 65,555 million kilowatt hours (million KWH) in 1995 to 58,643 million KWH in 1996, but increased in 1997 to 61,120 million KWH. There was a corresponding change in generator capacity use from 44% to 39% to 41% in the same period. As a basis of comparison, generation capacity use for all electric utilities in the U.S. was 48.4% in 1995, 49.5% in 1996, and 50.1% in 1997.

Natural gas fired steam turbine units provided the bulk of Louisiana electric utility generation in all three years, generating 30,132 million KWH (46%) in 1995, 23,399 million KWH (39.9%) in 1996, and 25,196 million KWH (41.2%) in 1997. Coal fired steam turbine units were second, generating 18,954 million KWH (28.9%) in 1995, 18,633 million KWH (31.8%) in 1996, and 20,953 million KWH in 1997. Nuclear steam turbines were a close third, generating 15,686 million KWH (23.9%) in 1995, 15,765 million KWH (26.9%) in 1996, and 13,511 million KWH (22.1%) in 1997. Generation from petroleum fired steam turbine and natural gas fired combustion turbine units accounted for only 1.5% - 2% of the Louisiana electric utility totals for these years.

Ranking of generation capacity use percentages for natural gas, coal, and nuclear steam turbine generators was the reverse of the generation quantity figures. Nuclear was first with 89% in both 1995 and 1996 and

77% in 1997; coal was second with 65%, 75%, and 69%, respectively; and natural gas was third with 31%, 22%, and 25%, respectively. These use levels correspond to the capabilities of unit types to be taken in and out of service and run at less than capacity.

TABLE 1
ELECTRIC UTILITY GENERATOR CAPACITY AND ELECTRICITY GENERATION IN LOUISIANA BY PRIME MOVER - 1995

		TOTAL ALL TYPES	1 GAS STEAM TURBINE	2 PETROLEUM STEAM TURBINE	3 COAL	4=1+2+3 TOTAL FOSSIL STEAM	5 GAS TURBINE/ INT.COMB.	6=4+5 TOTAL FOSSIL	7 NUCLEAR
GENERATORS	NUMBER	109	72	2	6	80	27	107	2
	PERCENT TOTAL	100%	66.06%	1.83%	5.50%	73.39%	24.77%	98.17%	1.83%
CAPACITY	MEGAWATTS	17,019	11,036	196	3,343	14,575	292	14,867	2,006
	PERCENT TOTAL	100%	64.85%	1.15%	19.64%	85.64%	1.72%	87.36%	11.79%
CAPACITY/ YEAR	MILLION KWH	149,086	96,675	1,717	29,285	127,677	2,558	130,235	17,573
	PERCENT TOTAL	100%	64.85%	1.15%	19.64%	85.64%	1.72%	87.36%	11.79%
GENERATION	MILLION KWH	65,555	30,132	49	18,954	49,134	735	49,870	15,686
	PERCENT TOTAL	100%	45.96%	0.07%	28.91%	74.95%	1.12%	76.07%	23.93%
CAPACITY USE	GENERATION/ CAPACITY	44%	31%	3%	65%	38%	29%	38%	89%

SOURCE: Electric Power Annual - 1995 and 1996; Energy Information Administration, Vol. 1, July 1996 and August 1997.

TABLE 2
ELECTRIC UTILITY GENERATOR CAPACITY AND ELECTRICITY GENERATION IN LOUISIANA
BY PRIME MOVER - 1996

		TOTAL ALL TYPES	1 GAS STEAM TURBINE	2 PETROLEUM STEAM TURBINE	3 COAL	4=1+2+3 TOTAL FOSSIL STEAM	5 GAS TURBINE/ INT. COMB.	6=4+5 TOTAL FOSSIL	7 NUCLEAR
GENERATORS	NUMBER	109	75	0	6	81	26	107	2
	PERCENT TOTAL	100%	68.81%	0.00%	5.50%	74.31%	23.85%	98.17%	1.83%
CAPACITY	MEGAWATTS	17,019	11,877	0	2,843	14,720	288	15,008	2,011
	PERCENT TOTAL	100%	69.79%	0.00%	16.71%	86.38%	1.69%	88.18%	11.82%
CAPACITY/ YEAR	MILLION KWH	149,086	104,043	0	24,905	128,948	2,523	131,471	17,616
	PERCENT TOTAL	100%	69.79%	0.00%	16.71%	86.49%	1.69%	88.18%	11.82%
GENERATION	MILLION KWH	58,643	23,399	273 *	18,633	42,305	573	42,878	15,765
	PERCENT TOTAL	100%	39.90%	0.47%	31.77%	72.14%	0.98%	73.12%	26.89%
CAPACITY USE	GENERATION/C APACITY	39%	22%	S	75%	33%	23%	33%	89%

* Not steam turbine.

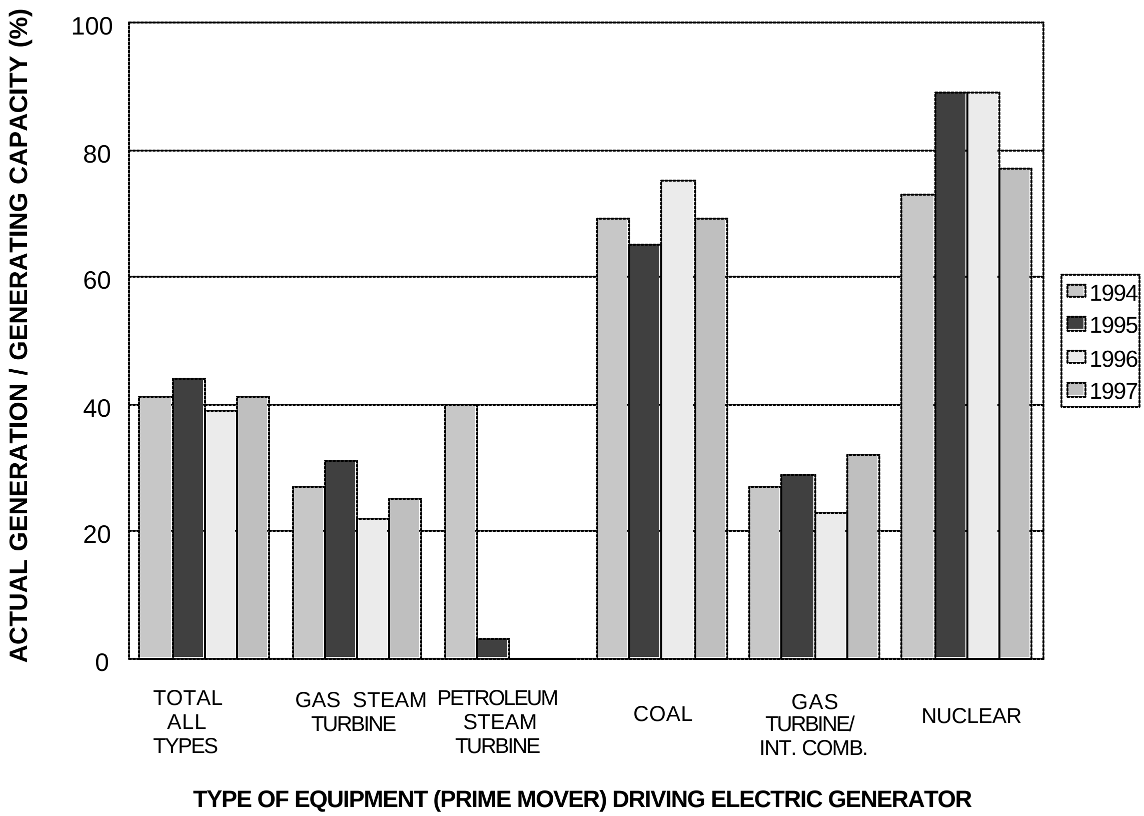
SOURCE: Electric Power Annual - 1996 and 1997; Energy Information Administration, Vol. 1, August 1997 and July 1998.

TABLE 3
ELECTRIC UTILITY GENERATOR CAPACITY AND ELECTRICITY GENERATION IN LOUISIANA
BY PRIME MOVER - 1997

		TOTAL ALL TYPES	1 GAS* STEAM TURBINE	2 PETROLEUM STEAM TURBINE	3 COAL	4=1+2+3 TOTAL FOSSIL STEAM	5 GAS TURBINE/ INT. COMB.	6=4+5 TOTAL FOSSIL	7 NUCLEAR
GENERATORS	NUMBER	109	75	0	6	81	26	107	2
	PERCENT TOTAL	100%	68.81%	0.00%	5.50%	74.31%	23.85%	98.17%	1.83%
CAPACITY	MEGAWATTS	17,185	11,398	0	3,488	14,886	288	15,174	2,011
	PERCENT TOTAL	100%	66.33%	0.00%	20.30%	86.62%	1.68%	88.30%	11.70%
CAPACITY/ YEAR	MILLION KWH	150,541	99,846	0	30,555	130,401	2,523	132,924	17,616
	PERCENT TOTAL	100%	66.33%	0.00%	20.30%	86.62%	1.68%	88.30%	11.70%
GENERATION	MILLION KWH	61,120	25,196	646 **	20,953	46,795	814	47,609	13,511
	PERCENT TOTAL	100%	41.22%	1.06%	34.28%	76.56%	1.33%	77.89%	22.11%
CAPACITY USE	GENERATION/CAPACITY	41%	25%	S	69%	36%	32%	36%	77%

* Includes dual fired petroleum/gas (62 generators; 10,893 MW capacity).
** Not steam turbine.
SOURCE: Electric Power Annual - 1996 and 1997; Energy Information Administration, Vol. 1, August 1997 and July 1998.

FIGURE 1
Comparison of Capacity Use Levels for Different Prime Mover Types for Louisiana Electric Utilities



Nuclear plants require immense effort, both operationally and administratively, in startup and shutdown. With the exception of refueling, which takes place about every 18 months, or an emergency, nuclear plants are never taken off line. Running any plant at steady output is easier from both an operations and safety standpoint, and since nuclear fuel is the least expensive per BTU of heat input of any utility boiler fuel, there is no incentive to run a nuclear plant at less than capacity. For these reasons, the nuclear steam turbine units come closer to maximum use than any other prime mover type.

Startup and shutdown of a coal fired unit, although hardly in the same class as a nuclear unit, is, nonetheless, difficult. So, coal fired units tend to be run continuously. Coal is the second least expensive fuel. In addition, some coal fired units in Louisiana receive their fuel under "take or pay" contracts which means the price for the fuel will be paid whether it is used or not. These two reasons provide incentive to run coal fired units as close to capacity as possible.

Of the three types of prime movers in predominate use by the electric utilities in Louisiana, the natural gas fired boiler and steam turbine units are the easiest to bring on and take off line. These units, then, are the most likely to not be run continuously. In addition, natural gas fuel is generally more expensive per BTU of heat input than coal or nuclear. For these reasons, natural gas fired boilers have only 31%, 22%, and 25% capacity use factors in 1995, 1996, and 1997, respectively.

Electricity Sales to Ultimate Customers in Louisiana by Electric Utilities

Tables 4, 5, and 6 present information on the sales of electricity in Louisiana by the electric utilities. Sales totaled 72,385 million KWH in 1995, 75,055 million KWH in 1996, and 75,465 million KWH in 1997. These figures represent a 4.2% increase in sales over the period. Total utility revenues from sales increased 10.9% from $4.148 billion in 1995 to $4.602 billion in 1997. Average electricity rates for all consumer classes went up 7% from 5.7 cents per KWH in 1995 to 6.1 cents per KWH in 1997.

Sales of electricity in Louisiana were also higher than the generation of electricity in Louisiana during the same years. In 1995, sales of electricity in the state topped generation in the state by 10.4%; in 1996, by 28%; and in 1997, by 23% This phenomenon is probably caused by both import of electricity by those Louisiana serving utilities having generation facilities in the adjacent state of Texas, as well as by purchase by all Louisiana utilities of electric power from other utilities outside of the state. NUGs in Louisiana and Texas selling power to utilities serving Louisiana (discussed later in this section) can account for only a small fraction of such purchased power.

TABLE 4
ELECTRIC UTILITY SALES OF ELECTRICITY IN LOUISIANA - 1995
BY CONSUMER SECTOR

		ALL SECTORS	RESIDENTIAL	COMMERCIAL	INDUSTRIAL	OTHER [1]
UTILITY SALES	MILLION KWH	72,385	23,835	15,483	30,685	2,382
	PERCENT TOTAL	100%	32.9%	21.4%	42.4%	3.3%
ESTIMATED REVENUES	MILLION DOLLARS	$4,148	$1,725	$1,041	$1,217	$165
	PERCENT TOTAL	100%	41.6%	25.1%	29.3%	4.0%
AVERAGE REVENUE PER KWH	DOLLARS/ KWH	$0.057	$0.072	$0.067	$0.040	$0.069

[1] Includes public street and highway lighting, other sales to public authorities, sales to railroads, and interdepartmental sales.

SOURCE: Electric Power Annual - 1995, Energy Information Administration, Vol. 1, July 1996.

TABLE 5
ELECTRIC UTILITY SALES OF ELECTRICITY IN LOUISIANA - 1996
BY CONSUMER SECTOR

		ALL SECTORS	RESIDENTIAL	COMMERCIAL	INDUSTRIAL	OTHER[1]
UTILITY SALES	MILLION KWH	75,055	24,124	15,091	32,592	2,348
	PERCENT TOTAL	100%	32.1%	20.1%	43.4%	3.2%
ESTIMATED REVENUES	MILLION DOLLARS	$4,597	$1,856	$1,137	$1,412	$192
	PERCENT TOTAL	100%	40.4%	24.7%	30.7%	4.2%
AVERAGE REVENUE PER KWH	DOLLARS/ KWH	$0.061	$0.077	$0.075	$0.043	$0.079

[1] Includes public street and highway lighting, other sales to public authorities, sales to railroads, and interdepartmental sales.

SOURCE: Electric Power Annual - 1996, Energy Information Administration, Vol. 1, August 1997.

TABLE 6
ELECTRIC UTILITY SALES OF ELECTRICITY IN LOUISIANA - 1997
BY CONSUMER SECTOR

		ALL SECTORS	RESIDENTIAL	COMMERCIAL	INDUSTRIAL	OTHER[1]
UTILITY SALES	MILLION KWH	75,465	24,277	16,210	32,442	2,536
	PERCENT TOTAL	100%	32.2%	21.5%	43.0%	3.4%
ESTIMATED REVENUES	MILLION DOLLARS	$4,602	$1,846	$1,147	$1,439	$170
	PERCENT TOTAL	100%	40.1%	24.9%	31.3%	3.7%
AVERAGE REVENUE PER KWH	DOLLARS/ KWH	$0.061	$0.076	$0.071	$0.044	$0.067

[1] Includes public street and highway lighting, other sales to public authorities, sales to railroads, and interdepartmental sales.

SOURCE: Electric Power Annual - 1997, Energy Information Administration, Vol. 1, July 1998.

The consuming sectors in Louisiana for 1995 and 1996 purchased the following from the electric utilities:

- Residential sector consumption increased 1.2% between 1995 and 1996, but increased only 0.6% between 1996 and 1997. Revenues increased 7.6% between 1995 and 1996, but then fell slightly (0.5%) from 1996 to 1997. As a percentage of total sales, the residential sector decreased 0.8% between 1995 and 1996, but then increased 0.1% between 1996 and 1997. Total revenues from the residential sector decreased from 41.6% in 1995 to 40.4% in 1996 to 40.1% in 1997. Average revenue per KWH increased 6.9% to 7.7 cents in 1996, then fell slightly to 7.6 cents in 1997.

- In the commercial sector, consumption decreased 2.6% from 1995 to 1996, then increased 7.4% between 1996 and 1997. Revenues were up 9.6% from 1995 to 1996, then increased more slowly at 0.9% from 1996 to 1997. As a percentage of total sales, the commercial sector decreased 1.3% between 1995 and 1996, but then increased by 1.4% from 1996 to 1997. However, total revenues from the commercial sector decreased from 25.1% in 1995 to 24.7% in 1996, then increased slightly to 24.9% in 1997. Average revenue increased 11.9% to 7.5 cents per KWH in 1996, then fell back to 7.1 cents per KWH in 1997 (a 5.6% reduction).

- The industrial sector consumption increased 6.2% from 1995 to 1996, but decreased 0.5% from 1996 to 1997. Revenues from this sector increased 16% from 1995 to 1996, then increased more slowly at 1.9% from 1996 to 1997. As a percentage of total sales, the industrial sector increased 1.0% from 1995 to 1996, then decreased 0.4% from 1996 to 1997. Total revenues from the industrial sector increased steadily from 29.3% in 1995 to 30.7% in 1996 to 31.3% in 1997. Average revenue per KWH also increased from 4.0 cents in 1995 to 4.3 cents in 1996 to 4.4 cents in 1997.

Sensitivity of Electricity Sales to Electricity Price Changes - Residential and Commercial Sectors

Many or even all of these changes may be explained by changes in weather patterns, changes in business patterns, or changes in industrial production levels. However, the increase in average revenue per KWH for commercial and residential sectors reverses the situation observed between 1994 to 1995 when unit prices decreased and total revenues also decreased. Under current regulatory circumstances, those in the residential sector and virtually all of those in the commercial sector have no choice about the source of their electricity. Further, the ability, or even willingness, of the entire inventory of residential and commercial consumers to adjust consumption over the short term is likely limited to only a few percentage points from one year to the next, as noted in comparing the 1994-1997 data. From 1995 to 1996, even though the residential sector consumption increased by onlly 1.2%, revenues from this sector increased 7.6%. From 1996 to 1997, the rate of increase in consumption by the residential sector was only 0.6%, and both revenue and the average cost per KWH were lower than during the 1995-1996 period.

The commercial sector posted a 2.6% decrease in consumption, a 1.3% decrease in percent of total sales, but provided a 9.2% increase in revenue from 1995 to 1996. However, from 1996 to 1997, consumption increased 7.4% while revenue increased a modest 0.9%, possibly a result of a 5.6% decrease in average cost per KWH. The generally small variations from one year to the next make it difficult to establish a consistent trend in reactions to price changes.

Sensitivity of Electricity Sales to Electricity Price Changes - Industrial Sector

Choices of electricity supplier are available in the Louisiana industrial sector. Currently, many industrial consumers in the state have two choices of electric power supply source: their serving electric utility or themselves. This additional choice, constituting a degree of competition, has significant effects on the electricity rates paid by these industrial consumers. The current industrial price of electricity in Louisiana is a reflection of the current internal cost to an industrial facility, now on the utility system, to produce its own electricity by building new internal generating facilities.

If an industrial facility constructs new internal generating facilities, the new industrial NUG will leave the utility system. In addition, its "avoided cost" or the price at which it will purchase electricity externally falls to the variable price of its generating fuel. Over the last several years this has ranged from 1.5 to 2.0 cents per KWH.

As a result, not only is industrial electric consumption in Louisiana sensitive to price, the effects of price on utility sales revenues are both discontinuous and nonsymmetric. On the price increase side, if utility rates to an industrial customer exceed, even by a small margin, the cost at which that customer can self-generate, the customer has an economic incentive to do so, probably leaving the utility system - forever. At a point slightly above to the current price, utility industrial electric sales revenues can react discontinuously to price. With higher prices, sales revenues are not just reduced by some percentage relative to the percentage price increase, they are immediately and irrevocably reduced by significant blocks as industrial customers permanently drop off the system.

Even at the current industrial average rate of 4.4 cents per KWH, Louisiana industrial prices may yet be high enough to drive some industrials out of the market. In the last half of 1996 the Technology Assessment Division in DNR was contacted by at least four engineering or consulting firms requesting data and indicating that they were involved in planning NUG cogeneration facilities for plants in Louisiana. Names of the plants were not discussed. It is not known whether these facilities are existing industrial NUGs expanding, non-generators now on a utility's system, or industrial firms new to Louisiana.

The effects that electricity rate decreases in Louisiana have on the utility's existing industrial customer base, on the other hand, are not symmetric with the effects of rate increases. Price decreases for the industrial plants who currently buy electricity from the utilities are likely to have sales revenues effects similar those exhibited by residential and commercial consumers. Electricity consumption is more likely to be affected by production requirements than price. A 6% or 7% decrease in price may increase industrial electricity consumption slightly. However, if the percentage increase in consumption is more than offset by the percentage price reduction, the net effect will be a decrease in utility electricity sales revenues.

Industrial electricity rate decreases can have effects which are similar to, but the reverse of, the effects of industrial rate increases. These effects hold for both the new plants of new industrial entrants into the state and plant expansions by NUGs who may not be on the utility system. In either case, the decision being made by the potential industrial customer is "make or buy." If the utility can offer rates to the potential industrial customer which are below that customer's cost of self-generating electricity, then sales revenues may be increased incrementally and in greater proportion than the percentage rate decrease. This is particularly true if a special lower rate can be applied on an industrial facility by industrial facility basis rather than through a general industrial rate decrease.

The percentage price decrease required to induce non-expanding NUGs to return to the utility system are too large to reasonably expect utilities to offer. Some Louisiana industrial NUGs are still selling power to the electric utilities at prices averaging 1.69 cents per KWH in 1994, 1.77 cents per KWH in 1995, and 2.09 cents per KWH in 1996. These values are representative of these NUGs' "avoided cost" threshold. Only at rates below these levels would these industrial NUGs purchase power instead of making it. These NUG threshold price limit levels would represent price decreases of 60% for 1994, 55% for 1995, and 51% for 1996 against the industrial rates effective in those respective years.

In summary, under the current regulatory system, Louisiana electric utilities have a dilemma with respect to industrial pricing. The utilities are faced with a narrow band of prices which maximize their industrial revenue. Above those prices, they lose industrial customers who leave the system, thereby forever cutting their revenues to the utility by an increment of 100%. Below those prices, for existing industrial customers, the utilities lose industrial revenue because industrial consumption of electricity does not increase by the same percentages as the percentage industrial electric price decreases. The only electric rate reduction scenario likely to increase overall income to the utility is the establishment of special industrial electric rates for new facilities which otherwise might become a NUG.

PART D - LOUISIANA NON-UTILITY GENERATOR (NUG) DATA

Data in this report on NUG generator type, capacity, and generation came from the Edison Electric Institute (EEI). Data on NUG sales to and prices from electric utilities came from previous editions of this report, the purchasing electric utilities, and some of the selling NUGs. While every effort was made to assure data quality, there are some apparent omissions and anomalies in these data. The effects of such omissions and anomalies on the validity of overall data are believed to be inconsequential. Efforts to identify and correct any errors and omissions are ongoing for each edition of this report.

Generator Capacity, Type, and Estimated Generation by Louisiana NUGs

Tables 5 and 6 present calendar year 1995 and 1996, respectively, information on NUG generator type, capacity, and fuel as well as estimated generation. Tables 5 and 6 group the data by basic prime mover type; Table 7 groups the 1996 data by industry type. Generation estimates for individual NUGs are not given because of confidentiality requirements.

These data from EEI were originally reported to EEI by Louisiana electric utilities. The data represent the assessment and categorization of NUG generating capability by those electric utilities as well as electric utility estimates of generation. It is likely that some Louisiana NUGs who are not QFs do not appear in these tables. In addition, the generation estimates by the utilities for at least some of the NUGs represent simple percentage factors applied across industry groups. On the whole, however, these are the best available data and are valid for the purposes of this report.

According to electric utility industry estimates for 1996, NUGs operating in Louisiana operated 67 generating units having a total capacity of 2800.65 MW or 24,534 million KWH per year. Their estimated generation of electricity was 17,452 million KWH. These figures represent a use factor of 71.1% for Louisiana NUGs.

In Tables 5 - 7, only one NUG in the state, Murray Hydro (an Independent Power Producer [IPP]), operates using non-thermal energy. This NUG uses low head hydropower -- mechanical energy in the form of a 10 to 20 foot elevation difference between the Mississippi and Atchafalaya Rivers -- to drive its electric generators.

The data for the other 66 NUG generating units indicate a clear preference for combustion turbine technology. For purposes of comparison here, those units in the EEI data classified as combined cycle and those classified as gas turbine are combined into a single category, combustion turbines. This is done because none of the reported NUG combustion turbines are of the simple cycle type (exhausting to the atmosphere) as the category “gas turbine” might imply. Combustion turbines are the prime mover for 1680.7 MW or 64.4% of the NUG thermally driven generator capacity of 2608.65 MW in Louisiana. Similarly, combustion turbines produce an estimated 10,882.5 million KWH or 65.9% of the estimated 16,513.4 million KWH of electricity generated by thermally driven NUG units in the state. Of the NUG steam turbine driven generators, the majority are driven by fuels not amenable for use in combustion turbines (e.g., paper manufacturing byproducts, petroleum

TABLE 5
EDISON ELECTRIC INSTITUTE GENERATION DATA FOR LOUISIANA NUGs - 1995
DATA GROUPED BY PRIME MOVER

Utility	Project	Units	Cap. MW	Type	QF	SIC Code	Start Date	Prime Mover	Energy Source	Service	Generation MWH
ELI	Murray Hydro	1	192.00	OTHER	N	IPP	05/01/90	Hydro	Hydro	Interconnected	925,031
	Totals For Hydro Power	**1**	**192.00**								**925,031**
EGSI	Air Liquide America Corp	1	36.00	COGEN	Y	D28	01/01/94	Comb. Cycle	Nat Gas	Interconnected	**
EGSI	BASF-Wyandotte	1	36.60	COGEN	Y	D28	07/01/85	Comb. Cycle	Nat Gas	Interconnected	**
EGSI	Exxon Chemical	1	84.00	COGEN	Y	D29	01/01/78	Comb. Cycle	Nat Gas	Interconnected	**
ENOI	Air Products-Cogeneration	1	23.00	COGEN	Y	D28	01/01/84	Comb. Cycle	Nat Gas	Interconnected	**
	Totals for Combined Cycle	**4**	**179.60**								**1,169,031**
EGSI	Amoco	1	0.80	COGEN	Y	D29	02/01/88	Gas Turbine	Nat Gas	Utility Backup	**
EGSI	Arcadian	1	21.50	COGEN	Y	D28	10/01/86	Gas Turbine	Nat Gas	Utility Backup	**
EGSI	Borden Chemical (Monochem) #1	1	21.50	COGEN	Y	D28	04/01/85	Gas Turbine	Nat Gas	Interconnected	**
EGSI	Borden Chemical (Monochem) #2	1	35.00	COGEN	Y	D28	10/01/86	Gas Turbine	Nat Gas	Interconnected	**
EGSI	Borden Chemical (Monochem) #3	1	35.00	COGEN	Y	D28	01/01/86	Gas Turbine	Nat Gas	Interconnected	**
EGSI	Dow Chemical (LA)	2	670.00	COGEN	Y	D28	01/01/78	Gas Turbine	Nat Gas	Interconnected	**
EGSI	Exxon Cyrogenic	1	0.90	COGEN	Y	D29	04/01/88	Gas Turbine	Nat Gas	Utility Backup	**
EGSI	Formosa Plastics #1	1	46.00	COGEN	Y	D28	03/01/85	Gas Turbine	Nat Gas	Utility Backup	**
EGSI	Formosa Plastics #2	1	46.00	COGEN	Y	D28	07/01/90	Gas Turbine	Nat Gas	Interconnected	**
EGSI	Montel (Himont)	1	13.50	COGEN	N	D28	01/01/78	Gas Turbine	Nat Gas	Utility Backup	**
EGSI	Placid	1	7.50	COGEN	Y	D29	04/01/90	Gas Turbine	Nat Gas	Utility Backup	**
EGSI	PPG-B	2	176.00	COGEN	Y	D28	01/01/78	Gas Turbine	Nat Gas	Utility Backup	**
EGSI	PPG-C	2	164.00	COGEN	Y	D28	06/01/85	Gas Turbine	Nat Gas	Utility Backup	**
EGSI	Texaco Henry	2	6.50	COGEN	N	D28	01/01/78	Gas Turbine	Nat Gas	Stand Alone	**
EGSI	Trunkline	2	15.00	COGEN	N	D29	01/01/78	Gas Turbine	Nat Gas	Utility Backup	**
EGSI	Vulcan Chemical	2	108.00	COGEN	Y	D28	12/01/85	Gas Turbine	Nat Gas	Interconnected	**
ELI	Kaiser Alum & Chemical-Grammercy	1	113.90	COGEN	Y	D28	01/01/78	Gas Turbine	Nat Gas	Stand Alone	**
ELI	Union Carbide Corp.- Hahnville-A	1	10.00	COGEN	N	D28	01/01/87	Gas Turbine	Nat Gas	Utility Backup	**
ELI	Union Carbide Corp.- Hahnville-B	1	10.00	COGEN	N	D28	01/01/87	Gas Turbine	Nat Gas	Utility Backup	**
	Totals for Gas Turbine	**25**	**1,501.10**								**9,857,895**

TABLE 5 (CONTINUED)
EDISON ELECTRIC INSTITUTE GENERATION DATA FOR LOUISIANA NUGs - 1995
DATA GROUPED BY PRIME MOVER

Utility	Project	Units	Cap. MW	Type	QF	SIC Code	Start Date	Prime Mover	Energy Source	Service	Generation MWH
CLECO	Jeanerette Sugar Mill	1	0.10	COGEN	Y	D20	2/1/85	Steam Turbine	Bagasse	Interconnected	**
EGSI	Agrielectric	1	14.30	SPP	Y	A07	7/1/84	Steam Turbine	Rice Husks	Interconnected	**
EGSI	Citgo	3	75.00	COGEN	N	D29	1/1/78	Steam Turbine	Nat Gas	Interconnected	**
EGSI	Copolymer	1	14.00	COGEN	N	D28	1/1/78	Steam Turbine	Nat Gas	Stand Alone	**
EGSI	Firestone	1	0.30	COGEN	N	D30	1/1/78	Steam Turbine	Nat Gas	Interconnected	**
EGSI	Georgia Pacific	1	59.00	COGEN	Y	D26	3/1/86	Steam Turbine	Nat Gas	Utility Backup	**
EGSI	James River #1	1	12.50	COGEN	Y	D26	1/1/78	Steam Turbine	Paper Mfg Byprod	Interconnected	**
EGSI	James River #2	1	45.00	COGEN	Y	D26	2/1/86	Steam Turbine	Paper Mfg Byprod	Interconnected	**
EGSI	Nelson Industrial Steam Co.	2	200.00	COGEN	Y	E496	10/1/88	Steam Turbine	Nat Gas	Interconnected	**
EGSI	Olin	1	3.00	COGEN	N	D28	1/1/78	Steam Turbine	Nat Gas	Utility Backup	**
EGSI	PPG-A	4	15.00	COGEN	N	D28	1/1/78	Steam Turbine	Nat Gas	Utility Backup	**
EGSI	PPG-D	3	125.00	COGEN	N	D28	1/1/78	Steam Turbine	Nat Gas	Utility Backup	**
ELI	Amstar Corp.	1	9.00	COGEN	Y	D20	1/1/78	Steam Turbine	Nat Gas	Utility Backup	**
ELI	BP Oil	1	19.15	COGEN	Y	D29	1/1/90	Steam Turbine	Refinery Gas	Interconnected	**
ELI	Calciner Industries- Chalmette	1	27.00	COGEN	Y	D33	1/1/74	Steam Turbine	Petr Coke	Interconnected	**
ELI	Colonial Sugars, Inc.	1	7.60	COGEN	Y	D20	1/1/78	Steam Turbine	Nat Gas	Utility Backup	**
ELI	Gaylord Container Corp. #1	1	37.00	COGEN	Y	D26	1/1/78	Steam Turbine	Paper Mfg Byprod	Utility Backup	**
ELI	Gaylord Container Corp. #2	1	25.00	COGEN	Y	D26	1/1/78	Steam Turbine	Paper Mfg Byprod	Utility Backup	**
ELI	IMC- Agrico, Uncle Sam	2	22.00	COGEN	Y	D28	1/1/68	Steam Turbine	Paper Mfg Byprod	Interconnected	**
ELI	International Paper #1	1	41.00	COGEN	Y	D26	1/1/80	Steam Turbine	Paper Mfg Byprod	Utility Backup	**
ELI	International Paper #2	1	15.00	COGEN	Y	D26	1/1/80	Steam Turbine	Paper Mfg Byprod	Utility Backup	**
ELI	Riverwood International Corp. #1	1	35.00	COGEN	Y	D26	1/1/77	Steam Turbine	Paper Mfg Byprod	Utility Backup	**
ELI	Riverwood International Corp. #2	1	30.00	COGEN	Y	D26	1/1/77	Steam Turbine	Paper Mfg Byprod	Utility Backup	**
ELI	Riverwood International Corp. #3	1	7.00	COGEN	Y	D26	1/1/77	Steam Turbine	Paper Mfg Byprod	Utility Backup	**
ELI	Riverwood International Corp. #4	1	7.00	COGEN	Y	D26	1/1/77	Steam Turbine	Paper Mfg Byprod	Utility Backup	**
ELI	Riverwood International Corp. #5	1	7.00	COGEN	Y	D26	1/1/77	Steam Turbine	Paper Mfg Byprod	Utility Backup	**
ELI	Stone Hodge, Inc.	1	66.00	COGEN	N	D26	1/1/78	Steam Turbine	Paper Mfg Byprod	Utility Backup	**
ELI	Union Carbide Corp. - Hahnville-C	1	10.00	COGEN	N	D28	1/1/87	Steam Turbine	Nat Gas	Utility Backup	**
	Totals for All Steam Turbines	**37**	**927.95**								**5,914,166**

TABLE 6 (CONTINUED)
EDISON ELECTRIC INSTITUTE GENERATION DATA FOR LOUISIANA NUGs - 1996
DATA GROUPED BY PRIME MOVER

Utility	Project	Units	Cap. MW	Type	QF	SIC Code	Start Date	Prime Mover	Energy Source	Service	Generation MWH
CLECO	Jeanerette Sugar Mill	1	0.10	COGEN	Y	D20	2/1/85	Steam Turbine	Bagasse	Interconnected	**
EGSI	Agrielectric	1	14.30	SPP	Y	A07	7/1/84	Steam Turbine	Rice Husks	Interconnected	**
EGSI	Citgo	3	75.00	COGEN	N	D29	1/1/78	Steam Turbine	Nat Gas	Interconnected	**
EGSI	Copolymer	1	14.00	COGEN	N	D28	1/1/78	Steam Turbine	Nat Gas	Stand Alone	**
EGSI	Firestone	1	0.30	COGEN	N	D30	1/1/78	Steam Turbine	Nat Gas	Interconnected	**
EGSI	Georgia Pacific	1	59.00	COGEN	Y	D26	3/1/86	Steam Turbine	Nat Gas	Utility Backup	**
EGSI	James River #1	1	12.50	COGEN	Y	D26	1/1/78	Steam Turbine	Paper Mfg Byprod	Interconnected	**
EGSI	James River #2	1	45.00	COGEN	Y	D26	2/1/86	Steam Turbine	Paper Mfg Byprod	Interconnected	**
EGSI	Nelson Industrial Steam Co.	2	200.00	COGEN	Y	E496	10/1/88	Steam Turbine	Nat Gas	Interconnected	**
EGSI	Olin	1	3.00	COGEN	N	D28	1/1/78	Steam Turbine	Nat Gas	Utility Backup	**
EGSI	PPG-A	4	15.00	COGEN	N	D28	1/1/78	Steam Turbine	Nat Gas	Utility Backup	**
EGSI	PPG-D	3	125.00	COGEN	N	D28	1/1/78	Steam Turbine	Nat Gas	Utility Backup	**
ELI	Amstar Corp.	1	9.00	COGEN	Y	D20	1/1/78	Steam Turbine	Nat Gas	Utility Backup	**
ELI	BP Oil	1	19.15	COGEN	Y	D29	1/1/90	Steam Turbine	Refinery Gas	Interconnected	**
ELI	Calciner Industries- Chalmette	1	27.00	COGEN	Y	D33	1/1/74	Steam Turbine	Petr Coke	Interconnected	**
ELI	Colonial Sugars, Inc.	1	7.60	COGEN	Y	D20	1/1/78	Steam Turbine	Nat Gas	Utility Backup	**
ELI	Gaylord Container Corp. #1	1	37.00	COGEN	Y	D26	1/1/78	Steam Turbine	Paper Mfg Byprod	Utility Backup	**
ELI	Gaylord Container Corp. #2	1	25.00	COGEN	Y	D26	1/1/78	Steam Turbine	Paper Mfg Byprod	Utility Backup	**
ELI	IMC- Agrico, Uncle Sam	2	22.00	COGEN	Y	D28	1/1/68	Steam Turbine	Paper Mfg Byprod	Interconnected	**
ELI	International Paper #1	1	41.00	COGEN	Y	D26	1/1/80	Steam Turbine	Paper Mfg Byprod	Utility Backup	**
ELI	International Paper #2	1	15.00	COGEN	Y	D26	1/1/80	Steam Turbine	Paper Mfg Byprod	Utility Backup	**
ELI	Riverwood International Corp. #1	1	35.00	COGEN	Y	D26	1/1/77	Steam Turbine	Paper Mfg Byprod	Utility Backup	**
ELI	Riverwood International Corp. #2	1	30.00	COGEN	Y	D26	1/1/77	Steam Turbine	Paper Mfg Byprod	Utility Backup	**
ELI	Riverwood International Corp. #3	1	7.00	COGEN	Y	D26	1/1/77	Steam Turbine	Paper Mfg Byprod	Utility Backup	**
ELI	Riverwood International Corp. #4	1	7.00	COGEN	Y	D26	1/1/77	Steam Turbine	Paper Mfg Byprod	Utility Backup	**
ELI	Riverwood International Corp. #5	1	7.00	COGEN	Y	D26	1/1/77	Steam Turbine	Paper Mfg Byprod	Utility Backup	**
ELI	Stone Hodge, Inc.	1	66.00	COGEN	N	D26	1/1/78	Steam Turbine	Paper Mfg Byprod	Utility Backup	**
ELI	Union Carbide Corp. - Hahnville-C	1	10.00	COGEN	N	D28	1/1/87	Steam Turbine	Nat Gas	Utility Backup	**
	Totals for All Steam Turbines	**37**	**927.95**								**5,630,956**
	Totals - All Prime Movers	**67**	**2800.65**								**17,451,780**

** Individual data not provided to preserve confidentiality.

coke, bagasse, and rice husks). Within the ranks of the 18 boilers fueled by natural gas, at least 10 of these can be identified as having been built before 1945.

Table 7 presents a grouping of 1996 Louisiana NUG data by industry group. Only two Louisiana NUGs are not affiliated with an industrial manufacturing activity: Murray Hydro, an independent power producer (IPP) using hydropower, and Agrielectric, a small power producer (SPP) burning agricultural waste (rice husks). Data for both of these plants can be given since both plants sell their entire electric output to utilities and are not subject to the confidentiality requirements applicable to industrial cogenerators.

According to utility records, Murray Hydro with a generating capacity of 192 MW or 1,682 million KWH per year generated 938.4 million KWH of electricity during 1996 for a capacity use of 55.8%. This facility's level of operation is limited by the fact that it is a "run of the river" type hydro facility. It can only operate successfully during those periods of time when the water levels of the Mississippi and Atchafalaya River differ by a sufficient amount.

Similarly, Agrielectric with a generating capacity of 14.3 MW or 125.3 million KWH per year generated 56.42 million KWH of electricity for Entergy during 1996, a capacity use of 45%. Although this facility runs throughout the year, it is dependent on available agricultural waste for production.

Of the cogenerating industrial NUGs in Louisiana, those operating as part of chemical manufacture had both the majority of generating capacity and electric generation. NUG generating capacity among chemical manufacturers in 1996 was estimated by EEI to be 1846.7 MW or 16,117 million KWH per year. Collectively, these NUGs generated an estimated 11,948.4 million KWH of electricity for a 73.9% use factor. These figures represented almost 66% of Louisiana NUG capacity and 68.5% of Louisiana NUG generation during 1996.

Louisiana NUGs operating in 1996 as part of paper and paper products manufacture placed a distant second in terms of both capacity and generation. These cogenerating industrial NUGs had a 1996 capacity of 386.5 MW or 3,385.7 million KWH per year and generated 2,239.2 million KWH of electricity during that year, representing a 66% use factor. Figures for the paper/paper products NUGs represented 13.8% of NUG capacity and 12.8% of NUG generation in Louisiana during 1996.

The estimated generating capacity of Louisiana NUGs engaging in refining or petroleum products manufacture was 344.45 MW or 3,017.4 million KWH per year in 1996. These NUGs generated an estimated 2,167.6 million KWH of electricity in that year for a capacity use of 71.8%. Compared to Louisiana NUG totals for 1996, this grouping represented 12.3% of generating capacity and 12.4% of generation.

The last NUG industry group is engaged in sugar cane milling or sugar refining. In 1996, this NUG industry group had an estimated generating capacity of 16.7 MW or 146 million KWH per year. Their estimated generation during that year was 101.7 million KWH representing a 69.5% use factor. Sugar industry NUGs had only 0.6% of statewide NUG generating capacity and 0.6% of statewide generation during 1996.

Sales of Electricity by Louisiana NUGs to Louisiana Electric Utilities

Table 8, Figures 2 through 5, and Tables 9 through 13 with associated Tables in Appendix B present data on purchases of NUG power by Louisiana electric utilities. As shown in Table 8, Louisiana NUGs sold a total of 374.2 million KWH of electricity to Louisiana utilities in 1996, the last year in which data are complete. These utilities paid a total of $8,397,977 for this power for an average unit cost of 2.24 cents per KWH.

Yearly average unit prices paid by each Louisiana electric utility are shown graphically in Figure 2. These prices are strong indicators of the natural gas prices paid by the various utilities for natural gas over the decade which the data span. All utilities except SWEPCO are grouped together rather closely. SWEPCO, however, is universally higher than any other utility. In 1993, its price paid to NUGs was almost triple the value for the utility having the lowest price paid cost in the state, New Orleans Public Service, Inc. (NOPSI, now known as Entergy New Orleans, Inc. [ENOI]). The reason for these high prices was that SWEPCO was locked into a high-priced ($5 to $6 per mcf) natural gas supply contract with one of its major suppliers. During that year, the Public Utility Commission of Texas (PUCT), which also regulates SWEPCO, investigated this situation and ordered the electric utility to renegotiate prices on this contract. Renegotiations resulted in the precipitous fall of price paid NUGs from 4.81 to 2.59 cents per KWH.

Figures 3 through 5 present graphic data on yearly totals of electricity purchases from NUGs by Louisiana electric utilities. Sums for all Louisiana NUGs are presented as bars; the total activity for all NUGs, both Louisiana and Texas, is presented as a line graph. As can be seen in Figures 3 and 4, the quantity and total cost of electricity purchased from Texas NUGs is significant. Data in Figure 5, however, indicates that the yearly average unit prices paid Louisiana NUGs vs. combined Texas and Louisiana NUGs are almost equal.

Starting with Table 9 through Table 14 and Figure 10, yearly summary data are presented by purchasing utility for each NUG selling electricity. Table 9 provides data on purchases by CLECO from one NUG supplier.

NUG purchase activity by Entergy Gulf States, Inc. (EGSI), is divided into two sets of tables and figures, one set (Table 10 and Figure 6) for Louisiana NUGs and one set (Table 11 and Figure 7) for Texas NUGs. EGSI purchases electricity from nine Louisiana NUG suppliers. The data presented in Table 10 provide sums for all nine suppliers, and also totals with Agrielectric excepted. Agrielectric is a small power producer in Lake Charles burning agricultural waste (rice husks). Because of a special agreement with EGSI approved by the Louisiana Public Service Commission, this SPP receives special rates which are roughly 200% of EGSI's avoided cost. The Agrielectric data are omitted from Figure 6 (average yearly unit prices for each supplier) in order to focus on standard average yearly unit prices paid industrial cogenerating QF NUGs. EGSI also purchases electric power from eight industrial cogenerating QF NUGs in Texas. These data are presented and summarized in Table 11. The average yearly unit prices for each of these NUGs are shown graphically in Figure 7. A visual examination of both EGSI figures indicates similarities in EGSI's prices paid NUGs among QFs and between states.

Table 12 presents yearly data on power purchased from three industrial cogenerating QF NUGs by Entergy Louisiana, Inc. (ELI). Figure 8 shows graphically ELI's yearly average unit price paid each of these suppliers. With the exception of the first year's (1985) data, these data cluster by year among the suppliers over the twelve years of data. The two "new" NUGs added in 1997 are somewhat more expensive than the ELI group average.

ENOI yearly power purchase activity with one industrial cogenerating QF NUG is presented in Table 13. Similarly, the yearly average unit price paid for such power from that supplier is shown graphically in Figure 9. These average unit prices lie within the price range paid by all other Louisiana electric utilities except SWEPCO.

Data on SWEPCO power purchasing activities with its two Texas industrial cogenerating QF NUGs is shown in Table 14. Yearly average unit prices paid by this utility to its NUG suppliers are shown graphically in Figure 10. As mentioned above, SWEPCO prices paid for power from these suppliers, a proxy for SWEPCO's weighted average cost of gas, are substantially higher than those of any other Louisiana electric utility in every year until 1994. The 1994 and subsequent unit prices, while still higher than those of every other Louisiana utility, are percentage wise much closer.

Disaggregate monthly data for each NUG supplying a Louisiana electric utility from 1990 to the present are shown in tables located in Appendix B. These 31 tables cover all individual NUGs selling to Louisiana and include summary tables for each electric utility having more than one NUG supplier. Data for the Entergy utilities cover the period from January 1990 through October or November 1997. Data for CLECO and SWEPCO cover the period from January 1990 through December 1996.

TABLE 8
PURCHASES OF ELECTRICITY FROM QFs - ALL LOUISIANA UTILITIES
YEARLY POWER PURCHASES (KWH), COST ($), AND AVERAGE COST (CENTS/KWH)
PURCHASES FROM ALL QF SUPPLIERS (LA & TX)

YEAR	CLECO	ENTERGY GSI - LA	ENTERGY LOUISIANA	ENTERGY NOI	TOTALS-LA QFs ONLY	SWEPCO	ENTERGY GSI - TX	TOTALS ALL QFs
POWER PURCHASED (KWH)								
1985	16,000	153,401,456	99,420,200	3,078,172	255,915,828	7570629	27,805,102	291,291,559
1986	106,000	374,503,084	91,280,900	3,370,000	469,259,984	10,331,263	50,970,958	530,562,205
1987	238,000	425,681,860	105,808,050	3,079,000	534,806,910	11,504,501	86,080,106	632,391,517
1988	196,000	274,373,997	97,262,077	1,772,000	373,604,074	15,332,465	126,948,281	515,884,820
1989	156,000	262,212,860	96,469,848	461,000	359,299,708	9,887,053	100,117,683	469,304,444
1990	73,000	303,991,026	144,734,454	147,000	448,945,480	8,662,149	71,422,665	529,030,294
1991	20,530	256,238,617	147,313,535	236,000	403,808,682	2,597,814	36,089,776	442,496,272
1992	1,450	244,130,416	140,037,201	496,000	384,665,067	9,270,742	127,600,698	521,536,597
1993	114,940	185,468,409	143,748,186	58,000	329,389,535	10,844,644	201,238,987	541,473,166
1994	437,400	129,519,067	144,122,869	369,000	274,448,336	8,871,238	229,113,009	512,432,583
1995	273,140	172,713,494	140,523,451	346000	313,582,945	5,367,123	110,239,536	423,822,481
1996	212,165	210,172,870	162,564,380	1,246,000	374,195,415	4,036,543	83,440,798	461,672,756
1997 *		145,822,524	288,916,826	1,068,000			71,490,759	
TOTALS	1,844,62	3,138,229,680	1,802,201,97	15,726,17	4,521,921,964	104,276,164	1,322,558,358	5,871,898,694
COST OF PURCHASED POWER (DOLLARS)								
1985	$440	$4,073,527	$3,187,118	$89,240	$7,350,325	$287,524	$716,836	$8,354,685
1986	$2,430	$6,297,966	$1,486,293	$53,456	$7,840,145	$331,817	$793,721	$8,985,683
1987	$4,284	$6,610,403	$1,694,835	$47,946	$8,357,468	$310,476	$1,309,159	$9,977,103
1988	$3,548	$4,803,258	$1,605,915	$29,332	$6,442,053	$487,018	$2,257,046	$9,186,117
1989	$2,918	$4,624,988	$1,663,094	$7,952	$6,298,952	$297,882	$1,722,246	$8,319,080
1990	$1,482	$5,433,674	$2,404,978	$2,733	$7,842,867	$296,885	$1,254,496	$9,394,248
1991	$455	$3,806,975	$2,210,781	$3,825	$6,022,036	$77,380	$596,849	$6,696,265
1992	$33	$4,353,919	$2,057,190	$6,680	$6,417,822	$400,640	$2,492,401	$9,310,863
1993	$2,506	$3,763,697	$2,563,930	$837	$6,330,970	$521,765	$4,011,091	$10,863,826
1994	$9,589	$2,123,488	$2,704,604	$5,268	$4,842,949	$229,458	$3,612,974	$8,685,381
1995	$5,946	$3,112,888	$2,532,286	$7,024	$5,652,198	$95,463	$1,841,669	$7,493,867
1996	$4619	$5,236,852	$3,131,023	$25,483	$8,397,977	$106,768	$1,669,739	$10,174,484
1997 *		$3,922,245	$6,290,765	$24,126			$1,539,756	
TOTALS	$38,250	$58,163,880	$33,532,812	$303,902	$81,795,762	$3,443,076	$23,817,983	$107,421,602
AVERAGE COST OF POWER (CENTS/KWH)								
1985	2.75	2.66	3.21	2.90	2.87	3.80	2.58	2.87
1986	2.29	1.68	1.63	1.59	1.67	3.21	1.56	1.69
1987	1.80	1.55	1.60	1.56	1.56	2.70	1.52	1.58
1988	1.81	1.75	1.65	1.66	1.72	3.18	1.78	1.78
1989	1.87	1.76	1.72	1.72	1.75	3.01	1.72	1.77
1990	2.03	1.79	1.66	1.86	1.75	3.43	1.76	1.78
1991	2.22	1.49	1.50	1.62	1.49	2.98	1.65	1.51
1992	2.28	1.78	1.47	1.35	1.67	4.32	1.95	1.79
1993	2.18	2.03	1.78	1.44	1.92	4.81	1.99	2.01
1994	2.19	1.64	1.88	1.43	1.76	2.59	1.58	1.69
1995	2.18	1.80	1.80	2.03	1.80	1.78	1.67	1.77
1996	2.18	2.49	1.93	2.05	2.24	2.65	2.00	2.20
1997 *		2.69	2.18	2.26			2.15	
OVERALL AVERAGE	2.07	1.85	1.86	1.93	1.81	3.30	1.80	1.83

* EGSI-LA and EGSI-TX data for January through October; ENOI data for January through November.

FIGURE 2

QF ELECTRICITY PURCHASES BY LOUISIANA ELECTRIC UTILITIES

UTILITY YEARLY AVERAGE PRICE PAID FOR POWER PURCHASED

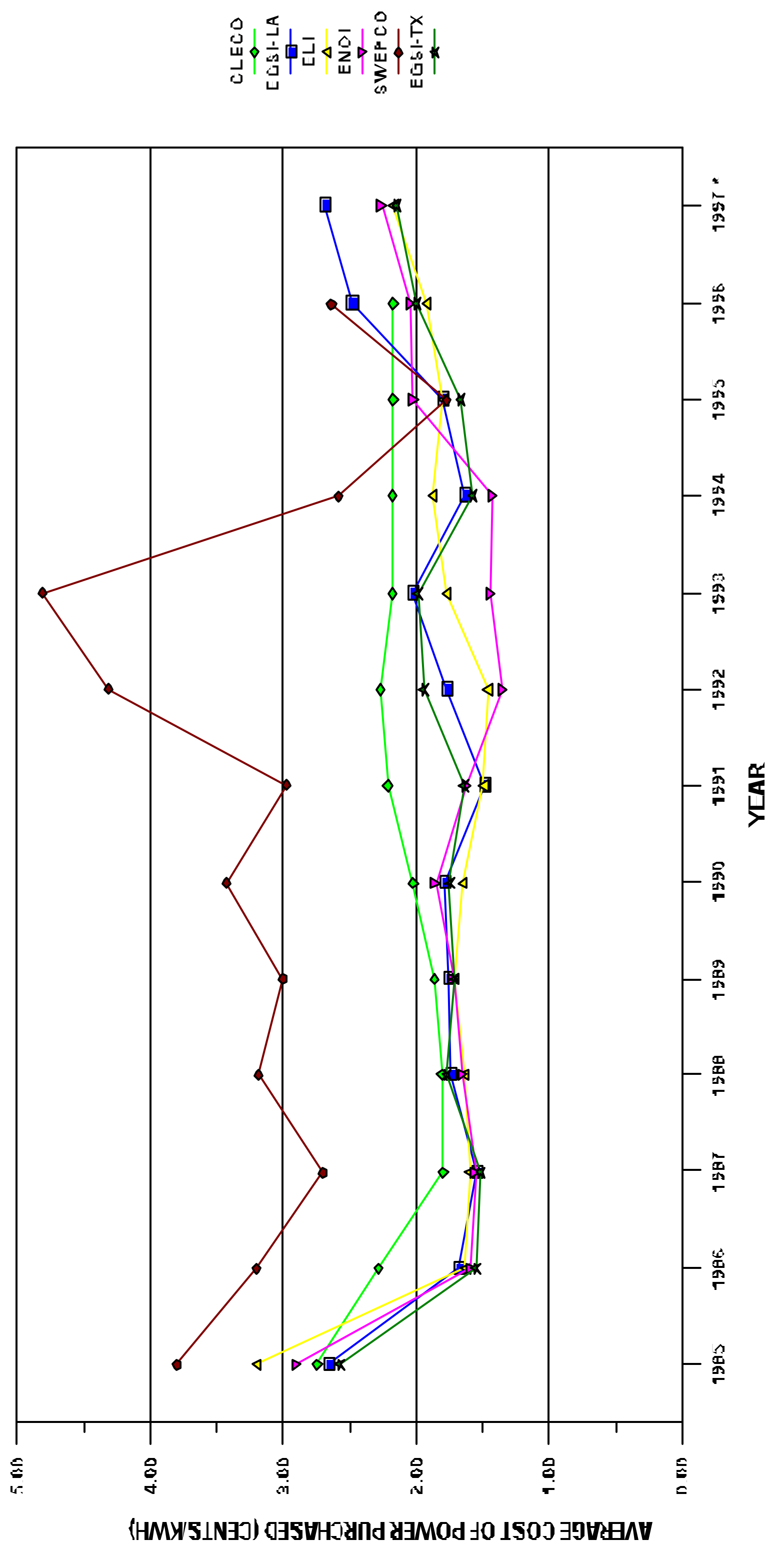


FIGURE 3

FIGURE 4
QF ELECTRICITY PURCHASES BY LOUISIANA ELECTRIC UTILITIES
YEARLY COST OF POWER PURCHASED BY QF GROUPINGS

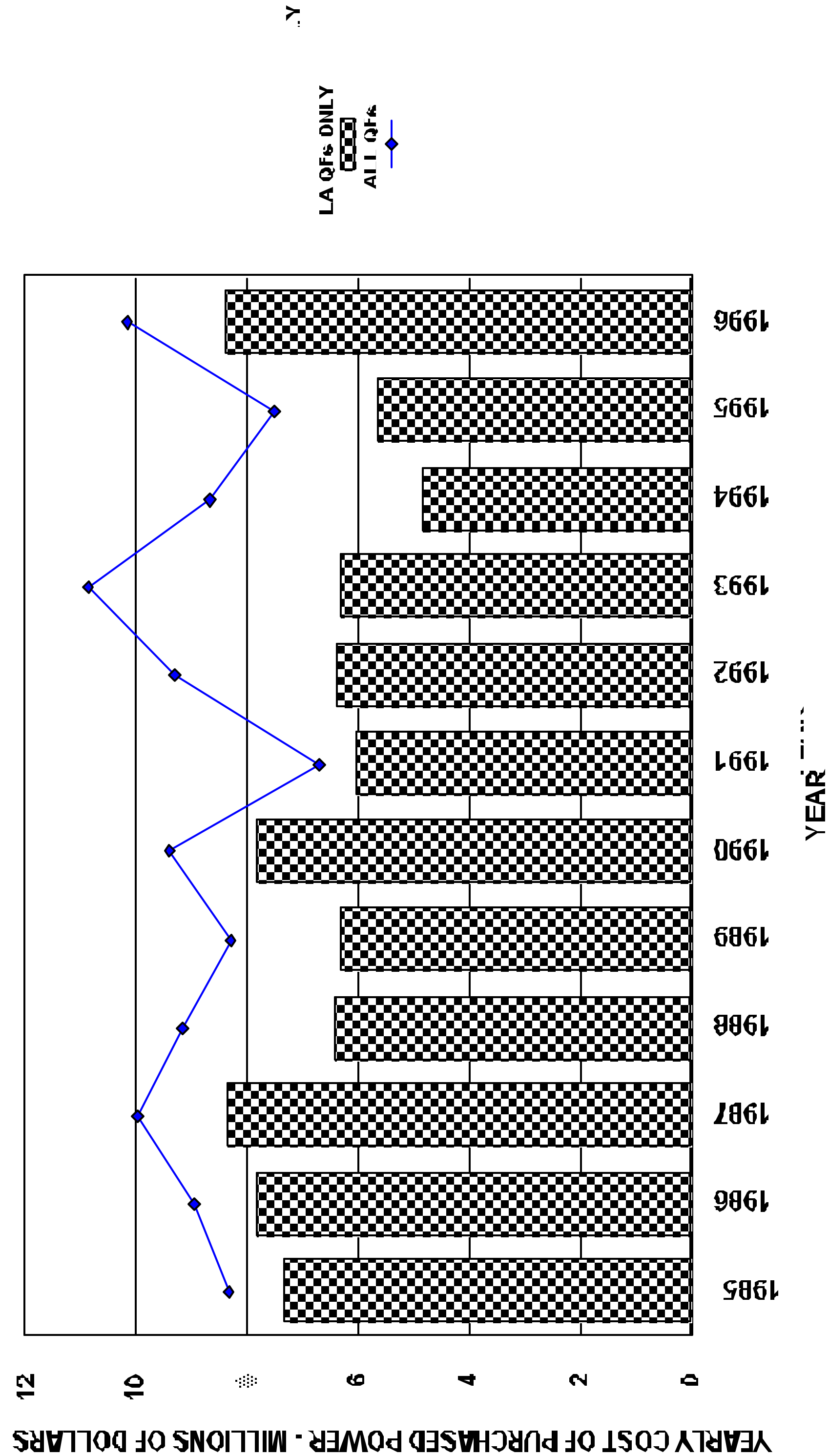


TABLE 9 CENTRAL LOUISIANA ELECTRIC COMPANY (CLECO) PURPA QF P

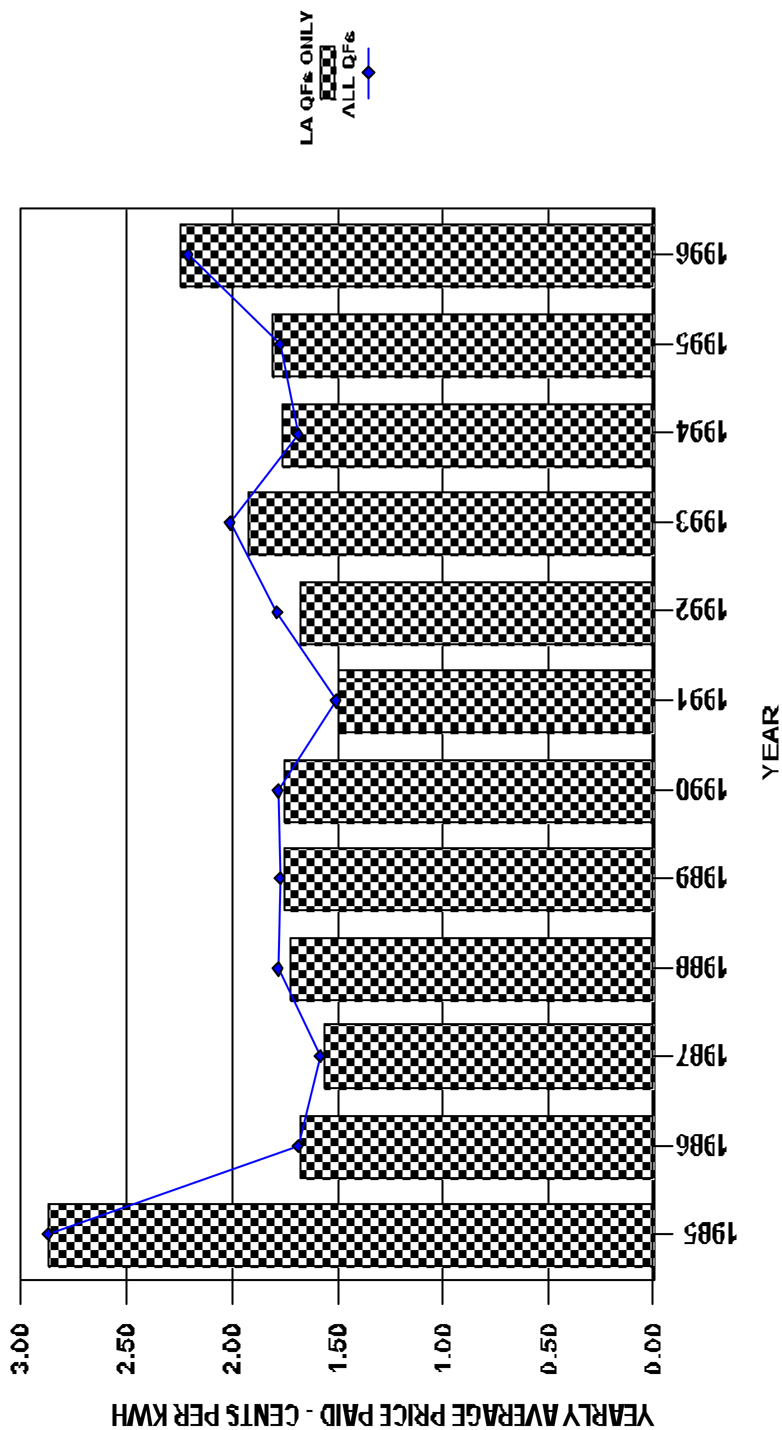


FIGURE 5
QF ELECTRICITY PURCHASES BY LOUISIANA ELECTRIC UTILITIES
YEARLY AVERAGE PRICE PAID BY QF GROUPINGS

URCHASES, COST, AVERAGE COST
YEARLY SUMMARY - ALL QF SUPPLIERS

SINGLE SUPPLIER: JEANERETTE SUGAR MILL

YEAR	KWH PURCHASED	COST ($)	AVERAGE COST (CENTS/KWH)
1985	16,000	$440	2.75
1986	106,000	$2,430	2.29
1987	238,000	$4,284	1.80
1988	196,000	$3,548	1.81
1989	156,000	$2,918	1.87
1990	73,000	$1,482	2.03
1991	20,530	$455	2.22
1992	1,450	$33	2.28
1993	114,940	$2,506	2.18
1994	437,400	$9,589	2.19
1995	273,140	$5,946	2.18
1996	212,165	$4,619	2.18
GRAND TOTALS	**1,844,625**	**$38,250**	**2.07**

TABLE 10
ENTERGY GULF STATES, INC. (EGSI)
PURPA QUALIFIED FACILITY (QF) POWER PURCHASES (KWH), COST($), AND AVERAGE COST(CENTS/KWH)

YEARLY SUMMARY OF ALL LOUISIANA QF SUPPLIERS

POWER PURCHASED (KWH)

YEAR	AGRI ELECTRIC	BASF	BORDEN	CROWN PAPER *	DOW	EXXON	FORMOS A	JAMES RIVER *	NISCO	VULCAN	ALL LOUISIANA QF'S	ALL QF'S EXCEPT AGRI ELEC.
1985	64,564,886	26,883,220			117,358,300					9,159,936	217,966,342	153,401,456
1986	66,689,393	52,525,840	40,965,246		123,297,324			23,826,762		133,887,912	441,192,477	374,503,084
1987	74,666,060	41,341,726	107,090,029		174,761,875			22,927,726		79,560,504	500,347,920	425,681,860
1988	77,792,352	35,404,645	105,807,252		81,844,613			6,819,512	12,212,907	32,285,068	352,166,349	274,373,997
1989	71,195,845	36,299,690	75,174,451		96,648,275			7,901,917	10,209,901	35,978,626	333,408,705	262,212,860
1990	80,192,798	24,100,593	45,698,455		142,570,565	2,666,336		6,884,572	7,081,181	74,989,324	384,183,824	303,991,026
1991	80,830,716	13,711,028	12,472,302		144,386,237	35,964,495	4,568,504	4,765,068	2,562,351	37,808,632	337,069,333	256,238,617
1992	69,099,298	5,202,610	7,030,669		175,689,362	29,536,408	1,780,030	2,954,977	489,880	21,446,480	313,229,714	244,130,416
1993	70,421,944	4,900,216	17,187,338		108,893,725	13,369,825	3,474,854	2,243,481	11,479,503	23,919,467	255,890,353	185,468,409
1994	72,863,885	475,142	9,852,613		59,866,346	29,008,952	4,054,604	2,762,362	2,341,724	21,157,324	202,382,952	129,519,067
1995	73,697,875	3,006,848	2,150,745		121,054,726	9,727,711	1,865,960	3,304,830	1,301,262	30,301,412	246,411,369	172,713,494
1996	56,418,051	3,067,740	8,299,687	1,962,071	79,351,150	4,122,285	20,150,850	2,424,094	9,000,559	25,376,383	210,172,870	153,754,819
1997	47,928,555	787,160	970,804	271,635	9,297,256	13,521,252	54,587,960		39,510	18,418,392	145,822,524	97,893,969
TOTALS	**906,361,658**	**247,706,458**	**432,699,591**	**2,233,706**	**1,435,019,754**	**137,917,264**	**90,482,762**	**86,815,301**	**56,718,778**	**544,289,460**	**3,940,244,732**	**3,033,883,074**

COST OF POWER ($)

YEAR	AGRI ELECTRIC	BASF	BORDEN	CROWN PAPER *	DOW	EXXON	FORMOS A	JAMES RIVER *	NISCO	VULCAN	ALL LOUISIANA QF'S	ALL QF'S EXCEPT AGRI ELEC.
1985	$1,632,104	$640,202			$3,238,949					$194,376	$5,705,631	$4,073,527
1986	$1,090,217	$919,812	$637,727		$2,031,267			$395,769		$2,313,391	$7,388,183	$6,297,966
1987	$1,435,383	$643,394	$1,651,829		$2,716,696			$360,224		$1,238,260	$8,045,786	$6,610,403
1988	$2,794,300	$619,619	$1,865,287		$1,408,851			$119,177	$227,485	$562,839	$7,597,558	$4,803,258
1989	$2,557,248	$636,692	$1,331,294		$1,695,444			$135,777	$190,550	$635,231	$7,182,236	$4,624,988
1990	$2,880,826	$445,803	$871,474		$2,521,668	$53,589		$124,107	$117,262	$1,299,771	$8,314,500	$5,433,674
1991	$2,903,755	$227,718	$226,488		$2,318,803	$242,750	$72,714	$79,519	$39,945	$599,038	$6,710,730	$3,806,975
1992	$2,454,018	$96,829	$127,524		$3,152,653	$492,406	$31,840	$51,467	$6,951	$394,249	$6,807,937	$4,353,919
1993	$2,494,346	$104,231	$342,778		$2,213,483	$270,301	$71,016	$47,258	$238,395	$476,235	$6,258,043	$3,763,697
1994	$2,580,200	$8,185	$173,106		$1,015,408	$445,155	$69,075	$45,851	$33,826	$332,882	$4,703,688	$2,123,488
1995	$2,610,382	$51,348	$36,237		$2,215,288	$171,669	$31,271	$62,497	$20,481	$524,097	$5,723,270	$3,112,888
1996	$1,998,327	$84,058	$182,785	$37,978	$1,742,854	$109,192	$403,415	$53,076	$144,627	$480,540	$5,236,852	$3,238,525
1997	$1,697,629	$12,487	$23,537	$5,680	$249,425	$342,094	$1,167,061		$862	$423,469	$3,922,244	$2,224,615
TOTALS	**$29,128,735**	**$4,490,378**	**$7,470,066**	**$43,658**	**$26,520,789**	**$2,127,156**	**$1,846,392**	**$1,474,722**	**$1,020,384**	**$9,474,378**	**$83,596,658**	**$54,467,924**

* SAME FACILITY, NAME CHANGED

(Table continued next page)

TABLE 10 (cont.)
ENTERGY GULF STATES, INC. (EGSI)

YEARLY SUMMARY OF ALL LOUISIANA QF SUPPLIERS

AVERAGE COST OF POWER (CENTS/KWH)

YEAR	AGRI ELECTRIC	BASF	BORDEN	CROWN PAPER *	DOW	EXXON	FORMOSA	JAMES RIVER *	NISCO	VULCAN	ALL LOUISIANA QF'S	ALL QF'S EXCEPT AGRI ELEC.
1985	2.53	2.38			2.76					2.12	2.62	2.66
1986	1.63	1.75	1.56		1.65			1.66		1.73	1.67	1.68
1987	1.92	1.56	1.54		1.55			1.57		1.56	1.61	1.55
1988	3.59	1.75	1.76		1.72			1.75	1.86	1.74	2.16	1.75
1989	3.59	1.75	1.77		1.75			1.72	1.87	1.77	2.15	1.76
1990	3.59	1.85	1.91		1.77	2.01		1.80	1.66	1.73	2.16	1.79
1991	3.59	1.66	1.82		1.61		1.59	1.67	1.56	1.58	1.99	1.49
1992	3.55	1.86	1.81		1.79	1.67	1.79	1.74	1.42	1.84	2.17	1.78
1993	3.54	2.13	1.99		2.03	2.02	2.04	2.11	2.08	1.99	2.45	2.03
1994	3.54	1.72	1.76		1.70	1.53	1.70	1.66	1.44	1.57	2.32	1.64
1995	3.54	1.71	1.68		1.83	1.76	1.68	1.89	1.57	1.73	2.32	1.80
1996	3.54	2.74	2.20	1.94	2.20	2.65	2.00	2.19	1.61	1.89	2.49	2.11
1997	3.54	1.59	2.42	2.09	2.68	2.53	2.14		2.18	2.30	2.69	2.27
GRAND AVERAGE	**3.21**	**1.81**	**1.73**	**1.95**	**1.85**	**1.54**	**2.04**	**1.70**	**1.80**	**1.74**	**2.12**	**1.80**

* SAME FACILITY, NAME CHANGED

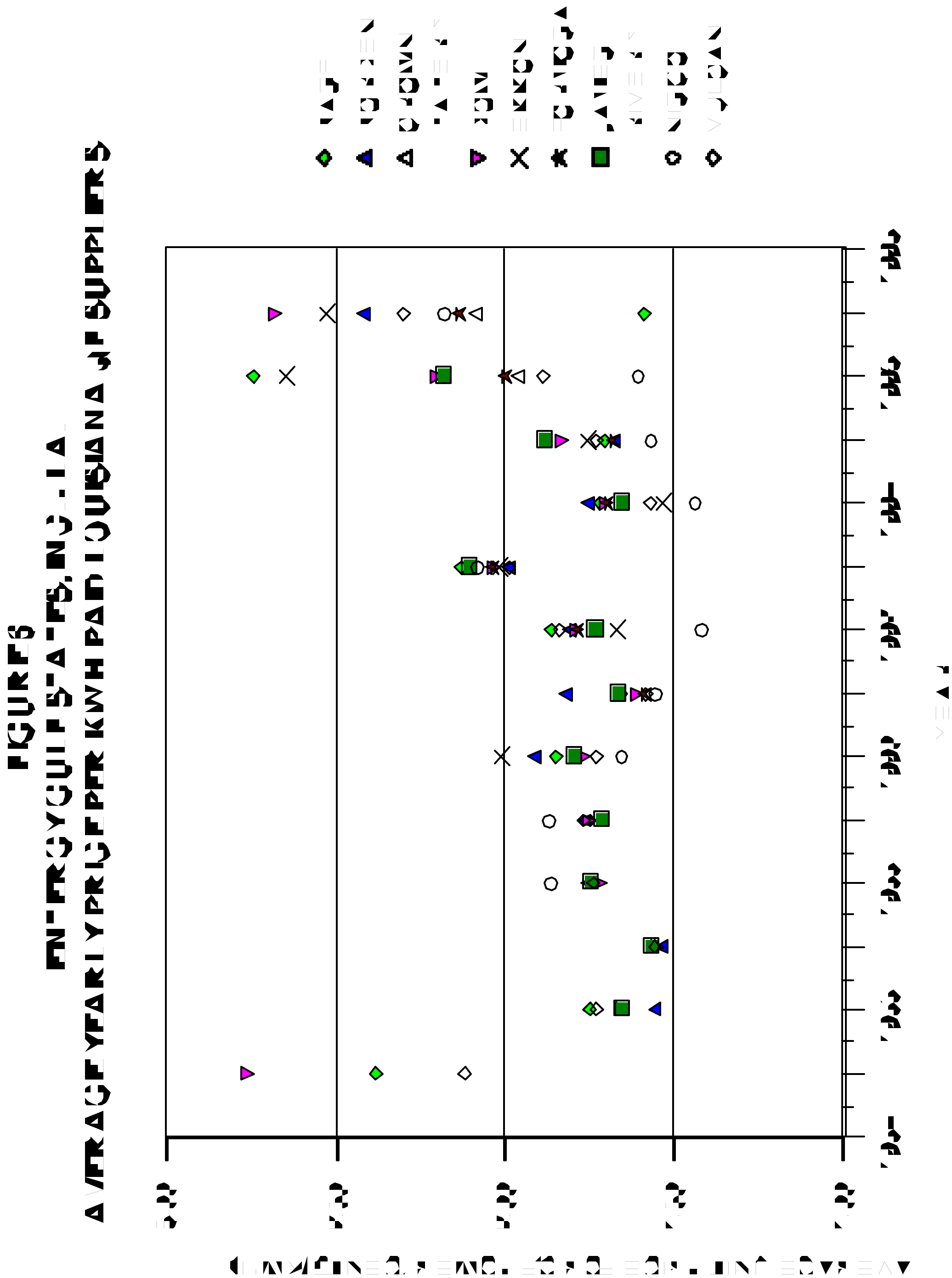


TABLE 11
ENTERGY GULF STATES, INC. (EGSI)
PURPA QUALIFIED FACILITY (QF) POWER PURCHASES (KWH), COST ($), AND AVERAGE COST (CENTS/KWH)
YEARLY SUMMARY OF ALL TEXAS QF SUPPLIERS

POWER PURCHASED (KWH)

YEAR	AIR LIQUIDE	CLARK REFINING	COGEN POWER	DUPONT	FINA	HUNTSMAN CORP.	ENGINEERED CARBONS	STAR ENTERPRISE	ALL QFs
1985			11,602,361				16,202,751		27,805,112
1986			16,508,655				19,108,749	15,353,554	50,970,958
1987			10,954,582	1,823,226			14,791,118	58,511,180	86,080,106
1988			7,161,304	6,801,690			20,369,423	92,615,864	126,948,281
1989			4,983,850	5,715,728	3,268,347		25,065,712	61,084,046	100,117,683
1990			5,773,423	4,413,499	5,424		15,936,881	45,293,438	71,422,665
1991			3,381,712	6,883,671	417,278		10,251,472	15,155,643	36,089,776
1992		10,506,622	2,768,274	934,023	438,044	43,171,465	13,152,931	56,629,339	127,600,698
1993		34,557,063	2,307,862	936,009	765,672	134,511,327	3,606,648	24,554,406	201,238,987
1994	56,750,345	12,548,319	2,623,487		28	115,447,047	13,832,047	28,931,736	230,133,009
1995	16,425,009	3,201,450	1,862,360	1,625,551	264,419	44,994,672	7,705,086	34,160,989	110,239,536
1996	12,113,098	6,607,158	1,648,496	235,675	$204,238	33,260,053	11,882,697	17,488,383	83,439,798
1997	6,162,519	18,381,978	430,228	164,350		32,590,428	6,756,432	7,004,824	71,490,759
TOTALS	**91,450,971**	**85,802,590**	**72,006,594**	**29,533,422**	**5,363,450**	**403,974,992**	**178,661,947**	**456,783,402**	**1,323,577,368**

COST OF POWER ($)

YEAR	AIR LIQUIDE	CLARK REFINING	COGEN POWER	DUPONT	FINA	HUNTSMAN CORP.	ENGINEERED CARBONS	STAR ENTERPRISE	ALL QFs
1985			$280,135				$436,701		$716,836
1986			$265,874				$300,530	$227,317	$793,721
1987			$164,861	$28,551			$221,699	$894,048	$1,309,159
1988			$119,705	$130,781			$337,851	$1,668,709	$2,257,046
1989			$85,141	$124,133	$53,052		$445,840	$1,014,080	$1,722,246
1990			$96,264	$79,801	$100		$268,932	$809,419	$1,254,516
1991			$51,508	$122,660	$7,103		$155,801	$259,777	$596,849
1992		$216,805	$51,916	$15,796	$6,973	$876,057	$221,255	$1,103,599	$2,492,401
1993		$670,260	$46,583	$17,992	$13,907	$2,702,356	$72,356	$487,637	$4,011,091
1994	$848,478	$198,310	$41,932			$1,826,610	$211,674	$485,970	$3,612,974
1995	$272,979	$61,126	$31,020	$26,763	$3,695	$751,066	$131,096	$563,923	$1,841,668
1996	$255,433	$140,923	$32,113	$10,923	$4,065	$639,650	$220,890	$395,741	$1,699,738
1997	$130,606	$387,379	$8,377	$3,584		$690,572	$143,994	$175,245	$1,539,757
TOTALS	**$1,507,496**	**$1,674,803**	**$1,275,429**	**$560,984**	**$88,895**	**$7,486,311**	**$3,168,619**	**$8,085,465**	**$23,848,002**

(Table continued next page)

TABLE 11 (cont.)
ENTERGY GULF STATES, INC. (EGSI)
YEARLY SUMMARY OF ALL TEXAS QF SUPPLIERS

AVERAGE COST OF POWER (CENTS/KWH)

YEAR	AIR LIQUIDE	CLARK REFINING	COGEN POWER	DUPONT	FINA	HUNTSMAN CORP.	ENGINEERED CARBONS	STAR ENTERPRISE	ALL QFs
1985			2.41				2.70		2.58
1986			1.61				1.57	1.48	1.56
1987			1.50	1.57			1.50	1.53	1.52
1988			1.67	1.92			1.66	1.80	1.78
1989			1.71	2.17	1.62		1.78	1.66	1.72
1990			1.67	1.81	1.84		1.69	1.79	1.76
1991			1.52	1.78	1.70		1.52	1.71	1.65
1992		2.06	1.88	1.69	1.59	2.03	1.68	1.95	1.95
1993		1.94	2.02	1.92	1.82	2.01	2.01	1.99	1.99
1994	1.50	1.58	1.60			1.58	1.53	1.68	1.57
1995	1.66	1.91	1.67	1.65	1.40	1.67	1.70	1.65	1.67
1996	2.11	2.13	1.95	4.63	1.99	1.92	1.86	2.26	2.04
1997	2.12	2.11	1.95	2.18		2.12	2.13	2.50	2.15
GRAND AVERAGE	**1.65**	**1.95**	**1.77**	**1.90**	**1.66**	**1.85**	**1.77**	**1.77**	**1.80**

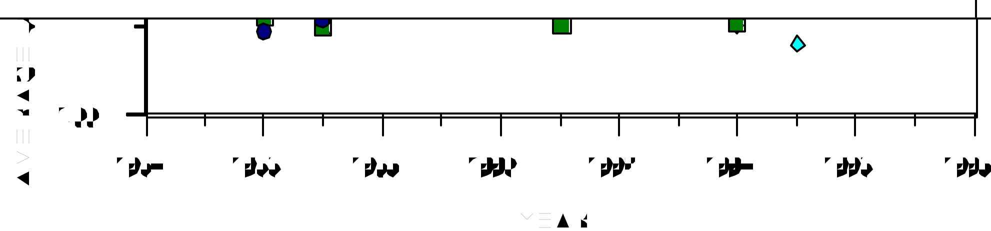


TABLE 12
ENTERGY LOUISIANA, INC. (ELI)
PURPA QUALIFIED FACILITY (QF) POWER PURCHASES, COST, AND AVERAGE COST PER KWH
YEARLY SUMMARY - ALL QF SUPPLIERS *EXCEPT MURRAY HYDRO (see App. B)*

POWER PURCHASED (KWH)

YEAR	B.P. OIL	CALCINER INDUSTRIES	GEORGIA GULF	IMC AGRICO	UNION CARBIDE	TOTAL ELI QFs
1985		99,420,200				99,420,200
1986		91,280,900				91,280,900
1987		105,808,050				105,808,050
1988		95,052,800		2,209,277		97,262,077
1989		90,915,350		5,554,498		96,469,848
1990	38,049,140	101,691,250		4,994,064		144,734,454
1991	38,291,280	105,701,800		3,320,455		147,313,535
1992	34,828,080	100,935,950		4,273,171		140,037,201
1993	31,756,620	109,636,800		2,354,766		143,748,186
1994	40,240,550	101,686,500		2,195,819		144,122,869
1995	27,111,000	107,815,600		5,596,851		140,523,451
1996	36,134,000	117,068,600		9,363,780		162,566,380
1997	33,824,000	126,194,250	36,774,000	9,889,116	85,235,480	291,916,846
TOTALS	280,234,670	1,353,208,050	36,774,000	49,751,797	85,235,480	1,805,203,997

COST OF POWER ($)

YEAR	B.P. OIL	CALCINER INDUSTRIES	GEORGIA GULF	IMC AGRICO	UNION CARBIDE	TOTAL ELI QFs
1985		$3,187,118				$3,187,118
1986		$1,486,293				$1,486,293
1987		$1,694,835				$1,694,835
1988		$1,569,871		$36,044		$1,605,915
1989		$1,568,799		$94,295		$1,663,094
1990	$633,600	$1,687,376		$84,002		$2,404,978
1991	$577,445	$1,584,100		$49,236		$2,210,781
1992	$491,439	$1,502,882		$62,869		$2,057,190
1993	$502,779	$2,029,278		$31,873		$2,563,930
1994	$667,474	$2,001,898		$35,232		$2,704,604
1995	$455,077	$1,981,266		$95,943		$2,532,286
1996	$731,145	$2,228,893		$170,886		$3,130,924
1997	$699,879	$2,534,262	$898,746	$184,602	$1,973,257	$6,290,746
TOTALS	$4,758,838	$25,056,871	$898,746	$844,982	$1,973,257	$33,532,694

AVERAGE COST OF POWER (CENTS/KWH)

YEAR	B.P. OIL	CALCINER INDUSTRIES	GEORGIA GULF	IMC AGRICO	UNION CARBIDE	TOTAL ELI QFs
1985		3.21				3.21
1986		1.63				1.63
1987		1.60				1.60
1988		1.65		1.63		1.65
1989		1.73		1.70		1.72
1990	1.67	1.66		1.68		1.66
1991	1.51	1.50		1.48		1.50
1992	1.41	1.49		1.47		1.47
1993	1.58	1.85		1.35		1.78
1994	1.66	1.97		1.60		1.88
1995	1.68	1.84		1.71		1.80
1996	2.02	1.90		1.82		1.93
1997	2.07	2.01	2.44	1.87	2.32	2.15

GRAND AVERAGE	1.70	1.85	2.44	1.70	2.32	1.86

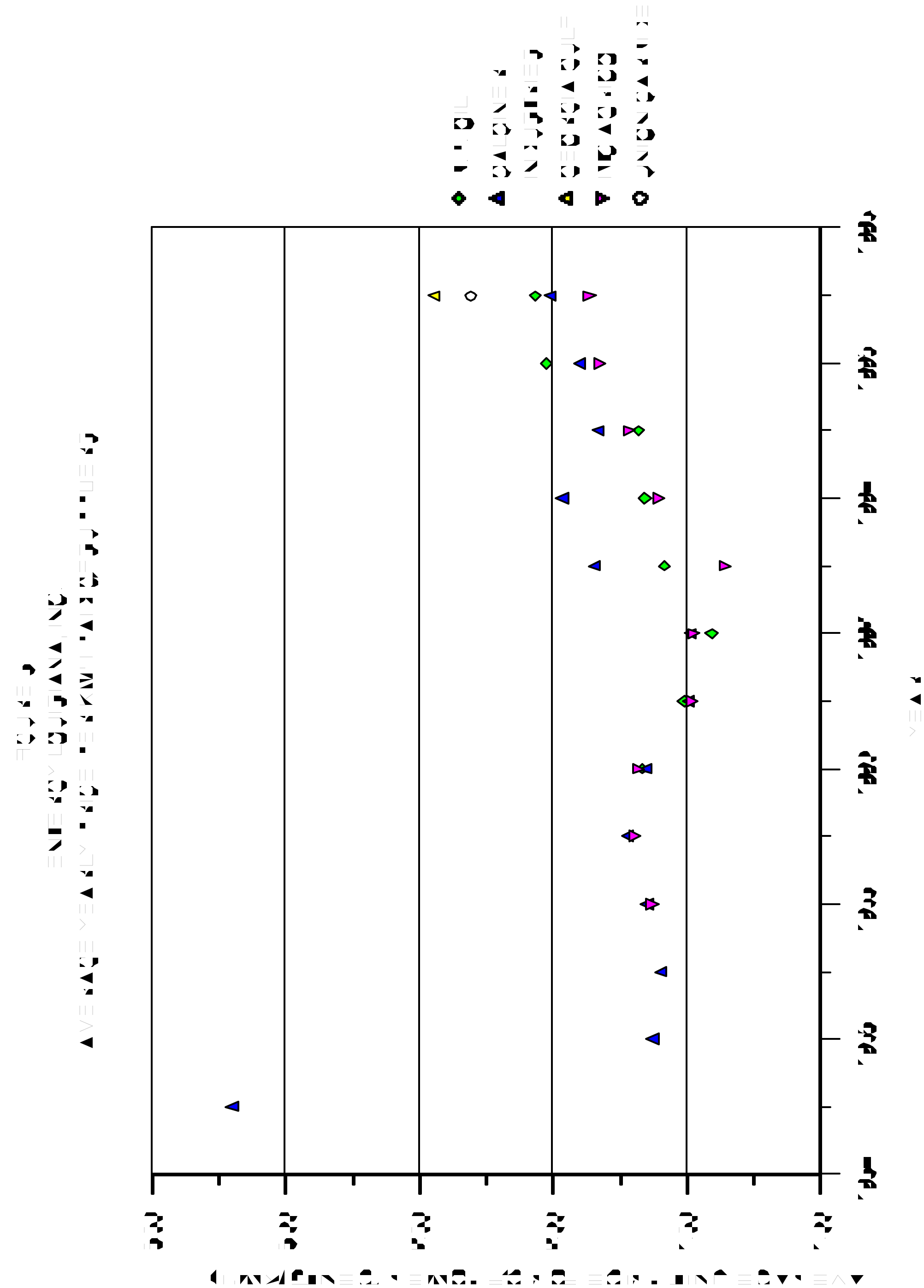


TABLE 13
ENTERGY NEW ORLEANS, INC. (ENOI)
PURPA QF POWER PURCHASES, COST AND AVERAGE COST PER KWH
YEARLY SUMMARY

SINGLE SUPPLIER: AIR PRODUCTS, NEW ORLEANS, LA.

YEAR	KWH PURCHASED	COST ($)	AVERAGE COST (CENTS/KWH)
1985	3,078,172	$89,240	2.90
1986	3,370,000	$53,456	1.59
1987	3,079,000	$47,946	1.56
1988	1,772,000	$29,332	1.66
1989	461,000	$7,952	1.72
1990	147,000	$2,733	1.86
1991	236,000	$3,825	1.62
1992	496,000	$6,680	1.35
1993	58,000	$837	1.44
1994	369,000	$5,268	1.43
1995	346,000	$7,024	2.03
1996	1,246,000	$25,483	2.05
1997	1,068,000	$24,126	2.26
GRAND TOTALS	**15,726,172**	**$303,902**	**1.93**

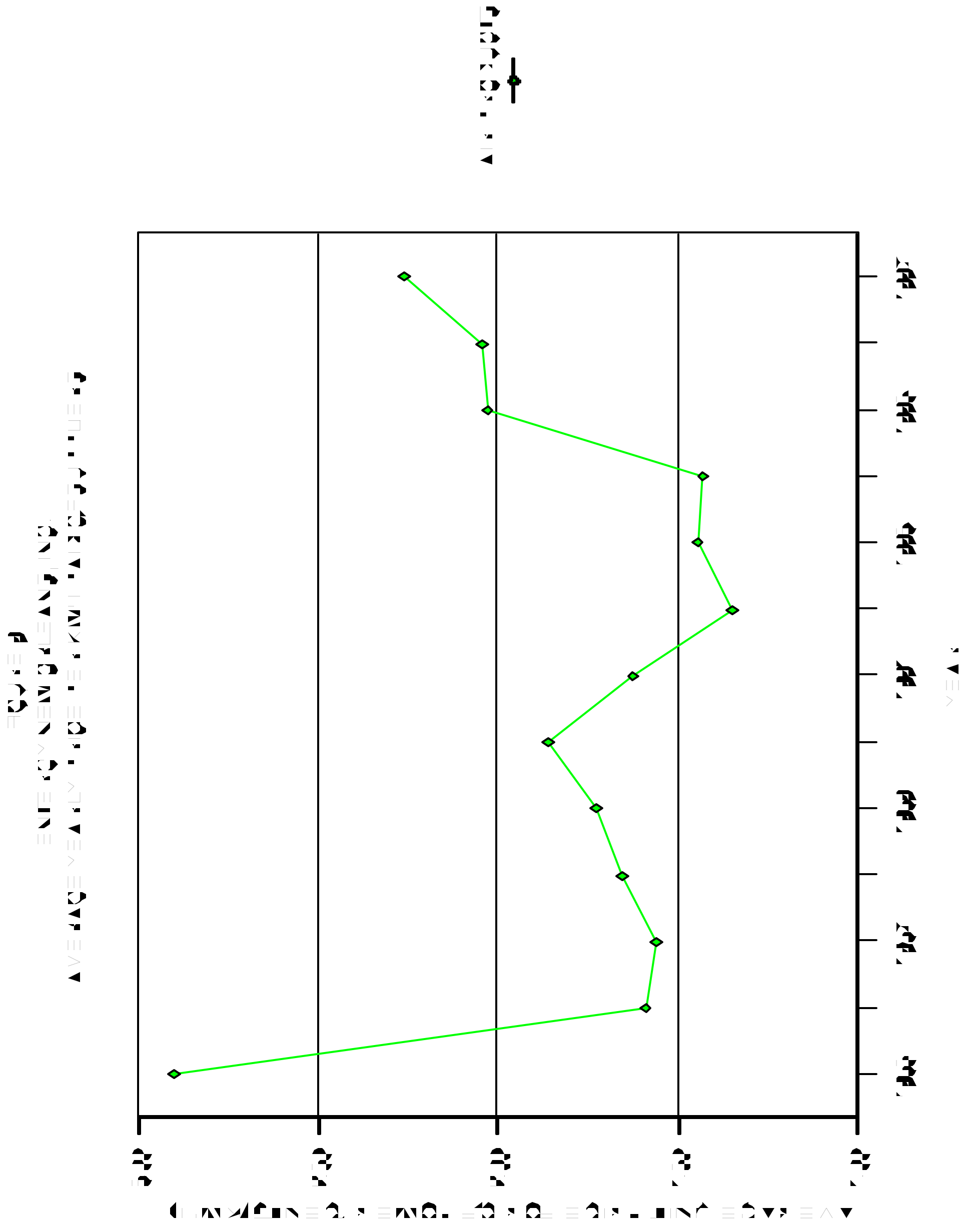


TABLE 14
SOUTHWESTERN ELECTRIC POWER COMPANY (SWEPCO)
PURPA QF POWER PURCHASES, COST, AND AVERAGE COST PER KWH
YEARLY SUMMARY OF ALL TEXAS QF SUPPLIERS

POWER PURCHASED (KWH)

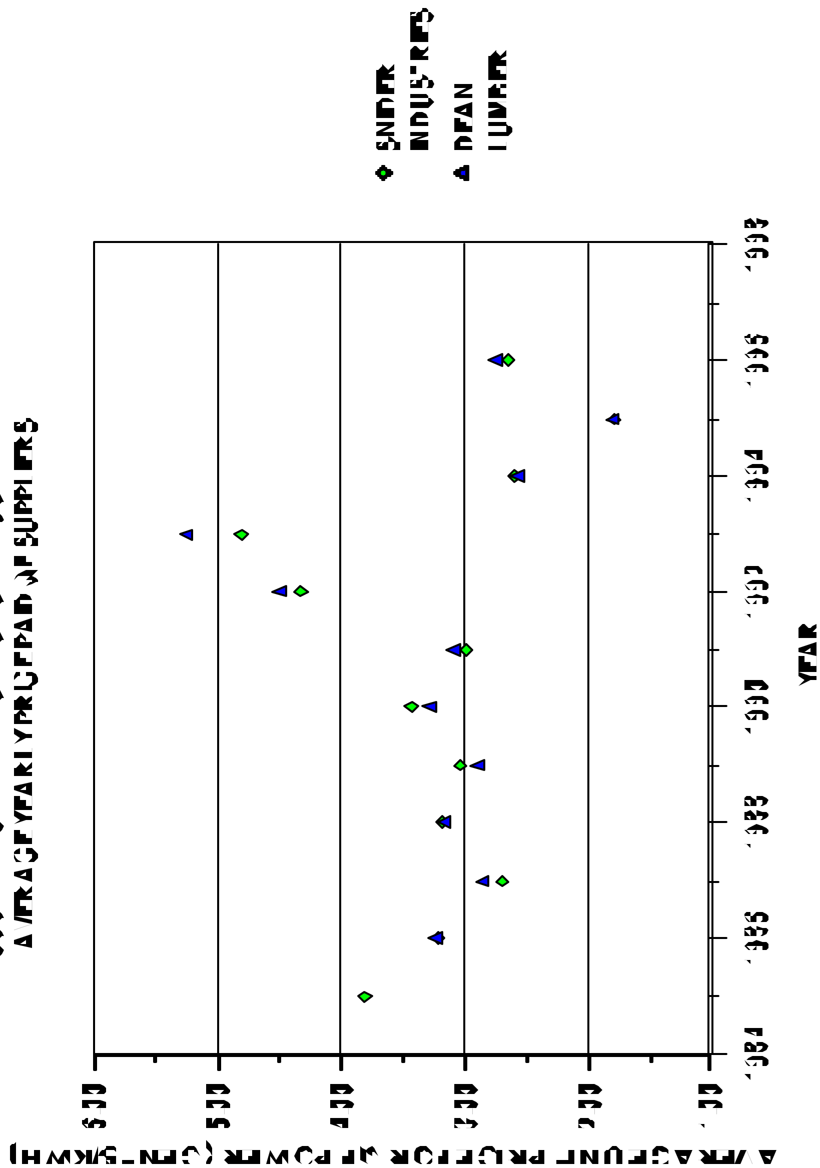
YEAR	SNIDER INDUSTRIES	DEAN LUMBER	ALL TX QFs
1985	7,570,629		7,570,629
1986	10,155,670	175,593	10,331,263
1987	10,982,104	522,397	11,504,501
1988	14,603,536	728,929	15,332,465
1989	8,933,373	953,680	9,887,053
1990	8,409,185	252,964	8,662,149
1991	2,512,954	84,860	2,597,814
1992	9,179,982	90,760	9,270,742
1993	10,792,061	52,583	10,844,644
1994	8,736,974	134,264	8,871,238
1995	5,324,870	42,253	5,367,123
1996	4,021,086	15,457	4,036,543
1997			
TOTALS	101,222,424	3,053,740	104,276,164

COST OF POWER ($)

YEAR	SNIDER INDUSTRIES	DEAN LUMBER	ALL TX QFs
1985	$287,524		$287,524
1986	$326,133	$5,684	$331,817
1987	$295,560	$14,916	$310,476
1988	$463,970	$23,048	$487,018
1989	$270,335	$27,547	$297,882
1990	$288,595	$8,290	$296,885
1991	$74,755	$2,625	$77,380
1992	$396,552	$4,088	$400,640
1993	$518,997	$2,768	$521,765
1994	$226,008	$3,450	$229,458
1995	$94,701	$762	$95,463
1996	$106,344	$424	$106,768
1997			
TOTALS	$3,349,474	$93,602	$3,443,076

AVERAGE COST OF POWER (CENTS/KWH)

YEAR	SNIDER INDUSTRIES	DEAN LUMBER	ALL TX QFs
1985	3.80		3.80
1986	3.21	3.24	3.21
1987	2.69	2.86	2.70
1988	3.18	3.16	3.18
1989	3.03	2.89	3.01
1990	3.43	3.28	3.43
1991	2.97	3.09	2.98
1992	4.32	4.50	4.32
1993	4.81	5.26	4.81
1994	2.59	2.57	2.59
1995	1.78	1.80	1.78
1996	2.64	2.74	2.65
1997			
OVERALL AVERAGE	3.31	3.07	3.30


YEAR

PART E - A COMPARISON OF ELECTRIC UTILITY AND NUG GENERATING DATA

Louisiana Electric Utility and NUG Generation Capacity and Electric Generation

Table 15 presents 1996 data on generating capacity, electric generation, and capacity use for Louisiana electric utilities and Louisiana NUGs. As discussed previously in this report, the NUGs in Louisiana, primarily industrial cogenerators, have historically generated a substantial fraction of total power generated in the state. In 1996, the number of generating units in Louisiana was 176. The electric utilities operated 109 (61.9%) of these units while the NUGs operated 67 units (38.1%). Generating capacity in the state totaled 19,820 MW or 173,623 million KWH per year. Of this capacity the electric utilities held 17,019 MW or 149,086 million KWH per year (85.9%) while the NUGs held 2,801 MW or 24,537 million KWH per year (14.1%). Estimated total generation of electricity totaled 76,127 million KWH in 1996 for a capacity use level of 43.8%. In that year, Louisiana electric utilities generated 58,643 million KWH (77%) for a capacity use percentage of 39.3%. During the same period Louisiana NUGs generated 17,484 million KWH (23%) using 71.3% of possible capacity.

Sales, Transfers, and Consumption of Electricity in Louisiana by Electric Utilities and Industrial NUGs

Data comparing 1996 sales, transfers, and consumption of electricity by electric utilities and NUGs in Louisiana are presented in Table 16. As stated above, reported electric utility generation was 77% of an estimated 76,127 million KWH state total while EEI estimated that NUG generation produced the remaining 23%. Electric utility delivery of electricity to ultimate consumers totaled 75,055 million KWH or 81.4% of total Louisiana consumption, 92,165 million KWH. After adjusting utility and NUG generation figures by 374.2 million KWH (0.4% of total consumption) representing sales from NUGs to utilities, the utilities made estimated combined out of state purchases and transfers from Louisiana utility generating facilities in Texas of 16,037.8 million KWH (17.4% of total state consumption). Net internal 1996 consumption of self-generated electric power by industrial NUGs in Louisiana was 17,110.2 million KWH (18.6% of total state consumption). This internally generated industrial consumption figure combined with the 32,592 million KWH (35.4% of total state consumption) delivered to industrials by Louisiana electric utilities implies that 1996 industrial consumption of electricity was over half (54%) of total electricity consumed in the state. Of this total 1996 Louisiana industrial consumption of electricity, the electric utility - NUG split was 65.6% - 34.4%.

TABLE 15
COMPARISON OF ELECTRIC UTILITY AND NON UTILITY GENERATOR DATA GENERATION FOR THE YEAR 1996

	GENERATING UNITS		CAPACITY IN MW		MAX YEARLY CAPACITY IN MWH		ACTUAL / ESTIMATED GENERATION IN MWH		PERCENT USE OF CAPACITY
	NUMBER	% STATE TOTAL	AMOUNT	% STATE TOTAL	AMOUNT	% STATE TOTAL	AMOUNT	% STATE TOTAL	
LOUISIANA NON UTILITY GENERATORS	67	38.1%	2,801	14.1%	24,536,760	14.1%	17,484,392	23.0%	71.3%
LOUISIANA ELECTRIC UTILITIES	109	61.9%	17,019	85.9%	149,086,440	85.9%	58,643,000	77.0%	39.3%
TOTAL	176	100%	19,820	100%	173,623,200	100%	76,127,392	100%	43.8%

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TABLE 16
COMPARISON OF ELECTRIC UTILITY AND NON UTILITY GENERATION AND SALES DATA
FOR THE YEAR 1996

DELIVERY OF ELECTRIC POWER TO CONSUMERS		GENERATION (MWH)	% TOTAL LA. GENERATION	PURCHASES AND SALES (MWH)	% TOTAL LA. CONSUMPTION	CONSUMER RECEIPTS (MWH)	% TOTAL LA. CONSUMPTION	INDUSTRIAL SECTOR CONSUMPTION (MWH)	% TOTAL LA. CONSUMPTION	% TOTAL LA. INDUSTRIAL CONSUMPTION
BY UTILITIES TO ALL CONSUMER SECTORS	LA UTILITY GENERATION	58,643,000	77.0%							
	UTILITY PURCHASES FROM LA. NUGs			374,195	0.4%					
	APPARENT UTILITY PURCHASES FROM OTHER SOURCES			16,037,805	17.4%					
	SALES REPORTED BY UTILITIES					75,055,000	81.4%			
	SALES BY UTILITIES TO INDUSTRIAL CUSTOMERS							32,592,000	35.4%	65.6%
BY NUGs TO THEMSELVES (INDUSTRIAL)	EEI ESTIMATE OF LA. NUG GENERATION	17,484,392	23.0%							
	LESS: REPORTED LA. NUG SALES TO ELECTRIC UTILITIES			(374,195)	-0.4%					
	NET INTERNAL CONSUMPTION OF ELECTRICITY BY NUGs					17,110,197	18.6%			
	INDUSTRIAL CONSUMPTION OF NUG GENERATION							17,110,000	18.6%	34.4%
TOTALS		76,127,392	100%			92,165,197	100%	49,702,197	54.0%	100%

ECTION II - LOUISIANA NON UTILITY GENERATION IN THE FUTURE - REALITIES AND POSSIBILITIES

Today, in Louisiana, there are two parallel systems of electric generation. One system, representing one fifth of the state's generation, is owned and operated by industrial NUGs. The other system, representing four fifths of the state's generation, is owned and operated by the regulated electric utilities. The industrial NUG system, which grew in a competitive environment, can produce electricity at 2 to 3 cents per KWH. The electric utility system, which grew limited by a regulatory environment, produces electricity at an average of 6.1 cents per KWH. Similar situations exist in other states. Reasons for how and why these systems exist simultaneously are discussed in Appendix A.

These price data suggest that electricity prices for all consumers could be reduced by the introduction of competition into the electricity market. This concept has created a move to deregulate the electrical generation system and provide all future electricity generators, NUG or utility, with equal access to electric transmission system.

Reaping the benefits of such comptetion, however, will not be without cost. Non utility generators using newer, more efficient generation technology have the capacity in a competitive generation market to capture substantial market share from the utilities. The resulting financial risk to the electric utilities is now well recognized. The terminology used to describe this risk is "stranded cost." This term represents the value of utility invested capital at risk of being lost as a result of competition or in other terms, non-competitive capital. Suggested total values for this capital at risk across the U.S. often exceed $200 billion.

The Regulatory Basis for the Introduction of Competition in Electricity Markets

The federal Energy Policy Act (EPACT) of 1992 has as its intent, not only the conservation of energy, but also the encouragement of competition in the marketplace for electricity. In response to EPACT, on April 24, 1996, the Federal Energy Regulatory Commission (FERC) issued final rules, Orders No. 888 and 889, designed to promote real competition in the generation and sale of electricity.

The first order, Rule 888, orders the electric utility owners of the electric transmission grid to provide non-discriminatory open access to others. This is intended to make the same transmission services available to electric utilities available to NUGs as well. The second order, Rule 889, mandates the creation of a real-time information system to assure that transmission owners or their affiliates do not have an unfair competitive advantage in using transmission to sell electric power. The overall effect of these Rules is intended to be the "unbundling" or separation of electric power generation and transmission and the potential creation of genuine competition in the generation sector of the electricity industry.

Operational Factors Affecting the Effectiveness and Onset Timing of Competition in Electricity Markets

This deregulation of electric generation and open access to transmission will have significant effects on the electric utilities, the NUGs, all electricity consumers, and the natural gas industry as well. NUG ability to compete with significant success seems assured. They have the ability to introduce new generation technology which is more efficient, less capital costly, and more environmentally friendly than the vast majority of the electric utility generation capacity inventory.

However, the degree to which such competition is invariably effective in an operational sense is based on a kaleidoscope of factors, most of which are still controlled by governmental and regulatory processes. The equally critical factor of time to actual institution of real competition is similarly controlled. Some (but certainly not all) major factors affecting the degree and timing of real electricity market competition are:

- FERC's Rule 888 explicitly includes decision making by the state electric regulatory commissions. This is certainly appropriate. However, it will almost certainly create a system which, operationally, will vary from state to state, thus being more fragmented, less simple, and, in some cases, more protectionist of the status quo.
- The electric utilities are faced with the loss of income on investment, known as "stranded cost," amounting to $200 billion dollars or more. These utilities have millions of stockholders. Electric utility stock occupies a prominent position in the portfolio of almost every pension fund in the nation. This presents a powerful political constituency favoring and lobbying for a "go slow and limit utility economic effects" process in any transition to competition.
- Other interest groups who are financially dependent on the operation of electric utilities under the "status quo" will add further weight to the pressure and lobbying described above. This includes producers of fuels which may be adversely affected as well as legislative and regulatory delegations from energy producing states in which such fuels are produced.

Even if all other factors, technical or economic, are excluded from consideration, those listed above are likely to present a formidable obstacle to quick or one-sided decisions regarding competition in the electricity market. Many hybrid systems of operation have been proposed. The final degree to which competition will exist is not and cannot be known at this time. Predicting the timing of the onset of any competition is equally difficult.

In the competitive circumstances in which new NUGs would enter such an electricity market, degree of competition and timing of onset are critical financial factors. Any NUG attempting early entry into such a market takes a serious risk. Failure to accurately predict either the competitive situation or the moment of its arrival could create fatal financial consequences.

Potential Effects of the New Electricity Market on the Natural Gas Industry

Combined cycle generation is the likely tool of any NUG entering the proposed new competitive electricity market. Natural gas is the fuel of choice for such generating plants. It is important, then, to understand which electric utility plants are at risk from combined cycle operations and how they are fueled.

To place this in perspective, the replacement values for various utility steam turbine fuels are considered in terms of natural gas potentially burned in combined cycle operations at 6.25 ft^3 per KWH of electricity generated. The resulting values are an upper limit since they assume full and unlimited competition. The following values are calculated with 1996 data:

- Nuclear generation in Louisiana was 15.765 billion KWH. If replaced by combined cycle generation, this represents a potential increase in natural gas consumption of 98.5 billion ft^3 per year.
- Coal fired generation in Louisiana was 18.633 billion KWH. If replaced by combined cycle generation, this represents a potential increase in natural gas consumption of 116.5 billion ft^3 per year.
- Natural gas fired steam turbine generation in Louisiana was 23.399 billion KWH and used 244.8 billion ft^3 of natural gas. If replaced by combined cycle generation, this represents a potential loss in natural gas consumption of 98.6 billion ft^3 per year because of the higher thermal efficiency of combined cycle plants (see discussion in Appendix A, Part I).
- Nuclear generation in the U.S. was 674.7 billion KWH. If 20% can be replaced by combined cycle generation, this represents a potential increase in natural gas consumption of 843.4 billion ft^3 per year.
- Coal fired generation in the U.S. was 1,737.5 billion KWH. If 20% can be replaced by combined cycle generation, this represents a potential increase in natural gas consumption of 2,171.9 billion ft^3 per year.
- Natural gas fired steam turbine generation in the U.S. was 218.8 billion KWH and used 2,282.2 billion ft^3 of natural gas. If completely replaced by combined cycle generation, this represents a potential decrease in natural gas consumption of 914.7 billion ft^3 due to the higher thermal efficiency of combined cycle generation.

The threshold limit which will be used for comparing combined cycle operations with electric utility units is the total cost to install and operate such a plant as well as an amount needed for profit. Under total competition, successful competition against an electric utility plant means that that plant is shut down. The threshold number against which electric utility plants may be measured is the sum of total operations and maintenance (O&M) costs plus any percentage of "fixed overhead" which disappear with the closing of the plant. Any electric utility plant for which this number is significantly above the threshold number for a nearby combined cycle plant is at risk.

An important key to measuring potential effects of natural gas fired combined cycle plants against electric utility plants is having threshold numbers calculated for both. Such data are not yet available.

APPENDIX A
BACKGROUND ON TECHNICAL AND ECONOMIC ISSUES AFFECTING BOTH THE PAST AND FUTURE OF LOUISIANA NON UTILITY GENERATORS

PART 1 - "PRIME MOVERS," THE EQUIPMENT DRIVING THE ELECTRIC GENERATORS

All practical processes in commercial use today for generating electricity have as their final stage the need for mechanical energy to rotate the moveable part of an electric generator --- a machine is needed to drive the generating machine. Other than hydroelectric power which uses the mechanical energy of falling water to turn the generator, the "front end" of all commercial generation processes is some type of system converting thermal (heat) energy into the necessary mechanical energy at the generator. The device that drives the generator (or a device that converts energy to electricity directly) is known as the "prime mover."

Focusing on systems which convert thermal or heat energy, there are two different pathways: the boiler - steam turbine system and the combustion turbine system. A hybrid system known as combined cycle combustion turbine is included with combustion turbines in this discussion.

Steam Turbine Generating Systems

The boiler - steam turbine system is the older of the two, having been invented in the nineteenth century. In the initial part of this process, a heat source is used to increase the thermal energy level of water by converting high pressure water at a lower temperature to steam at a higher temperature. Typical heat sources may be fuel (e.g., natural gas, petroleum products, coal, biomass, etc.) burned in a boiler, a nuclear reactor, or direct heat (geothermal, heat producing industrial processes, etc.)

This high energy (high temperature and pressure) steam is then passed through a (steam) turbine extracting energy and producing lower energy steam (lower pressure and temperature). The resulting expansion and cooling of the high energy steam rotates the turbine converting what was originally thermal energy into the necessary mechanical energy to drive a generator.

The overall energy efficiency (heat rate) of the steam turbine generation (or any other) process is expressed as useful energy output divided by energy input. For steam turbine generating systems in the U.S., efficiency is measured as British Thermal Units (BTU) of the net electrical energy out divided by BTU of the heat source in. The average heat rate in 1997 for electric utilities in Louisiana for natural gas fired steam turbine generation was 11,045 BTU heat input per KWH electricity output. During the same year, the average heat rate for coal fired steam turbine generation was 10,652 BTU per KWH. One KWH of electricity equals 3413 BTU. Louisiana gas fired steam generation operated at an overall efficiency of 30.9% in 1997; coal fired steam generation operated at an efficiency of 32.0%.

Capital costs, operating and maintenance (O&M) costs, and emissions of pollutants are dependent on the type of heat source used to create steam. Capital costs may vary from $1,000 to over $3,000 per kilowatt (KW) of generating capacity.

Combustion Turbine Generating Systems

Combustion turbine systems are the second basic method for providing mechanical energy to electric generators. These highly efficient systems evolved in the latter half of the twentieth century and were initially based on aircraft jet engines. Energy input into combustion turbines is thermal, typically coming from combustion of a gaseous or liquid fossil fuel (e.g., natural gas, coal gasses, petroleum distillates, etc.). Research has been conducted into the use of pulverized solid fuels (e.g., coal, petroleum coke, etc.) but, to date, has produced few practical results.

In combustion turbine systems, air compressed by an axial compressor (front section) is mixed with fuel and burned in a combustion chamber (middle section). The resulting hot gasses then expand and cool while passing through a turbine in the rear section. What was initially thermal energy is converted to mechanical energy rotating the turbine. The rotating rear turbine not only runs the axial compressor in the front section but also provides efficient mechanical (rotational) energy which can be directed to the electric generator. The exhaust from a combustion turbine can range in temperature between 600 and 1000 degrees Fahrenheit and contains substantial thermal energy. What is and is not done with this exhaust energy source determines how the combustion turbine system is used. There are two general types of combustion turbine generating systems in commercial use today: the simple cycle and the combined cycle.

A simple cycle combustion turbine system is one in which the exhaust from the gas turbine is vented to the atmosphere and its energy lost. Such a system is not particularly efficient (Louisiana utilities, 1997: 12,834 BTU per KWH or 26.6% efficiency). They are, however, inexpensive to purchase, are compact, and are simple to operate. Further, simple cycle combustion turbines can be started up and placed in service more rapidly than any system involving a steam turbine. Simple cycle systems are used by the electric utilities as a source of peaking, backup, or emergency power. Conversely, NUGs do not use simple cycle because they are fuel inefficient and produce no steam. NUGs are seldom faced with the problem of peaking power.

Typical NUGs in Louisiana operating in industrial electrical generation settings capture the energy content of the hot exhaust gasses of the gas turbine. This exhaust stream is directed through a waste heat boiler to produce steam. The resulting steam may be used in process units for heating, in a steam turbine for generating electricity, or both (see Cogeneration, below).

A combustion turbine driving an electric generator and exhausting to a waste heat boiler - steam turbine electric generator arrangement is known as a “combined cycle combustion turbine” system (usually shortened to combined cycle). Such systems have exceptional energy efficiencies. Some large scale combined cycle generation systems now require only 6500 BTU energy input per KWH of electricity output. This equates to an efficiency of more than 52%. This is double the efficiency of steam turbine electrical generation systems or, in other terms, half the fuel per unit of electricity.

Capital costs, O&M costs, and emissions of pollutants for combined cycle generation of electricity are low relative to the same costs for boiler - steam turbine prime movers. Capital costs are typically less than $1,000 per KW of generating capacity.

PART 2 - COGENERATION

Cogeneration, by definition, requires the production and use of steam or hot water in addition to the generation of electricity. This system is efficient because the thermal energy of the steam or hot water taken off the generating system can be used down to lower temperatures than would be possible in the generation process.

Some confusion has developed between the terms “cogeneration” and “combined cycle.” The term cogeneration is not specific to either combined cycle combustion turbine generation or steam turbine generation. Either type of prime mover can be used to “cogenerate.” Many of the NUGs that were in operation in Louisiana before the 1970s cogenerated using steam turbine generation which also produced process steam.

Combined cycle combustion turbine generation can be thought of as special case of cogeneration. In this system the co-production of steam in a waste heat recovery boiler is also used to generate electricity.

PART 3 - THE CURRENT SYSTEM UNDER WHICH ELECTRIC UTILITIES OPERATE

This part provides information intended for understanding the current system under which electric utilities operate. Such an understanding is essential in resolving an entire spectrum of issues in making the new unregulated, competitive market for electricity work.

The System in Effect for Regulating and Compensating Electric Utilities

Starting in the 1930s, during the Great Depression, electric utilities started becoming regulated. Electric utility operations were thought to be "natural monopolies" in both generation and transmission activities by economists of the day. Natural monopoly is a term describing the situation in which consumers are better off being served by one business entity (a monopoly) than by more than one. Having more than one set of power lines and more than one set of generating plants was thought to be redundant and more expensive than having just one. So having electric utilities with only one set of facilities in a service area was believed to allow for lower electricity prices to the consumers.

Such lower prices would occur if, of course, the monopoly owner of the single set of facilities was regulated in such a way that monopoly prices could not be charged. But, this immediately raised the question of what prices should be charged. Since there was no competition, there were no competitive prices against which to judge electricity prices. It was decided that prices charged by regulated utilities should be limited to provide a "fair" return on investments. Further, a fair return was allowed only on those investments which were "used and useful."

Another problem with respect to "fair" pricing also occurred. To promote the highest level of economic development in as many areas as possible in the nation, electric utility regulation from the 1930s until the present either strongly encouraged or required regulated electric utilities to serve virtually all customers in their service area. This requirement held even in many areas where a company operating on a truly competitive basis would have found constructing and operating electric systems not profitable. The "fair return" on investments, again, served to protect regulated electric utilities from financial harm in return for serving such "unprofitable" areas.

Regulatory bodies were created at both the state and federal levels to make decisions under this system regarding utility operations and the pricing of electricity to the consumer. A system by which electricity prices are established was set in place and operates today. Under the currently operative system, electricity prices or electric rates have long been established using the following general procedure:

- The electric utilities estimate, for a year period in the future, their electricity sales and their expenses based both on historical data as well as on "known and measurable" factors which are expected to exist in that future year.
- The utility then forecasts a level of capital to be in service during this forward year period based both on existing facilities in service and on new facilities expected to be brought into service.
- The utility then proposes a rate of return on this capital in service which is believed to be fair to both the utility and its customers.

- The dollar amount of forecast capital in service multiplied by the proposed rate of return on capital plus forecast expenses are then added together to determine a total revenue level needed for electric utility operations during that future year. In other words, a specific dollar quantity of required revenue is determined by two forecasts and a proposed rate of return.
- This specific dollar quantity is then divided by the forecast quantity of electricity (KWH) to be delivered to the utility's customers. This establishes an average unit electric rate in cents per KWH which will produce the utility's needed revenue stream in the future year.
- Adjustments are then made for customer classes such as residential, commercial, and industrial.
- These forecast expenses, capital in service, electricity sales and proposed rate of return along with all supporting documentation are then presented to the state regulatory body as part of a "rate case." The rate case is assigned a docket number and the utility submissions along with all analyses, new proposals, proposed revisions, etc. by regulatory body staff, electric customer groups, and other affected parties become part of a legal process presented in hearings held before commissioners of the state regulatory body.
- After these hearings are completed, the commissioners of the state regulatory body decide upon rates which are "fair and equitable" to the utility and its customers. Then the terms and conditions of these rates are published as "electric tariffs."
- The electricity rates established by this process are in effect until new rates are established in a new rate case before the utility regulatory body. As a result, rates are typically in effect for periods of three or more years.

Effects of the Current Electric Utility Regulatory System on "Competitive" Electricity Rates

This system under which regulated electric utilities operate worked very well from the 1930s through the 1960s. During that period capital costs for differing electric generating technologies did not exist. Steam turbine generation was the only alternative available. Wide swings in operating costs did not occur. Price and availability of all fuels was constant.

After about 1970, however, both the capital cost and operating expense environment changed. There were alternatives in generation technology, steam turbine or combustion turbine, with differing capital and operating costs. At that time there also began a series of great swings in both the real and perceived prices and availability of fuels. Under such conditions of change, components of the regulatory system have had some very specific consequences on the way in which electric utilities operated and on where their focus has been placed. Some of these are:

- The current system forces the utilities to focus on invested capital which is usefully in service. Under the system, such capital is their sole source of income. There are two immediate consequences of this circumstance:

  First, there is a powerful tendency to pursue strategies which are capital intensive. Given that any argument can be made in favor of lower operating costs for a generating technology with higher initial costs, that technology will be preferred over a generating technology which has lower initial costs. Further, should the passing of time show such a capital decision to be poor, more problems arise because of a second consequence.

For regulated electric utilities, once a capital decision is put in place, it tends to be irrevocable. Once a generating plant is in service, there is no way under the current regulatory system that the utility can replace it with newer, more efficient technology. Invested capital or sunk costs are everything; removing an operative plant from service irreplaceably reduces the sole basis on which the utility earns net income. This is precisely the reverse of the situation facing competitive industry. There, "sunk costs don't count." With revenues based on product cost not on capital invested, competitive industry replaces technologically inefficient plant and equipment on an immediate basis.

- The current system removes focus from operating expenses since their level is irrelevant to net income. The immediate consequence of this is a tendency for such expenses to exceed levels considered normal in competitive industry. Further, once the expenses are "locked in," they are difficult to reduce. The example of SWEPCO shown in the "Sales of Electricity to Utilities by NUGs" part in the body of this report illustrates this situation.

  SWEPCO negotiated a natural gas supply contract with a supplier of natural gas prior to 1985. This contract had a significant effect on SWEPCO's weighted average cost of gas (WACOG). Whether or not the initial pricing of natural gas under this contract was "high" is not known. The terms of the contract, however, caused SWEPCO's WACOG to be significantly higher than that of other electric utilities in Louisiana from 1985 through 1993. No renegotiation of the contract occurred until regulatory intervention in 1993. Lower gas prices were reached after this process.

- The current system produces electric rates which are not only based on forecasts but are relatively long lasting. Consequences of this circumstance are electricity rates which are slow to react to economic changes. Because of this inability of prices to react to such changes, at any given point in time, electricity rates are likely to be more or less favorable to either consumers or utilities than was intended by regulators.

PART 4 - DIVERGENT PATHWAYS BETWEEN ELECTRICITY GENERATORS IN REGULATED VS. COMPETITIVE ENVIRONMENTS

Until the late 1960s, parties wishing to generate electricity had, essentially, one basic technology as a choice - a steam turbine driven generator. The only differentiating choices lay in the thermal sources (i.e., fuels) by which the steam was generated. In fact, the electric utilities, during the latter two decades of this period, actually became more competitive because their larger boiler/steam turbine systems had economy of scale advantages over the smaller systems of potential NUGs.

With the successful development of combustion turbine systems for driving electric generators, however, the generation prime mover pathways of competitive industry and non-competitive electric utilities diverged. Competitive industry took note of the overwhelming fuel efficiencies of combustion turbine based prime movers as well as the low capital cost of such systems. In spite of looming natural gas supply shortages, industrial NUGs chose combustion turbine based generation wherever possible to minimize the cost of electricity imbedded in their product cost. The key here is reliable low cost electricity. Only in low cost electricity could these industrial NUGs remain competitive marketing the products they manufactured. High fuel efficiency and low capital costs were apparent and persuasive arguments in these firms making correct decisions to use combustion turbine technology.

For the electric utilities, however, choices were made according to different criteria. Neither at that time nor even today, do electric utilities make money by producing least expensive electricity. They make money by investing capital. This is a direct consequence of the regulatory system, discussed above, by which these utilities are compensated.

Having higher capital costs, steam turbine driven generation was favored in the system under which electric utilities operated. If there were concerns over the availability of natural gas at reasonable rates, even in regions such as Louisiana which traditionally used natural gas fired boilers, such problems could be circumvented by the use of coal fired boilers or nuclear reactors. As even greater incentive, coal fired boiler/steam turbine systems allowed greater investment in capital than did natural gas based systems and nuclear reactor systems allowed even greater investment opportunities than did coal fired systems. Long before the advent of the legal limitations initiated in 1978 by PURPA and the Powerplant and Industrial Fuel Use Act, industrial NUGs in Louisiana took one generation path and the electric utilities driven by regulatory law and incentives took another.

Adherence to these respective pathways was cemented in place in 1978 by the effects of legislation designed to "fix" the so-called energy crises. The Powerplant and Industrial Fuel Use Act (FUA) of that year forbade use of natural gas as a boiler fuel by 1990. Before 1978, the electric utilities had increasingly pursued the coal or nuclear steam turbine routes to powering generation as a result of powerful regulatory incentives. After 1978, those incentives became legal requirements.

The FUA, together with the Public Utilities Regulatory Policies Act (PURPA) of 1978, also set incentives, based in law, for the cogenerating industrial NUGs in Louisiana to continue the combined cycle route toward generating electricity. Incentives that had existed before 1978 still existed. These NUGs were cogenerators and combined cycle was the most efficient way to cogenerate. These incentives continued to exist because, under the FUA, cogenerators were exempt from the ban on using natural gas. Under PURPA, there were additional incentives in the form of potential sales to electric utilities. PURPA mandated that the electric utilities buy electricity from cogenerators at the utilities' avoided cost.

This divergence continued even after the repeal of FUA limitations on use of natural gas by the utilities. In Louisiana, new electric capacity was not needed. Any construction of combined cycle facilities by electric utilities would, therefore, replace existing investment. Under existing utility regulation, the utilities lacked the economic and financial capacity to replace operating investment. So no utility transition to combined cycle generation was possible.

The net result of this divergence of generation methodology by NUGs in a competitive environment and electric utilities in a regulated environment has been the creation of two distinct systems of generation in Louisiana. The one created in a competitive environment by the industrial NUGs is based on combined cycle generation technology. This system produced electricity at 4.3 cents per KWH, the 1996 average industrial electricity rate in Louisiana. The other system created under regulatory constraints by the electric utilities is based on steam turbine technology. That system produced electricity at an average rate of 7.5 cents per KWH in 1996 (see Table 4).

APPENDIX B - TABLES
PURPA QUALIFIED FACILITY (QF) POWER PURCHASES BY UTILITIES
POWER PURCHASED, COST, AND AVERAGE COST

MONTHLY BY UTILITY AND QF
FOR 1990 - 1997

NOTE: Data for 1985 - 1989 can be found in the November 1996 edition of this report, or by contacting the Technology Assessment Division at 504-342-2122.