Office of Utilities Regulation

EVALUATION OF GENERATION EXPANSION OPTIONS AND TARIFF IMPACT ASSESSMENT STUDY

OUR
OFFICE OF UTILITIES REGULATION

July 2007

MSD	Medium Speed Diesel
MT	Metric Tonne
MW	Mega-Watt
NG	Natural Gas
Net Capacity	Gross Capacity less Station Service
No.2 / ADO	Automotive Diesel Oil
No.6 / HFO	Heavy Fuel Oil / Bunker C
OEM	Original Equipment Manufacturer
OH	Old Harbour
O&M	Operation and Maintenance
OPCOST	Operational Cost
OUR	Office of Utilities Regulation
PETC_STM	Petcoke-Fired Steam
RF	Rockfort
SALVAL	Salvage Value
SCGT	Simple Cycle Gas Turbine
LSD	Low Speed Diesel
Station Service	Power used to support auxiliary equipment at power station
TIA	Tariff Impact Assessment
WACC	Weighted Average Cost of Capital
WASP	Wien Automatic System Planning Package

GLOSSARY OF TERMS

AMC	Acres Management Consultants
BIG	Biomass Investment Group
CC	Combined Cycle
CCGT	Combined Cycle Gas Turbine
CFSM_P/C	Coal-Fired Steam - Pulverize Coal
CNG	Compressed Natural Gas
CONCST	Construction Cost
EIA	Energy Information Administration
ENS	Energy Not Served
ENSCST	Energy Not Served Cost
GOJ	Government of Jamaica
GOV	Government of Venezuela
Gross Capacity	Total installed capacity of a power generation plant
MCR	Maximum Capacity Rating
GT	Gas Turbine (Combustion Turbine)
HB	Hunts Bay
IPP	Independent Power Producer
JEP	Jamaica Energy Partners
JPPC	Jamaica Private Power Company Limited
JPS	Jamaica Public Service Company Ltd.
kWh	kilowatt-hour
LNG	Liquefied Natural Gas
LCEP	Least Cost Expansion Plan
LOLP	Loss of load Probability
LRMC	Long Run Marginal Cost
MBtu	Million British thermal unit
MOU	Memorandum of Understanding

EXECUTIVE SUMMARY

Background

Consistent with its mandate to ensure the provision of a reliable supply of electricity to consumers at least cost, the Office of Utilities Regulation (OUR) has undertaken a review of the generation options available to determine the best strategy to address the capacity requirements for the public grid going forward. The review is largely based on recent assessments carried out by the OUR but takes into consideration, information from LCEP reports submitted by Jamaica Public Service Company Limited (JPS) and Acres Management Consultants (AMC) dated October 2006 and March 2007 respectively.

The review has been undertaken against the background where:

- Additional analyses are necessary to inform urgent and specific decisions to be taken with regard to the Public Electricity Supply Sector.
- There have been significant new developments relating to some of the key assumptions made in both of the previous studies, especially in relation to the availability of natural gas as an alternative fuel.
- A number of unsolicited proposals for the provision of new capacity have been received and these are of interest given their nature and scope.
- To better inform the necessary decisions, the OUR requires information on the expected impact of the different generation options on consumer tariffs; an aspect which was not addressed in any of the earlier studies.

A revised base case plan was derived based on the following key assumptions:

- Peak demand growth averaging 4.2% per annum;
- Revised fuel prices taking into account the most recent information available, including the proposed arrangement with Venezuela for the supply of Natural Gas;
- Other adjustments to the inputs used by JPS and AMC to update and improve the consistency of the data.

Conclusions and Recommendations

New baseload capacity is immediately required in the system, but given the expected constraints regarding construction time and/or fuel availability, it is unlikely that any such plant can be in place before 2012.

Table S1: Proposed Cogeneration Projects

Developer	Location	Fuel	Plant Capacity	Net Output to Grid	Possible In Service Date	Comments
JPS/ Petrojam	Hunts Bay	Petcoke	100 MW	82 MW	2012	The contracting dates for these should be coordinated with other projects & planned retirements
Windalco	Ewarton	Coal	90 MW	60 MW	2011/2012	
Windalco	Kirkvine	Coal	90 MW	60 MW	2011/2012	

3. A competitive tendering process should be immediately commenced for the provision of renewable energy based projects with total capacity up to 70 MW for installation by 2012.
4. Given the planned additions, the old JPS oil fired steam units should be scheduled for retirement in blocks as follows:
    a. 2012: Old Harbour OH1 & OH2 and Hunts Bay B6 (161.5 MW)
    b. 2015: Old Harbour OH3 and OH4 (137.0 MW).
5. The position on whether or not to "moth-ball" the retired units and retain them in the JPS rate base for specified periods would be reviewed by the OUR to determine what is in the best interest of electricity consumers.
6. If natural gas is available at or below the breakeven price,
    a. The gas supply should be extended to the Corporate Area for the following reasons:
        i. The Corporate Area accounts for over 60% of the overall system demand and if additional generating capacity is not located in this area, the strain on the Transmission System would be excessive, possibly leading to voltage, reactive power and stability problems, which would have to studied and addressed.
        ii. Given environmental constraints, it would be difficult and or/ very expensive to construct facilities utilizing other fuels in the area.
        iii. There could be other potential users, such as the various industries in the area, which could increase the volume of gas required and thereby reduce the average costs.
    b. Consideration should also be given to making the gas supply

Over the next twenty (20) years approximately 1,200 MW of new capacity will be required to compensate for expected load growth and plant retirements. About 600 MW of this will be required during the first ten (10) years at an average of about 60 MW per year.

The most critical variables in the determination of the type of plants to be installed relate to the availability of natural gas in terms of:

- Price,
- Quantity, and
- Timing.

The key decisions to be taken therefore revolve around expectations for these parameters. To the extent that specific information on the availability of natural gas is not provided, an optimized generation plan cannot be confirmed.

The following recommendations therefore depend on whether or not natural gas will be available at or below the breakeven price range of $4.5-5.0/MBtu.

1. Short term/interim capacity should be installed as follows:
    a. Approximately 40 MW of new capacity should be installed as soon as possible but no later than the end of the third quarter 2008 in order to avoid excessive power cuts.
        i. This could be a gas turbine which would subsequently be incorporated into a combined cycle plant burning natural gas, if this fuel can be made available at an attractive price in the near term.
    b. An additional 40 MW should be installed by 2010.
        i. If natural gas is going to be available at an attractive price, this along with the first new gas turbine should be subsequently incorporated into a 120 MW combined cycle plant by adding a 40 MW heat recovery steam generator.
        ii. If natural gas is not going to be available at an attractive price and no baseload plant can be in place by 2010, then the possibility of procuring this additional capacity as an interim / temporary plant should be examined.
2. A number of cogeneration type projects have been proposed using different fuels. These should be supported based on the expected significant discounts in price due to the use of a cheap fuel and expected high thermal efficiencies. The proposed projects are briefly described in table S1 below.

Table S1: Proposed Cogeneration Projects

Developer	Location	Fuel	Plant Capacity	Net Output to Grid	Possible In Service Date	Comments
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3. A competitive tendering process should be immediately commenced for the provision of renewable energy based projects with total capacity up to 70 MW for installation by 2012.
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    a. 2012: Old Harbour OH1 & OH2 and Hunts Bay B6 (161.5 MW)
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5. The position on whether or not to "moth-ball" the retired units and retain them in the JPS rate base for specified periods would be reviewed by the OUR to determine what is in the best interest of electricity consumers.
6. If natural gas is available at or below the breakeven price,
    a. The gas supply should be extended to the Corporate Area for the following reasons:
        i. The Corporate Area accounts for over 60% of the overall system demand and if additional generating capacity is not located in this area, the strain on the Transmission System would be excessive, possibly leading to voltage, reactive power and stability problems, which would have to studied and addressed.
        ii. Given environmental constraints, it would be difficult and or/ very expensive to construct facilities utilizing other fuels in the area.
        iii. There could be other potential users, such as the various industries in the area, which could increase the volume of gas required and thereby reduce the average costs.
    b. Consideration should also be given to making the gas supply

available to Montego Bay for the following reasons:

i. The existing facilities at Bogue would be otherwise significantly under-utilized due to the much higher cost of the fuel type currently being used.

ii. The demand is growing most rapidly along the north coast and strain on the transmission system would continue and increase with no additional generation in the area.

iii. Given environmental constraints, it would be difficult and/or very expensive to construct facilities utilizing other fuels in the area. In fact there is a long standing embargo on the bunkering of heavy fuel oil along the North Coast in view of tourism considerations.

iv. There could be other potential users in the region which could increase the volume of gas required and thereby reduce the average costs while increasing overall economic benefits.

v. The net savings in generation costs from converting only the existing facilities to burn natural gas would be about US$70 Million and there would be additional benefits from the ability to locate additional generating capacity in the vicinity.

7. Using a Loss of Load Probability (LOLP) standard of 2 days /year, the complete capacity requirements over the planning period for:

   a. natural gas available, and

   b. natural gas not available

   are summarized in tables S2, S3 and S4 shown below.

8. Interim capacity requirement to 2012 is not shown in the above mentioned tables as it being treated separately.

9. Summary of results for the various expansion options and their corresponding cumulative present value cost are shown in Table S5 below.

Table S2: Summary of Base Case Plan (Natural gas available at $4.5/MBtu)

			Base Case (Unconstrained)							
Year	**Net Capacity Retired (MW)**	**Net Capacity Additions (MW)**	**Plant Added**	**Plant Retired**	**Total Net Capacity (MW)**	**Net Peak (MW)**	**Reserve Capacity (MW)**	**Reserve Capacity (%)**	**Loss of load Probability (%)**	**Loss of load Probability (days/year)**
2007					791.5	623.7	167.8	26.90	0.524	1.9
2008					791.5	652.2	139.3	21.36	1.065	3.9
2009					791.5	679.6	111.9	16.47	1.952	7.1
2010					791.5	707.4	84.1	11.89	3.517	12.8
2011					791.5	736.4	55.1	7.48	6.146	22.4
2012		273	Install 2 NGCCs and 1 NGGT; Convert OH2,OH3,OH4, B6, JEP to Natural Gas		1064.5	766.8	297.7	38.82	0.096	0.4
2013					1064.5	798.7	265.8	33.28	0.209	0.8
2014	28.5	117	Install NGCC unit	Retire OH1	1153.0	831.5	321.5	38.67	0.068	0.2
2015	60	117	Install NGCC unit	Retire JPPC	1210.0	866.7	343.3	39.61	0.052	0.2
2016					1210.0	904.1	305.9	33.83	0.117	0.4
2017		117	Install NGCC unit		1327.0	943.2	383.8	40.69	0.030	0.1
2018					1327.0	983.3	343.7	34.95	0.067	0.2
2019					1327.0	1025.7	301.3	29.38	0.020	0.1
2020	34.6	117	Install NGCC unit	Retire RF1 and RF2	1409.4	1070.5	338.9	31.66	0.086	0.3
2021					1409.4	1116.4	293.0	26.25	0.215	0.8
2022	57	117	Install NGCC unit	Retire OH2	1469.4	1164.4	305.0	26.19	0.181	0.7
2023					1469.4	1214.4	255.0	21.00	0.451	1.6
2024	61.8	117	Install NGCC unit	Retire OH3	1524.6	1266.7	257.9	20.36	0.427	1.6
2025		39	Install NGGT unit		1563.6	1321.8	241.8	18.29	0.174	0.6
2026	65.1	117	Install NGCC unit	Retire B6	1615.5	1379.3	236.2	17.12	0.189	0.7

Interim capacity requirement to 2012 is not included in this table

Table S3: Summary of Capacity Requirements with Natural Gas available at $4.50/MBtu.

			Natural Gas, Petcoke and Coal Available							
Year	Net Capacity Retired (MW)	Net Capacity Additions (MW)	Plant Added	Plant Retired	Total Net Capacity (MW)	Net Peak (MW)	Reserve capacity (MW)	Reserve capacity (%)	Loss of load Probability (%)	Loss of load Probability (days/year)
2007					791.5	623.7	167.8	26.9	0.524	1.9
2008					791.5	652.2	139.3	21.4	1.065	3.9
2009					791.5	679.6	111.9	16.5	1.952	7.1
2010					791.5	707.4	84.1	11.9	3.517	12.8
2011					791.5	736.4	55.1	7.5	6.146	22.4
2012		226	Install 1 Petc (113MW) and 1 (112MW) Coal unit ; Convert OH2,OH3,OH4, B6,JEP to Natural Gas		1017.5	766.8	250.7	32.7	0.053	0.2
2013		117	Install NGCC unit		1134.5	798.7	335.8	42.0	0.110	0.4
2014	28.5	39	Install NGGT	Retire OH1	1145.0	831.5	313.5	37.7	0.082	0.3
2015	60	117	Install NGCC unit	Retire JPPC	1202.0	866.7	335.3	38.7	0.182	0.7
2016					1202.0	904.1	297.9	32.9	0.117	0.4
2017		117	Install NGCC unit		1319.0	943.2	375.8	39.8	0.044	0.2
2018					1319.0	983.3	335.7	34.1	0.102	0.4
2019		117	Install NGCC unit		1436.0	1025.7	410.3	40.0	0.029	0.1
2020	34.6			Retire RF1 and RF2	1401.4	1070.5	330.9	30.9	0.127	0.5
2021					1401.4	1116.4	285	25.5	0.038	0.1
2022	57	117	Install NGCC unit	Retire OH2	1461.4	1164.4	297	25.5	0.258	0.9
2023					1461.4	1214.4	247	20.3	0.539	2.0
2024	61.8	117	Install NGCC unit	Retire OH3	1516.6	1266.7	249.9	19.7	0.506	1.8
2025		39	Install NGGT unit		1555.6	1321.8	233.8	17.7	0.207	0.8
2026	65.1	117	Install NGCC unit	Retire B6	1607.5	1379.3	228.2	16.5	0.224	0.8

Interim capacity requirement to 2012 is not included in this table

Table S4: Summary of Capacity Requirements **without** Natural Gas

			No Natural Gas; Petcoke and Coal Available							
Year	Net Capacity Retired (MW)	Net Capacity Additions (MW)	Plant Added	Plant Retired	Total Net Capacity (MW)	Net Peak (MW)	Reserve capacity (MW)	Reserve capacity (%)	Loss of load Probability (%)	Loss of load Probability (days/year)
2007					791.5	623.7	167.8	26.9	0.524	1.9
2008					791.5	652.2	139.3	21.4	1.065	3.9
2009					791.5	679.6	111.9	16.5	1.952	7.1
2010					791.5	707.4	84.1	11.9	3.517	12.8
2011					791.5	736.4	55.1	7.5	6.146	22.4
2012	150.6	347	Install 1Petc (113 MW), 1 Coal (cogen - 113 MW), 1 MSD and 1 PV-coal (112 MW) unit	Retire OH1, OH2 and B6	987.9	766.8	221.1	28.8	0.306	1.1
2013		112	Install Coal unit		1099.9	798.7	301.2	37.7	0.071	0.3
2014					1099.9	831.5	268.4	32.3	0.148	0.5
2015	186.9	224	Install 2 Coal units	Retire OH3, OH4 and JPPC	1137.0	866.7	270.3	31.2	0.194	0.7
2016					1137.0	904.1	232.9	25.8	0.381	1.4
2017		112	Install Coal unit		1249.0	943.2	305.8	32.4	0.100	0.4
2018					1249.0	983.3	265.7	27.0	0.258	0.9
2019					1249.0	1025.7	223.3	21.8	0.529	1.9
2020	34.6	112	Install Coal unit	Retire RF1 and RF2	1326.4	1070.5	255.9	23.9	0.361	1.3
2021		29	Install LSD unit		1355.4	1116.4	239	21.4	0.479	1.7
2022		112	Install Coal unit		1467.4	1164.4	303	26.0	0.188	0.7
2023					1467.4	1214.4	253	20.8	0.457	1.7
2024		112	Install Coal unit		1579.4	1266.7	312.7	24.7	0.199	0.7
2025					1579.4	1321.8	257.6	19.5	0.496	1.8
2026		112	Install Coal		1691.4	1379.3	312.1	22.6	0.242	0.9

Interim capacity requirement to 2012 is not included in this table.

1. INTRODUCTION

1.1. BACKGROUND

Consistent with its mandate to ensure the provision of a reliable supply of electricity to consumers at least cost, the Office of Utilities Regulation (OUR) has undertaken a review of the generation options available to determine the best strategy to address the capacity requirements for the public grid going forward. The review is largely based on recent assessments carried out by the OUR but takes into consideration information from LCEP reports submitted by Jamaica Public Service Company Limited (JPS) and Acres Management Consultants (AMC) dated October 2006 and March 2007 respectively.

The review became necessary because:

- Additional analysis is required to inform urgent and specific decisions which needs to be taken with regard to the power sector.
- There have been significant developments regarding some of the key assumptions made in both of the previous studies mentioned, especially in relation to the availability of natural gas as an alternative fuel.
- A number of unsolicited proposals for the provision of new capacity have been received and these are of interest given their nature and scope.
- To better inform the necessary decisions, the OUR requires information on the expected impact of the different generation options on consumer tariffs and this was not addressed in any of the earlier studies.

1.2. OBJECTIVES OF STUDY

The OUR evaluation of generation expansion options and tariff impact assessment study has been undertaken for a number of reasons. These may be summarized as follows:

1. To establish the least cost expansion option for generation in order to meet projected load growth and to cover the replacement of generators due for retirement over the next twenty (20) years.
2. To establish the retirement schedule of existing JPS and Independent Power Producers (IPP) generating plants, including determination of the long term position regarding the utilization and/or retirement of gas turbines (single cycle) in the generation mix and whether Rockfort diesel plant burning HFO should be retained.
3. To evaluate the various fuel alternatives available (Natural Gas, Coal,

Petcoke, etc.) for generation investment projects and determine the mix for the future in order to satisfy the requirement for fuel diversity while satisfying the least cost objective.

4. To determine how natural gas should be considered and incorporated within the long term concept of power generation, given the probability of various price options from Venezuela, including natural gas at Henry Hub market rates.

5. To determine how Coal should be considered and incorporated within the power generation mix.

6. To determine how renewable energy (i.e. E-grass, wind energy, solar projects, hydro, bio-mass, etc.) should be considered and incorporated within the long term plans for power generation and Government policy

7. To determine the viability and impact of the proposed Petrojam/Petcoke project.

8. To determine the viability and impact of the proposed Windalco 2 x 60 MW coal co-generation plants proposed for Kirkvine and Ewarton plants.

9. To determine the position regarding the demand for energy from Bogue 120MW combined cycle plant, given competing proposed future generation investments.

10. To consider a number of specific options so as to enable planning for contingencies in connection with the following:

    a) Jamalco 85MW combined cycle co-generation plant.

    b) Petcoke 100MW co-generation Plant.

    c) Windalco 2 x 60 MW coal co-generation plants

    d) Biomass Investment Group Inc. (E-grass) 70MW renewable energy project.

    e) Natural Gas not available at any point in the study timeframe.

    f) Bogue 120MW combined cycle plant and gas turbines at that location operating on natural gas.

    g) JPPC available after 2015 burning HFO.

11. To determine, based on a tariff impact assessment study, the cost per kilowatt hour impact on retail electricity prices resulting from the new generation investments.

1.3. PROSPECTIVE PROJECTS AND ISSUES

A number of projects have been proposed as well as consideration given to the fuel sources such as Natural Gas, Coal and Petcoke. The major projects and related issues are discussed below.

1.3.1. Natural Gas - LNG / CNG

The MOU which has been signed between the Government of Jamaica (GOJ) and the Government of Venezuela (GOV) for the supply of natural gas has stimulated a sense of optimism that Jamaica may obtain the fuel in the future. However, in the absence of a definitive supply agreement, the following critical questions remain unanswered:

- What is the precise time frame within which natural gas will be made available?
- At what locations on the island will the gas be made available?
- What are the quantities that will be made available?
- Who will be the major consumers? Which, if any, of the bauxite/alumina facilities will utilize the fuel?
- At what price will the gas will be delivered to generators?
- What is the timeframe for knowing the answers to these questions?

The Natural Gas project team has commenced a pre-qualification exercise for development of the storage and re-gasification facilities. Allowing time for selection of a developer, finalization of project agreements and construction of the facilities, natural gas from LNG is not expected to be available for another 3 years i.e. not before mid 2010 at the earliest.

However, this may not be the ultimate constraint as the supply facilities to be constructed by Venezuela may not be completed before 2012. Alternatives to the facilities expected to be constructed by Venezuela are being explored but there is no firm information on timing, volumes or prices that would be possible.

Compressed natural gas (CNG) is also being contemplated as an alternative means of supplying natural gas to Jamaica. However, there are no specific plans or feasibility assessments with regard to this option.

1.3.2. Coal

JPS was previously awarded a 120 MW coal plant which the Company proposed to construct at Old Harbour by 2012. The proposal also included use of the existing Port Esquivel facilities to receive and store coal purchased from Colombia. An overhead conveyor system would be used to transport the coal from Port Esquivel to the plant site. The net benefit is the avoidance of having to construct a special coal port to serve the new power plant and any future developments at that location.

However, due to the Company's more recent interest in the 100 MW Petcoke fired plant proposed for Hunts Bay, the Old Harbour coal plant project, as a result, is likely to be held in abeyance.

1.3.3. Petcoke 100 MW Project

The proposal is for JPS to construct a 100 MW circulating fluidized bed type facility to burn Petcoke. The plant could burn coal with equal efficiency.

Petrojam refinery, as part of its expansion plan and installation of a Coker facility would provide the needed Petcoke. 18 MW would be supplied to the Petrojam refinery along with steam.

In light of the anticipated reduced cost per MBtu of Petcoke relative to coal and the higher efficiency cogeneration facility, the energy provided to the grid from the plant should reflect significant price reductions.

1.3.4. Windalco Cogeneration

Windalco has indicated an interest in providing 60 MW from coal cogeneration facilities proposed for Kirkvine and Ewarton, totaling 120 MW. Each plant would have 90 MW capacity installed, 30 MW of which would be utilized by the refinery and the remaining 60 MW supplied to the JPS grid.

Process steam would also be made available to the Windalco plant. Given that the facility is cogeneration which significantly improves thermal efficiency, it is expected that the price of electricity to the grid would be discounted through a shared benefit approach. Windalco has indicated that the plants could be completed within three (3) years after a go ahead.

1.3.5. Retirement of Existing Generating Units

All the JPS oil fired steam units totaling 298.5 MW of capacity and located at Hunts Bay and Old Harbour are in excess of 30 years old and may need to be retired on economic grounds. The specific dates for retiring the respective units can be determined based on the improvement in overall cost and tariff impact as more efficient plants are installed. The proposed retirements would not commence before 2012 and involve OH1, OH2, OH 3 & 4 and HB B6

1.3.6. Jamalco 85 MW

Jamalco has proposed a project to supply 85 MW from a cogeneration system using a natural gas fired combined cycle plant. This proposal corresponds with a refinery expansion program to double the alumina output.

A determination establishing, inter alia, the retail price for the energy to JPS was previously undertaken. However, uncertainties regarding the natural gas supply appear to have adversely affected the project.

1.3.7. Biomass Investment Group 70 MW E-Grass Renewable Energy Project

The Biomass Investment Group has proposed a 70 MW plant burning e-grass and possibly bagasse from sugar factories. The plant is intended to operate on a 24/7 basis which means it would be in competition with other baseload units on the grid. Since the project qualifies as a renewable, GOJ policy calls for the attachment of a 15% premium above the avoided cost of energy.

Issues related to the viability of the project still require some attention. Recognizing though, that price will be a determining factor if it is to successfully compete with other fuel options.

1.3.8. Bogue 120 MW Combined Cycle Plant

This plant is operated on a 24/7 basis at fairly high dispatch given that it serves as both security for the North Coast as well as supply existing loads in the region. It currently runs on No. 2 fuel which is relatively very expensive.

The link to the rest of the grid which is via a 138 kV transmission line and a number of 69 kV circuits is weak. Providing natural gas to Bogue which has other gas turbines would reduce generating costs.

1.3.9. JEP Medium Speed Diesel Plant

JEP operates 124 MW of medium speed diesels on two barges at Old Harbour. These units currently operate on 2.2% sulphur HFO and would not be competitive with other baseload units in the future unless they are converted to burn natural gas assuming that this is available at an attractive price.

1.3.10. JPPC Low Speed Diesel Plant

JPPC operates a 60 MW low speed diesel plant at Rockfort. The licence for the plant expires in 2015. However, the plant may still be able to operate after this date and could continue to enjoy reasonable levels of dispatch, given its efficiency. Nevertheless, the current retail prices would have to undergo adjustments in order to compete with future baseload generation.

1.3.11. JPS Rockfort Low Speed Diesel Plant

At present, JPS operates a 2x18 MW low speed diesel plant at Rockfort. The plant was installed in 1985 but retirement originally scheduled for 2015 could be delayed if the plant maintains relatively high levels of efficiency and reliability.

1.4. OUTLINE OF REPORT

The report is structured as follows:

Chapter 1: Introduction

Chapter 2: Objective and Scope of Review

Chapter 3: Planning Parameters and Assumptions

Chapter 4: Demand Forecast

Chapter 5: Fuel Prices

Chapter 6: Existing System Data

Chapter 7: Expansion Options

Chapter 8: Optimization Results

Chapter 9: Tariff Impact Assessments

Chapter 10: Conclusions and Recommendations

Appendices

2. OBJECTIVE AND SCOPE OF REVIEW

2.1. OVERALL OBJECTIVE

The primary objective of this review is to establish an optimized development program for the public electricity generation sector designed to secure a reliable supply of electricity over the long term at least cost.

Related to this is the minimization of risks associated with electricity supply through diversification of fuel supply and use of local renewable energy resources.

In order to achieve this objective, the OUR in this study has:

1. Reviewed the various inputs and assumptions used in the earlier studies and updated these based on currently available information.
2. Extended the analytical timeframe within which projects are evaluated in order to minimize distortions due to end of period effects intrinsic in the WASP optimization program used for the analyses.
3. Updated the long term demand forecast based on recent outturns.
4. Evaluated various fuel supply options in order to determine the appropriate fuel/generation mix for the future taking into consideration the need for diversification and reduced dependence on fuel oil.
5. Established a retirement schedule for the existing JPS and IPP owned plants based on economic considerations.
6. Identified and evaluated alternative generation options based on known projects and technologies available in the market.
7. Determined the present value cost associated with different generation development sequences under different assumptions and constraints and assessed variations in this cost when the estimated outcomes for key variables are changed.
8. Determined the expected tariff impact of different generation expansion scenarios.

2.2. EVALUATION OF FUEL SUPPLY OPTIONS

In the evaluation of the various fuel supply options and the establishment of the appropriate generation mix for the future, the following were accomplished:

- Determination of the implications for use of natural gas within the context of different supply and pricing scenarios.

- Examination of the benefits of having natural gas at particular prices at different locations including:
  - Old Harbour
  - Hunts Bay
  - Bogue

- Determination of the conditions under which coal becomes a preferred fuel.
- Determination of the conditions under which Petcoke becomes competitive.
- Determination of the relative competitiveness and implications of incorporating cogeneration plants located at the bauxite/alumina plants.

2.3. ESTABLISHMENT OF OPTIMIZED RETIREMENT SCHEDULE

In the establishment of a retirement schedule for the existing JPS and IPP owned plants, due consideration was given to the following:

- Oil Fired Steam Units:
  - Examination of the implications of retiring plants in the context of availability of cheaper fuel and more efficient technologies.
  - Evaluation of the benefits of converting these plants to use an alternative lower cost fuel and delaying the retirement dates.
- Rockfort Barge:
  - Examination of the attractiveness of continuing to operate this plant on HFO given its relatively high efficiency and location.
- Simple Cycle Combustion Turbines:
  - Determination of a long term position regarding the utilization and /or retirement of these units located at Hunts Bay in Kingston and Bogue in Montego Bay.
- Independent Power Producers:
  - Examination of the relative attractiveness of continuing with JPPC and JEP (IPP owned) plants at reduced capacity charge after the respective contractual terms have expired.

- Determination of the potential benefits of converting one or more of these plants to operate on an alternative fuel.

- Bogue Combined Cycle Plant:
    - Determination of the implications of continuing to operate this facility on No. 2 fuel, on expected plant usage and average energy production cost.
    - Determination of the benefits of providing natural gas to the Bogue plant site.

2.4. IDENTIFICATION OF GENERATION OPTIONS

A number of specific generation options have been identified based on proposals /expressions of interest received from prospective developers. These include the following:

- 100 MW Petcoke fired plant near the Petrojam refinery.
- Jamalco 85 MW combined cycle cogeneration plant.
- Windalco 2x 60 MW coal fired cogeneration plants at Kirkvine and Ewarton.
- Biomass Investment Group 70 MW e-grass project.
- Other renewable energy based projects.

In addition to the specific proposals received, other options were considered and included based on technologies known to be available in the wider market. These include:

- Combined cycle gas turbines – using natural gas or No. 2 fuel.
- Simple cycle gas turbines – using natural gas or No. 2 fuel.
- Low speed diesel – using No. 6 fuel oil.
- Medium speed diesel – using No.6 fuel oil or natural gas.
- Steam turbines – using coal or No. 6 fuel.

2.5. EVALUATION OF SYSTEM DEVELOPMENT SEQUENCES

The evaluation of each generation sequence included comparisons of the present value of all costs as well as determination of the expected impacts on consumer tariffs.

Present value costs were determined by discounting the costs for each year relating to capital investments, fuel, operations and maintenance as well as the cost of outages to consumers.

Tariff impacts were determined by estimating what the yearly JPS tariffs would be for the different generation sequences using the tariff methodology established in the All-Island electricity licence and the most recently used assumptions and available data.

3. PLANNING PARAMETERS AND ASSUMPTIONS

3.1. Base Year and Study Period

For this study a planning period of thirty (30) years was used with reference year 2007 and an effective study period of twenty (20) years. This approach is adapted to effectively buffer against any possible computational distortion towards the end of the study period.

3.2. Loss of Load Probability

Generally, in power system planning and operation, the reliability criteria used to identify the need for new generating capacity is the Loss of Load Probability (LOLP). The benchmark value applicable for the JPS system is 0.55% which is equivalent to 48 hours per year. Essentially, this value represents the chance that the demand will outstrip the available capacity for a total of 48 hours in any year taking into consideration planned maintenance, forced outage rates and the demand.

3.3. Cost of Energy Not Served

Estimated cost of energy not served (ENS)[1] was increased to \$2.15/kWh, consistent with what was used in both the JPS and AMC studies which themselves were based on the original figure of \$1.5/kWh which was derived in 1991 and adjusted for inflation.

3.4. Discount Rate

The average rate used to bring costs to a present value was 12%, the weighted average cost of capital (WACC), derived for JPS by the OUR and used in the 2004 tariff review. This is consistent with the rates used by JPS and AMC.

3.5. Currency

All costs are expressed in United States Dollars.

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[1] Cost of ENS represents the estimated economic / social cost of power outages.

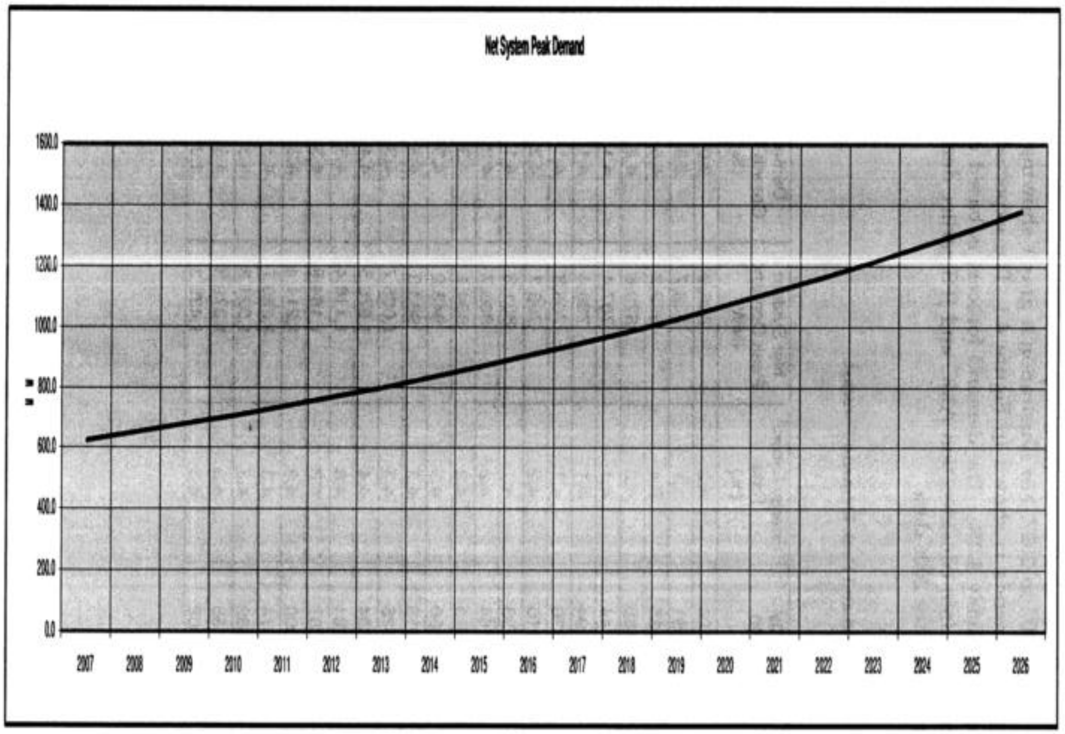
4. DEMAND FORECAST

Table 4.1 shows the projected energy and peak demand values over a twenty (20) year period from 2007 to 2027. For illustration a graph showing the historical and forecasted peak demands is shown in Figure 4.1. The expected average demand growth is approximately 4.2%. The demand forecast is based on the most recent OUR update taking into consideration AMC and JPS earlier demand forecasts and making adjustments for 2006 data.

Table 4.1: Net Generation and Peak Demand Forecast

Year	Net Energy Generation (MWh)	Energy Growth Rate (%)	Net System Peak Demand (MW)	Demand Growth Rate (%)	Load Factor (%)
2006	4,046,429	4.3	606.9	3.0	75.2
2007	4,089,391	1.1	623.7	2.8	74.8
2008	4,309,185	5.4	652.2	4.6	75.4
2009	4,490,485	4.2	679.6	4.2	75.4
2010	4,673,844	4.1	707.4	4.1	75.4
2011	4,865,294	4.1	736.4	4.1	75.4
2012	5,066,170	4.1	766.8	4.1	75.4
2013	5,277,116	4.2	798.7	4.2	75.4
2014	5,493,799	4.1	831.5	4.1	75.4
2015	5,726,164	4.2	866.7	4.2	75.4
2016	5,973,619	4.3	904.1	4.3	75.4
2017	6,231,660	4.3	943.2	4.3	75.4
2018	6,497,113	4.3	983.3	4.3	75.4
2019	6,777,325	4.3	1,025.7	4.3	75.4
2020	7,072,894	4.4	1,070.5	4.4	75.4
2021	7,376,284	4.3	1,116.4	4.3	75.4
2022	7,696,007	4.3	1,164.8	4.3	75.4
2023	8,024,090	4.3	1,214.4	4.3	75.4
2024	8,369,674	4.3	1,266.7	4.3	75.4
2025	8,733,689	4.3	1,321.8	4.3	75.4
2026	9,113,535	4.3	1,379.3	4.3	75.4
2027	9,509,902	4.3	1,439.3	4.3	75.4

Figure 4.1: Historical and Forecasted Peak Demand



5. FUEL PRICES

5.1. GENERAL

Fuel price is one of the most critical determinants of the cost of power generation and consequently is a major factor in selecting the optimal generation system development path. Forecasts are important but difficult to generate as fuel prices are not only influenced by the dynamics of supply and demand but also by geo-political events, perceptions and speculation.

Prices and heat contents used in the review were determined based on the JPS and AMC reports as well as updated information.

5.2. NATURAL GAS

There is uncertainty regarding the availability of natural gas for power generation in Jamaica. Following the disclosure that Trinidad and Tobago was not going to be providing gas to Jamaica, an MOU between Jamaica and Venezuela was subsequently signed under which, it is understood, that Venezuela could provide an uncapped quantity of gas to Jamaica at a price to be agreed. Preliminary indications are that an expected 2.5 Million tons per year could be imported from Venezuela, depending on the demand.

Even though there is no doubt that Venezuela has sufficient gas reserves to supply Jamaica, perceived uncertainties with this new arrangement relate to the following:

- Venezuela does not at present produce LNG which is the form in which Jamaica is preparing to import the fuel.
- It is not clear when Venezuela is likely to complete an LNG plant or if there is a firm commitment to build such a plant at present.
- The feasibility of supplying gas to Jamaica in an alternative form, such as CNG or via pipeline, has not been explored.
- The price at which gas would be provided has not yet been agreed and it is not clear how competitive this will be.
- The final demand quantities have not been determined and may not be determined until a price is agreed. Alternatively, the final price of delivered gas or whether or not the venture is feasible will depend on the overall demand.
- At least one of the Bauxite Companies seems to be committing to a coal

based option which means the expected demand for natural gas could change.

Nevertheless, because of the potential benefits of obtaining natural gas at an attractive price and the apparent commitment of the Government to pursue this venture, this fuel option warrants very serious attention.

Given the uncertainties in price, different delivered prices were used by JPS and AMC. The OUR, in this review, assumed a base case price of $4.5 /MBtu and performed sensitivity analyses at different prices to determine the implications of price variations.

The different natural gas prices used by JPS and AMC are summarized in Table 5.1 below.

Table 5.1: Different prices used by JPS and AMC for Natural Gas

Price ($/MBtu)	Comment
3.50	Used by JPS in their "hybrid" case as price for gas from T&T
5.57	Used by JPS in their coal case
4.50	Used by AMC for gas from T&T
6.05	Used by AMC for world market price in Planning Parameters Report
6.00	Used by AMC for world market price in their Final Report
4.50	Used by AMC in final report as base case price

Based on discussions with the LNG project team, OUR has derived the expected prices for natural gas delivered to the power stations as shown in Table 5.2.

Table 5.2: Expected price of Natural Gas from Venezuela

Price Component	Low Value ($/MBtu)	High Value ($/MBtu)	Average ($/MBtu)
Well Head Price	1.00	1.50	1.25
Transport to LNG plant	0.40	1.00	0.70
Liquefaction	1.00	1.20	1.10
Shipping to Jamaica	0.40	0.70	0.55
Transmission to power stations	0.60	1.20	0.90
TOTAL	**3.4**	**5.6**	**4.5**

Given the information in Table 5.2, the price used for the base case scenario was $4.5/MBtu. However, given the uncertainties associated with the supply, sensitivities were done at different prices ranging up to $7.5 / MBtu, the latter representing the expected open market price.

A breakeven price for natural gas was also determined as part of the analysis. This is the price at which coal becomes more attractive.

5.3. PETCOKE

The prices used in the respective studies are shown in Table 5.3 below. Sensitivity analyses were done to determine at what price Petcoke becomes more competitive than Natural Gas at the base price, given the other assumptions regarding capital costs and O&M expenses.

Table 5.3: Petcoke prices used by JPS, AMC and OUR

$/MT	MBtu/MT	$/MBtu	Comments
47.73	30.85	1.55	Used by JPS in WASP files
49.49	30.85	1.60	Stated by AMC in Planning Parameters report
50.00	30.85	1.62	Used by AMC in Final Report
50.00	**30.85**	**1.62**	**Used by OUR as base case price**

5.4. COAL

There was a significant difference between the heat content for the coal used by JPS and AMC. OUR used the higher figure of 26.45 MBtu/MT which is what was determined by AMC as opposed to the 25.00 MBtu/MT used by JPS. However, having used a higher base fuel price of $55/MT compared to the $51.44 / MT used by JPS, the net cost in terms of $/MBtu used by JPS and OUR became very close (2.06 and 2.08 respectively). The figures used by AMC in their final report resulted in a $/MBtu of 1.89 as opposed to the $2.29 based on their Planning Parameters report. Prices used for coal are shown in Table 5.4 below.

OUR performed sensitivity analyses for coal prices at $50/MT and $60 /MT and also determined the breakeven price for coal to compete with natural gas at $4.50/MBtu.

Table 5.4: Coal prices used by JPS, AMC and OUR

$/MT	MBtu/MT	$/MBtu	Comments
51.44	25.00	2.06	Used by JPS in WASP files
60.56	26.45	2.29	Stated by AMC in Planning Parameters Report
50.00	26.45	1.89	Used by AMC in Final Report
55.00	**26.45**	**2.08**	**OUR base case**
60.00	**26.45**	**2.27**	**OUR sensitivity**
50.00	**26.45**	**1.89**	**OUR sensitivity**

5.5. HEAVY FUEL OIL

The prices used for HFO are shown in Table 5.5 below. There was some inconsistency in the prices used by AMC for new LSD and MSD as these should not have been significantly different from the JEP and JPPC prices, as the assumption would be that these new plants would use the same 2.2%S fuel.

There was also an inconsistency in the JPS number stated in their report when comparison is made with the figure derived from their WASP input data.

Table 5.5: HFO prices used by JPS, AMC and OUR

$/BBL	MBtu/BBL	$/MBtu	Comments
42.43	6.20	6.84	$/bbl specified by JPS in report
51.40	6.20	8.29	Used by JPS in WASP
42.50	6.20	6.85	Used by AMC for Old Harbour
44.00	6.20	7.10	Used by AMC for Hunts Bay & Rockfort
45.00	6.20	7.26	Used by AMC for JEP and JPPC
42.50	6.20	6.85	Used by AMC for new LSD and MSD
43.44	**6.20**	**6.85**	**OUR base case for Old Harbour**
44.45	**6.20**	**6.85**	**OUR base case for Hunts Bay & Rockfort**
45.00	**6.20**	**7.26**	**OUR base case for JEP & JPPC**
45.00	**6.20**	**7.26**	**OUR base case for new LSD and MSD**

5.6. AUTOMOTIVE DIESEL OIL

The prices used for ADO are shown in Table 5.6 below.

There was an inconsistency in the JPS numbers in their report and what was derived from their WASP input data.

Table 5.6: ADO prices used by JPS, AMC and OUR

$/BBL	MBtu/BBL	$/MBtu	Comments
62.21	5.81	10.71	Based on $/bbl in JPS report
66.54	5.81	11.45	Used by JPS in WASP
61.50	5.81	10.59	Used by AMC for Hunts Bay, New GT, New CCGT
63.00	5.81	10.84	Used by AMC for Bogue
75.33	**5.81**	**10.59**	**OUR base case for Hunts Bay**
76.04	**5.81**	**10.84**	**OUR base case for Bogue**

6. EXISTING SYSTEM DATA

Information on the existing plants is summarized in Table 6.1. Data used in the simulations are given in Table 6.2.

Table 6.1: Existing Generating Units

Plants	Name Plate Capacity (MW)	Net Output Rating (MW)	Technology	In Service Date	Forced Outage Rate (%)	Availability (%)
OH1	33.0	28.5	Oil-fired Steam	1968	8.0	85
OH2	60.0	57.0	Oil-fired Steam	1970	8.0	85
OH3	68.5	61.8	Oil-fired Steam	1972	8.0	85
OH4	68.5	65.1	Oil-fired Steam	1973	8.0	85
B6	68.5	65.1	Oil-fired Steam	1976	8.0	85
RF1	20.0	17.3	Low Speed Diesel	1985	5.0	85
RF2	20.0	17.3	Low Speed Diesel	1985	5.0	85
GT 12	40.0	38.0		2002		
GT 13	40.0	38.0	Combined Cycle Plant	2002	3.0	90
ST 14	40.0	38.0		2003		
GT 3	22.8	21.4	Combustion Turbine	1973	5.0	85
GT 4	22.8	-	Combustion Turbine	1974	5.0	85
GT 5	22.5	21.4	Combustion Turbine	1974	5.0	85
GT 6	18.5	13.9	Combustion Turbine	1990	5.0	90
GT 7	18.5	13.9	Combustion Turbine	1990	5.0	90
GT 8	16.5	13.9	Combustion Turbine	1992	5.0	90
GT 9	20.5	19.9	Combustion Turbine	1992	5.0	90
GT 10	33.0	32.1	Combustion Turbine	1993	5.0	85
GT 11	20.0	19.9	Combustion Turbine	2001	5.0	90
JEP	126.0	124.2	Medium Speed Diesel	1995	5.0	90
JPPC	60.0	60.0	Low Speed Diesel	1996	5.0	90
Jamalco	11.0	11.0	Oil Fired Steam		5.0	90
Hydros	23.0	20.4	Hydro	Various	-	-
Wind	20.0	7.0	Wind	2004	-	-
TOTAL	893.6	805.1				

Table 6.2: Existing System Data used in Simulations

Name/ Symbol	No. of sets in Base Year	Min Load MW	Cpacity MW	Base Load Heat Rate kCal/kWh	Avg. Incr. Heat Rate kCal/kWh	Domestic Fuel Cost c/kCal	Foreign Fuel Cost c/kCal	Fuel Type	Fast Spin Res. %	F.O.R. %	Days Sched. Mtce	Mtce. Class MW	Fixed O&M $/kW/M	Variable O&M $/kWh	Equivalent Heat Rate kCal/kWh	Equivalent Heat Rate Btu/kWh
OH1	1	14.0	28.0	3,906	3,512	0	2,720	0	10	8	28	30	0.75	6.70	3,709	14,718
OH2	1	30.0	57.0	3,659	3,334	0	2,720	0	10	8	28	60	0.38	6.70	3,505	13,909
OH3	1	30.0	62.0	3,578	2,546	0	2,720	0	10	8	28	60	0.35	6.70	3,045	12,085
OH4	1	30.0	65.0	3,195	2,901	0	2,720	0	10	8	28	60	0.33	6.70	3,037	12,051
HB6	1	30.0	65.0	3,436	2,715	0	2,720	0	10	8	28	60	0.33	6.70	3,048	12,094
RF1	1	9.0	17.0	2,511	2,063	0	2,720	0	10	5	38	20	0.93	8.00	2,300	9,128
RF2	1	9.0	17.0	2,511	2,063	0	2,720	0	10	5	38	20	0.93	8.00	2,300	9,128
GT4	0	5.0	21.0	6,514	2,357	0	3,936	2	0	5	38	20	0.39	5.00	3,347	13,281
GT5	1	5.0	21.0	7,104	2,698	0	3,936	2	0	5	38	20	0.39	5.00	3,747	14,869
GT10	1	8.0	32.0	5,048	2,523	0	3,936	2	0	5	38	30	0.26	5.00	3,154	12,517
GT3	1	5.0	21.0	6,702	2,451	0	4,032	2	0	5	38	20	0.39	5.00	3,463	13,743
GT6	1	5.0	14.0	5,244	3,450	0	4,032	2	0	5	19	20	0.60	5.00	4,091	16,233
GT7	1	5.0	14.0	5,390	3,129	0	4,032	2	0	5	19	20	0.60	5.00	3,937	15,621
GT8	1	5.0	14.0	5,944	2,908	0	4,032	2	0	5	19	20	0.60	5.00	3,992	15,843
GT9	1	8.0	20.0	7,694	622	0	4,032	2	0	5	19	20	0.42	5.00	3,451	13,694
GT11	1	8.0	20.0	6,300	885	0	4,032	2	0	5	19	20	0.42	5.00	3,051	12,107
BOCC	1	20.0	111.0	2,268	1,839	0	4,032	2	0	3	26	120	0.99	6.00	1,916	7,604
JPPC	1	10.0	60.0	1,929	1,929	0	2,880	0	10	3	26	30	35.39	7.28	1,929	7,655
JEP1	0	3.0	73.0	1,996	1,996	0	2,880	0	0	4	23	20	23.48	18.29	1,996	7,921
JEP2	1	3.0	124.0	1,960	1,960	0	2,880	0	0	4	23	120	17.53	18.11	1,960	7,778
ALCO	1	4.0	5.0	2,268	2,268	0	2,720	0	0	5	19	20	15.00	10.59	2,268	9,000
BRLS	0	3.0	13.0	1,764	1,764	0	2,880	0	0	5	19	20	-	16.30	1,764	7,000

7.1. OVERVIEW

The capacity and cost data used for the different expansion options are given in Table 7.1. Information used in the simulations is given in Table 7.2.

Table 7.1: Parameters Used for Expansion Candidates

Technology	Plant Size (MW)	Capital Cost ($/kW)	Heat Rate (Btu/kWh)	Fixed O&M ($/kW/mth.)	Variable O&M ($/MWh)	Comment
Gas Turbine (NG)	39.0	667	10,350	0.37	1.50	
Gas Turbine (ADO)	39.0	667	10,350	0.37	3.00	
Combined Cycle (NG)	115.5	1,120	7,500	0.99	3.00	
Combined Cycle (ADO)	115.5	1,120	7,500	0.99	3.00	
Medium Speed Diesel (NG)	*9*	*1106*	*7,800*	*1.80*	*15.00*	
Medium Speed Diesel (HFO)	9	1106	7,800	1.80	15.00	
Low Speed Diesel (HFO)	30	1,549	7,600	2.48	8.00	
Coal	120.0	2,011	10,200	2.48	7.00	
Petcoke	112.0	2,030	10,200	2.48	7.50	
Coal Cogen	*120*	*1,827*	*8,670*	*2.11*	*5.95*	*Assumed 15% discount*
Petcoke Cogen	*112*	*1,623*	*8,670*	*2.11*	*6.38*	*Assumed 20% discount*

Table 7.2: Data use for Expansion Options in Simulations

Name/ Symbol	Min Load MW	Cpacity MW	Base Load Heat Rate kCal/kWh	Avg. Incr. Heat Rate kCal/kWh	Domestic Fuel Cost c/kCal	Foreign Fuel Cost c/kCal	Fuel Type	Fast Spin Res. %	F.O.R. %	Days Sched. Mtce	Mtce. Class MW	Fixed O&M $/kW/yr	Fixed O&M $/kW/M	Variable O&M $/MWh	Equivalent Heat Rate kCal/kWh	Equivalent Heat Rate Btu/kWh
GTAD	8.0	39.0	**4,285**	**2,175**	-	3,936	2	2	3	19	40	4.47	0.37	1.50	2,608	10,350
GTNG	8.0	39.0	**4,285**	**2,175**	-	1,786	6	0	3	26	40	4.47	0.37	3.00	2,608	10,350
CC#2	20.0	117.0	**2,241**	**1,817**	-	4,032	2	0	3	26	120	11.91	0.99	6.00	1,890	7,500
NGCC	20.0	117.0	**3,722**	**1,512**	-	1,786	6	0	3	26	120	11.91	0.99	3.00	1,890	7,500
MSD	5.0	9.0	**1,966**	**1,966**	-	2,880	0	0	6	33	20	21.59	1.80	15.00	1,966	7,800
MSNG	5.0	9.0	1,966	1,966	-	2,880	-	-	6	33	20	21.59	1.80	6.00	1,966	7,800
LSD	10.0	29.0	**1,915**	**1,915**	-	2,880	0	10	5	19	40	29.78	2.48	8.00	1,915	7,600
COAL	**40.0**	112.0	**3,092**	**2,281**	-	825	1	10	5	26	120	29.76	2.48	7.00	2,570	10,200
PETC	40.0	113.0	**3,046**	**2,310**	-	643	4	10	5	26	120	29.76	2.48	7.50	2,570	10,200
COCG	40.0	113.0	2,628	1,939	-	825	1	10	5	26	120	25.30	2.11	5.95	2,185	8,670
PCCG	40.0	113.0	2,589	1,963	-	643	4	10	5	26	120	25.30	2.11	6.38	2,185	8,670

GTAD – Gas Turbine running on Automotive Diesel Oil

NGCC – Natural gas Combined Cycle Gas Turbine

MSD – Medium Speed Diesel

COCG- Cogeneration Coal Plant

CC#2 – Combined Cycle running on Automotive Diesel Oil

PETC- Petcoke Cogeneration Plant

GTNG- Open Cycle Gas Turbine running on Natural Gas

COAL – Pulverized Coal Steam Plant

LSD- Low Speed Diesel

8.1. STRATEGIC FRAMEWORK

8.1.1. Critical Questions

The major sets of decisions required to ensure the achievement of the objectives for the sector of providing reliable power to consumers at least cost over the long term are follows:

1. What should be the long term choice for fuel type and technology that will supply the baseload for the period 2012-2026?
2. Given the decision for the long term, what should be the choice of fuel and technology to address the short term capacity requirements for the period 2008 to 2011 in order to ensure optimal compatibility with the first decision?
3. What will be the complementary type plants to be included to add to fuel diversity, import reduction and cost minimization?

8.1.2. Decision for Long Term

There are three major competing options for the new **primary baseload** plant:

1. Natural Gas Fired Combined Cycle Plants (including possible cogeneration projects)
2. Coal/Petcoke Fired Steam Plants (including possible cogeneration projects)
3. Combination of Natural Gas and Coal/Petcoke Fired Plants

The final decision will depend on answers to the following:

- Can natural gas be made available by 2012 with prices and quantities that make it competitive with coal?
- Based on the Government's Policy of fuel diversification, should there be dependence on only one of these fuel/technology types?

8.1.3. Decision for Short Term

Once a decision has been taken on the long term strategy, the decision for the short term becomes easier.

1. For a scenario involving the presence of natural gas, the short term choice would be to construct gas turbines which would initially run on ADO/or HFO and then converted to natural gas once this is available.

2. For a scenario where there will be no natural gas, the options are:
    a. Implement a least cost interim project which would be removed once the first coal plants are commissioned.
        i. The apparent options would be gas turbines or medium speed diesels mounted on a barge.
    b. Implement a plant that will remain for the long term which best complements coal as baseload.
        i. The apparent options would be gas turbines or medium speed diesels.
    c. Combination of (a) and (b) above.

8.1.4. Decision for Complementary Type Plants

This will include the peaking/intermediate type plants and renewables which will be necessary to complement the baseload units. The front running options are:

- Gas Turbines
- Medium Speed Diesels
- Renewables – biomass, wind, hydro, solar, etc.

8.2. OVERVIEW OF RESULTS

As a result of the unknown variables, primarily in relation to the availability and price of natural gas, a definitive generation program cannot be specified at this time. Given the uncertainties surrounding the supply of natural gas and any related policy decisions that the government may take regarding diversification, a number of scenarios were examined based on the above strategic framework and different assumptions.

A summary of the key results is illustrated in Figures 8.1, 8.2, 8.3 and 8.4 below. Further details are included in the Appendices as follows:

Appendix I –	Optimization results for all scenarios examined
Appendix II -	Detailed report for the Base Case
Appendix III -	Expected Plant Outputs and Capacity Factors
Appendix IV -	Details of Tariff Impact Analysis for Selected Scenarios

8.3. BASE CASE – PETCOKE, COAL COGEN & NATURAL GAS

8.3.1. Base Assumptions

The Recommended Plan is based on the following assumptions:

- Planning objective of having a loss of load probability of no more than 0.55% (or 48 hours per year).
- Average growth in demand of just over 4.2% per year in accordance with the updated demand forecast.
- Natural gas fuel available from Venezuela at a price of $4.50 /MBtu at the power plant site.
- Natural Gas from Venezuela can be made available in 2012.
- Coal available at plant at an average price of $2.08/mbtu.
- Medium speed diesels and gas turbines can be made available by 2009. The gas turbines made available in these years can be converted to combined cycle plants in 2012 which can be run on the expected natural gas from Venezuela.
- Average discount rate of 12% for calculating present value of costs.
- **Petcoke**: Given the apparent commitment of the GOJ to the Petrojam Refinery upgrade and the utilization of the Petcoke to be produced, the proposed Petcoke project is included in the base case. This plant is assumed to be able to provide 82 MW to the Grid at a price which is 15% less than what would have been expected without cogeneration.
- **Windalco Coal Cogen**: Windalco seems committed to constructing coal fired plants at each of its facilities at Ewarton and Kirkvine which would contribute a net 120 MW (2X60 MW) for use by the Grid. Assuming that natural gas can still be made available at $4.50/MBtu with these plants in place, they are included in the base case with a 15% discount on all costs due to the expected benefits from cogeneration. It should be noted that since no agreement is in place, these plants are not firmly committed.

The results for this case are shown in Figure 8.1 and 8.2 below.

8.3.2. Results

Figure 8.1: **Base Case Solution** **(Base Case-Unconstrained)**

YEAR------ PRESENT WORTH COST OF THE YEAR (K$) ------						OBJ.FUN.	LOLP	GTAD		MSD		CC#2		GTNG		LSD
	CONCST	SALVAL	OPCOST	ENSCST	TOTAL	(CUMM.)	%		NGCC		COCG		PETC		COAL	
2007	0	0	382028	2868	384896	384896	0.524	0	0	0	0	0	0	0	0	0
2008	0	0	363045	6097	369142	754038	1.065	0	0	0	0	0	0	0	0	0
2009	0	0	341485	10275	351760	1105798	1.952	0	0	0	0	0	0	0	0	0
2010	0	0	321753	17049	338803	1444600	3.517	0	0	0	0	0	0	0	0	0
2011	0	0	303589	0	303589	1748189	6.146	0	0	0	0	0	0	0	0	0
2012	163364	0	165121	0	328486	2076675	0.038	0	2	0	0	0	0	1	0	0
2013	0	0	154600	0	154600	2231275	0.081	0	2	0	0	0	0	1	0	0
2014	59236	350	132631	0	191517	2422792	0.029	0	3	0	0	0	0	1	0	0
2015	52889	524	106699	0	159064	2581856	0.023	0	4	0	0	0	0	1	0	0
2016	0	0	100409	0	100409	2682265	0.051	0	4	0	0	0	0	1	0	0
2017	42163	874	88808	0	130097	2812362	0.014	0	5	0	0	0	0	1	0	0
2018	0	0	83400	0	83400	2895762	0.030	0	5	0	0	0	0	1	0	0
2019	0	0	78557	0	78557	2974318	0.073	0	5	0	0	0	0	1	0	0
2020	30011	1399	70098	0	98710	3073029	0.040	0	6	0	0	0	0	1	0	0
2021	0	0	65937	0	65937	3138966	0.102	0	6	0	0	0	0	1	0	0
2022	23924	1748	59523	0	81699	3220665	0.086	0	7	0	0	0	0	1	0	0
2023	0	0	55874	0	55874	3276539	0.224	0	7	0	0	0	0	1	0	0
2024	19072	2098	50958	0	67932	3344471	0.216	0	8	0	0	0	0	1	0	0
2025	3381	451	47660	0	50590	3395060	0.292	0	8	0	0	0	0	2	0	0
2026	15204	2448	43879	0	56636	3451696	0.343	0	9	0	0	0	0	2	0	0

The unconstrained case in the context of this study refers to the condition where no plants were designated as committed in the WASP modules in preparing for the simulation exercises, so the program in the quest to produce an optimized solution at least cost, would freely seek to identify the most economical candidate plants and configuration to satisfy the system load demand and reliability criteria.

Figure 8.2: **Natural Gas, Petcoke and Coal Available**

YEAR	CONCST	SALVAL	OPCOST	ENSCST	TOTAL	OBJ.FUN. (CUMM.)	LOLP %	GTAD	NGCC	MSD	COCG	CC#2	PETC	GTNG	COAL	LSD
	------ PRESENT WORTH COST OF THE YEAR (K$) ------															
2007	0	0	382112	2868	384980	384980	0.524	0	0	0	0	0	0	0	0	0
2008	0	0	363121	6097	369218	754198	1.065	0	0	0	0	0	0	0	0	0
2009	0	0	341553	10275	351827	1106025	1.952	0	0	0	0	0	0	0	0	0
2010	0	0	321813	17049	338863	1444888	3.517	0	0	0	0	0	0	0	0	0
2011	0	0	303642	0	303642	1748530	6.146	0	0	0	0	0	0	0	0	0
2012	221263	2169	164703	0	383796	2132326	0.159	0	0	0	1	0	1	0	0	0
2013	66401	175	139990	0	206216	2338543	0.052	0	1	0	1	0	1	0	0	0
2014	11762	69	128870	0	140563	2479105	0.046	0	1	0	1	0	1	1	0	0
2015	52934	525	103121	0	155530	2634635	0.036	0	2	0	1	0	1	1	0	0
2016	0	0	97317	0	97317	2731952	0.079	0	2	0	1	0	1	1	0	0
2017	42199	875	85798	0	127122	2859073	0.020	0	3	0	1	0	1	1	0	0
2018	0	0	80802	0	80802	2939875	0.045	0	3	0	1	0	1	1	0	0
2019	33641	1225	72318	0	104733	3044608	0.014	0	4	0	1	0	1	1	0	0
2020	0	0	67943	0	67943	3112551	0.060	0	4	0	1	0	1	1	0	0
2021	0	0	64094	0	64094	3176645	0.148	0	4	0	1	0	1	1	0	0
2022	23945	1750	57751	0	79946	3256591	0.124	0	5	0	1	0	1	1	0	0
2023	0	0	54387	0	54387	3310978	0.313	0	5	0	1	0	1	1	0	0
2024	19089	2100	49531	0	66520	3377498	0.297	0	6	0	1	0	1	1	0	0
2025	3381	451	46414	0	49344	3426842	0.396	0	6	0	1	0	1	2	0	0
2026	15217	2450	42719	0	55487	3482329	0.459	0	7	0	1	0	1	2	0	0

8.4. GAS BASED PLAN – PETCOKE, NATURAL GAS, NO COAL

8.4.1. Changes to Base Assumptions

- (Petrojam/JPS Petcoke plant still included)
- No supply from coal fired cogeneration at bauxite/alumina plants
- No other coal fired plant units allowed
- Natural gas fired cogeneration plant at Jamalco included

8.4.2. Results

The results are shown in Figure 8.3 below.

Figure 8.3: **Natural Gas, Petcoke, No Coal**

YEAR------	PRESENT WORTH COST OF THE YEAR (K$) ------					OBJ.FUN.	LOLP	GTAD		MSD		CC#2		GTNG		LSD
	CONCST	SALVAL	OPCOST	ENSCST	TOTAL	(CUMM.)	%		NGCC		COCG		PETC		COAL	
2007	0	0	382112	2868	384980	384980	0.524	0	0	0	0	0	0	0	0	0
2008	0	0	363121	6097	369218	754198	1.065	0	0	0	0	0	0	0	0	0
2009	0	0	341553	10275	351827	1106025	1.952	0	0	0	0	0	0	0	0	0
2010	0	0	321813	17049	338863	1444888	3.517	0	0	0	0	0	0	0	0	0
2011	0	0	303642	0	303642	1748530	6.146	0	0	0	0	0	0	0	0	0
2012	178473	1021	166549	0	344002	2092532	0.124	0	1	0	0	0	1	0	0	0
2013	66401	175	141871	0	208097	2300629	0.041	0	2	0	0	0	1	0	0	0
2014	11762	69	130563	0	142255	2442884	0.036	0	2	0	0	0	1	1	0	0
2015	52934	525	104740	0	157150	2600034	0.029	0	3	0	0	0	1	1	0	0
2016	0	0	98708	0	98709	2698742	0.063	0	3	0	0	0	1	1	0	0
2017	42199	875	87167	0	128491	2827233	0.017	0	4	0	0	0	1	1	0	0
2018	0	0	81977	0	81977	2909210	0.037	0	4	0	0	0	1	1	0	0
2019	33641	1225	73477	0	105893	3015103	0.013	0	5	0	0	0	1	1	0	0
2020	0	0	68925	0	68925	3084028	0.049	0	5	0	0	0	1	1	0	0
2021	0	0	64929	0	64929	3148957	0.122	0	5	0	0	0	1	1	0	0
2022	23945	1750	58558	0	80753	3229710	0.102	0	6	0	0	0	1	1	0	0
2023	0	0	55057	0	55057	3284768	0.264	0	6	0	0	0	1	1	0	0
2024	19089	2100	50181	0	67170	3351938	0.252	0	7	0	0	0	1	1	0	0
2025	3381	451	46979	0	49909	3401847	0.338	0	7	0	0	0	1	2	0	0
2026	15217	2450	43249	0	56017	3457864	0.395	0	8	0	0	0	1	2	0	0

8.5. COAL BASED PLAN – PETCOKE, COAL, NO NATURAL GAS

8.5.1. Changes to Base Assumptions

- No natural gas fired plants

The results are summarized in Figure 8.4.

8.5.2. Results

Figure 8.4 : **No Natural Gas, Petcoke and Windalco Coal (cogen) Plants committed**

YEAR------	PRESENT WORTH COST OF THE YEAR (K$) ------					OBJ.FUN.	LOLP	GTAD		MSD		CC#2		GTNG		LSD
	CONCST	SALVAL	OPCOST	ENSCST	TOTAL	(CUMM.)	%		NGCC		COCG		PETC		COAL	
2007	0	0	382112	2868	384980	384980	0.524	0	0	0	0	0	0	0	0	0
2008	0	0	363121	6097	369218	754198	1.065	0	0	0	0	0	0	0	0	0
2009	0	0	341553	10275	351827	1106025	1.952	0	0	0	0	0	0	0	0	0
2010	0	0	321813	17049	338863	1444888	3.517	0	0	0	0	0	0	0	0	0
2011	0	0	303642	0	303642	1748530	6.146	0	0	0	0	0	0	0	0	0
2012	354715	3422	174577	0	525870	2274400	0.291	0	0	1	1	0	1	0	1	0
2013	114110	1503	141534	0	254140	2528541	0.067	0	0	1	1	0	1	0	2	0
2014	0	0	134458	0	134458	2662998	0.140	0	0	1	1	0	1	0	2	0
2015	181935	4009	91273	0	269199	2932197	0.194	0	0	1	1	0	1	0	4	0
2016	0	0	87551	0	87551	3019748	0.381	0	0	1	1	0	1	0	4	0
2017	72519	2506	75159	0	145172	3164919	0.100	0	0	1	1	0	1	0	5	0
2018	0	0	71613	0	71613	3236532	0.258	0	0	1	1	0	1	0	5	0
2019	0	0	68643	0	68643	3305175	0.529	0	0	1	1	0	1	0	5	0
2020	51617	3258	60162	0	108522	3413697	0.361	0	0	1	1	0	1	0	6	0
2021	9191	540	57029	0	65680	3479378	0.479	0	0	1	1	0	1	0	6	1
2022	41149	3759	50644	0	88034	3567412	0.188	0	0	1	1	0	1	0	7	1
2023	0	0	48120	0	48120	3615531	0.457	0	0	1	1	0	1	0	7	1
2024	32804	4260	43187	0	71731	3687262	0.199	0	0	1	1	0	1	0	8	1
2025	0	0	40977	0	40977	3728239	0.496	0	0	1	1	0	1	0	8	1
2026	26151	4761	37084	0	58473	3786712	0.242	0	0	1	1	0	1	0	9	1

8.6. ANALYSIS AND TREATMENT OF RENEWABLES

8.6.1. Biomass

The only serious renewable proposal received is for power generation from e-grass. Based on the figures proposed, this project would not be competitive.

Nevertheless, it is believed that biomass fired projects are potentially feasible and the numbers should be re-visited.

8.6.2. Wind

There is no firm wind power project proposal but it has been demonstrated by the Wigton farm that wind can play a role in the mix. The feasibility of additional wind powered plants should be further examined.

8.6.3. Hydro

Hydro power plants already generate approximately 4% of net energy produced for the Grid. However, existing plants are very old and no new hydro project has been implemented in recent times. There are many options for small hydro plants which had been identified several years ago but which were not competitive at the low fuel prices that obtained then.

The feasibility of these projects should be now analyzed in light of oil prices being nearly five (5) times higher than what they were when these plants were last examined.

8.6.4. Solar

The use of solar power for large scale power generation is not widespread and is not expected to be feasible. However, the use of photovoltaics and solar water heaters on the demand side should be encouraged, with the latter demonstrated to be financially very attractive. The former could be feasible for remote areas not yet electrified and as a complement to grid supply in other areas.

8.6.5. Other Renewables

There have been discussion on other renewable/alternative power supply options and even though these are not expected to make a large dent in the base load capacity requirements, they could make a reasonable contribution to the supply mix. A comprehensive look at the various options in light of new technologies should be done to determine the more attractive projects.

8.7. TREATMENT OF EXISTING JPS OWNED UNITS

8.7.1. Oil Fired Steam Units

Retirements:

The retirement of power generating plants under normal circumstances is mainly driven by economic considerations. Consequently, the retirement decision, which incorporates the timing of the retirements among other things, is premised on a number of criteria. Chief among them are the designated plant life as prescribed by the OEM and low utilization levels as new baseload units are added.

Against this background, the economics of retiring the existing JPS oil fired steam units were carefully examined and in this regard a number of expansion scenarios were developed as a means of determining the effect of changing retirement dates on existing units.

In principle, these scenarios were evaluated on the basis that the existing steam units, which have all exceeded their normal useful lives, would be retired as newer and more efficient base load plants would be added to the system. Additionally, the principle also incorporates the analyses of the Tariff Impact Assessment on the retirement sequencing. In deriving an appropriate retirement schedule, the timing and sequence of plant removal are essential, which in the context of this study are estimated based on very low capacity factors and generation tariff impact.

The Capacity Factor of a generating unit is the ratio of the actual output of the unit over a period of time and its output if it had operated at full capacity over that time period.

Table 8.1 below shows the expected capacity factors for JPS steam units from 2007 to 2026. These values were generated by WASP from simulations in which these units were kept on the system running on HFO throughout the study period.

It is also important to note that the timing for retirement of the existing steam units to a large extent is influenced by the fuel types being considered to be used for future expansion, which according to the plan should be available by 2012; suggesting that retirement of existing steam units should commence by 2012.

The following scenarios outline the retirement schedule for the existing steam units, which were developed in order to suitably assess the economic benefit associated with their removal from the system. A tariff impact assessment was done and this will serve as a measure to determine the potential economic benefit of retirement. Figure 8.5 below illustrates the impact on tariff with respect to the proposed retirement strategy represented by scenario 1, 2 and 3. It is also important to highlight that subsequent to the retirement of these units careful consideration may be necessary to determine the mode that will be adopted in relation to the treatment of these plants, for example, removing the asset from the rate base or possibly mothballing the plants, etc.

Scenario 1: No retirement of steam units (or conversion to Natural Gas) throughout the study period.

Table 8.1: Capacity Factor of existing steam units - No retirements (or conversion to Natural Gas)

Year	Capacity Factor (%)				
	OH1	OH2	OH3	OH4	B6
2007	31.98	68.57	84.47	84.89	85.56
2008	39.08	77.94	88.87	84.89	83.44
2009	47.09	81.08	84.89	84.89	84.05
2010	58.02	82.22	84.89	84.89	84.5
2011	63.7	83.14	84.89	84.89	84.75
2012	2.40	10.57	44.21	62.13	22.79
2013	4.29	15.75	51.47	69.71	32.68
2014	0.94	4.23	22.97	43.37	10.84
2015	2.57	10.38	41.00	55.81	20.78
2016	0.66	2.85	15.84	33.14	7.47
2017	1.26	5.29	24.34	43.24	12.30
2018	0.31	1.56	10.00	19.39	3.81
2019	0.75	3.03	15.21	29.90	7.44
2020	0.23	1.05	6.50	15.06	2.61
2021	0.53	2.20	11.65	23.38	5.06
2022	0.18	0.77	4.71	11.54	2.00
2023	0.42	1.74	9.04	18.60	3.99
2024	0.16	0.64	3.75	9.22	1.60
2025	0.39	1.54	7.46	15.27	3.48
2026	0.97	3.43	13.42	24.52	6.94

Scenario 2: Retirement of OH1, OH2 and B6 2012

The simulation results from scenario 2 were summarized and the capacity factors of the respective steam units recorded as shown in Table 8.2 below. (More details can be found in Appendix I of this document)

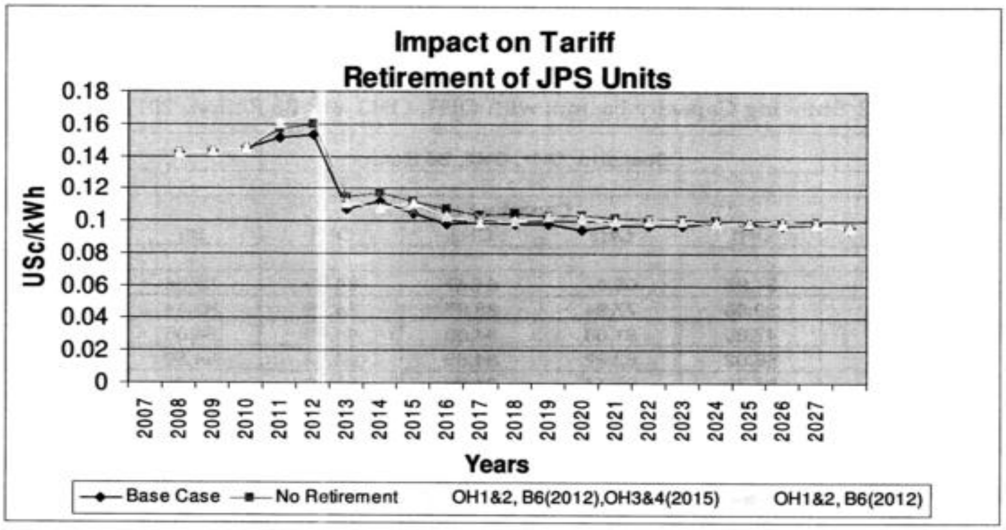
Table 8.2: Showing Capacity Factors with OH1, OH2 and B6 Retired 2012

		Scenario: OH1, OH2, B6 Retired			
Year	Capacity Factor (%)				
	OH1	OH2	OH3	OH4	B6
2007	31.98	68.57	84.47	84.89	85.56
2008	39.08	77.94	88.87	84.89	83.44
2009	47.09	81.08	84.89	84.89	84.05
2010	58.02	82.22	84.89	84.89	84.50
2011	63.70	83.14	84.89	84.89	84.75
2012	Retired	Retired	17.8	38.14	Retired
2013	-	-	5.07	12.56	-
2014	-	-	4.29	11.26	-
2015	-	-	2.9	8.61	-
2016	-	-	5.61	13.07	-
2017	-	-	1.64	4.13	-
2018	-	-	2.86	7.98	-
2019	-	-	5.6	12.77	-
2020	-	-	2.06	5.89	-
2021	-	-	3.82	10.43	-
2022	-	-	7.75	16.50	-
2023	-	-	3.01	7.89	-
2024	-	-	5.92	13.30	-
2025	-	-	11.48	21.16	-
2026	-	-	5.76	12.36	-

Scenario 3: 2012- OH1 & 2 and B6 Retired; 2015 - OH3 & OH4 Retired

As can be seen from Table 8.2, the capacity factors of OH3 and OH4 were significantly reduced after 2012, the reason being that newer and more efficient base load capacity was added to the system replacing the retired steam units. This effect together with the generation tariff impact yielded from scenario 2, indicate that OH3 and OH4 could be retired during the period 2014 -2015.

Figure 8.5: Impact of Retirement of JPS units on Generation Tariff



Essentially, the tariff impact assessment as illustrated in figure 8.5 forms the basis for the proposed retirement schedule and shows the expected benefit associated with the retirements.

Retirement Implications:

If retirement of JPS units is pursued as an option, then the following issues related to network stability and adequacy may arise but will require further studies.

- Location and siting of new replacement generation.
- Transmission system reinforcement and upgrade.

Other Possible Considerations:

1. Continue to operate the plants on HFO until they have been fully depreciated.
2. Convert the existing oil fired steam plants (except for OH1) to use natural gas and operate them for another ten (10) years as was factored in the Base Case Scenario. As for the no gas scenario, retirement of the existing steam units would follow the retirement sequence outlined above.

8.7.2. Gas Turbines and Bogue Combined Cycle plants

These are expected to burn natural gas in the base case as it is assumed that the gas would be eventually made available at both Hunts Bay and Bogue. Alternatives would be:

- Not to have natural gas available at Hunts Bay or Bogue.
- Mass retirement of these units when natural gas becomes available and replacement with more efficient units.

The potential savings for just converting the existing Bogue plants to operate on natural gas is approximately $70 Million.

There would be other benefits in terms of the ability to site new natural gas burning combined cycle units on the north coast where demand is growing fastest and in terms of reduced need for transmission system upgrading. More information would be required to quantify these.

For Hunts Bay, with B6 expected to be retired shortly after natural gas is available in the country, only 82 MW of baseload from the Petcoke plant would be at Hunts Bay. With the Corporate Area accounting for 60% of total system demand and the low speed diesel plants scheduled for retirement by 2015, if no new capacity is installed in the Corporate Area:

- Transmission system upgrading requirements would be significant.
- The risks of island wide outages would be significantly higher.
- T&D losses would also be greater.

Given environmental constraints, the only likely baseload type plant that could be readily installed in the Corporate Area would be the natural gas fired combined cycle plants.

Therefore, even though sufficient information was not available to fully quantify the value of natural gas in the Corporate Area, it appears that this would be very desirable. Other benefits would be the ability to include other large users such as the industrial and large commercial entities in the area. Aside from the other economic benefits, this would increase the average throughput of gas required and thereby reduce the average cost to the power sector.

8.7.3. Rockfort Low Speed Diesels

The existing JPS owned low speed diesel units at Rockfort were installed in 1985 and would normally be expected to have useful lives of 25 to 30 years. Due to the relatively high efficiencies of these units compared to the oil fired units, they would continue to operate at fairly good capacity factors and thus some consideration could be given to extending their usage. However, to better examine this, information on their expected availabilities and expected maintenance costs would be necessary.

The effect of delaying the retirement of the JPS owned low speed diesels, assuming no major change in O&M costs or plant availability is illustrated in Figure 8.5 below.

Figure 8-5: Delayed Retirement of Rockfort LSDs (RF1 and RF2)

YEAR------	PRESENT WORTH COST OF THE YEAR (K$) ------					OBJ.FUN.	LOLP	GTAD		MSD		CC#2		GTNG		LSD
	CONCST	SALVAL	OPCOST	ENSCST	TOTAL	(CUMM.)	%		NGCC		COCG		PETC		COAL	
2007	0	0	382112	2868	384980	384980	0.524	0	0	0	0	0	0	0	0	0
2008	0	0	363121	6097	369218	754198	1.065	0	0	0	0	0	0	0	0	0
2009	0	0	341553	10275	351827	1106025	1.952	0	0	0	0	0	0	0	0	0
2010	0	0	321813	17049	338863	1444888	3.517	0	0	0	0	0	0	0	0	0
2011	0	0	303642	0	303642	1748530	6.146	0	0	0	0	0	0	0	0	0
2012	220871	2165	164778	0	383484	2132014	0.160	0	0	0	1	0	1	0	0	0
2013	66344	175	140061	0	206231	2338245	0.053	0	1	0	1	0	1	0	0	0
2014	11762	69	128933	0	140625	2478869	0.047	0	1	0	1	0	1	1	0	0
2015	52889	525	103163	0	155527	2634396	0.036	0	2	0	1	0	1	1	0	0
2016	0	0	97372	0	97372	2731769	0.080	0	2	0	1	0	1	1	0	0
2017	42163	874	85840	0	127129	2858898	0.020	0	3	0	1	0	1	1	0	0
2018	0	0	80845	0	80845	2939742	0.045	0	3	0	1	0	1	1	0	0
2019	33612	1224	72347	0	104735	3044477	0.015	0	4	0	1	0	1	1	0	0
2020	0	0	68013	0	68013	3112490	0.032	0	4	0	1	0	1	1	0	0
2021	0	0	64116	0	64116	3176606	0.080	0	4	0	1	0	1	1	0	0
2022	23924	1748	57782	0	79958	3256564	0.066	0	5	0	1	0	1	1	0	0
2023	0	0	54364	0	54364	3310927	0.176	0	5	0	1	0	1	1	0	0
2024	19072	2098	49515	0	66490	3377417	0.169	0	6	0	1	0	1	1	0	0
2025	3381	451	46435	0	49365	3426782	0.402	0	6	0	1	0	1	2	0	0
2026	15204	2448	42734	0	55490	3482272	0.465	0	7	0	1	0	1	2	0	0

8.8. TREATMENT OF IPP PLANTS

8.8.1. JPPC

The arguments relating to the JPS owned low speed diesels also apply here. The major difference is that this plant is privately owned and the power purchase agreement comes to an end in 2015. It may be feasible to extend the term of the agreement with a greatly reduced capacity charge. The new capacity charge would be expected to reflect life extension capital costs.

The effect of keeping the JPPC plant in the system at zero capacity charge is shown below in Appendix I. Based on this, the present value of the maximum capacity charge that should be paid (which relates to the cost for life extension) ought not to exceed US$14.1 million.

8.8.2. JEP

Under the base case scenario, the JEP units will not operate at high capacity factors due to the relatively high cost of HFO. This problem could be addressed by converting the units to operate on natural gas. The added benefit of increasing the throughput of gas would also serve to reduce the average cost of the fuel.

The expected effect of having JEP operate on natural gas is illustrated below in Appendix I . Based on this, the cost to convert it to use natural gas ought not to exceed US$67.5M.

9. TARIFF IMPACT ASSESSMENT

9.1. OVERVIEW

The electricity sector in any economy is a strategic national resource. The significance of having reliable, secure and competitively priced energy cannot be over-stated. Analysis of the Jamaican electricity market indicates that the supply capacity of the electricity market and the unit cost of electricity are major concerns to all Jamaicans. Underinvestment in generation infrastructure, rapid increases in demand and the failure to attract sufficient new entrants to the market to make the appropriate investment when needed have led to capacity constraints and concerns over the ability of the Jamaican energy market to cater to further economic expansion and to provide competitively priced energy.

The need for a strategy to address these issues is both compelling and immediate. A significant level of investment in the upgrading and improvement of electricity infrastructure is currently being proposed. The need for this investment is recognized by all. Additionally, the very investment required to ensure security of supply can reduce the cost of electricity to the end user. The price increases in electric energy in recent years have put Jamaica at a severe competitive disadvantage in relation to some of its Caribbean economies.

9.1.1. Price Concerns

The escalation in domestic energy costs over the past few years is partly a result of increases in international fuel costs, which are a major input into Jamaican electricity prices. Even prior to these latest price increases, Jamaica's electricity costs are relatively high in relation to its major trading partners. These price increases are not limited to business users, as prices have increased substantially for domestic users as well. While such price increases have obvious implications for Jamaica's competitiveness, they are also highly regressive from an equity point of view, since those in lower income brackets spend a higher proportion of their income on energy.

9.1.2. The Components of Electricity Prices

Electricity tariffs in Jamaica are composed of the following cost elements:

- Generation costs
- Transmission costs
- Distribution costs
- Other residual factors such as 15% premium on renewable energy

The key issues contributing to the recent changes in electricity tariffs are increases in global fuel costs and the significant underinvestment in the electricity infrastructure during the past two decades resulting in the need for an accelerated capital investment programme given the projected 4.2% growth levels of demand. Oil and gas, which are the principal fuels used in electricity generation, have experienced rapid price inflation since 2000, compounded by global instability and declining output. However, these factors affect many countries. Analyses of several generation expansion options have indicated that the costs of investment in critical plant capacity for addition and replacement infrastructure will put downward pressure on electricity prices. This section, however, will only assess the impact of the various generation development options on the generation component of the electricity tariff.

9.2. TARIFF IMPACT MODEL

The process of assessing the tariff impact commences with a demand (sales) forecast for the market. This is followed by the determination of the mix of generating capacity to meet the forecast demand. This was simulated using the WASP to optimize the costs. The most critical variables in the determination of the type of plants to be installed relate to the availability of natural gas in terms of:

- Price
- Quantity, and
- Timing

The mix of generating capacity is in terms of the technology type, i.e. hydro, geothermal, coal, petroleum, nuclear, biomass, wind etc. It is also in terms of the ownership i.e. JPS, IPP or a mix of both. The next step involves the determination of the present value cost associated with different generation development sequences under different assumptions and constraints. The fourth step involves the assessment of variations in the generation cost when the estimated outcomes for key variables are changed and the determination of the Generation total revenue requirements based on the simulated costs of generation and supply likely to be incurred by the sector during the plan period 2007 – 2026. The final step is the determination of average costs of generation tariff and the expected tariff impact of different generation expansion scenarios.

9.2.1. Tariff Structure

The structure of the generation tariff is designed to facilitate the recovery of the costs that is expected to be imposed on the system by consumers. These are the capacity related costs and energy related costs, respectively.

Capacity related costs are generation and usage related costs. They are costs which are incurred as a result of a change in the level of peak demand on the system, and hence include capacity charge for existing units and costs of future additions of generation capacity as well as fixed operations and maintenance. *Capacity related* cost is derived by calculating the return on net book value of opening assets, net of tax and adding annual depreciation. The rate of return is JPS allowed Weighted Average Cost of Capital (12%).

Energy related costs are design-demand related costs. They are costs which are incurred in the supply of an extra kWh of energy whenever it occurs, hence are dominated by expenditure on fuel and variable operations and maintenance. These costs are generated by the *WASP* in the simulations of the generation expansion options. The energy related costs are the minimized accumulated present value of the Operating Cost of the Generation assets.

The Average Generation Tariff is then calculated by dividing the Generation Revenue Requirements by the projected energy sales within each year, where ;

Revenue Requirement[2] = Operating Cost + real rate of return * Opening Net Book Value Assets + Annual Depreciation

9.3. BASE CASE RESULTS

The Base Case Tariff Impact Result is based on the following assumptions:

- Average growth in demand of just over 4.2% per year in accordance with the updated demand forecast.
- Natural gas available at a price of $4.50 / MBtu at the power plant site.
- Natural Gas can be made available in 2012.
- Coal available at plant at an average price of $2.08/MBtu.
- Medium speed diesels and gas turbines can be made available by 2009. The gas turbines made available in these years can be converted to combined cycle plants in 2012 which can be run on the expected natural gas from Venezuela.
- Average discount rate of 12% for calculating present value of costs.

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[2] Revenue requirements do not include overheads costs such as local labour costs, motor vehicles etc. (these are already included in the fixed O&M allocated overheads for generation).

- Petcoke: Given the commitment of the GOJ to the Petrojam Refinery Upgrade and the utilization of the Petcoke to be produced, the proposed Petcoke project is included in the base case. This plant is assumed to be able to provide 82 MW to the Grid at a price which is 15% less than what would have been expected without cogeneration.
- Jamalco Cogen: There appears to be a commitment by Jamalco to build a natural gas fired cogeneration power plant if natural gas is available at an acceptable price. With natural gas available at $4.50/MBtu, it is assumed that the Jamalco project would proceed. It is assumed that this plant would provide power at a 15% discount due to the expected cogeneration benefits.
- Windalco Coal Cogen: Windalco seems committed to constructing coal fired plants at each of its facilities at Ewarton and Kirkvine to produce a net 60 MW at each site for use by the Grid. Assuming that natural gas can still be made available at $4.50/MBtu with these plants in place, they are included in the base case with a 15% discount on all costs due to the expected benefits from cogeneration. It should be noted that since no agreement is in place, this plant is not firmly committed.

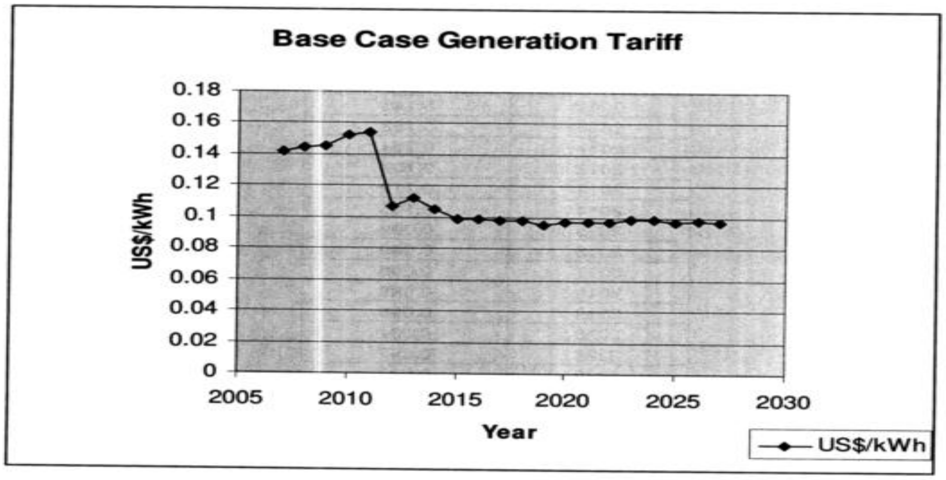
This base case option will result in a sustainable reduction in generation tariff of approximately US5.5¢/kWh beginning 2015.

Table 9.1 and figure 9.0 below shows the expected annual generation tariff for the base case taking into account the various assumptions made.

Table 9.1: Base Case Generation Tariff

Generation Tariff	
Year	(US$/kWh)
2007	0.142
2008	0.144
2009	0.145
2010	0.152
2011	0.154
2012	0.107
2013	0.112
2014	0.105
2015	0.099
2016	0.099
2017	0.098
2018	0.098
2019	0.095
2020	0.097
2021	0.097
2022	0.097
2023	0.099
2024	0.099
2025	0.097
2026	0.098
2027	0.097

Figure 9.0: Generation Tariff for Base Case Scenario



9.4. EFFECTS OF CHANGING RETIREMENT DATES

The old JPS oil fired steam units could be scheduled for retirement in blocks as follows:

Option 1

2012: Old Harbour 1 & 2 and Hunts Bay B6 (161.5 MW)

2015: Old Harbour 3 & 4 (137.0 MW).

Option 2

2012: Old Harbour 1, 2, 3 and 4 and Hunts Bay B6 (298.5 MW)

The retired units will be "moth-balled" and retained in the JPS rate base.

The tariff impact of changing retirement dates of existing units is miniscule as can be seen from the tables 9.2 and 9.3 and the graph below. The major tariff impact will come from the addition of new technology units. The additions of new units, beginning 2012 will see reductions in tariff of US 4.0 c/kWh to US 6.3 c/kWh depending on the option.

Table 9.2: Effect of Changing Retirement Dates of Existing Units (US$/kWh) on generation/tariff

Year	Effect of Changing Retirement Dates of Existing Units (US$/kWh) on generation/tariff		
	Base Case	Retirement (OH1,2,3,4,B6,2012,JPPC(2015)	Phased Retirement: 2012 - OH1,2, B6; 2015 - OH3,4, JPPC
2007	0.1425	0.1425	0.1425
2008	0.1436	0.1437	0.1437
2009	0.1449	0.1449	0.1449
2010	0.1515	0.1608	0.1515
2011	0.1537	0.1671	0.1582
2012	0.1070	0.1048	0.1186
2013	0.1117	0.1050	0.1084
2014	0.1051	0.1045	0.1051
2015	0.0987	0.0977	0.1059
2016	0.0989	0.1006	0.0999
2017	0.0982	0.1000	0.0963
2018	0.0981	0.1011	0.1027
2019	0.0947	0.1001	0.1025
2020	0.0974	0.0967	0.0967
2021	0.0972	0.0986	0.0986
2022	0.0969	0.0978	0.0978
2023	0.0993	0.0984	0.0984
2024	0.0992	0.0974	0.0974
2025	0.0970	0.0979	0.0979
2026	0.0978	0.0968	0.0974
2027	0.0967	0.0951	0.0942

Figure 9.1: TIA - Illustrating the Effect of Changing Retirement dates of Existing Units

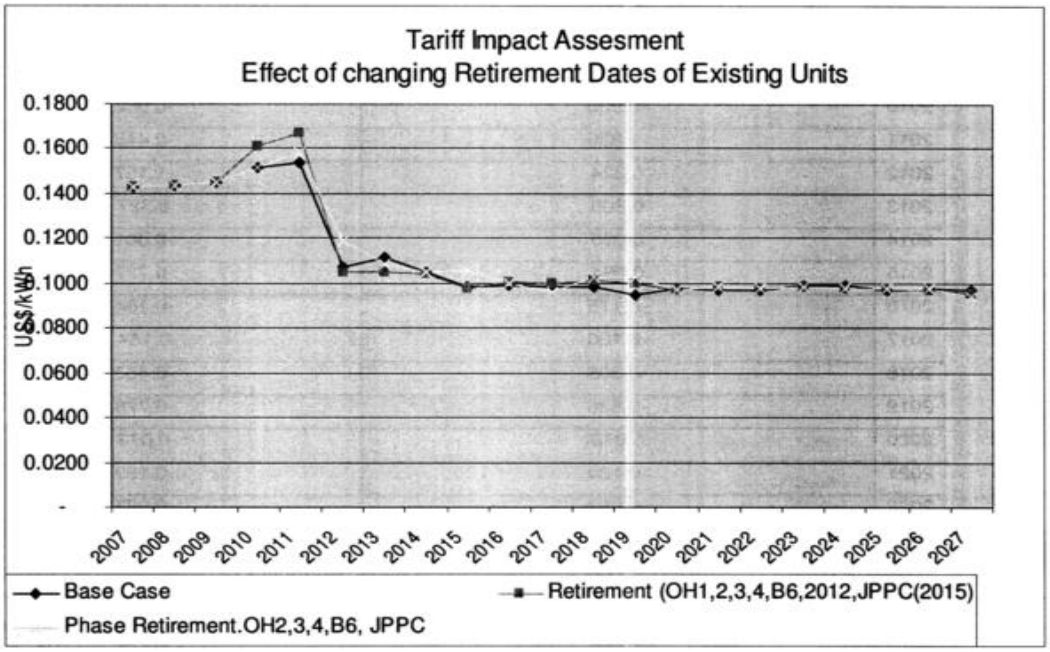


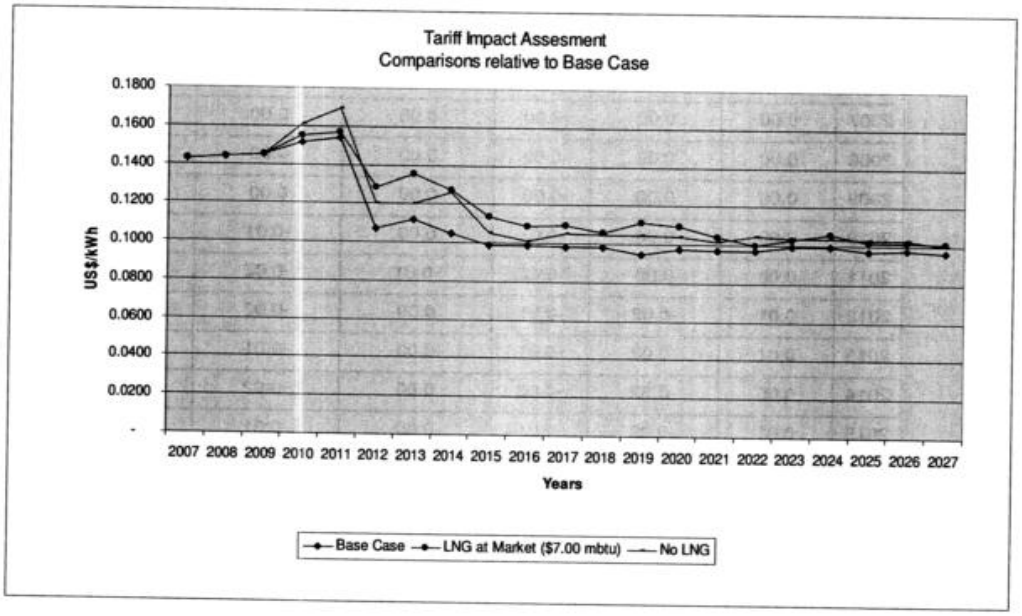
Table 9.3: Illustrating Tariff Impact of Retirement schedule

Generation Tariff Impact (USc/kWh)		
Year	Retirement:OH1,2,3,4,B6 (2012); JPPC(2015)	Phase Retirement. 2012 – OH1,2,B6; 2015 – OH3,4, JPPC
2007	-0.003	-0.003
2008	-0.003	-0.003
2009	-0.002	-0.002
2010	-0.930	-0.002
2011	-1.339	-0.448
2012	0.224	-1.157
2013	0.666	0.327
2014	0.055	-0.001
2015	0.094	-0.727
2016	-0.175	-0.104
2017	-0.180	0.184
2018	-0.308	-0.463
2019	-0.536	-0.778
2020	0.073	0.073
2021	-0.139	-0.139
2022	-0.087	-0.087
2023	0.086	0.087
2024	0.188	0.189
2025	-0.093	-0.093
2026	0.100	0.039
2027	0.157	0.251

Table 9.4: Tariff Impact Relative to Base Case

(US$/kWh)						
Year	Natural Gas at Bogue	Natural Gas (at $7.00 MBtu)	No Natural Gas	Natural Gas, Petcoke and Windalco Coal	No Natural Gas, Petcoke and Windalco Coal	E-grass
2007	0.00	0.00	0.00	0.00	0.00	0.00
2008	0.00	0.00	0.00	0.00	0.00	0.00
2009	0.00	0.00	0.00	0.00	0.00	0.00
2010	0.00	0.00	-0.01	0.00	-0.01	0.00
2011	0.00	0.00	-0.02	-0.01	-0.02	0.02
2012	0.01	-0.02	-0.01	0.00	-0.02	0.00
2013	0.01	-0.02	-0.01	0.00	-0.01	0.00
2014	0.00	-0.02	-0.02	0.00	-0.02	0.00
2015	0.01	-0.02	-0.01	0.00	-0.01	0.00
2016	0.00	-0.01	0.00	0.00	-0.01	0.00
2017	0.00	-0.01	-0.01	0.00	-0.01	0.00
2018	0.00	-0.01	-0.01	0.00	-0.01	0.00
2019	0.00	-0.02	-0.01	0.00	-0.02	0.00
2020	0.00	-0.01	-0.01	0.00	-0.01	0.00
2021	0.00	-0.01	0.00	0.00	-0.01	0.00
2022	0.00	0.00	-0.01	0.00	-0.01	0.00
2023	0.00	0.00	0.00	0.00	-0.01	0.00
2024	0.00	-0.01	0.00	0.00	-0.01	0.00
2025	0.00	-0.01	-0.01	0.00	-0.01	0.00
2026	0.00	0.00	-0.01	0.00	-0.01	0.00
2027	0.00	0.00	0.00	0.00	-0.01	0.00

Figure 9.2: TIA – Comparisons Relative to Base Case



10. CONCLUSIONS AND RECOMMENDATIONS

In order to put the recommendations into perspective, it is necessary to have an appreciation of the demand / supply balance if no new capacity is added to the system. This scenario is characterized by the following:

- Based on expectations of a peak demand of 652.2 MW in 2008 and available useful capacity of 791.5 MW, the reserve margin in 2008 will be 139.3 MW or 21.4% of peak demand. This situation will contribute to power cuts with the loss of load probability (LOLP) of 1.07% exceeding the benchmark safe level of 0.55%.
- In 2009, with the peak demand expected to grow at over 4.2% per annum, the reserve capacity would rapidly reduce to 111.9 MW or 16.5%, and by 2010 the reserve capacity would be 84.1 MW and the reserve margin 11.9%. At this point, the LOLP would be close to 3.5% and severe power cuts would be likely. From then on the situation would dramatically worsen.
- With a significant number of the existing large steam plants at or approaching their normal useful lives and with tighter reserve margins and fewer opportunities to comfortably schedule maintenance, equipment failures would worsen.

New baseload capacity is immediately required in the system, but given the expected constraints regarding construction time and/or fuel availability, it is likely that no such plant can be in place before 2012.

Over the next twenty (20) years approximately 1,200 MW of new capacity will be required to compensate for load growth and plant retirements. About 600 MW of this will be required during the next ten (10) years at an average of about 60 MW per year.

The most critical variables in the determination of the type of plants to be installed relate to the availability of natural gas in terms of:

- Price
- Quantity, and
- Timing

The key decisions to be taken therefore revolve around expectations for these parameters. To the extent that specific information on the availability of natural gas is not provided, an optimized generation plan cannot be confirmed.

The following recommendations therefore depend on whether or not natural gas will be available at or below the breakeven price of $4.5-5.0/MBtu.

1. Short term/interim capacity should be installed as follows:
    a. Approximately 40 MW of new capacity should be installed as soon as possible but no later than mid 2009 in order to avoid excessive power cuts.
        i. This could be a gas turbine which would subsequently be incorporated into a combined cycle plant burning natural gas, if this fuel can be made available at an attractive price in the near term.
    b. An additional 40 MW should be installed by 2010.
        i. If natural gas is going to be available at an attractive price, this along with the first new gas turbine, should be incorporated into a 120 MW combined cycle plant by adding a 40 MW heat recovery steam generator.
        ii. If natural gas is not expected to be available at an attractive price and no baseload plant can be in place by 2010, then the possibility of procuring this additional capacity as an interim / temporary plant should be examined until base load units are fully operational.
2. A number of cogeneration type projects have been proposed using different fuels. These should be supported based on the expected significant discounts in price due to the use of a cheap fuel and expected high thermal efficiencies. A brief description of these projects is given in table 10.2 below.

Table 10.2: Proposed Cogeneration Projects

Developer	Location	Fuel	Plant Capacity	Net Output to Grid	Possible In Service Date	Comments
JPS/ Petrojam	Hunts Bay	Petcoke	100 MW	82 MW	2012	The contracting dates for these should be coordinated with other projects & planned retirements
Windalco	Ewarton	Coal	90 MW	60 MW	2011/2012	
Windalco	Kirkvine	Coal	90 MW	60 MW	2011/2012	

3. A competitive tendering process should be immediately commenced for the provision of renewable energy based projects with total capacity up to 70 MW for installation by 2012.
4. The existing JPS oil fired steam units should be scheduled for retirement in blocks as follows:
    a. 2012: Old Harbour 1 & 2 and Hunts Bay B6 (161.5 MW)
    b. 2015: Old Harbour 3 & 4 (137.0 MW).
5. The position on whether or not to "moth-ball" the retired units and retain them in the JPS rate base for specified periods should be reviewed by the OUR to determine what is in the best interest of electricity consumers.
6. If natural gas is available at or below the breakeven price,
    a. The gas supply should be extended to the Corporate Area for the following reasons:
        i. The Corporate Area accounts for over 60% of the overall system demand and if additional generating capacity is not located in this area, the strain on the Transmission System would be excessive.
        ii. Given environmental constraints, it would be difficult and/ or very expensive to construct facilities utilizing other fuels in the area.
        iii. There could be other potential users such as the various industries in the area which could increase the volume of gas required and thereby reduce the average costs.
    b. The gas supply should also be extended to the Montego Bay for the following reasons:
        i. The existing facilities at Bogue would be significantly under-utilized due to the much higher cost of the fuel being used.
        ii. The demand is growing most rapidly in the along north coast and strain on the transmission system would continue and increase with no additional generation in the area;
        iii. Given environmental constraints, it would be difficult and or/very expensive to construct facilities utilizing other fuels in the area while.

Table S4: Summary of Capacity Requirements **without** Natural Gas

			No Natural Gas; Petcoke and Coal Available							
Year	**Net Capacity Retired (MW)**	**Net Capacity Additions (MW)**	**Plant Added**	**Plant Retired**	**Total Net Capacity (MW)**	**Net Peak (MW)**	**Reserve capacity (MW)**	**Reserve capacity (%)**	**Loss of load Probability (%)**	**Loss of load Probability (days/year)**
2007					791.5	623.7	167.8	26.9	0.524	1.9
2008					791.5	652.2	139.3	21.4	1.065	3.9
2009					791.5	679.6	111.9	16.5	1.952	7.1
2010					791.5	707.4	84.1	11.9	3.517	12.8
2011					791.5	736.4	55.1	7.5	6.146	22.4
2012	150.6	347	Install 1Petc (113 MW), 1 Coal (cogen - 113 MW), 1 MSD and 1 PV-coal (112 MW) unit	Retire OH1, OH2 and B6	987.9	766.8	221.1	28.8	0.306	1.1
2013		112	Install Coal unit		1099.9	798.7	301.2	37.7	0.071	0.3
2014					1099.9	831.5	268.4	32.3	0.148	0.5
2015	186.9	224	Install 2 Coal units	Retire OH3, OH4 and JPPC	1137.0	866.7	270.3	31.2	0.194	0.7
2016					1137.0	904.1	232.9	25.8	0.381	1.4
2017		112	Install Coal unit		1249.0	943.2	305.8	32.4	0.100	0.4
2018					1249.0	983.3	265.7	27.0	0.258	0.9
2019					1249.0	1025.7	223.3	21.8	0.529	1.9
2020	34.6	112	Install Coal unit	Retire RF1 and RF2	1326.4	1070.5	255.9	23.9	0.361	1.3
2021		29	Install LSD unit		1355.4	1116.4	239	21.4	0.479	1.7
2022		112	Install Coal unit		1467.4	1164.4	303	26.0	0.188	0.7
2023					1467.4	1214.4	253	20.8	0.457	1.7
2024		112	Install Coal unit		1579.4	1266.7	312.7	24.7	0.199	0.7
2025					1579.4	1321.8	257.6	19.5	0.496	1.8
2026		112	Install Coal unit		1691.4	1379.3	312.1	22.6	0.242	0.9

APPENDIX I

11. APPENDIX I: OPTIMIZATION RESULTS

Base Case (Unconstrained)

YEAR------	PRESENT WORTH COST OF THE YEAR (K$) ------					OBJ.FUN.	LOLP	GTAD		MSD		CC#2		GTNG		LSD
	CONCST	SALVAL	OPCOST	ENSCST	TOTAL	(CUMM.)	%		NGCC		COCG		PETC		COAL	
2007	0	0	382028	2868	384896	384896	0.524	0	0	0	0	0	0	0	0	0
2008	0	0	363045	6097	369142	754038	1.065	0	0	0	0	0	0	0	0	0
2009	0	0	341485	10275	351760	1105798	1.952	0	0	0	0	0	0	0	0	0
2010	0	0	321753	17049	338803	1444600	3.517	0	0	0	0	0	0	0	0	0
2011	0	0	303589	0	303589	1748189	6.146	0	0	0	0	0	0	0	0	0
2012	163364	0	165121	0	328486	2076675	0.038	0	2	0	0	0	0	1	0	0
2013	0	0	154600	0	154600	2231275	0.081	0	2	0	0	0	0	1	0	0
2014	59236	350	132631	0	191517	2422792	0.029	0	3	0	0	0	0	1	0	0
2015	52889	524	106699	0	159064	2581856	0.023	0	4	0	0	0	0	1	0	0
2016	0	0	100409	0	100409	2682265	0.051	0	4	0	0	0	0	1	0	0
2017	42163	874	88808	0	130097	2812362	0.014	0	5	0	0	0	0	1	0	0
2018	0	0	83400	0	83400	2895762	0.030	0	5	0	0	0	0	1	0	0
2019	0	0	78557	0	78557	2974318	0.073	0	5	0	0	0	0	1	0	0
2020	30011	1399	70098	0	98710	3073029	0.040	0	6	0	0	0	0	1	0	0
2021	0	0	65937	0	65937	3138966	0.102	0	6	0	0	0	0	1	0	0
2022	23924	1748	59523	0	81699	3220665	0.086	0	7	0	0	0	0	1	0	0
2023	0	0	55874	0	55874	3276539	0.224	0	7	0	0	0	0	1	0	0
2024	19072	2098	50958	0	67932	3344471	0.216	0	8	0	0	0	0	1	0	0
2025	3381	451	47660	0	50590	3395060	0.292	0	8	0	0	0	0	2	0	0
2026	15204	2448	43879	0	56636	3451696	0.343	0	9	0	0	0	0	2	0	0
2027	2695	521	41041	0	43216	3494912	0.500	0	9	0	0	0	0	3	0	0
2028	14527	3353	36742	0	47917	3542829	0.306	0	10	0	0	0	0	4	0	0
2029	2149	590	34404	0	35963	3578792	0.495	0	10	0	0	0	0	5	0	0
2030	19325	6294	29910	0	42941	3621733	0.259	0	12	0	0	0	0	5	0	0
2031	1713	659	27989	0	29043	3650775	0.468	0	12	0	0	0	0	6	0	0
2032	7703	3497	25961	0	30167	3680942	0.258	0	13	0	0	0	0	6	0	0
2033	1366	729	24295	0	24932	3705874	0.507	0	13	0	0	0	0	7	0	0
2034	12282	7693	22430	0	27019	3732893	0.296	0	15	0	0	0	0	7	0	0
2035	5483	4021	20922	0	22384	3755276	0.208	0	16	0	0	0	0	7	0	0
2036	972	833	19473	0	19612	3774888	0.456	0	16	0	0	0	0	8	0	0

OPTIONS/SCENARIOS

E-Grass

YEAR------	PRESENT WORTH COST OF THE YEAR (K$) ------					OBJ.FUN.	LOLP	GTAD		MSD		CC#2		GTNG		LSD	
	CONCST	SALVAL	OPCOST	ENSCST	TOTAL	(CUMM.)	%		NGCC		COCG		PETC		COAL		BICC
2007	0	0	382112	2868	384980	384980	0.524	0	0	0	0	0	0	0	0	0	0
2008	0	0	363121	6097	369218	754198	1.065	0	0	0	0	0	0	0	0	0	0
2009	0	0	341553	10275	351827	1106025	1.952	0	0	0	0	0	0	0	0	0	0
2010	0	0	321813	17049	338863	1444888	3.517	0	0	0	0	0	0	0	0	0	0
2011	0	0	303642	0	303642	1748530	6.146	0	0	0	0	0	0	0	0	0	0
2012	236016	2169	160644	0	394492	2143022	0.064	0	0	0	1	0	1	1	0	0	0
2013	34400	453	143528	0	177475	2320497	0.034	0	0	0	1	0	1	1	0	0	1
2014	30715	529	128602	0	158788	2479284	0.033	0	0	0	1	0	1	1	0	0	2
2015	52934	525	103111	0	155521	2634805	0.026	0	1	0	1	0	1	1	0	0	2
2016	0	0	97217	0	97217	2732022	0.057	0	1	0	1	0	1	1	0	0	2
2017	0	0	91879	0	91879	2823902	0.133	0	1	0	1	0	1	1	0	0	2
2018	37678	1050	80847	0	117475	2941376	0.034	0	2	0	1	0	1	1	0	0	2
2019	0	0	76272	0	76272	3017649	0.081	0	2	0	1	0	1	1	0	0	2
2020	30036	1400	68088	0	96725	3114374	0.044	0	3	0	1	0	1	1	0	0	2
2021	0	0	64131	0	64131	3178505	0.111	0	3	0	1	0	1	1	0	0	2
2022	23945	1750	57943	0	80138	3258643	0.092	0	4	0	1	0	1	1	0	0	2
2023	0	0	54438	0	54439	3313081	0.241	0	4	0	1	0	1	1	0	0	2
2024	19089	2100	49695	0	66684	3379765	0.230	0	5	0	1	0	1	1	0	0	2
2025	3381	451	46530	0	49460	3429225	0.313	0	5	0	1	0	1	2	0	0	2
2026	15217	2450	42851	0	55619	3484844	0.341	0	6	0	1	0	1	2	0	0	2
2027	2695	521	40127	0	42302	3527146	0.497	0	6	0	1	0	1	3	0	0	2
2028	14538	3355	35941	0	47123	3574269	0.321	0	7	0	1	0	1	4	0	0	2
2029	2149	590	33691	0	35249	3609519	0.508	0	7	0	1	0	1	5	0	0	2
2030	15416	5127	29513	0	39802	3649320	0.528	0	8	1	1	0	1	5	0	0	3
2031	5129	2066	27575	0	30639	3679959	0.539	0	8	2	1	0	1	5	0	0	4
2032	3059	1389	25797	0	27467	3707426	0.529	0	8	2	1	0	1	7	0	0	4
2033	3254	1737	24207	0	25724	3733150	0.488	0	8	3	1	0	1	9	0	0	4
2034	9797	6182	22335	0	25950	3759101	0.533	0	9	4	1	0	1	9	0	0	5
2035	2594	1903	20931	0	21623	3780723	0.548	0	9	5	1	0	1	11	0	0	5
2036	3510	3024	19567	0	20054	3800777	0.473	0	9	5	1	0	1	12	0	0	6

Natural Gas, Petcoke and Coal Available

YEAR------	PRESENT WORTH COST OF THE YEAR (K$) ------					OBJ.FUN.	LOLP	GTAD		MSD		CC#2		GTNG		LSD
	CONCST	SALVAL	OPCOST	ENSCST	TOTAL	(CUMM.)	%		NGCC		COCG		PETC		COAL	
2007	0	0	382112	2868	384980	384980	0.524	0	0	0	0	0	0	0	0	0
2008	0	0	363121	6097	369218	754198	1.065	0	0	0	0	0	0	0	0	0
2009	0	0	341553	10275	351827	1106025	1.952	0	0	0	0	0	0	0	0	0
2010	0	0	321813	17049	338863	1444888	3.517	0	0	0	0	0	0	0	0	0
2011	0	0	303642	0	303642	1748530	6.146	0	0	0	0	0	0	0	0	0
2012	221263	2169	164703	0	383796	2132326	0.159	0	0	0	1	0	1	0	0	0
2013	66401	175	139990	0	206216	2338543	0.052	0	1	0	1	0	1	0	0	0
2014	11762	69	128870	0	140563	2479105	0.046	0	1	0	1	0	1	1	0	0
2015	52934	525	103121	0	155530	2634635	0.036	0	2	0	1	0	1	1	0	0
2016	0	0	97317	0	97317	2731952	0.079	0	2	0	1	0	1	1	0	0
2017	42199	875	85798	0	127122	2859073	0.020	0	3	0	1	0	1	1	0	0
2018	0	0	80802	0	80802	2939875	0.045	0	3	0	1	0	1	1	0	0
2019	33641	1225	72318	0	104733	3044608	0.014	0	4	0	1	0	1	1	0	0
2020	0	0	67943	0	67943	3112551	0.060	0	4	0	1	0	1	1	0	0
2021	0	0	64094	0	64094	3176645	0.148	0	4	0	1	0	1	1	0	0
2022	23945	1750	57751	0	79946	3256591	0.124	0	5	0	1	0	1	1	0	0
2023	0	0	54387	0	54387	3310978	0.313	0	5	0	1	0	1	1	0	0
2024	19089	2100	49531	0	66520	3377498	0.297	0	6	0	1	0	1	1	0	0
2025	3381	451	46414	0	49344	3426842	0.396	0	6	0	1	0	1	2	0	0
2026	15217	2450	42719	0	55487	3482329	0.459	0	7	0	1	0	1	2	0	0
2027	13587	2625	39387	0	50349	3532678	0.193	0	8	0	1	0	1	2	0	0
2028	12131	2800	35444	0	44776	3577453	0.229	0	9	0	1	0	1	2	0	0
2029	2149	590	33098	0	34656	3612110	0.358	0	9	0	1	0	1	3	0	0
2030	13508	4399	29140	0	38249	3650359	0.339	0	10	0	1	0	1	5	0	0
2031	2369	912	27306	0	28763	3679122	0.521	0	10	1	1	0	1	6	0	0
2032	7710	3500	25341	0	29551	3708672	0.291	0	11	1	1	0	1	6	0	0
2033	1889	1008	23745	0	24626	3733298	0.490	0	11	2	1	0	1	7	0	0
2034	12292	7699	21925	0	26518	3759815	0.289	0	13	2	1	0	1	7	0	0
2035	1506	1104	20490	0	20891	3780707	0.530	0	13	3	1	0	1	8	0	0
2036	4900	4200	19078	0	19778	3800484	0.391	0	14	3	1	0	1	8	0	0

OPTIONS/SCENARIOS

E-Grass

YEAR	CONCST	SALVAL	OPCOST	ENSCST	TOTAL	OBJ.FUN. (CUMM.)	LOLP %	GTAD	NGCC	MSD	COCG	CC#2	PETC	GTNG	COAL	LSD	BICC
	------ PRESENT WORTH COST OF THE YEAR (K$) ------																
2007	0	0	382112	2868	384980	384980	0.524	0	0	0	0	0	0	0	0	0	0
2008	0	0	363121	6097	369218	754198	1.065	0	0	0	0	0	0	0	0	0	0
2009	0	0	341553	10275	351827	1106025	1.952	0	0	0	0	0	0	0	0	0	0
2010	0	0	321813	17049	338863	1444888	3.517	0	0	0	0	0	0	0	0	0	0
2011	0	0	303642	0	303642	1748530	6.146	0	0	0	0	0	0	0	0	0	0
2012	236016	2169	160644	0	394492	2143022	0.064	0	0	0	1	0	1	1	0	0	0
2013	34400	453	143528	0	177475	2320497	0.034	0	0	0	1	0	1	1	0	0	1
2014	30715	529	128602	0	158788	2479284	0.033	0	0	0	1	0	1	1	0	0	2
2015	52934	525	103111	0	155521	2634805	0.026	0	1	0	1	0	1	1	0	0	2
2016	0	0	97217	0	97217	2732022	0.057	0	1	0	1	0	1	1	0	0	2
2017	0	0	91879	0	91879	2823902	0.133	0	1	0	1	0	1	1	0	0	2
2018	37678	1050	80847	0	117475	2941376	0.034	0	2	0	1	0	1	1	0	0	2
2019	0	0	76272	0	76272	3017649	0.081	0	2	0	1	0	1	1	0	0	2
2020	30036	1400	68088	0	96725	3114374	0.044	0	3	0	1	0	1	1	0	0	2
2021	0	0	64131	0	64131	3178505	0.111	0	3	0	1	0	1	1	0	0	2
2022	23945	1750	57943	0	80138	3258643	0.092	0	4	0	1	0	1	1	0	0	2
2023	0	0	54438	0	54439	3313081	0.241	0	4	0	1	0	1	1	0	0	2
2024	19089	2100	49695	0	66684	3379765	0.230	0	5	0	1	0	1	1	0	0	2
2025	3381	451	46530	0	49460	3429225	0.313	0	5	0	1	0	1	2	0	0	2
2026	15217	2450	42851	0	55619	3484844	0.341	0	6	0	1	0	1	2	0	0	2
2027	2695	521	40127	0	42302	3527146	0.497	0	6	0	1	0	1	3	0	0	2
2028	14538	3355	35941	0	47123	3574269	0.321	0	7	0	1	0	1	4	0	0	2
2029	2149	590	33691	0	35249	3609519	0.508	0	7	0	1	0	1	5	0	0	2
2030	15416	5127	29513	0	39802	3649320	0.528	0	8	1	1	0	1	5	0	0	3
2031	5129	2066	27575	0	30639	3679959	0.539	0	8	2	1	0	1	5	0	0	4
2032	3059	1389	25797	0	27467	3707426	0.529	0	8	2	1	0	1	7	0	0	4
2033	3254	1737	24207	0	25724	3733150	0.488	0	8	3	1	0	1	9	0	0	4
2034	9797	6182	22335	0	25950	3759101	0.533	0	9	4	1	0	1	9	0	0	5
2035	2594	1903	20931	0	21623	3780723	0.548	0	9	5	1	0	1	11	0	0	5
2036	3510	3024	19567	0	20054	3800777	0.473	0	9	5	1	0	1	12	0	0	6

Jamalco Option

YEAR	PRESENT WORTH COST OF THE YEAR (K$) CONCST	SALVAL	OPCOST	ENSCST	TOTAL	OBJ.FUN. (CUMM.)	LOLP %	GTAD	NGCC	MSD	COCG	CC#2	PETC	GTNG	COAL	LSD
2007	0	0	382112	2868	384980	384980	0.524	0	0	0	0	0	0	0	0	0
2008	0	0	363121	6097	369218	754198	1.065	0	0	0	0	0	0	0	0	0
2009	0	0	341553	10275	351827	1106025	1.952	0	0	0	0	0	0	0	0	0
2010	0	0	321813	17049	338863	1444888	3.517	0	0	0	0	0	0	0	0	0
2011	0	0	303642	0	303642	1748530	6.146	0	0	0	0	0	0	0	0	0
2012	135798	1187	178005	0	312616	2061146	0.064	0	0	0	1	0	0	1	0	0
2013	92950	1225	150707	0	242432	2303578	0.029	0	0	0	1	0	1	1	0	0
2014	0	0	140713	0	140713	2444291	0.060	0	0	0	1	0	1	1	0	0
2015	52934	525	113510	0	165919	2610210	0.045	0	1	0	1	0	1	1	0	0
2016	0	0	106691	0	106691	2716901	0.102	0	1	0	1	0	1	1	0	0
2017	42199	875	93949	0	135273	2852174	0.025	0	2	0	1	0	1	1	0	0
2018	0	0	88162	0	88162	2940336	0.057	0	2	0	1	0	1	1	0	0
2019	33641	1225	78674	0	111090	3051425	0.017	0	3	0	1	0	1	1	0	0
2020	0	0	73737	0	73737	3125163	0.075	0	3	0	1	0	1	1	0	0
2021	0	0	69349	0	69349	3194512	0.188	0	3	0	1	0	1	1	0	0
2022	23945	1750	62299	0	84494	3279006	0.156	0	4	0	1	0	1	1	0	0
2023	0	0	58554	0	58554	3337559	0.390	0	4	0	1	0	1	1	0	0
2024	19089	2100	53105	0	70094	3407653	0.372	0	5	0	1	0	1	1	0	0
2025	3381	451	49658	0	52588	3460241	0.500	0	5	0	1	0	1	2	0	0
2026	15217	2450	45519	0	58287	3518527	0.542	0	6	0	1	0	1	2	0	0
2027	13587	2625	41831	0	52793	3571320	0.244	0	7	0	1	0	1	2	0	0
2028	12131	2800	37323	0	46655	3617975	0.287	0	8	0	1	0	1	2	0	0
2029	2149	590	34871	0	36430	3654405	0.450	0	8	0	1	0	1	3	0	0
2030	13508	4399	30633	0	39742	3694147	0.425	0	9	0	1	0	1	5	0	0
2031	8635	3325	28322	0	33632	3727778	0.230	0	10	0	1	0	1	5	0	0
2032	1529	694	26531	0	27366	3755144	0.415	0	10	0	1	0	1	6	0	0
2033	6884	3675	24568	0	27777	3782921	0.252	0	11	0	1	0	1	6	0	0
2034	7365	4613	22771	0	25523	3808444	0.457	0	12	0	1	0	1	7	0	0
2035	5488	4025	21180	0	22643	3831086	0.315	0	13	0	1	0	1	7	0	0
2036	1716	1471	19780	0	20026	3851112	0.528	0	13	2	1	0	1	8	0	0

Natural Gas at Bogue

YEAR	PRESENT WORTH COST OF THE YEAR (K$) CONCST	SALVAL	OPCOST	ENSCST	TOTAL	OBJ.FUN. (CUMM.)	LOLP %	GTAD	NGCC	MSD	COCG	CC#2	PETC	GTNG	COAL	LSD
2007	0	0	382112	2868	384980	384980	0.524	0	0	0	0	0	0	0	0	0
2008	0	0	363121	6097	369218	754198	1.065	0	0	0	0	0	0	0	0	0
2009	0	0	341553	10275	351827	1106025	1.952	0	0	0	0	0	0	0	0	0
2010	0	0	321813	17049	338863	1444888	3.517	0	0	0	0	0	0	0	0	0
2011	0	0	303642	0	303642	1748530	6.146	0	0	0	0	0	0	0	0	0
2012	148738	0	155782	0	304519	2053050	0.096	0	2	0	0	0	0	0	0	0
2013	66401	175	135167	0	201392	2254442	0.032	0	3	0	0	0	0	0	0	0
2014	0	0	126223	0	126223	2380665	0.067	0	3	0	0	0	0	0	0	0
2015	52934	525	102356	0	154765	2535430	0.052	0	4	0	0	0	0	0	0	0
2016	0	0	95968	0	95968	2631398	0.116	0	4	0	0	0	0	0	0	0
2017	0	0	90209	0	90209	2721607	0.270	0	4	0	0	0	0	0	0	0
2018	37678	1050	80581	0	117209	2838816	0.066	0	5	0	0	0	0	0	0	0
2019	0	0	75544	0	75544	2914360	0.157	0	5	0	0	0	0	0	0	0
2020	30036	1400	68293	0	96930	3011290	0.085	0	6	0	0	0	0	0	0	0
2021	0	0	63855	0	63855	3075145	0.213	0	6	0	0	0	0	0	0	0
2022	23945	1750	58279	0	80474	3155619	0.178	0	7	0	0	0	0	0	0	0
2023	0	0	54361	0	54362	3209981	0.445	0	7	0	0	0	0	0	0	0
2024	19089	2100	49954	0	66943	3276923	0.423	0	8	0	0	0	0	0	0	0
2025	17043	2275	46307	0	61076	3337999	0.171	0	9	0	0	0	0	0	0	0
2026	15217	2450	43093	0	55861	3393860	0.186	0	10	0	0	0	0	0	0	0
2027	0	0	39884	0	39884	3433744	0.525	0	10	0	0	0	0	0	0	0
2028	14538	3355	36053	0	47236	3480980	0.323	0	11	0	0	0	0	1	0	0
2029	2149	590	33487	0	35046	3516026	0.516	0	11	0	0	0	0	2	0	0
2030	19342	6299	29724	0	42767	3558792	0.272	0	13	0	0	0	0	2	0	0
2031	1713	660	27554	0	28608	3587400	0.483	0	13	0	0	0	0	3	0	0
2032	7710	3500	25763	0	29973	3617373	0.271	0	14	0	0	0	0	3	0	0
2033	1366	729	23905	0	24542	3641914	0.522	0	14	0	0	0	0	4	0	0
2034	6146	3850	22322	0	24618	3666533	0.331	0	15	0	0	0	0	4	0	0
2035	1922	1410	20757	0	21270	3687802	0.535	0	15	2	0	0	0	5	0	0
2036	4900	4200	19362	0	20062	3707864	0.394	0	16	2	0	0	0	5	0	0

Natural Gas at Bogue; Petcoke and Windalco coal Plants committed

YEAR------	PRESENT WORTH COST OF THE YEAR (K$) ------					OBJ.FUN.	LOLP	GTAD		MSD		CC#2		GTNG		LSD
	CONCST	SALVAL	OPCOST	ENSCST	TOTAL	(CUMM.)	%		NGCC		COCG		PETC		COAL	
2007	0	0	382112	2868	384980	384980	0.524	0	0	0	0	0	0	0	0	0
2008	0	0	363121	6097	369218	754198	1.065	0	0	0	0	0	0	0	0	0
2009	0	0	341553	10275	351827	1106025	1.952	0	0	0	0	0	0	0	0	0
2010	0	0	321813	17049	338863	1444888	3.517	0	0	0	0	0	0	0	0	0
2011	0	0	303642	0	303642	1748530	6.146	0	0	0	0	0	0	0	0	0
2012	221263	2169	150997	0	370091	2118621	0.159	0	0	0	1	0	1	0	0	0
2013	66401	175	130651	0	196877	2315497	0.052	0	1	0	1	0	1	0	0	0
2014	0	0	122222	0	122222	2437719	0.109	0	1	0	1	0	1	0	0	0
2015	52934	525	98532	0	150941	2588660	0.082	0	2	0	1	0	1	0	0	0
2016	0	0	92648	0	92648	2681308	0.180	0	2	0	1	0	1	0	0	0
2017	0	0	87325	0	87326	2768634	0.404	0	2	0	1	0	1	0	0	0
2018	37678	1050	77817	0	114445	2883078	0.101	0	3	0	1	0	1	0	0	0
2019	0	0	73135	0	73135	2956213	0.235	0	3	0	1	0	1	0	0	0
2020	30036	1400	65998	0	94635	3050848	0.126	0	4	0	1	0	1	0	0	0
2021	0	0	61873	0	61873	3112721	0.304	0	4	0	1	0	1	0	0	0
2022	23945	1750	56397	0	78592	3191313	0.254	0	5	0	1	0	1	0	0	0
2023	1624	146	52839	0	54317	3245630	0.530	0	5	1	1	0	1	0	0	0
2024	19089	2100	48545	0	65534	3311164	0.497	0	6	1	1	0	1	0	0	0
2025	17043	2275	45020	0	59789	3370952	0.204	0	7	1	1	0	1	0	0	0
2026	15217	2450	41919	0	54687	3425639	0.220	0	8	1	1	0	1	0	0	0
2027	1032	199	38962	0	39795	3465434	0.524	0	8	2	1	0	1	0	0	0
2028	14538	3355	35065	0	46248	3511682	0.325	0	9	2	1	0	1	1	0	0
2029	2149	590	32622	0	34181	3545863	0.511	0	9	2	1	0	1	2	0	0
2030	19342	6300	28909	0	41952	3587814	0.274	0	11	2	1	0	1	2	0	0
2031	1713	660	26841	0	27894	3615708	0.475	0	11	2	1	0	1	3	0	0
2032	7710	3500	25117	0	29327	3645035	0.272	0	12	2	1	0	1	3	0	0
2033	1366	729	23340	0	23977	3669012	0.511	0	12	2	1	0	1	4	0	0
2034	6146	3850	21811	0	24107	3693120	0.329	0	13	2	1	0	1	4	0	0
2035	5488	4025	20395	0	21858	3714977	0.234	0	14	2	1	0	1	4	0	0
2036	972	833	18946	0	19085	3734062	0.492	0	14	2	1	0	1	5	0	0

Natural Gas at $7.50/MBtu - Petcoke and Coal available

YEAR------	PRESENT WORTH COST OF THE YEAR (K$) ------					OBJ.FUN.	LOLP	GTAD		MSD		CC#2		GTNG		LSD
	CONCST	SALVAL	OPCOST	ENSCST	TOTAL	(CUMM.)	%		NGCC		COCG		PETC		COAL	
2007	0	0	382112	2868	384980	384980	0.524	0	0	0	0	0	0	0	0	0
2008	0	0	363121	6097	369218	754198	1.065	0	0	0	0	0	0	0	0	0
2009	0	0	341553	10275	351827	1106025	1.952	0	0	0	0	0	0	0	0	0
2010	0	0	321813	17049	338863	1444888	3.517	0	0	0	0	0	0	0	0	0
2011	0	0	303642	0	303642	1748530	6.146	0	0	0	0	0	0	0	0	0
2012	226912	2169	205078	0	429821	2178352	0.130	0	0	1	1	0	1	0	0	0
2013	0	0	193728	0	193728	2372080	0.276	0	0	1	1	0	1	0	0	0
2014	101884	1754	156601	0	256730	2628810	0.116	0	0	1	1	0	1	0	1	0
2015	90967	2005	123420	0	212383	2841192	0.109	0	0	1	1	0	1	0	2	0
2016	81221	2255	100197	0	179163	3020355	0.032	0	0	1	1	0	1	0	3	0
2017	0	0	96633	0	96633	3116988	0.071	0	0	1	1	0	1	0	3	0
2018	64749	2757	79752	0	141744	3258732	0.025	0	0	1	1	0	1	0	4	0
2019	0	0	77120	0	77120	3335852	0.055	0	0	1	1	0	1	0	4	0
2020	51617	3258	66431	0	114791	3450643	0.038	0	0	1	1	0	1	0	5	0
2021	0	0	64154	0	64154	3514797	0.088	0	0	1	1	0	1	0	5	0
2022	41149	3759	55050	0	92440	3607236	0.088	0	0	1	1	0	1	0	6	0
2023	36740	4010	48381	0	81112	3688348	0.038	0	0	1	1	0	1	0	7	0
2024	0	0	46306	0	46307	3734655	0.249	0	0	1	1	0	1	0	7	0
2025	29289	4511	41125	0	65904	3800558	0.115	0	0	1	1	0	1	0	8	0
2026	26151	4761	37117	0	58507	3859065	0.146	0	0	1	1	0	1	0	9	0
2027	0	0	35263	0	35263	3894328	0.393	0	0	1	1	0	1	0	9	0
2028	12131	2800	32650	0	41981	3936309	0.448	0	1	1	1	0	1	0	9	0
2029	4298	1180	31015	0	34132	3970441	0.381	0	1	1	1	0	1	2	9	0
2030	33239	11527	25698	0	47409	4017850	0.286	0	1	1	1	0	1	2	11	0
2031	1713	660	24383	0	25436	4043286	0.465	0	1	1	1	0	1	3	11	0
2032	13249	6265	22377	0	29361	4072647	0.313	0	1	1	1	0	1	3	12	0
2033	1366	729	21293	0	21930	4094577	0.541	0	1	1	1	0	1	4	12	0
2034	8585	5377	20111	0	23318	4117895	0.536	0	2	1	1	0	1	6	12	0
2035	9430	7017	18486	0	20900	4138795	0.430	0	2	1	1	0	1	6	13	0
2036	1944	1666	17667	0	17945	4156740	0.509	0	2	1	1	0	1	8	13	0

Natural Gas at $6.00/MBtu - Petcoke and Coal available

YEAR------	PRESENT WORTH COST OF THE YEAR (K$) ------					OBJ.FUN.	LOLP	GTAD		MSD		CC#2		GTNG		LSD
	CONCST	SALVAL	OPCOST	ENSCST	TOTAL	(CUMM.)	%		NGCC		COCG		PETC		COAL	
2007	0	0	382112	2868	384980	384980	0.524	0	0	0	0	0	0	0	0	0
2008	0	0	363121	6097	369218	754198	1.065	0	0	0	0	0	0	0	0	0
2009	0	0	341553	10275	351827	1106025	1.952	0	0	0	0	0	0	0	0	0
2010	0	0	321813	17049	338863	1444888	3.517	0	0	0	0	0	0	0	0	0
2011	0	0	303642	0	303642	1748530	6.146	0	0	0	0	0	0	0	0	0
2012	221263	2169	186442	0	405536	2154066	0.159	0	0	0	1	0	1	0	0	0
2013	114110	1504	152783	0	265389	2419455	0.067	0	0	0	1	0	1	0	1	0
2014	0	0	144374	0	144374	2563829	0.140	0	0	0	1	0	1	0	1	0
2015	90967	2005	113393	0	202356	2766185	0.130	0	0	0	1	0	1	0	2	0
2016	81221	2255	94222	0	173187	2939373	0.038	0	0	0	1	0	1	0	3	0
2017	0	0	90229	0	90230	3029602	0.084	0	0	0	1	0	1	0	3	0
2018	64749	2756	76116	0	138108	3167710	0.028	0	0	0	1	0	1	0	4	0
2019	0	0	72997	0	72997	3240707	0.063	0	0	0	1	0	1	0	4	0
2020	51617	3258	63470	0	111830	3352537	0.044	0	0	0	1	0	1	0	5	0
2021	0	0	60768	0	60768	3413305	0.103	0	0	0	1	0	1	0	5	0
2022	41149	3759	53063	0	90454	3503759	0.102	0	0	0	1	0	1	0	6	0
2023	0	0	50622	0	50622	3554381	0.250	0	0	0	1	0	1	0	6	0
2024	32804	4260	44959	0	73503	3627884	0.288	0	0	0	1	0	1	0	7	0
2025	3381	451	42761	0	45691	3673574	0.379	0	0	0	1	0	1	1	7	0
2026	26151	4761	38364	0	59754	3733328	0.474	0	0	0	1	0	1	1	8	0
2027	13587	2625	35787	0	46749	3780078	0.209	0	1	0	1	0	1	1	8	0
2028	12131	2800	32809	0	42141	3822218	0.247	0	2	0	1	0	1	1	8	0
2029	1646	452	31169	0	32363	3854581	0.508	0	2	2	1	0	1	1	8	0
2030	20457	7013	26759	0	40202	3894783	0.549	0	2	2	1	0	1	3	9	0
2031	14839	6014	24461	0	33285	3928068	0.362	0	2	2	1	0	1	3	10	0
2032	2115	960	23224	0	24379	3952447	0.532	0	2	3	1	0	1	4	10	0
2033	11829	6516	21277	0	26591	3979039	0.385	0	2	3	1	0	1	4	11	0
2034	16708	10616	19550	0	25643	4004681	0.267	0	3	3	1	0	1	4	12	0
2035	1089	798	18464	0	18754	4023435	0.505	0	3	3	1	0	1	5	12	0
2036	8420	7267	17040	0	18193	4041628	0.428	0	3	3	1	0	1	5	13	0

Natural Gas at $5.00/MBtu - Petcoke and Coal available

YEAR	------ PRESENT WORTH COST OF THE YEAR (K$)				------	OBJ.FUN.	LOLP	GTAD		MSD		CC#2		GTNG		LSD
	CONCST	SALVAL	OPCOST	ENSCST	TOTAL	(CUMM.)	%		NGCC		COCG		PETC		COAL	
2007	0	0	382112	2868	384980	384980	0.524	0	0	0	0	0	0	0	0	0
2008	0	0	363121	6097	369218	754198	1.065	0	0	0	0	0	0	0	0	0
2009	0	0	341553	10275	351827	1106025	1.952	0	0	0	0	0	0	0	0	0
2010	0	0	321813	17049	338863	1444888	3.517	0	0	0	0	0	0	0	0	0
2011	0	0	303642	0	303642	1748530	6.146	0	0	0	0	0	0	0	0	0
2012	220871	2165	172283	0	390989	2139519	0.160	0	0	0	1	0	1	0	0	0
2013	114110	1504	143111	0	255717	2395236	0.068	0	0	0	1	0	1	0	1	0
2014	0	0	134575	0	134575	2529810	0.141	0	0	0	1	0	1	0	1	0
2015	90967	2005	105244	0	194207	2724017	0.131	0	0	0	1	0	1	0	2	0
2016	81221	2255	89087	0	168053	2892070	0.038	0	0	0	1	0	1	0	3	0
2017	0	0	84756	0	84756	2976825	0.084	0	0	0	1	0	1	0	3	0
2018	64749	2757	72639	0	134632	3111457	0.028	0	0	0	1	0	1	0	4	0
2019	0	0	69202	0	69202	3180659	0.064	0	0	0	1	0	1	0	4	0
2020	51617	3258	60144	0	108504	3289163	0.044	0	0	0	1	0	1	0	5	0
2021	0	0	57271	0	57271	3346434	0.103	0	0	0	1	0	1	0	5	0
2022	1819	133	54861	0	56548	3402982	0.529	0	0	1	1	0	1	0	5	0
2023	21361	1923	49653	0	69091	3472073	0.181	0	1	1	1	0	1	0	5	0
2024	19072	2098	45829	0	62803	3534876	0.179	0	2	1	1	0	1	0	5	0
2025	0	0	43338	0	43338	3578214	0.458	0	2	1	1	0	1	0	5	0
2026	15204	2448	40185	0	52942	3631155	0.494	0	3	1	1	0	1	0	5	0
2027	4760	920	37977	0	41818	3672973	0.526	0	3	3	1	0	1	1	5	0
2028	13042	3010	34211	0	44244	3717217	0.527	0	4	4	1	0	1	1	5	0
2029	10822	2972	31817	0	39667	3756883	0.266	0	5	4	1	0	1	1	5	0
2030	11867	3865	28327	0	36329	3793212	0.540	0	6	7	1	0	1	1	5	0
2031	8627	3322	26548	0	31854	3825065	0.307	0	7	7	1	0	1	1	5	0
2032	1529	694	24849	0	25685	3850750	0.520	0	7	7	1	0	1	2	5	0
2033	6878	3672	23276	0	26482	3877232	0.327	0	8	7	1	0	1	2	5	0
2034	7827	4903	21787	0	24712	3901944	0.495	0	9	8	1	0	1	3	5	0
2035	5483	4021	20404	0	21865	3923809	0.351	0	9	8	1	1	1	3	5	0
2036	4895	4196	19123	0	19822	3943631	0.268	0	10	8	1	1	1	3	5	0

No Natural Gas throughout study, Petcoke and Coal available

YEAR	------ PRESENT WORTH COST OF THE YEAR (K$) ------					OBJ.FUN.	LOLP	GTAD	NGCC	MSD	COCG	CC#2	PETC	GTNG	COAL	LSD
	CONCST	SALVAL	OPCOST	ENSCST	TOTAL	(CUMM.)	%									
2007	0	0	382112	2868	384980	384980	0.524	0	0	0	0	0	0	0	0	0
2008	0	0	363121	6097	369218	754198	1.065	0	0	0	0	0	0	0	0	0
2009	0	0	341553	10275	351827	1106025	1.952	0	0	0	0	0	0	0	0	0
2010	0	0	321813	17049	338863	1444888	3.517	0	0	0	0	0	0	0	0	0
2011	0	0	303642	0	303642	1748530	6.146	0	0	0	0	0	0	0	0	0
2012	354715	3422	174555	0	525848	2274378	0.306	0	0	1	1	0	1	0	1	0
2013	114110	1504	141517	0	254123	2528501	0.071	0	0	1	1	0	1	0	2	0
2014	0	0	134442	0	134443	2662943	0.148	0	0	1	1	0	1	0	2	0
2015	181935	4009	91273	0	269199	2932142	0.194	0	0	1	1	0	1	0	4	0
2016	0	0	87551	0	87551	3019693	0.381	0	0	1	1	0	1	0	4	0
2017	72519	2506	75159	0	145172	3164864	0.100	0	0	1	1	0	1	0	5	0
2018	0	0	71613	0	71613	3236477	0.258	0	0	1	1	0	1	0	5	0
2019	0	0	68643	0	68643	3305120	0.529	0	0	1	1	0	1	0	5	0
2020	51617	3258	60162	0	108522	3413642	0.361	0	0	1	1	0	1	0	6	0
2021	9191	540	57029	0	65680	3479323	0.479	0	0	1	1	0	1	0	6	1
2022	41149	3759	50644	0	88034	3567357	0.188	0	0	1	1	0	1	0	7	1
2023	0	0	48120	0	48120	3615476	0.457	0	0	1	1	0	1	0	7	1
2024	32804	4260	43187	0	71731	3687207	0.199	0	0	1	1	0	1	0	8	1
2025	0	0	40977	0	40977	3728184	0.496	0	0	1	1	0	1	0	8	1
2026	26151	4761	37084	0	58473	3786657	0.242	0	0	1	1	0	1	0	9	1
2027	1032	199	35100	0	35933	3822590	0.537	0	0	2	1	0	1	0	9	1
2028	20847	5262	31948	0	47533	3870123	0.297	0	0	2	1	0	1	0	10	1
2029	3712	1019	30189	0	32881	3903004	0.511	0	0	2	1	0	1	0	10	2
2030	20457	7013	26314	0	39757	3942762	0.539	2	0	2	1	0	1	0	11	2
2031	14839	6014	24126	0	32950	3975712	0.353	2	0	2	1	0	1	0	12	2
2032	2115	960	23040	0	24195	3999906	0.517	3	0	3	1	0	1	0	12	2
2033	11829	6515	21099	0	26413	4026320	0.370	3	0	3	1	0	1	0	13	2
2034	12715	8115	19456	0	24057	4050376	0.544	4	0	5	1	0	1	0	14	2
2035	2594	1903	18604	0	19295	4069671	0.538	6	0	6	1	0	1	0	14	2
2036	8420	7267	17124	0	18277	4087948	0.453	6	0	6	1	0	1	0	15	2

Natural Gas and Petcoke available, No Coal

YEAR------	PRESENT WORTH	COST OF THE	YEAR (K$)	------		OBJ.FUN.	LOLP	GTAD		MSD		CC#2		GTNG		LSD
	CONCST	SALVAL	OPCOST	ENSCST	TOTAL	(CUMM.)	%		NGCC		COCG		PETC		COAL	
2007	0	0	382112	2868	384980	384980	0.524	0	0	0	0	0	0	0	0	0
2008	0	0	363121	6097	369218	754198	1.065	0	0	0	0	0	0	0	0	0
2009	0	0	341553	10275	351827	1106025	1.952	0	0	0	0	0	0	0	0	0
2010	0	0	321813	17049	338863	1444888	3.517	0	0	0	0	0	0	0	0	0
2011	0	0	303642	0	303642	1748530	6.146	0	0	0	0	0	0	0	0	0
2012	178473	1021	166549	0	344002	2092532	0.124	0	1	0	0	0	1	0	0	0
2013	66401	175	141871	0	208097	2300629	0.041	0	2	0	0	0	1	0	0	0
2014	11762	69	130563	0	142255	2442884	0.036	0	2	0	0	0	1	1	0	0
2015	52934	525	104740	0	157150	2600034	0.029	0	3	0	0	0	1	1	0	0
2016	0	0	98708	0	98709	2698742	0.063	0	3	0	0	0	1	1	0	0
2017	42199	875	87167	0	128491	2827233	0.017	0	4	0	0	0	1	1	0	0
2018	0	0	81977	0	81977	2909210	0.037	0	4	0	0	0	1	1	0	0
2019	33641	1225	73477	0	105893	3015103	0.013	0	5	0	0	0	1	1	0	0
2020	0	0	68925	0	68925	3084028	0.049	0	5	0	0	0	1	1	0	0
2021	0	0	64929	0	64929	3148957	0.122	0	5	0	0	0	1	1	0	0
2022	23945	1750	58558	0	80753	3229710	0.102	0	6	0	0	0	1	1	0	0
2023	0	0	55057	0	55057	3284768	0.264	0	6	0	0	0	1	1	0	0
2024	19089	2100	50181	0	67170	3351938	0.252	0	7	0	0	0	1	1	0	0
2025	3381	451	46979	0	49909	3401847	0.338	0	7	0	0	0	1	2	0	0
2026	15217	2450	43249	0	56017	3457864	0.395	0	8	0	0	0	1	2	0	0
2027	13587	2625	39894	0	50856	3508720	0.165	0	9	0	0	0	1	2	0	0
2028	12131	2800	35893	0	45225	3553944	0.198	0	10	0	0	0	1	2	0	0
2029	823	226	33587	0	34184	3588128	0.515	0	10	1	0	0	1	2	0	0
2030	19342	6299	29525	0	42568	3630696	0.273	0	12	1	0	0	1	2	0	0
2031	1713	660	27501	0	28555	3659250	0.481	0	12	1	0	0	1	3	0	0
2032	7710	3500	25607	0	29817	3689067	0.272	0	13	1	0	0	1	3	0	0
2033	1366	729	23881	0	24517	3713584	0.518	0	13	1	0	0	1	4	0	0
2034	12292	7699	22201	0	26794	3740378	0.304	0	14	1	0	1	1	4	0	0
2035	5488	4025	20713	0	22176	3762554	0.217	0	15	1	0	1	1	4	0	0
2036	972	833	19292	0	19431	3781985	0.461	0	15	1	0	1	1	5	0	0

JEP not converted to run on Natural Gas

YEAR------	PRESENT WORTH COST OF THE YEAR (K$) ------					OBJ.FUN.	LOLP	GTAD		MSD		CC#2		GTNG		LSD
	CONCST	SALVAL	OPCOST	ENSCST	TOTAL	(CUMM.)	%		NGCC		COCG		PETC		COAL	
2007	0	0	382028	2868	384896	384896	0.524	0	0	0	0	0	0	0	0	0
2008	0	0	363045	6097	369142	754038	1.065	0	0	0	0	0	0	0	0	0
2009	0	0	341485	10275	351760	1105798	1.952	0	0	0	0	0	0	0	0	0
2010	0	0	321753	17049	338803	1444600	3.517	0	0	0	0	0	0	0	0	0
2011	0	0	303589	0	303589	1748189	6.146	0	0	0	0	0	0	0	0	0
2012	235625	2165	173668	0	407127	2155316	0.065	0	0	0	1	0	1	1	0	0
2013	0	0	163484	0	163484	2318800	0.136	0	0	0	1	0	1	1	0	0
2014	59236	350	136792	0	195678	2514478	0.047	0	1	0	1	0	1	1	0	0
2015	52889	525	108967	0	161332	2675810	0.036	0	2	0	1	0	1	1	0	0
2016	0	0	103169	0	103169	2778978	0.080	0	2	0	1	0	1	1	0	0
2017	42163	874	89381	0	130669	2909648	0.020	0	3	0	1	0	1	1	0	0
2018	0	0	84598	0	84599	2994246	0.045	0	3	0	1	0	1	1	0	0
2019	33612	1224	74543	0	106931	3101177	0.015	0	4	0	1	0	1	1	0	0
2020	0	0	70373	0	70373	3171550	0.060	0	4	0	1	0	1	1	0	0
2021	26795	1574	63020	0	88242	3259792	0.020	0	5	0	1	0	1	1	0	0
2022	0	0	59393	0	59393	3319185	0.126	0	5	0	1	0	1	1	0	0
2023	4241	382	55552	0	59412	3378597	0.157	0	5	0	1	0	1	2	0	0
2024	19072	2098	50388	0	67362	3445959	0.152	0	6	0	1	0	1	2	0	0
2025	0	0	47581	0	47581	3493540	0.402	0	6	0	1	0	1	2	0	0
2026	15204	2448	43511	0	56268	3549808	0.465	0	7	0	1	0	1	2	0	0
2027	5391	1041	40556	0	44906	3594714	0.349	0	7	0	1	0	1	4	0	0
2028	12121	2797	36394	0	45717	3640431	0.412	0	8	0	1	0	1	4	0	0
2029	4298	1180	33977	0	37094	3677525	0.344	0	8	0	1	0	1	6	0	0
2030	19325	6294	29114	0	42146	3719670	0.188	0	10	0	1	0	1	6	0	0
2031	1713	660	27278	0	28332	3748002	0.325	0	10	0	1	0	1	7	0	0
2032	7703	3497	25336	0	29542	3777544	0.190	0	11	0	1	0	1	7	0	0
2033	1366	729	23735	0	24372	3801915	0.358	0	11	0	1	0	1	8	0	0
2034	12282	7693	21926	0	26515	3828430	0.217	0	13	0	1	0	1	8	0	0
2035	1089	798	20491	0	20781	3849211	0.448	0	13	0	1	0	1	9	0	0
2036	4895	4196	19076	0	19776	3868986	0.331	0	14	0	1	0	1	9	0	0

RETIREMENTS

No Retirement of Steam Units (OH1-4 & B6) or Conversion to Natural Gas

YEAR	CONCST	SALVAL	OPCOST	ENSCST	TOTAL	OBJ.FUN. (CUMM.)	LOLP %	GTAD	NGCC	MSD	COCG	CC#2	PETC	GTNG	COAL	LSD
	------ PRESENT WORTH COST OF THE YEAR (K$) ------															
2007	0	0	382028	2868	384896	384896	0.524	0	0	0	0	0	0	0	0	0
2008	0	0	363045	6097	369142	754038	1.065	0	0	0	0	0	0	0	0	0
2009	0	0	341485	10275	351760	1105798	1.952	0	0	0	0	0	0	0	0	0
2010	0	0	321753	17049	338803	1444600	3.517	0	0	0	0	0	0	0	0	0
2011	0	0	303589	0	303589	1748189	6.146	0	0	0	0	0	0	0	0	0
2012	236016	2169	174343	0	408190	2156379	0.064	0	0	0	1	0	1	1	0	0
2013	0	0	165225	0	165225	2321604	0.135	0	0	0	1	0	1	1	0	0
2014	59286	350	135759	0	194696	2516300	0.027	0	1	0	1	0	1	1	0	0
2015	10501	104	119339	0	129736	2646036	0.087	0	1	0	1	0	1	2	0	0
2016	47263	700	100423	0	146986	2793021	0.021	0	2	0	1	0	1	2	0	0
2017	0	0	95787	0	95787	2888809	0.046	0	2	0	1	0	1	2	0	0
2018	37678	1050	82447	0	119074	3007883	0.014	0	3	0	1	0	1	2	0	0
2019	0	0	78403	0	78403	3086286	0.030	0	3	0	1	0	1	2	0	0
2020	40259	1876	68330	0	106712	3192998	0.012	0	4	0	1	0	1	2	0	1
2021	0	0	64845	0	64845	3257843	0.025	0	4	0	1	0	1	2	0	1
2022	23945	1750	57953	0	80148	3337991	0.011	0	5	0	1	0	1	2	0	1
2023	0	0	54762	0	54762	3392753	0.022	0	5	0	1	0	1	2	0	1
2024	19089	2100	49465	0	66454	3459206	0.011	0	6	0	1	0	1	2	0	1
2025	0	0	46634	0	46634	3505840	0.024	0	6	0	1	0	1	2	0	1
2026	0	0	44265	0	44265	3550105	0.066	0	6	0	1	0	1	2	0	1
2027	13587	2625	40051	0	51013	3601117	0.030	0	7	0	1	0	1	2	0	1
2028	0	0	37965	0	37965	3639082	0.091	0	7	0	1	0	1	2	0	1
2029	10831	2975	34498	0	42355	3681437	0.044	0	8	0	1	0	1	2	0	1
2030	9671	3150	30784	0	37306	3718742	0.152	0	9	0	1	0	1	2	0	1
2031	1713	660	29060	0	30113	3748855	0.268	0	9	0	1	0	1	3	0	1
2032	7710	3500	26573	0	30783	3779639	0.155	0	10	0	1	0	1	3	0	1
2033	2731	1458	24904	0	26178	3805816	0.164	0	10	0	1	0	1	5	0	1
2034	6146	3850	22923	0	25219	3831035	0.527	0	11	0	1	0	1	5	0	1
2035	5488	4025	21226	0	22689	3853724	0.369	0	12	0	1	0	1	5	0	1
2036	2089	1790	19999	0	20297	3874021	0.539	0	12	3	1	0	1	6	0	1

Retirements: OH1, OH2, and B6 - 2012

YEAR------	PRESENT WORTH COST OF THE YEAR (K$) ------					OBJ.FUN.	LOLP	GTAD		MSD		CC#2		GTNG		LSD
	CONCST	SALVAL	OPCOST	ENSCST	TOTAL	(CUMM.)	%		NGCC		COCG		PETC		COAL	
2007	0	0	382028	2868	384896	384896	0.524	0	0	0	0	0	0	0	0	0
2008	0	0	363045	6097	369142	754038	1.065	0	0	0	0	0	0	0	0	0
2009	0	0	341485	10275	351760	1105798	1.952	0	0	0	0	0	0	0	0	0
2010	0	0	321753	17049	338803	1444600	3.517	0	0	0	0	0	0	0	0	0
2011	0	0	303589	0	303589	1748189	6.146	0	0	0	0	0	0	0	0	0
2012	295632	2169	156982	0	450444	2198633	0.288	0	1	0	1	0	1	0	0	0
2013	66401	175	131544	0	197770	2396403	0.052	0	2	0	1	0	1	0	0	0
2014	11762	69	121383	0	133076	2529479	0.046	0	2	0	1	0	1	1	0	0
2015	52934	525	98967	0	151377	2680856	0.035	0	3	0	1	0	1	1	0	0
2016	0	0	93285	0	93285	2774140	0.078	0	3	0	1	0	1	1	0	0
2017	42199	875	83607	0	124931	2899071	0.020	0	4	0	1	0	1	1	0	0
2018	0	0	78284	0	78284	2977355	0.043	0	4	0	1	0	1	1	0	0
2019	0	0	73697	0	73697	3051052	0.106	0	4	0	1	0	1	1	0	0
2020	40259	1876	65754	0	104136	3155188	0.033	0	5	0	1	0	1	1	0	1
2021	0	0	61712	0	61712	3216899	0.083	0	5	0	1	0	1	1	0	1
2022	0	0	58341	0	58341	3275240	0.214	0	5	0	1	0	1	1	0	1
2023	21379	1925	52745	0	72199	3347439	0.068	0	6	0	1	0	1	1	0	1
2024	0	0	49627	0	49627	3397066	0.188	0	6	0	1	0	1	1	0	1
2025	0	0	47106	0	47106	3444172	0.496	0	6	0	1	0	1	1	0	1
2026	15217	2450	42647	0	55415	3499587	0.211	0	7	0	1	0	1	1	0	1
2027	2695	521	40021	0	42196	3541783	0.309	0	7	0	1	0	1	2	0	1
2028	12131	2800	36624	0	45956	3587739	0.138	0	8	0	1	0	1	2	0	1
2029	0	0	34501	0	34501	3622239	0.413	0	8	0	1	0	1	2	0	1
2030	19342	6299	29954	0	42997	3665236	0.228	0	10	0	1	0	1	2	0	1
2031	1713	660	28119	0	29172	3694408	0.389	0	10	0	1	0	1	3	0	1
2032	3059	1389	26362	0	28032	3722440	0.384	0	10	0	1	0	1	5	0	1
2033	2731	1458	24733	0	26006	3748446	0.401	0	10	0	1	0	1	7	0	1
2034	8585	5377	22892	0	26100	3774546	0.397	2	11	0	1	0	1	7	0	1
2035	2177	1597	21481	0	22061	3796607	0.466	2	11	0	1	0	1	9	0	1
2036	2316	1985	20182	0	20513	3817120	0.509	2	11	1	1	0	1	11	0	1

Retirement: 2012 - OH1,OH2,B6 2012; 2015 - OH3, OH4

YEAR	------ PRESENT WORTH COST OF THE YEAR (K$) ------					OBJ.FUN.	LOLP	GTAD		MSD		CC#2		GTNG		LSD
	CONCST	SALVAL	OPCOST	ENSCST	TOTAL	(CUMM.)	%		NGCC		COCG		PETC		COAL	
2007	0	0	382028	2868	384896	384896	0.524	0	0	0	0	0	0	0	0	0
2008	0	0	363045	6097	369142	754038	1.065	0	0	0	0	0	0	0	0	0
2009	0	0	341485	10275	351760	1105798	1.952	0	0	0	0	0	0	0	0	0
2010	0	0	321753	17049	338803	1444600	3.517	0	0	0	0	0	0	0	0	0
2011	0	0	303589	0	303589	1748189	6.146	0	0	0	0	0	0	0	0	0
2012	295632	2169	156982	0	450444	2198633	0.288	0	1	0	1	0	1	0	0	0
2013	66401	175	131544	0	197770	2396403	0.052	0	2	0	1	0	1	0	0	0
2014	11762	69	121383	0	133076	2529479	0.046	0	2	0	1	0	1	1	0	0
2015	52934	525	99463	0	151872	2681351	0.346	0	3	0	1	0	1	1	0	0
2016	47263	700	89535	0	136098	2817448	0.089	0	4	0	1	0	1	1	0	0
2017	0	0	83697	0	83697	2901145	0.196	0	4	0	1	0	1	1	0	0
2018	0	0	78608	0	78608	2979753	0.387	0	4	0	1	0	1	1	0	0
2019	6674	243	73454	0	79885	3059638	0.416	0	4	0	1	0	1	2	0	0
2020	30036	1400	64251	0	92888	3152526	0.243	0	5	0	1	0	1	2	0	0
2021	0	0	60719	0	60720	3213245	0.541	0	5	0	1	0	1	2	0	0
2022	23945	1750	55087	0	77282	3290527	0.189	0	6	0	1	0	1	2	0	0
2023	0	0	51725	0	51725	3342252	0.443	0	6	0	1	0	1	2	0	0
2024	19089	2100	47426	0	64415	3406667	0.175	0	7	0	1	0	1	2	0	0
2025	0	0	44509	0	44509	3451176	0.462	0	7	0	1	0	1	2	0	0
2026	15217	2450	40962	0	53730	3504906	0.183	0	8	0	1	0	1	2	0	0
2027	0	0	38398	0	38398	3543303	0.511	0	8	0	1	0	1	2	0	0
2028	12131	2800	35444	0	44775	3588079	0.229	0	9	0	1	0	1	2	0	0
2029	2149	590	33097	0	34656	3622735	0.358	0	9	0	1	0	1	3	0	0
2030	19342	6299	29093	0	42135	3664870	0.199	0	11	0	1	0	1	3	0	0
2031	656	253	27183	0	27586	3692456	0.547	0	11	1	1	0	1	3	0	0
2032	3059	1388	25381	0	27051	3719507	0.536	0	11	1	1	0	1	5	0	0
2033	3254	1737	23745	0	25262	3744768	0.490	0	11	2	1	0	1	7	0	0
2034	6969	4365	23071	0	25675	3770444	0.536	3	11	2	1	0	1	8	0	1
2035	2594	1903	21661	0	22353	3792796	0.550	3	11	3	1	0	1	10	0	1
2036	4900	4200	20113	0	20813	3813609	0.405	3	12	3	1	0	1	10	0	1

TREATMENT OF JPPC AFTER 2015

JPPC available after 2015, Petcoke, Coal and Natural Gas Available

YEAR	CONCST	SALVAL	OPCOST	ENSCST	TOTAL	OBJ.FUN. (CUMM.)	LOLP %	GTAD	NGCC	MSD	COCG	CC#2	PETC	GTNG	COAL	LSD
	------ PRESENT WORTH COST OF THE YEAR (K$) ------															
2007	0	0	382112	2868	384980	384980	0.524	0	0	0	0	0	0	0	0	0
2008	0	0	363121	6097	369218	754198	1.065	0	0	0	0	0	0	0	0	0
2009	0	0	341553	10275	351827	1106025	1.952	0	0	0	0	0	0	0	0	0
2010	0	0	321813	17049	338863	1444888	3.517	0	0	0	0	0	0	0	0	0
2011	0	0	303642	0	303642	1748530	6.146	0	0	0	0	0	0	0	0	0
2012	220871	2165	164778	0	383484	2132014	0.160	0	0	0	1	0	1	0	0	0
2013	66344	175	140061	0	206231	2338245	0.053	0	1	0	1	0	1	0	0	0
2014	0	0	131431	0	131431	2469676	0.110	0	1	0	1	0	1	0	0	0
2015	52889	524	106616	0	158981	2628657	0.024	0	2	0	1	0	1	0	0	0
2016	9376	139	99102	0	108340	2736996	0.024	0	2	0	1	0	1	1	0	0
2017	0	0	93425	0	93425	2830421	0.053	0	2	0	1	0	1	1	0	0
2018	37645	1049	82363	0	118959	2949380	0.016	0	3	0	1	0	1	1	0	0
2019	0	0	77584	0	77584	3026964	0.034	0	3	0	1	0	1	1	0	0
2020	30011	1399	69222	0	97834	3124798	0.021	0	4	0	1	0	1	1	0	0
2021	0	0	65124	0	65124	3189923	0.048	0	4	0	1	0	1	1	0	0
2022	23924	1748	58744	0	80920	3270843	0.042	0	5	0	1	0	1	1	0	0
2023	0	0	55161	0	55161	3326004	0.108	0	5	0	1	0	1	1	0	0
2024	19072	2098	50236	0	67210	3393214	0.104	0	6	0	1	0	1	1	0	0
2025	0	0	47182	0	47182	3440395	0.285	0	6	0	1	0	1	1	0	0
2026	15204	2448	43289	0	56045	3496441	0.329	0	7	0	1	0	1	1	0	0
2027	2695	521	40540	0	42715	3539156	0.475	0	7	0	1	0	1	2	0	0
2028	13042	3010	37128	0	47161	3586316	0.486	0	8	1	1	0	1	2	0	0
2029	10822	2972	34248	0	42098	3628414	0.231	0	9	1	1	0	1	2	0	0
2030	19325	6294	29160	0	42191	3670605	0.321	0	11	1	1	0	1	2	0	0
2031	2369	912	27185	0	28642	3699247	0.487	0	11	2	1	0	1	3	0	0
2032	7703	3497	25315	0	29521	3728768	0.278	0	12	2	1	0	1	3	0	0
2033	1366	729	23630	0	24266	3753035	0.524	0	12	2	1	0	1	4	0	0
2034	12282	7693	22036	0	26625	3779659	0.311	0	14	2	1	0	1	4	0	0
2035	5483	4021	20605	0	22067	3801726	0.222	0	15	2	1	0	1	4	0	0
2036	972	833	19113	0	19252	3820977	0.466	0	15	2	1	0	1	5	0	0

JPPC available after 2015, Petcoke and Coal (cogen) committed, No Natural Gas

YEAR	CONCST	SALVAL	OPCOST	ENSCST	TOTAL	OBJ.FUN. (CUMM.)	LOLP %	GTAD	NGCC	MSD	COCG	CC#2	PETC	GTNG	COAL	LSD
	------ PRESENT WORTH COST OF THE YEAR (K$) ------															
2007	0	0	382112	2868	384980	384980	0.524	0	0	0	0	0	0	0	0	0
2008	0	0	363121	6097	369218	754198	1.065	0	0	0	0	0	0	0	0	0
2009	0	0	341553	10275	351827	1106025	1.952	0	0	0	0	0	0	0	0	0
2010	0	0	321813	17049	338863	1444888	3.517	0	0	0	0	0	0	0	0	0
2011	0	0	303642	0	303642	1748530	6.146	0	0	0	0	0	0	0	0	0
2012	349065	3422	175709	0	521352	2269882	0.347	0	0	0	1	0	1	0	1	0
2013	114110	1504	142208	0	254814	2524696	0.081	0	0	0	1	0	1	0	2	0
2014	0	0	135138	0	135138	2659834	0.169	0	0	0	1	0	1	0	2	0
2015	181935	4010	91860	0	269785	2929619	0.057	0	0	0	1	0	1	0	4	0
2016	0	0	87554	0	87554	3017172	0.137	0	0	0	1	0	1	0	4	0
2017	0	0	83877	0	83877	3101050	0.312	0	0	0	1	0	1	0	4	0
2018	64749	2757	72037	0	134029	3235078	0.084	0	0	0	1	0	1	0	5	0
2019	0	0	68624	0	68624	3303702	0.214	0	0	0	1	0	1	0	5	0
2020	51617	3258	60541	0	108901	3412603	0.131	0	0	0	1	0	1	0	6	0
2021	0	0	57596	0	57596	3470199	0.328	0	0	0	1	0	1	0	6	0
2022	41149	3759	51354	0	88744	3558943	0.129	0	0	0	1	0	1	0	7	0
2023	0	0	48622	0	48622	3607565	0.314	0	0	0	1	0	1	0	7	0
2024	32804	4260	43774	0	72318	3679882	0.137	0	0	0	1	0	1	0	8	0
2025	0	0	41409	0	41409	3721291	0.350	0	0	0	1	0	1	0	8	0
2026	26151	4761	37553	0	58943	3780234	0.168	0	0	0	1	0	1	0	9	0
2027	0	0	35513	0	35514	3815747	0.443	0	0	0	1	0	1	0	9	0
2028	20847	5262	32343	0	47929	3863676	0.241	0	0	0	1	0	1	0	10	0
2029	1646	452	30546	0	31740	3895416	0.501	0	0	2	1	0	1	0	10	0
2030	27085	9172	26314	0	44227	3939643	0.539	2	0	2	1	0	1	0	11	2
2031	14839	6014	24126	0	32950	3972593	0.353	2	0	2	1	0	1	0	12	2
2032	2115	960	23040	0	24195	3996787	0.517	3	0	3	1	0	1	0	12	2
2033	11829	6515	21099	0	26413	4023201	0.370	3	0	3	1	0	1	0	13	2
2034	12715	8115	19456	0	24057	4047257	0.544	4	0	5	1	0	1	0	14	2
2035	2594	1903	18604	0	19295	4066552	0.538	6	0	6	1	0	1	0	14	2
2036	8420	7267	17124	0	18277	4084829	0.453	6	0	6	1	0	1	0	15	2

Short-term/Interim capacity (2008 -10)

40MW ADOGT-2008; 40MW ADOGT-2010; 2102 convert GTs to Natural Gas and add 40MW Heat Recovery unit to CCGT.

YEAR	PRESENT WORTH COST OF THE YEAR (K$)					OBJ.FUN.	LOLP	GTAD		MSD		CC#2		GTNG		LSD
	CONCST	SALVAL	OPCOST	ENSCST	TOTAL	(CUMM.)	%		NGCC		COCG		PETC		COAL	
2007	0	0	382028	2868	384896	384896	0.524	0	0	0	0	0	0	0	0	0
2008	0	0	361434	2370	363803	748699	0.393	0	0	0	0	0	0	0	0	0
2009	0	0	339335	3977	343312	1092012	0.773	0	0	0	0	0	0	0	0	0
2010	0	0	317470	2726	320197	1412209	0.577	0	0	0	0	0	0	0	0	0
2011	0	0	298406	0	298406	1710615	1.140	0	0	0	0	0	0	0	0	0
2012	118674	1019	162708	0	280363	1990978	0.050	0	0	0	0	0	1	1	0	0
2013	0	0	152564	0	152564	2143542	0.105	0	0	0	0	0	1	1	0	0
2014	96325	1658	128943	0	223610	2367152	0.047	0	0	0	1	0	1	1	0	0
2015	52889	524	103171	0	155535	2522687	0.036	0	1	0	1	0	1	1	0	0
2016	0	0	97380	0	97380	2620066	0.080	0	1	0	1	0	1	1	0	0
2017	42163	874	85846	0	127135	2747201	0.020	0	2	0	1	0	1	1	0	0
2018	0	0	80850	0	80850	2828051	0.045	0	2	0	1	0	1	1	0	0
2019	33612	1224	72350	0	104739	2932790	0.015	0	3	0	1	0	1	1	0	0
2020	0	0	67980	0	67980	3000770	0.060	0	3	0	1	0	1	1	0	0
2021	0	0	64133	0	64133	3064903	0.150	0	3	0	1	0	1	1	0	0
2022	23924	1748	57778	0	79954	3144857	0.126	0	4	0	1	0	1	1	0	0
2023	0	0	54419	0	54419	3199276	0.318	0	4	0	1	0	1	1	0	0
2024	19072	2098	49553	0	66528	3265804	0.302	0	5	0	1	0	1	1	0	0
2025	3381	451	46436	0	49366	3315170	0.403	0	5	0	1	0	1	2	0	0
2026	15204	2448	42734	0	55491	3370661	0.466	0	6	0	1	0	1	2	0	0
2027	13575	2623	39397	0	50349	3421010	0.197	0	7	0	1	0	1	2	0	0
2028	12121	2797	35263	0	44586	3465596	0.233	0	8	0	1	0	1	2	0	0
2029	2149	590	32977	0	34536	3500131	0.364	0	8	0	1	0	1	3	0	0
2030	13051	4250	29051	0	37851	3537983	0.495	0	9	2	1	0	1	4	0	0
2031	8627	3322	26934	0	32239	3570222	0.264	0	10	2	1	0	1	4	0	0
2032	1529	694	25255	0	26090	3596312	0.480	0	10	2	1	0	1	5	0	0
2033	6878	3672	23444	0	26650	3622962	0.291	0	11	2	1	0	1	5	0	0
2034	7360	4610	21785	0	24535	3647497	0.530	0	12	2	1	0	1	6	0	0
2035	5483	4021	20319	0	21781	3669277	0.364	0	13	2	1	0	1	6	0	0
2036	4895	4196	18964	0	19664	3688941	0.272	0	14	2	1	0	1	6	0	0

Interim Capacity: 40MW GT (ADO) - 2008

YEAR	PRESENT CONCST	WORTH COST OF THE YEAR (K$) SALVAL	OPCOST	ENSCST	TOTAL	OBJ.FUN. (CUMM.)	LOLP %	GTAD	NGCC	MSD	COCG	CC#2	PETC	GTNG	COAL	LSD
2007	0	0	382028	2868	384896	384896	0.524	0	0	0	0	0	0	0	0	0
2008	0	0	361434	2370	363803	748699	0.393	0	0	0	0	0	0	0	0	0
2009	0	0	339335	3977	343312	1092012	0.773	0	0	0	0	0	0	0	0	0
2010	0	0	319061	6795	325856	1417867	1.473	0	0	0	0	0	0	0	0	0
2011	0	0	300420	0	300420	1718287	2.746	0	0	0	0	0	0	0	0	0
2012	224750	2204	160622	0	383168	2101455	0.063	0	0	0	1	0	1	0	0	0
2013	0	0	150816	0	150816	2252271	0.133	0	0	0	1	0	1	0	0	0
2014	59236	350	128879	0	187765	2440036	0.046	0	1	0	1	0	1	0	0	0
2015	52889	525	103049	0	155414	2595450	0.035	0	2	0	1	0	1	0	0	0
2016	0	0	97279	0	97279	2692729	0.078	0	2	0	1	0	1	0	0	0
2017	42163	874	85619	0	126908	2819637	0.020	0	3	0	1	0	1	0	0	0
2018	0	0	80702	0	80702	2900339	0.045	0	3	0	1	0	1	0	0	0
2019	33612	1224	71783	0	104171	3004510	0.014	0	4	0	1	0	1	0	0	0
2020	0	0	67694	0	67694	3072204	0.059	0	4	0	1	0	1	0	0	0
2021	26795	1574	60811	0	86033	3158237	0.020	0	5	0	1	0	1	0	0	0
2022	0	0	57306	0	57306	3215543	0.123	0	5	0	1	0	1	0	0	0
2023	0	0	54194	0	54194	3269737	0.312	0	5	0	1	0	1	0	0	0
2024	19072	2098	48967	0	65941	3335678	0.297	0	6	0	1	0	1	0	0	0
2025	3381	451	45990	0	48920	3384598	0.397	0	6	0	1	0	1	1	0	0
2026	15204	2448	42068	0	54825	3439423	0.460	0	7	0	1	0	1	1	0	0
2027	13575	2623	38604	0	49556	3488979	0.194	0	8	0	1	0	1	1	0	0
2028	12121	2797	35581	0	44904	3533883	0.231	0	9	0	1	0	1	1	0	0
2029	2149	590	33202	0	34761	3568644	0.360	0	9	0	1	0	1	2	0	0
2030	19325	6294	29256	0	42287	3610931	0.201	0	11	0	1	0	1	2	0	0
2031	1713	660	27225	0	28278	3639209	0.341	0	11	0	1	0	1	3	0	0
2032	2115	960	25445	0	26600	3665809	0.543	0	11	1	1	0	1	4	0	0
2033	3254	1737	23795	0	25312	3691121	0.494	0	11	2	1	0	1	6	0	0
2034	8579	5374	22060	0	25266	3716387	0.501	0	12	2	1	0	1	8	0	0
2035	2594	1903	20678	0	21370	3737757	0.517	0	12	3	1	0	1	10	0	0
2036	4895	4196	19229	0	19928	3757685	0.381	0	13	3	1	0	1	10	0	0

Interim Capacity: 40MW MSD (HFO) - 2008

YEAR	PRESENT WORTH COST OF THE YEAR (K$)					OBJ.FUN.	LOLP	GTAD		MSD		CC#2		GTNG		LSD
	CONCST	SALVAL	OPCOST	ENSCST	TOTAL	(CUMM.)	%		NGCC		COCG		PETC		COAL	
2007	0	0	382028	2868	384896	384896	0.524	0	0	0	0	0	0	0	0	0
2008	0	0	359033	2435	361468	746364	0.405	0	0	0	0	0	0	0	0	0
2009	0	0	336565	4088	340653	1087017	0.795	0	0	0	0	0	0	0	0	0
2010	0	0	315672	6981	322653	1409670	1.510	0	0	0	0	0	0	0	0	0
2011	0	0	296930	0	296930	1706600	2.809	0	0	0	0	0	0	0	0	0
2012	224750	2203	165869	0	388415	2095016	0.065	0	0	0	1	0	1	0	0	0
2013	0	0	155509	0	155509	2250525	0.137	0	0	0	1	0	1	0	0	0
2014	59236	350	133037	0	191923	2442448	0.047	0	1	0	1	0	1	0	0	0
2015	52889	524	106710	0	159074	2601522	0.036	0	2	0	1	0	1	0	0	0
2016	0	0	100566	0	100566	2702088	0.080	0	2	0	1	0	1	0	0	0
2017	42163	874	88582	0	129870	2831958	0.021	0	3	0	1	0	1	0	0	0
2018	0	0	83334	0	83334	2915292	0.046	0	3	0	1	0	1	0	0	0
2019	33612	1224	74383	0	106772	3022064	0.015	0	4	0	1	0	1	0	0	0
2020	0	0	69884	0	69884	3091948	0.061	0	4	0	1	0	1	0	0	0
2021	0	0	65883	0	65883	3157831	0.151	0	4	0	1	0	1	0	0	0
2022	23924	1748	59201	0	81377	3239208	0.126	0	5	0	1	0	1	0	0	0
2023	0	0	55766	0	55767	3294974	0.318	0	5	0	1	0	1	0	0	0
2024	19072	2098	50637	0	67611	3362586	0.304	0	6	0	1	0	1	0	0	0
2025	3381	451	47416	0	50346	3412931	0.405	0	6	0	1	0	1	1	0	0
2026	15204	2448	43546	0	56303	3469234	0.468	0	7	0	1	0	1	1	0	0
2027	5391	1042	40672	0	45021	3514255	0.350	0	7	0	1	0	1	3	0	0
2028	12121	2797	36527	0	45851	3560106	0.413	0	8	0	1	0	1	3	0	0
2029	10822	2972	33650	0	41500	3601606	0.198	0	9	0	1	0	1	3	0	0
2030	11581	3772	29681	0	37491	3639096	0.346	0	10	0	1	0	1	4	0	0
2031	2369	912	27783	0	29240	3668336	0.532	0	10	1	1	0	1	5	0	0
2032	7703	3497	25766	0	29973	3698309	0.298	0	11	1	1	0	1	5	0	0
2033	1889	1008	24123	0	25003	3723312	0.502	0	11	2	1	0	1	6	0	0
2034	6969	4365	23358	0	25962	3749274	0.547	3	11	2	1	0	1	7	0	1
2035	5483	4021	21676	0	23138	3772412	0.378	3	12	2	1	0	1	7	0	1
2036	1944	1666	20308	0	20586	3792998	0.467	3	12	2	1	0	1	9	0	1

APPENDIX II

12. APPENDIX II: BASE CASE DETAILED REPORT

SUMMARY REPORT

ON A GENERATION EXPANSION PLAN FOR

Base case

PROCESSED BY THE WASP-IV COMPUTER PROGRAM PACKAGE

OF THE IAEA

STUDY PERIOD

2007 - 2036

PLANNING PERIOD

2007 - 2036

CONSTRUCTION COSTS

IN MILLION $

ARE REPORTED ONLY FOR

PLANTS COMMISSIONED

DURING THE PLANNING PERIOD.

ALL OTHER INFORMATION IS GIVEN

FOR THE WHOLE STUDY PERIOD.

THIS IS A LIST OF THE DIFFERENT TYPES OF ELECTRIC POWER PLANTS

USED IN THE STUDY.

THE NUMERIC CODES ARE USED BY THE COMPUTER PROGRAMS

0	HFO	Bunker C (NO6)
1	COAL	Coal
2	DISL	Diesel (NO2)
3	LNGW	LNG World Market
4	PETC	PETCOKE
5	ORIM	ORIMULSION
6	LNGG	LNG from Venezuela
7	****	NOT APPLICABLE
8	****	NOT APPLICABLE
9	****	NOT APPLICABLE

SYSTEM WITHOUT PUMPED STORAGE PROJECTS:

HROR	RUN-OF-RIVER PLANT
HSTO	SHORT TERM STORAGE

ANNUAL LOAD DESCRIPTION

PERIOD(S) PER YEAR : 4

YEAR	PEAKLOAD	GR.RATE	MIN.LOAD	GR.RATE	ENERGY	GR.RATE	LOADFACTOR
	MW	%	MW	%	GWH	%	%
2007	623.7	-	295.7	-	4089.2	-	74.85
2008	652.2	4.6	324.8	9.9	4310.1	5.4	75.44
2009	679.6	4.2	338.5	4.2	4491.2	4.2	75.44
2010	707.4	4.1	352.3	4.1	4674.9	4.1	75.44
2011	736.4	4.1	366.8	4.1	4866.6	4.1	75.44
2012	766.8	4.1	381.9	4.1	5067.5	4.1	75.44
2013	798.7	4.2	397.8	4.2	5278.3	4.2	75.44
2014	831.5	4.1	414.1	4.1	5495.0	4.1	75.44
2015	866.7	4.2	431.7	4.2	5727.7	4.2	75.44
2016	904.1	4.3	450.3	4.3	5974.8	4.3	75.44
2017	943.2	4.3	469.8	4.3	6233.2	4.3	75.44
2018	983.3	4.3	489.7	4.3	6498.2	4.3	75.44
2019	1025.7	4.3	510.9	4.3	6778.4	4.3	75.44
2020	1070.5	4.4	533.2	4.4	7074.5	4.4	75.44
2021	1116.4	4.3	556.0	4.3	7377.8	4.3	75.44
2022	1164.8	4.3	580.1	4.3	7697.7	4.3	75.44
2023	1214.4	4.3	604.8	4.3	8025.5	4.3	75.44
2024	1266.7	4.3	630.9	4.3	8371.1	4.3	75.44
2025	1321.8	4.3	658.3	4.3	8735.2	4.3	75.44
2026	1379.3	4.4	687.0	4.4	9115.2	4.4	75.44
2027	1439.3	4.4	716.9	4.4	9511.7	4.4	75.44
2028	1501.9	4.3	748.0	4.3	9925.4	4.3	75.44
2029	1567.2	4.3	780.6	4.3	10357.0	4.3	75.44
2030	1635.4	4.4	814.5	4.4	10807.7	4.4	75.44
2031	1706.5	4.3	849.9	4.3	11277.6	4.3	75.44
2032	1780.7	4.3	886.9	4.3	11767.9	4.3	75.44
2033	1858.2	4.4	925.5	4.4	12280.1	4.4	75.44
2034	1939.0	4.3	965.7	4.3	12814.1	4.3	75.44
2035	2023.3	4.3	1007.7	4.3	13371.2	4.3	75.44
2036	2111.3	4.3	1051.5	4.3	13952.7	4.3	75.44

FIXED SYSTEM

SUMMARY DESCRIPTION OF THERMAL PLANTS IN YEAR 2007

NO.	NAME	NO. OF SETS	MIN. LOAD MW	CAPA CITY MW	HEAT RATES KCAL/KWH BASE LOAD	AVGE INCR	FUEL COSTS CENTS/ MILLION KCAL DMSTC	FORGN	FUEL TYPE	FAST SPIN RES %	FOR %	DAYS SCHL MAIN	MAIN CLAS MW	O&M (FIX) $/KWM	O&M (VAR) $/MWH
3	OH1	1	14.	28.	3906.	3512.	0.0	2780.0	0	10	8.0	28	30.	0.75	6.70
4	OH2	1	30.	57.	3659.	3334.	0.0	2780.0	0	10	8.0	28	60.	0.38	6.70
5	OH3	1	30.	62.	3578.	2546.	0.0	2780.0	0	10	8.0	28	60.	0.35	6.70
6	OH4	1	30.	65.	3195.	2901.	0.0	2780.0	0	10	8.0	28	60.	0.33	6.70
7	HB6	1	30.	65.	3436.	2715.	0.0	2845.0	0	10	8.0	28	60.	0.33	6.70
8	RF1	1	9.	17.	2511.	2063.	0.0	2880.0	0	10	5.0	38	20.	0.93	8.00
9	RF2	1	9.	17.	2511.	2063.	0.0	2880.0	0	10	5.0	38	20.	0.93	8.00
10	GT4	0	5.	21.	6514.	2357.	0.0	5145.0	2	0	5.0	38	20.	0.39	5.00
11	GT5	1	5.	21.	7104.	2698.	0.0	5145.0	2	0	5.0	38	20.	0.39	5.00
12	GT10	1	8.	32.	5048.	2523.	0.0	5145.0	2	0	5.0	38	30.	0.26	5.00
13	GT3	1	5.	21.	6702.	2451.	0.0	5194.0	2	0	5.0	38	20.	0.39	5.00
14	GT6	1	5.	14.	5244.	3450.	0.0	5194.0	2	0	5.0	19	20.	0.60	5.00
15	GT7	1	5.	14.	5390.	3129.	0.0	5194.0	2	0	5.0	19	20.	0.60	5.00
16	GT8	1	5.	14.	5944.	2908.	0.0	5194.0	2	0	5.0	19	20.	0.60	5.00
17	GT9	1	8.	20.	7694.	2622.	0.0	5194.0	2	0	5.0	19	20.	0.42	5.00
18	GT11	1	8.	20.	6300.	2885.	0.0	5194.0	2	0	5.0	19	20.	0.42	5.00
19	BOCC	1	20.	111.	2268.	1839.	0.0	5194.0	2	0	3.0	26	120.	0.99	6.00
20	JPPC	1	10.	60.	1929.	1929.	0.0	2880.0	0	10	3.0	26	30.	35.39	7.28
21	JEP1	0	3.	73.	1996.	1996.	0.0	2880.0	0	0	4.0	23	20.	23.48	18.29
22	JEP2	1	3.	124.	1960.	1960.	0.0	2880.0	0	0	4.0	23	120.	17.53	18.11
23	ALCO	1	4.	5.	2268.	2268.	0.0	2780.0	0	0	5.0	19	20.	15.00	10.59
24	BRLS	0	3.	13.	1764.	1764.	0.0	2880.0	0	0	5.0	19	20.	0.00	16.30
25	OH1n	0	14.	28.	4101.	3688.	0.0	1786.0	6	10	8.0	28	30.	0.75	6.03
26	OH2n	0	30.	57.	3843.	3500.	0.0	1786.0	6	10	8.0	28	60.	0.38	6.03
27	OH3n	0	30.	62.	3762.	2673.	0.0	1786.0	6	10	8.0	28	60.	0.35	6.03
28	OH4n	0	30.	65.	3345.	3055.	0.0	1786.0	6	10	8.0	28	60.	0.33	6.03
29	HB6n	0	30.	65.	3363.	3060.	0.0	1786.0	6	10	8.0	28	60.	0.33	6.03
30	JEPn	0	3.	124.	1960.	1960.	0.0	1786.0	6	0	4.0	23	120.	16.40	14.64
31	ALng	0	80.	85.	2040.	2040.	0.0	1786.0	6	0	5.0	8	60.	22.45	6.00

32	AL#2	0	80.	85.	2040.	2040.	0.0	5194.0	2	0	5.0	8	60.	22.45	6.00
33	ALdp	0	3.	20.	2040.	2040.	0.0	1786.0	6	0	5.0	8	20.	0.58	6.00
34	GT6u	0	5.	18.	6208.	3450.	0.0	5194.0	2	0	5.0	19	20.	1.01	5.00
35	GT7u	0	5.	18.	6487.	3129.	0.0	5194.0	2	10	5.0	19	20.	1.01	5.00
36	GT8u	0	5.	18.	7263.	2908.	0.0	5194.0	2	0	5.0	19	20.	1.01	5.00
37	RF1u	0	9.	19.	2561.	2063.	0.0	2880.0	0	10	5.0	38	20.	1.94	8.00
38	RF2u	0	9.	19.	2561.	2063.	0.0	2880.0	0	10	5.0	38	20.	1.94	8.00
39	BCCu	0	20.	123.	2314.	1839.	0.0	5194.0	2	0	3.0	26	120.	1.36	6.00
40	BCC6	0	20.	111.	2268.	1839.	0.0	2880.0	0	0	3.0	26	120.	0.99	6.00
41	UntX	0	8.	20.	2047.	2047.	0.0	5194.0	2	0	5.0	8	20.	0.62	6.35
42	UntY	0	10.	60.	1929.	1929.	0.0	2880.0	0	10	3.0	26	30.	8.85	8.00
43	GT5N	0	5.	21.	7104.	2698.	0.0	1786.0	6	0	5.0	38	20.	0.39	5.00
44	G10N	0	8.	32.	5048.	2523.	0.0	1786.0	6	0	5.0	38	30.	0.26	5.00
45	GT4N	0	5.	21.	6514.	2357.	0.0	1786.0	6	0	5.0	38	20.	0.39	5.00

FIXED SYSTEM

SUMMARY DESCRIPTION OF COMPOSITE HYDROELECTRIC PLANT TYPE HROR

*** CAPACITY IN MW * ENERGY IN GWH ***

FIXED O&M COSTS : 2.000 $/KW-MONTH

	P		HYDROCONDITION 1		
	R	P	PROB.: 1.00		
	O	E	CAPACITY		ENERGY
YEAR	J	R	BASE	PEAK	
2007	8	1	10.	0.	22.
		2	11.	0.	25.
		3	12.	0.	27.
		4	12.	0.	27.
		INST.CAP.	23.		
		TOTAL ENERGY			101.

FIXED SYSTEM

THERMAL ADDITIONS AND RETIREMENTS

NUMBER OF SETS ADDED AND RETIRED(-) 2007 TO 2036

YEAR: 19.. (200./20..)

NO.	NAME	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
3	OH1			-1																				
4	OH2	-1																						
5	OH3	-1																						
6	OH4	-1																						
7	HB6	-1																						
8	RF1									-1														
9	RF2									-1														
11	GT5	-1																						
12	GT10	-1																						
19	BOCC																							-1
20	JPPC				-1																			
22	JEP2	-1																						
26	OH2n	1										-1												
27	OH3n	1												-1										
28	OH4n	1																-1						
29	HB6n	1														-1								
30	JEPn	1																		-1				
43	GT5N	1																						
44	G10N	1																						

FIXED SYSTEM

SUMMARY OF INSTALLED CAPACITIES

(NOMINAL CAPACITIES (MW))

	HYDROELECTRIC				THERMAL										TOTAL
	HROR		HSTO		FUEL TYPE										
					0	1	2	3	4	5	6	7	8	9	
YEAR	PR.	CAP	PR.	CAP	HFO	COAL	DISL	LNGW	PETC	ORIM	LNGG	****	****	****	
2007	8	23.	0	0.	501.	0.	267.	0.	0.	0.	0.	0.	0.	0.	791.
2008	8	23.	0	0.	501.	0.	267.	0.	0.	0.	0.	0.	0.	0.	791.
2009	8	23.	0	0.	501.	0.	267.	0.	0.	0.	0.	0.	0.	0.	791.
2010	8	23.	0	0.	501.	0.	267.	0.	0.	0.	0.	0.	0.	0.	791.
2011	8	23.	0	0.	501.	0.	267.	0.	0.	0.	0.	0.	0.	0.	791.
2012	8	23.	0	0.	128.	0.	214.	0.	0.	0.	427.	0.	0.	0.	791.
2013	8	23.	0	0.	128.	0.	214.	0.	0.	0.	427.	0.	0.	0.	791.
2014	8	23.	0	0.	100.	0.	214.	0.	0.	0.	427.	0.	0.	0.	763.
2015	8	23.	0	0.	40.	0.	214.	0.	0.	0.	427.	0.	0.	0.	703.
2016	8	23.	0	0.	40.	0.	214.	0.	0.	0.	427.	0.	0.	0.	703.
2017	8	23.	0	0.	40.	0.	214.	0.	0.	0.	427.	0.	0.	0.	703.
2018	8	23.	0	0.	40.	0.	214.	0.	0.	0.	427.	0.	0.	0.	703.
2019	8	23.	0	0.	40.	0.	214.	0.	0.	0.	427.	0.	0.	0.	703.
2020	8	23.	0	0.	5.	0.	214.	0.	0.	0.	427.	0.	0.	0.	668.
2021	8	23.	0	0.	5.	0.	214.	0.	0.	0.	427.	0.	0.	0.	668.
2022	8	23.	0	0.	5.	0.	214.	0.	0.	0.	370.	0.	0.	0.	611.
2023	8	23.	0	0.	5.	0.	214.	0.	0.	0.	370.	0.	0.	0.	611.
2024	8	23.	0	0.	5.	0.	214.	0.	0.	0.	308.	0.	0.	0.	550.
2025	8	23.	0	0.	5.	0.	214.	0.	0.	0.	308.	0.	0.	0.	550.
2026	8	23.	0	0.	5.	0.	214.	0.	0.	0.	243.	0.	0.	0.	484.
2027	8	23.	0	0.	5.	0.	214.	0.	0.	0.	243.	0.	0.	0.	484.
2028	8	23.	0	0.	5.	0.	214.	0.	0.	0.	178.	0.	0.	0.	419.
2029	8	23.	0	0.	5.	0.	214.	0.	0.	0.	178.	0.	0.	0.	419.
2030	8	23.	0	0.	5.	0.	214.	0.	0.	0.	54.	0.	0.	0.	295.
2031	8	23.	0	0.	5.	0.	214.	0.	0.	0.	54.	0.	0.	0.	295.
2032	8	23.	0	0.	5.	0.	214.	0.	0.	0.	54.	0.	0.	0.	295.

2033	8	23.	0	0.	5.	0.	214.	0.	0.	0.	54.	0.	0.	0.	295.
2034	8	23.	0	0.	5.	0.	103.	0.	0.	0.	54.	0.	0.	0.	184.
2035	8	23.	0	0.	5.	0.	103.	0.	0.	0.	54.	0.	0.	0.	184.
2036	8	23.	0	0.	5.	0.	103.	0.	0.	0.	54.	0.	0.	0.	184.

VARIABLE SYSTEM

SUMMARY DESCRIPTION OF THERMAL PLANTS

					HEAT RATES		FUEL COSTS			FAST					
		NO.	MIN.	CAPA	KCAL/KWH		CENTS/			SPIN	FOR	DAYS	MAIN	O&M	O&M
		OF	LOAD	CITY	BASE	AVGE	MILLION	KCAL	FUEL	RES		SCHL	CLAS	(FIX)	(VAR)
NO.	NAME	SETS	MW	MW	LOAD	INCR	DMSTC	FORGN	TYPE	%	%	MAIN	MW	$/KWM	$/MWH
1	GTAD	0	8.	39.	4285.	2175.	0.0	5145.0	2	2	3.0	19	40.	0.37	1.50
2	NGCC	0	20.	117.	3722.	1512.	0.0	1786.0	6	0	3.0	26	120.	0.99	3.00
3	MSD	0	5.	9.	1966.	1966.	0.0	2880.0	0	0	6.0	33	20.	1.80	5.00
4	COCG	0	40.	113.	2999.	2335.	0.0	825.0	1	10	5.0	26	120.	2.48	7.00
5	CC#2	0	20.	117.	2241.	1817.	0.0	5194.0	2	0	3.0	26	120.	0.99	6.00
6	PETC	0	40.	113.	3046.	2310.	0.0	643.0	4	10	5.0	26	120.	4.60	7.50
7	GTNG	0	8.	39.	4285.	2175.	0.0	1786.0	6	0	3.0	26	40.	0.37	1.50
8	COAL	0	20.	112.	3092.	2281.	0.0	825.0	1	10	5.0	26	120.	2.48	7.00
9	LSD	0	10.	29.	1915.	1915.	0.0	2880.0	0	10	5.0	19	40.	2.48	8.00

C O N G E N

CONSTRAINTS ON CONFIGURATIONS GENERATED

CON: NUMBER OF CONFIGURATIONS

MIMIMUM

MAXIMUM

RES. PERMITTED EXTREME CONFIGURATIONS OF ALTERNATIVES

YEAR	CON	MAR- GIN	GTAD	NGCC	MSD	COCG	CC#2	PETC	GTNG	COAL	LSD
2007	1	0	0	0	0	0	0	0	0	0	0
		40	0	0	0	0	0	0	0	0	0
2008	1	0	0	0	0	0	0	0	0	0	0
		40	0	0	0	0	0	0	0	0	0
2009	1	0	0	0	0	0	0	0	0	0	0
		40	0	0	0	0	0	0	0	0	0
2010	1	0	0	0	0	0	0	0	0	0	0
		40	0	0	0	0	0	0	0	0	0
2011	1	0	0	0	0	0	0	0	0	0	0
		40	0	0	0	0	0	0	0	0	0
2012	11	0	0	1	0	0	0	0	0	0	0
		40	0	3	0	1	0	1	2	1	0
2013	15	0	0	1	0	0	0	0	0	0	0
		40	0	3	0	1	0	1	2	1	0
2014	11	0	0	2	0	0	0	0	0	0	0
		40	0	4	0	1	0	1	2	1	0
2015	11	0	0	3	0	0	0	0	0	0	0
		40	0	5	0	1	0	1	2	1	0
2016	15	0	0	3	0	0	0	0	0	0	0
		40	0	5	0	1	0	1	2	1	0
2017	11	0	0	4	0	0	0	0	0	0	0
		40	0	6	0	1	0	1	2	1	0
2018	15	0	0	4	0	0	0	0	0	0	0
		40	0	6	0	1	0	1	2	1	0
2019	29	0	0	4	0	0	0	0	0	0	0
		40	0	6	0	1	0	1	2	1	0
2020	44	0	0	5	0	0	0	0	0	0	0

		40	0	7	1	1	0	1	2	1	0
2021	71	0	0	5	0	0	0	0	0	0	0
		40	0	7	1	1	0	1	2	1	0
2022	72	0	0	6	0	0	0	0	0	0	0
		40	0	8	1	1	0	1	2	1	0
2023	100	0	0	6	0	0	0	0	0	0	0
		40	0	8	1	1	0	1	2	1	0
2024	101	0	0	7	0	0	0	0	0	0	0
		40	0	9	1	1	0	1	2	1	0
2025	114	0	0	7	0	0	0	0	1	0	0
		40	0	9	1	1	0	1	3	1	0
2026	122	0	0	8	0	0	0	0	1	0	0
		40	0	10	1	1	0	1	3	1	0
2027	130	0	0	8	0	0	0	0	2	0	0
		40	0	10	1	1	0	1	4	1	0
2028	195	0	0	9	0	0	0	0	3	0	0
		40	0	11	2	1	0	1	5	1	0
2029	208	0	0	9	0	0	0	0	4	0	0
		40	0	11	2	1	0	1	6	1	0
2030	403	0	0	11	0	0	0	0	4	0	0
		40	0	13	2	1	0	1	6	1	1
2031	422	0	0	11	0	0	0	0	5	0	0
		40	0	13	2	1	0	1	7	1	1
2032	419	0	0	12	0	0	0	0	5	0	0
		40	0	14	2	1	0	1	7	1	1
2033	429	0	0	12	0	0	0	0	6	0	0
		40	0	14	2	1	1	1	8	0	1
2034	428	0	0	14	0	0	0	0	6	0	0
		40	0	16	2	1	1	1	8	0	1
2035	428	0	0	15	0	0	0	0	6	0	0
		40	0	17	2	1	1	1	8	0	1
2036	216	0	0	15	0	0	0	0	7	0	0
		40	0	17	0	1	1	1	9	0	2

4025 TOTAL NUMBER OF CONFIGURATIONS GENERATED

D Y N P R O

SUMMARY OF CAPITAL COSTS OF ALTERNATIVES IN $/KW

PLANT	CAPITAL COSTS (DEPRECIABLE PART) DOMESTIC	FOREIGN	INCLUSIVE IDC %	CONSTR. TIME (YEARS)	PLANT LIFE (YEARS)	CAPITAL COSTS (NON-DEPREC. PART) DOMESTIC	FOREIGN
THERMAL PLANT CAPITAL COSTS							
GTAD	0.0	666.7	4.90	0.50	25.	0.0	0.0
NGCC	0.0	1120.2	9.61	2.00	25.	0.0	0.0
MSD	0.0	1106.3	9.61	2.00	25.	0.0	0.0
COCG	0.0	1887.8	14.13	3.00	30.	0.0	0.0
CC#2	0.0	1120.2	9.61	2.00	25.	0.0	0.0
PETC	0.0	1623.6	14.13	3.00	30.	0.0	0.0
GTNG	0.0	666.7	4.90	0.50	25.	0.0	0.0
COAL	0.0	1879.3	14.13	3.00	30.	0.0	0.0
LSD	0.0	1548.8	9.61	2.00	25.	0.0	0.0

D Y N P R O

ECONOMIC PARAMETERS AND CONSTRAINTS

ALL COSTS WILL BE DISCOUNTED TO YEAR : 2007

BASE YEAR FOR ESCALATION CALCULATION IS : 2007

DISCOUNT RATE APPLIED TO ALL DOMESTIC COSTS - %/YR 12.0

DISCOUNT RATE APPLIED TO ALL FOREIGN COSTS - %/YR 12.0

2007 INITIAL VALUES : (XX) = INDEX NUMBER; (0) = NO INDEX READ

****

NAME OF ALTERNATIVES :

ESCALATION RATIOS FOR CAPITAL COSTS (0)

	GTAD	NGCC	MSD	COCG	CC#2	PETC	GTNG	COAL	LSD
DOMESTIC	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FOREIGN	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

D Y N P R O (CONTD.)

ECONOMIC PARAMETERS AND CONSTRAINTS

2007 INITIAL VALUES : (XX) = INDEX NUMBER; (0) = NO INDEX READ

****

FUEL TYPE:	THERMAL										HYDRO		ENERGY
	HFO	COAL	DISL	LNGW	PETC	ORIM	LNGG	****	****	****	HROR	HSTO	NOT SERVED
ESCALATION RATIOS FOR OPERATING COSTS (0)													
DOMESTIC	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FOREIGN	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
ESCALATION RATIOS FOR FUEL COSTS (17)													
DOMESTIC	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FOREIGN	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

COEFFICIENTS OF ENERGY NOT SERVED COST FUNCTION (11)		CF1	CF2	CF3
	($/KWH)	2.1500	0.0000	0.0000
PENALTY FACTOR ON FOREIGN EXPENDITURE	(3)	1.0000		
CRITICAL LOSS OF LOAD PROBABILITY IN %	(12)	10.5500		

DEPRECIATION OPTION (16) : 0 = LINEAR

```
                                   D Y N P R O

                    LISTING OF MODIFIED CONSTRAINTS DURING STUDY PERIOD

    2008 YEAR WHEN NEW VALUES ARE IN FORCE :  (XX) = INDEX NUMBER; ( 0) = NO INDEX READ

         *********************************

ESCALATION RATIOS FOR FUEL COSTS (17)
--------------------------------
DOMESTIC  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00
FOREIGN   1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00
FOREIGN   1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00
    2026 YEAR WHEN NEW VALUES ARE IN FORCE :  (XX) = INDEX NUMBER; ( 0) = NO INDEX READ
         *********************************
PENALTY FACTOR ON FOREIGN EXPENDITURE    ( 3)           1.0000

COEFFICIENTS OF ENERGY NOT SERVED COST FUNCTION (11)    CF1        CF2        CF3
------------------------------------------------
                                           ($/KWH)       0.0000     0.0000     0.0000
ESCALATION RATIOS FOR FUEL COSTS (17)
--------------------------------
DOMESTIC  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00
FOREIGN   1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00
          1.00  1.00  1.00  1.00  1.00  1.00
    2036 YEAR WHEN NEW VALUES ARE IN FORCE :  (XX) = INDEX NUMBER; ( 0) = NO INDEX READ
         *********************************
PENALTY FACTOR ON FOREIGN EXPENDITURE    ( 3)           1.0000

COEFFICIENTS OF ENERGY NOT SERVED COST FUNCTION (11)    CF1        CF2        CF3
------------------------------------------------
                                           ($/KWH)       0.0000     0.0000     0.0000
ESCALATION RATIOS FOR FUEL COSTS (17)
--------------------------------
DOMESTIC  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00
FOREIGN   1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00  1.00
```

EXPECTED COST OF OPERATION

FUEL COST - DOMESTIC

TYPE OF PLANT:		HFO	COAL	DISL	LNGW	PETC	ORIM	LNGG	****	****	****
YEAR	TOTAL			COST BY FUEL TYPE (MILLION $)							
2007	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2008	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2009	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2010	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2011	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2012	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2013	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2014	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2015	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2016	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2017	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2018	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2019	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2020	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2021	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2022	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2023	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2024	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2025	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2026	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2027	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2028	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2029	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2030	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2031	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2032	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2033	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2034	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2035	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2036	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		0.0		0.0		0.0		0.0		0.0	
TOTALS	0.0		0.0		0.0		0.0		0.0		0.0

EXPECTED COST OF OPERATION

FUEL COST - FOREIGN

TYPE OF PLANT:		HFO	COAL	DISL	LNGW	PETC	ORIM	LNGG	****	****	****
YEAR	TOTAL	COST BY FUEL TYPE (MILLION $)									
2007	309.1	263.1	0.0	46.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2008	333.8	270.5	0.0	63.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2009	355.8	274.3	0.0	81.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2010	379.8	277.9	0.0	101.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2011	406.0	279.9	0.0	126.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2012	218.1	27.9	0.0	2.1	0.0	0.0	0.0	188.1	0.0	0.0	0.0
2013	231.8	29.5	0.0	3.9	0.0	0.0	0.0	198.4	0.0	0.0	0.0
2014	219.7	23.7	0.0	1.0	0.0	0.0	0.0	195.1	0.0	0.0	0.0
2015	216.2	0.5	0.0	0.7	0.0	0.0	0.0	215.0	0.0	0.0	0.0
2016	229.2	0.9	0.0	1.5	0.0	0.0	0.0	226.9	0.0	0.0	0.0
2017	228.2	0.2	0.0	0.4	0.0	0.0	0.0	227.6	0.0	0.0	0.0
2018	241.0	0.5	0.0	0.8	0.0	0.0	0.0	239.7	0.0	0.0	0.0
2019	255.5	0.9	0.0	1.7	0.0	0.0	0.0	252.8	0.0	0.0	0.0
2020	256.9	0.0	0.0	0.9	0.0	0.0	0.0	255.9	0.0	0.0	0.0
2021	271.8	0.1	0.0	2.1	0.0	0.0	0.0	269.6	0.0	0.0	0.0
2022	276.3	0.1	0.0	1.7	0.0	0.0	0.0	274.6	0.0	0.0	0.0
2023	291.6	0.2	0.0	3.7	0.0	0.0	0.0	287.8	0.0	0.0	0.0
2024	299.6	0.1	0.0	3.4	0.0	0.0	0.0	296.0	0.0	0.0	0.0
2025	315.9	0.2	0.0	4.3	0.0	0.0	0.0	311.4	0.0	0.0	0.0
2026	327.8	0.2	0.0	4.7	0.0	0.0	0.0	322.9	0.0	0.0	0.0
2027	345.3	0.2	0.0	6.1	0.0	0.0	0.0	339.0	0.0	0.0	0.0
2028	346.6	0.2	0.0	4.0	0.0	0.0	0.0	342.4	0.0	0.0	0.0
2029	365.4	0.2	0.0	5.6	0.0	0.0	0.0	359.6	0.0	0.0	0.0
2030	376.1	0.1	0.0	3.3	0.0	0.0	0.0	372.7	0.0	0.0	0.0
2031	395.5	0.2	0.0	5.0	0.0	0.0	0.0	390.3	0.0	0.0	0.0
2032	409.9	0.1	0.0	3.0	0.0	0.0	0.0	406.8	0.0	0.0	0.0
2033	431.0	0.2	0.0	4.9	0.0	0.0	0.0	425.9	0.0	0.0	0.0
2034	444.1	0.0	0.0	1.0	0.0	0.0	0.0	443.1	0.0	0.0	0.0
2035	463.6	0.0	0.0	0.7	0.0	0.0	0.0	462.9	0.0	0.0	0.0
2036	484.3	0.0	0.0	1.4	0.0	0.0	0.0	482.9	0.0	0.0	0.0
TOTALS	9726.0	1451.9	0.0	486.7	0.0	0.0	0.0	7787.3	0.0	0.0	0.0

EXPECTED COST OF OPERATION

OPERATION & MAINTENANCE AND ENERGY NOT SERVED (ENS) - DOMESTIC

TYPE OF PLANT:		HFO	COAL	DISL	LNGW	PETC	ORIM	LNGG	****	****	****	HROR	HSTO	ENS
YEAR	TOTAL	COST BY FUEL TYPE (MILLION $)												
2007	95.2	90.1	0.0	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0
2008	96.5	90.6	0.0	5.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0
2009	97.5	90.9	0.0	6.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0
2010	98.6	91.1	0.0	6.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0
2011	99.6	91.2	0.0	7.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0
2012	89.9	30.6	0.0	2.0	0.0	0.0	0.0	56.6	0.0	0.0	0.0	0.5	0.0	0.0
2013	91.2	30.8	0.0	2.1	0.0	0.0	0.0	57.7	0.0	0.0	0.0	0.5	0.0	0.0
2014	90.6	29.9	0.0	2.0	0.0	0.0	0.0	58.2	0.0	0.0	0.0	0.5	0.0	0.0
2015	63.4	1.3	0.0	2.0	0.0	0.0	0.0	59.6	0.0	0.0	0.0	0.5	0.0	0.0
2016	65.4	1.4	0.0	2.0	0.0	0.0	0.0	61.5	0.0	0.0	0.0	0.5	0.0	0.0
2017	63.8	1.3	0.0	1.9	0.0	0.0	0.0	59.9	0.0	0.0	0.0	0.5	0.0	0.0
2018	66.0	1.3	0.0	2.0	0.0	0.0	0.0	62.2	0.0	0.0	0.0	0.5	0.0	0.0
2019	68.4	1.4	0.0	2.0	0.0	0.0	0.0	64.5	0.0	0.0	0.0	0.5	0.0	0.0
2020	66.8	0.9	0.0	2.0	0.0	0.0	0.0	63.4	0.0	0.0	0.0	0.5	0.0	0.0
2021	69.3	0.9	0.0	2.0	0.0	0.0	0.0	65.8	0.0	0.0	0.0	0.5	0.0	0.0
2022	68.5	0.9	0.0	2.0	0.0	0.0	0.0	65.0	0.0	0.0	0.0	0.5	0.0	0.0
2023	70.9	0.9	0.0	2.1	0.0	0.0	0.0	67.3	0.0	0.0	0.0	0.5	0.0	0.0
2024	70.7	0.9	0.0	2.1	0.0	0.0	0.0	67.2	0.0	0.0	0.0	0.5	0.0	0.0
2025	71.9	0.9	0.0	2.1	0.0	0.0	0.0	68.3	0.0	0.0	0.0	0.5	0.0	0.0
2026	72.2	0.9	0.0	2.1	0.0	0.0	0.0	68.6	0.0	0.0	0.0	0.5	0.0	0.0
2027	73.7	0.9	0.0	2.2	0.0	0.0	0.0	70.0	0.0	0.0	0.0	0.5	0.0	0.0
2028	73.5	0.9	0.0	2.1	0.0	0.0	0.0	70.0	0.0	0.0	0.0	0.5	0.0	0.0
2029	75.1	0.9	0.0	2.2	0.0	0.0	0.0	71.5	0.0	0.0	0.0	0.5	0.0	0.0
2030	52.8	0.9	0.0	2.1	0.0	0.0	0.0	49.3	0.0	0.0	0.0	0.5	0.0	0.0
2031	54.1	0.9	0.0	2.2	0.0	0.0	0.0	50.5	0.0	0.0	0.0	0.5	0.0	0.0
2032	57.2	0.9	0.0	2.1	0.0	0.0	0.0	53.6	0.0	0.0	0.0	0.5	0.0	0.0
2033	58.5	0.9	0.0	2.2	0.0	0.0	0.0	54.9	0.0	0.0	0.0	0.5	0.0	0.0
2034	62.1	0.9	0.0	0.6	0.0	0.0	0.0	60.0	0.0	0.0	0.0	0.5	0.0	0.0
2035	65.2	0.9	0.0	0.6	0.0	0.0	0.0	63.2	0.0	0.0	0.0	0.5	0.0	0.0
2036	66.9	0.9	0.0	0.6	0.0	0.0	0.0	64.8	0.0	0.0	0.0	0.5	0.0	0.0
TOTALS	2215.5	567.7	0.0	77.9	0.0	0.0	0.0	1553.4	0.0	0.0	0.0	16.4	0.0	0.0

EXPECTED COST OF OPERATION

TOTAL COST - DOMESTIC AND FOREIGN

TYPE OF PLANT:		HFO	COAL	DISL	LNGW	PETC	ORIM	LNGG	****	****	****	HROR	HSTO	ENS
YEAR	TOTAL	COST BY FUEL TYPE (MILLION $)												
2007	404.3	353.2	0.0	50.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0
2008	430.3	361.1	0.0	68.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0
2009	453.3	365.2	0.0	87.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0
2010	478.4	369.0	0.0	108.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0
2011	505.6	371.1	0.0	133.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0
2012	308.0	58.5	0.0	4.1	0.0	0.0	0.0	244.7	0.0	0.0	0.0	0.5	0.0	0.0
2013	322.9	60.3	0.0	6.0	0.0	0.0	0.0	256.0	0.0	0.0	0.0	0.5	0.0	0.0
2014	310.3	53.5	0.0	3.0	0.0	0.0	0.0	253.3	0.0	0.0	0.0	0.5	0.0	0.0
2015	279.6	1.8	0.0	2.7	0.0	0.0	0.0	274.6	0.0	0.0	0.0	0.5	0.0	0.0
2016	294.7	2.3	0.0	3.5	0.0	0.0	0.0	288.4	0.0	0.0	0.0	0.5	0.0	0.0
2017	291.9	1.6	0.0	2.3	0.0	0.0	0.0	287.5	0.0	0.0	0.0	0.5	0.0	0.0
2018	307.0	1.8	0.0	2.8	0.0	0.0	0.0	301.9	0.0	0.0	0.0	0.5	0.0	0.0
2019	323.9	2.3	0.0	3.7	0.0	0.0	0.0	317.3	0.0	0.0	0.0	0.5	0.0	0.0
2020	323.7	1.0	0.0	2.9	0.0	0.0	0.0	319.3	0.0	0.0	0.0	0.5	0.0	0.0
2021	341.0	1.0	0.0	4.1	0.0	0.0	0.0	335.4	0.0	0.0	0.0	0.5	0.0	0.0
2022	344.8	1.0	0.0	3.7	0.0	0.0	0.0	339.6	0.0	0.0	0.0	0.5	0.0	0.0
2023	362.5	1.1	0.0	5.8	0.0	0.0	0.0	355.1	0.0	0.0	0.0	0.5	0.0	0.0
2024	370.3	1.1	0.0	5.5	0.0	0.0	0.0	363.2	0.0	0.0	0.0	0.5	0.0	0.0
2025	387.9	1.1	0.0	6.4	0.0	0.0	0.0	379.8	0.0	0.0	0.0	0.5	0.0	0.0
2026	400.0	1.1	0.0	6.8	0.0	0.0	0.0	391.5	0.0	0.0	0.0	0.5	0.0	0.0
2027	419.0	1.2	0.0	8.3	0.0	0.0	0.0	408.9	0.0	0.0	0.0	0.5	0.0	0.0
2028	420.1	1.1	0.0	6.1	0.0	0.0	0.0	412.4	0.0	0.0	0.0	0.5	0.0	0.0
2029	440.6	1.1	0.0	7.8	0.0	0.0	0.0	431.1	0.0	0.0	0.0	0.5	0.0	0.0
2030	429.0	1.0	0.0	5.4	0.0	0.0	0.0	422.0	0.0	0.0	0.0	0.5	0.0	0.0
2031	449.6	1.1	0.0	7.2	0.0	0.0	0.0	440.8	0.0	0.0	0.0	0.5	0.0	0.0
2032	467.1	1.0	0.0	5.0	0.0	0.0	0.0	460.4	0.0	0.0	0.0	0.5	0.0	0.0
2033	489.6	1.1	0.0	7.1	0.0	0.0	0.0	480.9	0.0	0.0	0.0	0.5	0.0	0.0
2034	506.2	0.9	0.0	1.6	0.0	0.0	0.0	503.1	0.0	0.0	0.0	0.5	0.0	0.0
2035	528.8	0.9	0.0	1.3	0.0	0.0	0.0	526.1	0.0	0.0	0.0	0.5	0.0	0.0
2036	551.3	0.9	0.0	2.0	0.0	0.0	0.0	547.7	0.0	0.0	0.0	0.5	0.0	0.0
TOTALS	11941.5	2019.7	0.0	564.7	0.0	0.0	0.0	9340.7	0.0	0.0	0.0	16.4	0.0	0.0

APPENDIX III

13. APPENDIX III: EXPECTED PLANT CAPACITY FACTORS

Plant Capacity Factors for No retirement Case (2007 – 2026)

SUMMARY OF YEAR 2007

	PLANT NAME	PLANT TYPE	UNIT CAPACITY (MW)	NO.OF UNITS	CAPACITY FACTOR (%)	ENERGY (GWH)	FUEL CONSUMPTION DOMESTIC (TON)	FUEL CONSUMPTION FOREIGN (TON)	GENERATION COSTS (K$)
1	HROR	10	0.0	1	50.67	101.21	0.00	0.00	547.200
2	HSTO	11	0.0	1	0.00	0.00	0.00	0.00	0.000
3	OH1	0	0.0	1	31.98	79.85	0.00	0.00	9277.153
4	OH2	0	0.0	1	68.57	342.37	0.00	0.00	36067.273
5	OH3	0	0.0	1	84.47	457.30	0.00	0.00	42088.312
6	OH4	0	0.0	1	84.89	484.09	0.00	0.00	44365.594
7	HB6	0	0.0	1	81.56	465.10	0.00	0.00	43759.047
8	RF1	0	0.0	1	85.15	129.05	0.00	0.00	9759.031
9	RF2	0	0.0	1	85.15	129.05	0.00	0.00	9759.027
10	GT4	2	0.0	0	0.00	0.00	0.00	0.00	0.000
11	GT5	2	0.0	1	3.64	6.81	0.00	0.00	1506.385
12	GT10	2	0.0	1	8.74	24.59	0.00	0.00	4419.898
13	GT3	2	0.0	1	5.35	10.04	0.00	0.00	2025.411
14	GT6	2	0.0	1	1.39	1.69	0.00	0.00	474.470
15	GT7	2	0.0	1	2.59	3.15	0.00	0.00	776.496
16	GT8	2	0.0	1	1.89	2.30	0.00	0.00	603.803
17	GT9	2	0.0	1	0.58	1.01	0.00	0.00	367.234
18	GT11	2	0.0	1	0.94	1.64	0.00	0.00	488.452
19	BOCC	2	0.0	1	36.69	356.76	0.00	0.00	39874.918
20	JPPC	0	0.0	1	90.13	473.71	0.00	0.00	55246.500
21	JEP1	0	0.0	0	0.00	0.00	0.00	0.00	0.000
22	JEP2	0	0.0	1	89.94	978.59	0.00	0.00	99088.445
23	ALCO	0	0.0	1	90.08	39.45	0.00	0.00	3805.386
TOTALS						4087.76			404300.062

SUMMARY OF YEAR 2008

	PLANT NAME	PLANT TYPE	UNIT CAPACITY (MW)	NO.OF UNITS	CAPACITY FACTOR (%)	ENERGY (GWH)	FUEL CONSUMPTION DOMESTIC (TON)	FOREIGN (TON)	GENERATION COSTS (K$)
1	HROR	10	0.0	1	50.67	101.21	0.00	0.00	547.200
2	HSTO	11	0.0	1	0.00	0.00	0.00	0.00	0.000
3	OH1	0	0.0	1	39.08	97.56	0.00	0.00	11231.369
4	OH2	0	0.0	1	77.94	389.17	0.00	0.00	40857.789
5	OH3	0	0.0	1	84.87	459.46	0.00	0.00	42257.988
6	OH4	0	0.0	1	84.89	484.09	0.00	0.00	44365.598
7	HB6	0	0.0	1	83.44	475.86	0.00	0.00	44744.039
8	RF1	0	0.0	1	85.15	129.05	0.00	0.00	9759.027
9	RF2	0	0.0	1	85.15	129.05	0.00	0.00	9759.027
10	GT4	2	0.0	0	0.00	0.00	0.00	0.00	0.000
11	GT5	2	0.0	1	6.16	11.54	0.00	0.00	2466.313
12	GT10	2	0.0	1	14.76	41.51	0.00	0.00	7325.743
13	GT3	2	0.0	1	9.09	17.04	0.00	0.00	3384.143
14	GT6	2	0.0	1	2.62	3.19	0.00	0.00	805.791
15	GT7	2	0.0	1	4.78	5.82	0.00	0.00	1343.350
16	GT8	2	0.0	1	3.57	4.34	0.00	0.00	1050.287
17	GT9	2	0.0	1	1.15	2.00	0.00	0.00	623.596
18	GT11	2	0.0	1	1.79	3.11	0.00	0.00	836.756
19	BOCC	2	0.0	1	47.41	460.98	0.00	0.00	50817.973
20	JPPC	0	0.0	1	90.13	473.71	0.00	0.00	55246.500
21	JEP1	0	0.0	0	0.00	0.00	0.00	0.00	0.000
22	JEP2	0	0.0	1	89.94	978.59	0.00	0.00	99088.445
23	ALCO	0	0.0	1	90.08	39.45	0.00	0.00	3805.387
TOTALS						4306.74			430316.344

SUMMARY OF YEAR 2009

	PLANT NAME	PLANT TYPE	UNIT CAPACITY (MW)	NO.OF UNITS	CAPACITY FACTOR (%)	ENERGY (GWH)	FUEL CONSUMPTION DOMESTIC (TON)	FUEL CONSUMPTION FOREIGN (TON)	GENERATION COSTS (K$)
1	HROR	10	0.0	1	50.67	101.21	0.00	0.00	547.200
2	HSTO	11	0.0	1	0.00	0.00	0.00	0.00	0.000
3	OH1	0	0.0	1	47.09	117.56	0.00	0.00	13419.457
4	OH2	0	0.0	1	81.08	404.83	0.00	0.00	42443.332
5	OH3	0	0.0	1	84.89	459.55	0.00	0.00	42265.461
6	OH4	0	0.0	1	84.89	484.09	0.00	0.00	44365.602
7	HB6	0	0.0	1	84.05	479.33	0.00	0.00	45058.059
8	RF1	0	0.0	1	85.15	129.05	0.00	0.00	9759.026
9	RF2	0	0.0	1	85.15	129.05	0.00	0.00	9759.028
10	GT4	2	0.0	0	0.00	0.00	0.00	0.00	0.000
11	GT5	2	0.0	1	10.07	18.89	0.00	0.00	3980.064
12	GT10	2	0.0	1	20.81	58.52	0.00	0.00	10179.213
13	GT3	2	0.0	1	14.68	27.52	0.00	0.00	5364.799
14	GT6	2	0.0	1	4.61	5.62	0.00	0.00	1340.422
15	GT7	2	0.0	1	7.70	9.37	0.00	0.00	2101.326
16	GT8	2	0.0	1	5.98	7.28	0.00	0.00	1683.370
17	GT9	2	0.0	1	2.08	3.63	0.00	0.00	1050.681
18	GT11	2	0.0	1	3.22	5.61	0.00	0.00	1426.166
19	BOCC	2	0.0	1	56.77	551.96	0.00	0.00	60449.000
20	JPPC	0	0.0	1	90.13	473.71	0.00	0.00	55246.500
21	JEP1	0	0.0	0	0.00	0.00	0.00	0.00	0.000
22	JEP2	0	0.0	1	89.94	978.59	0.00	0.00	99088.445
23	ALCO	0	0.0	1	90.08	39.45	0.00	0.00	3805.386
TOTALS						4484.83			453332.594

SUMMARY OF YEAR 2010

	PLANT NAME	PLANT TYPE	UNIT CAPACITY (MW)	NO.OF UNITS	CAPACITY FACTOR (%)	ENERGY (GWH)	FUEL CONSUMPTION DOMESTIC (TON)	FUEL CONSUMPTION FOREIGN (TON)	GENERATION COSTS (K$)
1	HROR	10	0.0	1	50.67	101.21	0.00	0.00	547.200
2	HSTO	11	0.0	1	0.00	0.00	0.00	0.00	0.000
3	OH1	0	0.0	1	58.02	144.86	0.00	0.00	16397.408
4	OH2	0	0.0	1	82.22	410.57	0.00	0.00	43035.160
5	OH3	0	0.0	1	84.89	459.55	0.00	0.00	42265.457
6	OH4	0	0.0	1	84.89	484.09	0.00	0.00	44365.594
7	HB6	0	0.0	1	84.50	481.86	0.00	0.00	45280.180
8	RF1	0	0.0	1	85.15	129.05	0.00	0.00	9759.029
9	RF2	0	0.0	1	85.15	129.05	0.00	0.00	9759.029
10	GT4	2	0.0	0	0.00	0.00	0.00	0.00	0.000
11	GT5	2	0.0	1	15.93	29.87	0.00	0.00	6181.208
12	GT10	2	0.0	1	29.90	84.08	0.00	0.00	14737.651
13	GT3	2	0.0	1	20.70	38.81	0.00	0.00	7423.635
14	GT6	2	0.0	1	7.52	9.16	0.00	0.00	2120.299
15	GT7	2	0.0	1	12.56	15.29	0.00	0.00	3363.942
16	GT8	2	0.0	1	9.72	11.83	0.00	0.00	2676.976
17	GT9	2	0.0	1	3.73	6.51	0.00	0.00	1801.537
18	GT11	2	0.0	1	5.53	9.64	0.00	0.00	2360.060
19	BOCC	2	0.0	1	64.37	625.91	0.00	0.00	68179.430
20	JPPC	0	0.0	1	90.13	473.71	0.00	0.00	55246.500
21	JEP1	0	0.0	0	0.00	0.00	0.00	0.00	0.000
22	JEP2	0	0.0	1	89.94	978.59	0.00	0.00	99088.453
23	ALCO	0	0.0	1	90.08	39.45	0.00	0.00	3805.385
TOTALS						4663.09			478394.188

SUMMARY OF YEAR 2011

	PLANT NAME	PLANT TYPE	UNIT CAPACITY (MW)	NO.OF UNITS	CAPACITY FACTOR (%)	ENERGY (GWH)	FUEL CONSUMPTION DOMESTIC (TON)	FUEL CONSUMPTION FOREIGN (TON)	GENERATION COSTS (K$)
1	HROR	10	0.0	1	50.67	101.21	0.00	0.00	547.200
2	HSTO	11	0.0	1	0.00	0.00	0.00	0.00	0.000
3	OH1	0	0.0	1	63.70	159.03	0.00	0.00	17930.959
4	OH2	0	0.0	1	83.14	415.15	0.00	0.00	43506.898
5	OH3	0	0.0	1	84.89	459.55	0.00	0.00	42265.461
6	OH4	0	0.0	1	84.89	484.09	0.00	0.00	44365.602
7	HB6	0	0.0	1	84.75	483.30	0.00	0.00	45403.176
8	RF1	0	0.0	1	85.15	129.05	0.00	0.00	9759.032
9	RF2	0	0.0	1	85.15	129.05	0.00	0.00	9759.032
10	GT4	2	0.0	0	0.00	0.00	0.00	0.00	0.000
11	GT5	2	0.0	1	22.16	41.54	0.00	0.00	8503.961
12	GT10	2	0.0	1	41.32	116.20	0.00	0.00	19857.539
13	GT3	2	0.0	1	29.88	56.02	0.00	0.00	10813.326
14	GT6	2	0.0	1	12.35	15.04	0.00	0.00	3416.497
15	GT7	2	0.0	1	19.25	23.44	0.00	0.00	5074.761
16	GT8	2	0.0	1	15.71	19.13	0.00	0.00	4254.897
17	GT9	2	0.0	1	6.40	11.16	0.00	0.00	2993.108
18	GT11	2	0.0	1	9.12	15.91	0.00	0.00	3825.992
19	BOCC	2	0.0	1	71.36	693.92	0.00	0.00	75135.094
20	JPPC	0	0.0	1	90.13	473.71	0.00	0.00	55246.496
21	JEP1	0	0.0	0	0.00	0.00	0.00	0.00	0.000
22	JEP2	0	0.0	1	89.94	978.59	0.00	0.00	99088.453
23	ALCO	0	0.0	1	90.08	39.45	0.00	0.00	3805.386
TOTALS						4844.54			505552.812

SUMMARY OF YEAR 2012

	PLANT NAME	PLANT TYPE	UNIT CAPACITY (MW)	NO.OF UNITS	CAPACITY FACTOR (%)	ENERGY (GWH)	FUEL CONSUMPTION DOMESTIC (TON)	FUEL CONSUMPTION FOREIGN (TON)	GENERATION COSTS (K$)
1	HROR	10	0.0	1	50.67	101.21	0.00	0.00	547.200
2	HSTO	11	0.0	1	0.00	0.00	0.00	0.00	0.000
3	OH1	0	0.0	1	2.40	5.98	0.00	0.00	938.109
4	OH2	0	0.0	1	10.57	52.77	0.00	0.00	5806.076
5	OH3	0	0.0	1	44.21	239.34	0.00	0.00	22480.215
6	OH4	0	0.0	1	62.13	354.33	0.00	0.00	32667.947
7	HB6	0	0.0	1	22.79	129.96	0.00	0.00	12701.806
8	RF1	0	0.0	1	79.63	120.68	0.00	0.00	9158.694
9	RF2	0	0.0	1	74.57	113.00	0.00	0.00	8580.586
10	GT4	2	0.0	0	0.00	0.00	0.00	0.00	0.000
11	GT5	2	0.0	0	0.00	0.00	0.00	0.00	0.000
12	GT10	2	0.0	0	0.00	0.00	0.00	0.00	0.000
13	GT3	2	0.0	1	0.46	0.86	0.00	0.00	265.359
14	GT6	2	0.0	1	0.17	0.21	0.00	0.00	146.168
15	GT7	2	0.0	1	0.31	0.38	0.00	0.00	182.743
16	GT8	2	0.0	1	0.22	0.26	0.00	0.00	157.809
17	GT9	2	0.0	1	0.06	0.11	0.00	0.00	128.431
18	GT11	2	0.0	1	0.11	0.19	0.00	0.00	147.369
19	BOCC	2	0.0	1	2.59	25.19	0.00	0.00	4109.728
20	JPPC	0	0.0	1	88.33	464.28	0.00	0.00	54653.895
21	JEP1	0	0.0	0	0.00	0.00	0.00	0.00	0.000
22	JEP2	0	0.0	0	0.00	0.00	0.00	0.00	0.000
23	ALCO	0	0.0	1	85.93	37.64	0.00	0.00	3671.545
30	JEPn	6	0.0	1	89.87	977.74	0.00	0.00	72983.172
43	GT5N	6	0.0	1	80.52	150.95	0.00	0.00	10961.048
44	G10N	6	0.0	1	84.55	237.75	0.00	0.00	14693.755
45	GT4N	6	0.0	0	0.00	0.00	0.00	0.00	0.000
46	GTAD	2	0.0	0	0.00	0.00	0.00	0.00	0.000
47	NGCC	6	0.0	0	0.00	0.00	0.00	0.00	0.000
48	MSD	0	0.0	0	0.00	0.00	0.00	0.00	0.000
49	COCG	1	0.0	1	88.20	873.05	0.00	0.00	27985.332
50	CC#2	2	0.0	0	0.00	0.00	0.00	0.00	0.000
51	PETC	4	0.0	1	88.20	873.05	0.00	0.00	27215.645
52	GTNG	6	0.0	1	90.16	308.02	0.00	0.00	14981.594
53	COAL	1	0.0	0	0.00	0.00	0.00	0.00	0.000
54	LSD	0	0.0	0	0.00	0.00	0.00	0.00	0.000
TOTALS						5066.98			325164.188

SUMMARY OF YEAR 2013

	PLANT NAME	PLANT TYPE	UNIT CAPACITY (MW)	NO.OF UNITS	CAPACITY FACTOR (%)	ENERGY (GWH)	FUEL CONSUMPTION DOMESTIC (TON)	FUEL CONSUMPTION FOREIGN (TON)	GENERATION COSTS (K$)
1	HROR	10	0.0	1	50.67	101.21	0.00	0.00	547.200
2	HSTO	11	0.0	1	0.00	0.00	0.00	0.00	0.000
3	OH1	0	0.0	1	4.29	10.72	0.00	0.00	1474.973
4	OH2	0	0.0	1	15.75	78.66	0.00	0.00	8518.803
5	OH3	0	0.0	1	51.47	278.65	0.00	0.00	26051.586
6	OH4	0	0.0	1	69.71	397.54	0.00	0.00	36596.062
7	HB6	0	0.0	1	32.68	186.37	0.00	0.00	18060.891
8	RF1	0	0.0	1	81.95	124.20	0.00	0.00	9405.330
9	RF2	0	0.0	1	79.86	121.03	0.00	0.00	9170.794
10	GT4	2	0.0	0	0.00	0.00	0.00	0.00	0.000
11	GT5	2	0.0	0	0.00	0.00	0.00	0.00	0.000
12	GT10	2	0.0	0	0.00	0.00	0.00	0.00	0.000
13	GT3	2	0.0	1	0.89	1.66	0.00	0.00	423.579
14	GT6	2	0.0	1	0.36	0.43	0.00	0.00	196.265
15	GT7	2	0.0	1	0.61	0.74	0.00	0.00	258.641
16	GT8	2	0.0	1	0.46	0.57	0.00	0.00	222.898
17	GT9	2	0.0	1	0.14	0.25	0.00	0.00	164.423
18	GT11	2	0.0	1	0.23	0.39	0.00	0.00	194.454
19	BOCC	2	0.0	1	4.51	43.86	0.00	0.00	6170.920
20	JPPC	0	0.0	1	88.99	467.71	0.00	0.00	54869.559
21	JEP1	0	0.0	0	0.00	0.00	0.00	0.00	0.000
22	JEP2	0	0.0	0	0.00	0.00	0.00	0.00	0.000
23	ALCO	0	0.0	1	87.28	38.23	0.00	0.00	3715.152
24	BRLS	0	0.0	0	0.00	0.00	0.00	0.00	0.000
30	JEPn	6	0.0	1	89.91	978.19	0.00	0.00	73005.320
43	GT5N	6	0.0	1	82.29	154.27	0.00	0.00	11165.363
44	G10N	6	0.0	1	84.91	238.76	0.00	0.00	14744.114
45	GT4N	6	0.0	0	0.00	0.00	0.00	0.00	0.000
46	GTAD	2	0.0	0	0.00	0.00	0.00	0.00	0.000
47	NGCC	6	0.0	0	0.00	0.00	0.00	0.00	0.000
48	MSD	0	0.0	0	0.00	0.00	0.00	0.00	0.000
49	COCG	1	0.0	1	88.20	873.05	0.00	0.00	27985.330
50	CC#2	2	0.0	0	0.00	0.00	0.00	0.00	0.000
51	PETC	4	0.0	1	88.20	873.05	0.00	0.00	27215.643
52	GTNG	6	0.0	1	90.16	308.02	0.00	0.00	14981.596
53	COAL	1	0.0	0	0.00	0.00	0.00	0.00	0.000
54	LSD	0	0.0	0	0.00	0.00	0.00	0.00	0.000
TOTALS						5277.55			345138.875

SUMMARY OF YEAR 2014

	PLANT NAME	PLANT TYPE	UNIT CAPACITY (MW)	NO.OF UNITS	CAPACITY FACTOR (%)	ENERGY (GWH)	FUEL CONSUMPTION DOMESTIC (TON)	FUEL CONSUMPTION FOREIGN (TON)	GENERATION COSTS (K$)
1	HROR	10	0.0	1	50.67	101.21	0.00	0.00	547.200
2	HSTO	11	0.0	1	0.00	0.00	0.00	0.00	0.000
3	OH1	0	0.0	1	0.94	2.34	0.00	0.00	523.125
4	OH2	0	0.0	1	4.23	21.13	0.00	0.00	2483.250
5	OH3	0	0.0	1	22.97	124.36	0.00	0.00	12015.495
6	OH4	0	0.0	1	43.37	247.33	0.00	0.00	22892.777
7	HB6	0	0.0	1	10.84	61.82	0.00	0.00	6167.716
8	RF1	0	0.0	1	61.08	92.56	0.00	0.00	7085.202
9	RF2	0	0.0	1	53.68	81.35	0.00	0.00	6237.051
10	GT4	2	0.0	0	0.00	0.00	0.00	0.00	0.000
11	GT5	2	0.0	0	0.00	0.00	0.00	0.00	0.000
12	GT10	2	0.0	0	0.00	0.00	0.00	0.00	0.000
13	GT3	2	0.0	1	0.15	0.28	0.00	0.00	155.667
14	GT6	2	0.0	1	0.06	0.07	0.00	0.00	115.830
15	GT7	2	0.0	1	0.12	0.14	0.00	0.00	130.207
16	GT8	2	0.0	1	0.09	0.11	0.00	0.00	124.763
17	GT9	2	0.0	1	0.04	0.06	0.00	0.00	116.197
18	GT11	2	0.0	1	0.03	0.06	0.00	0.00	114.089
19	BOCC	2	0.0	1	1.01	9.79	0.00	0.00	2406.945
20	JPPC	0	0.0	1	81.68	429.31	0.00	0.00	52456.430
21	JEP1	0	0.0	0	0.00	0.00	0.00	0.00	0.000
22	JEP2	0	0.0	0	0.00	0.00	0.00	0.00	0.000
23	ALCO	0	0.0	1	67.76	29.68	0.00	0.00	3085.523
24	BRLS	0	0.0	0	0.00	0.00	0.00	0.00	0.000
30	JEPn	6	0.0	1	88.81	966.27	0.00	0.00	72413.828
43	GT5N	6	0.0	1	62.70	117.55	0.00	0.00	8653.510
44	G10N	6	0.0	1	82.32	231.47	0.00	0.00	14379.370
45	GT4N	6	0.0	0	0.00	0.00	0.00	0.00	0.000
46	GTAD	2	0.0	0	0.00	0.00	0.00	0.00	0.000
47	NGCC	6	0.0	1	90.08	923.21	0.00	0.00	35319.191
48	MSD	0	0.0	0	0.00	0.00	0.00	0.00	0.000
49	COCG	1	0.0	1	88.22	873.26	0.00	0.00	27991.352
50	CC#2	2	0.0	0	0.00	0.00	0.00	0.00	0.000
51	PETC	4	0.0	1	88.22	873.26	0.00	0.00	27220.773
52	GTNG	6	0.0	1	90.16	308.02	0.00	0.00	14981.598
53	COAL	1	0.0	0	0.00	0.00	0.00	0.00	0.000
54	LSD	0	0.0	0	0.00	0.00	0.00	0.00	0.000
TOTALS						5494.65			317617.062

SUMMARY OF YEAR 2015

	PLANT NAME	PLANT TYPE	UNIT CAPACITY (MW)	NO.OF UNITS	CAPACITY FACTOR (%)	ENERGY (GWH)	FUEL CONSUMPTION DOMESTIC (TON)	FUEL CONSUMPTION FOREIGN (TON)	GENERATION COSTS (K$)
1	HROR	10	0.0	1	50.67	101.21	0.00	0.00	547.200
2	HSTO	11	0.0	1	0.00	0.00	0.00	0.00	0.000
3	OH1	0	0.0	1	2.57	6.41	0.00	0.00	986.156
4	OH2	0	0.0	1	10.38	51.84	0.00	0.00	5704.390
5	OH3	0	0.0	1	41.00	221.99	0.00	0.00	20928.166
6	OH4	0	0.0	1	55.81	318.29	0.00	0.00	29367.803
7	HB6	0	0.0	1	20.78	118.51	0.00	0.00	11575.545
8	RF1	0	0.0	1	78.57	119.07	0.00	0.00	9085.975
9	RF2	0	0.0	1	67.20	101.84	0.00	0.00	7755.338
10	GT4	2	0.0	0	0.00	0.00	0.00	0.00	0.000
11	GT5	2	0.0	0	0.00	0.00	0.00	0.00	0.000
12	GT10	2	0.0	0	0.00	0.00	0.00	0.00	0.000
13	GT3	2	0.0	1	0.52	0.97	0.00	0.00	288.272
14	GT6	2	0.0	1	0.21	0.26	0.00	0.00	157.939
15	GT7	2	0.0	1	0.37	0.46	0.00	0.00	197.818
16	GT8	2	0.0	1	0.29	0.35	0.00	0.00	175.706
17	GT9	2	0.0	1	0.09	0.16	0.00	0.00	139.766
18	GT11	2	0.0	1	0.13	0.23	0.00	0.00	156.443
19	BOCC	2	0.0	1	2.76	26.85	0.00	0.00	4283.072
20	JPPC	0	0.0	0	0.00	0.00	0.00	0.00	0.000
21	JEP1	0	0.0	0	0.00	0.00	0.00	0.00	0.000
22	JEP2	0	0.0	0	0.00	0.00	0.00	0.00	0.000
23	ALCO	0	0.0	1	87.60	38.37	0.00	0.00	3725.510
24	BRLS	0	0.0	0	0.00	0.00	0.00	0.00	0.000
30	JEPn	6	0.0	1	88.05	957.96	0.00	0.00	72000.984
43	GT5N	6	0.0	1	78.46	147.09	0.00	0.00	10858.399
44	G10N	6	0.0	1	81.60	229.45	0.00	0.00	14278.243
45	GT4N	6	0.0	0	0.00	0.00	0.00	0.00	0.000
46	GTAD	2	0.0	0	0.00	0.00	0.00	0.00	0.000
47	NGCC	6	0.0	1	90.08	923.21	0.00	0.00	35319.195
48	MSD	0	0.0	0	0.00	0.00	0.00	0.00	0.000
49	COCG	1	0.0	1	88.22	873.26	0.00	0.00	27991.355
50	CC#2	2	0.0	0	0.00	0.00	0.00	0.00	0.000
51	PETC	4	0.0	1	88.22	873.26	0.00	0.00	27220.775
52	GTNG	6	0.0	2	90.15	615.99	0.00	0.00	29960.961
53	COAL	1	0.0	0	0.00	0.00	0.00	0.00	0.000
54	LSD	0	0.0	0	0.00	0.00	0.00	0.00	0.000
TOTALS						5727.03			312705.000

SUMMARY OF YEAR 2016

	PLANT NAME	PLANT TYPE	UNIT CAPACITY (MW)	NO.OF UNITS	CAPACITY FACTOR (%)	ENERGY (GWH)	FUEL CONSUMPTION DOMESTIC (TON)	FUEL CONSUMPTION FOREIGN (TON)	GENERATION COSTS (K$)
1	HROR	10	0.0	1	50.67	101.21	0.00	0.00	547.200
2	HSTO	11	0.0	1	0.00	0.00	0.00	0.00	0.000
3	OH1	0	0.0	1	0.66	1.65	0.00	0.00	443.971
4	OH2	0	0.0	1	2.85	14.22	0.00	0.00	1756.574
5	OH3	0	0.0	1	15.84	85.77	0.00	0.00	8319.842
6	OH4	0	0.0	1	33.14	188.97	0.00	0.00	17606.184
7	HB6	0	0.0	1	7.47	42.59	0.00	0.00	4364.985
8	RF1	0	0.0	1	67.25	101.92	0.00	0.00	7929.830
9	RF2	0	0.0	1	45.05	68.27	0.00	0.00	5264.919
10	GT4	2	0.0	0	0.00	0.00	0.00	0.00	0.000
11	GT5	2	0.0	0	0.00	0.00	0.00	0.00	0.000
12	GT10	2	0.0	0	0.00	0.00	0.00	0.00	0.000
13	GT3	2	0.0	1	0.10	0.18	0.00	0.00	136.909
14	GT6	2	0.0	1	0.05	0.06	0.00	0.00	113.521
15	GT7	2	0.0	1	0.08	0.10	0.00	0.00	120.352
16	GT8	2	0.0	1	0.08	0.10	0.00	0.00	120.900
17	GT9	2	0.0	1	0.03	0.06	0.00	0.00	113.172
18	GT11	2	0.0	1	0.01	0.03	0.00	0.00	106.479
19	BOCC	2	0.0	1	0.69	6.69	0.00	0.00	2063.660
20	JPPC	0	0.0	0	0.00	0.00	0.00	0.00	0.000
21	JEP1	0	0.0	0	0.00	0.00	0.00	0.00	0.000
22	JEP2	0	0.0	0	0.00	0.00	0.00	0.00	0.000
23	ALCO	0	0.0	1	82.37	36.08	0.00	0.00	3556.769
24	BRLS	0	0.0	0	0.00	0.00	0.00	0.00	0.000
30	JEPn	6	0.0	1	77.56	843.80	0.00	0.00	66333.359
43	GT5N	6	0.0	1	58.46	109.60	0.00	0.00	8864.226
44	G10N	6	0.0	1	62.41	175.50	0.00	0.00	11577.266
45	GT4N	6	0.0	0	0.00	0.00	0.00	0.00	0.000
46	GTAD	2	0.0	0	0.00	0.00	0.00	0.00	0.000
47	NGCC	6	0.0	2	89.99	1844.63	0.00	0.00	70581.844
48	MSD	0	0.0	0	0.00	0.00	0.00	0.00	0.000
49	COCG	1	0.0	1	88.20	873.06	0.00	0.00	27985.566
50	CC#2	2	0.0	0	0.00	0.00	0.00	0.00	0.000
51	PETC	4	0.0	1	88.20	873.06	0.00	0.00	27215.844
52	GTNG	6	0.0	2	88.82	606.87	0.00	0.00	29592.904
53	COAL	1	0.0	0	0.00	0.00	0.00	0.00	0.000
54	LSD	0	0.0	0	0.00	0.00	0.00	0.00	0.000
TOTALS						5974.40			294716.250

SUMMARY OF YEAR 2017

	PLANT NAME	PLANT TYPE	UNIT CAPACITY (MW)	NO.OF UNITS	CAPACITY FACTOR (%)	ENERGY (GWH)	FUEL CONSUMPTION DOMESTIC (TON)	FUEL CONSUMPTION FOREIGN (TON)	GENERATION COSTS (K$)
1	HROR	10	0.0	1	50.67	101.21	0.00	0.00	547.200
2	HSTO	11	0.0	1	0.00	0.00	0.00	0.00	0.000
3	OH1	0	0.0	1	1.26	3.16	0.00	0.00	615.890
4	OH2	0	0.0	1	5.29	26.42	0.00	0.00	3040.303
5	OH3	0	0.0	1	24.34	131.79	0.00	0.00	12702.324
6	OH4	0	0.0	1	43.24	246.56	0.00	0.00	22815.393
7	HB6	0	0.0	1	12.30	70.14	0.00	0.00	6943.982
8	RF1	0	0.0	1	70.44	106.75	0.00	0.00	8255.504
9	RF2	0	0.0	1	51.61	78.21	0.00	0.00	5999.251
10	GT4	2	0.0	0	0.00	0.00	0.00	0.00	0.000
11	GT5	2	0.0	0	0.00	0.00	0.00	0.00	0.000
12	GT10	2	0.0	0	0.00	0.00	0.00	0.00	0.000
13	GT3	2	0.0	1	0.24	0.44	0.00	0.00	185.461
14	GT6	2	0.0	1	0.09	0.11	0.00	0.00	124.921
15	GT7	2	0.0	1	0.20	0.25	0.00	0.00	152.359
16	GT8	2	0.0	1	0.15	0.19	0.00	0.00	141.613
17	GT9	2	0.0	1	0.07	0.12	0.00	0.00	129.364
18	GT11	2	0.0	1	0.06	0.10	0.00	0.00	124.053
19	BOCC	2	0.0	1	1.41	13.72	0.00	0.00	2836.714
20	JPPC	0	0.0	0	0.00	0.00	0.00	0.00	0.000
21	JEP1	0	0.0	0	0.00	0.00	0.00	0.00	0.000
22	JEP2	0	0.0	0	0.00	0.00	0.00	0.00	0.000
23	ALCO	0	0.0	1	83.86	36.73	0.00	0.00	3604.813
24	BRLS	0	0.0	0	0.00	0.00	0.00	0.00	0.000
30	JEPn	6	0.0	1	82.73	900.12	0.00	0.00	69129.578
43	GT5N	6	0.0	1	64.73	121.35	0.00	0.00	9489.352
44	G10N	6	0.0	1	68.55	192.75	0.00	0.00	12440.968
45	GT4N	6	0.0	0	0.00	0.00	0.00	0.00	0.000
46	GTAD	2	0.0	0	0.00	0.00	0.00	0.00	0.000
47	NGCC	6	0.0	2	90.03	1845.56	0.00	0.00	70609.773
48	MSD	0	0.0	0	0.00	0.00	0.00	0.00	0.000
49	COCG	1	0.0	1	88.20	873.06	0.00	0.00	27985.564
50	CC#2	2	0.0	0	0.00	0.00	0.00	0.00	0.000
51	PETC	4	0.0	1	88.20	873.06	0.00	0.00	27215.844
52	GTNG	6	0.0	2	89.41	610.89	0.00	0.00	29755.297
53	COAL	1	0.0	0	0.00	0.00	0.00	0.00	0.000
54	LSD	0	0.0	0	0.00	0.00	0.00	0.00	0.000
TOTALS						6232.69			314845.531

SUMMARY OF YEAR 2018

	PLANT NAME	PLANT TYPE	UNIT CAPACITY (MW)	NO.OF UNITS	CAPACITY FACTOR (%)	ENERGY (GWH)	FUEL CONSUMPTION DOMESTIC (TON)	FUEL CONSUMPTION FOREIGN (TON)	GENERATION COSTS (K$)
1	HROR	10	0.0	1	50.67	101.21	0.00	0.00	547.200
2	HSTO	11	0.0	1	0.00	0.00	0.00	0.00	0.000
3	OH1	0	0.0	1	0.31	0.78	0.00	0.00	345.669
4	OH2	0	0.0	1	1.56	7.80	0.00	0.00	1080.184
5	OH3	0	0.0	1	10.00	54.14	0.00	0.00	5370.765
6	OH4	0	0.0	1	19.39	110.59	0.00	0.00	10433.786
7	HB6	0	0.0	1	3.81	21.75	0.00	0.00	2348.498
8	RF1	0	0.0	1	60.94	92.35	0.00	0.00	7285.253
9	RF2	0	0.0	1	31.18	47.25	0.00	0.00	3708.580
10	GT4	2	0.0	0	0.00	0.00	0.00	0.00	0.000
11	GT5	2	0.0	0	0.00	0.00	0.00	0.00	0.000
12	GT10	2	0.0	0	0.00	0.00	0.00	0.00	0.000
13	GT3	2	0.0	1	0.06	0.10	0.00	0.00	118.114
14	GT6	2	0.0	1	0.00	0.00	0.00	0.00	101.067
15	GT7	2	0.0	1	0.08	0.09	0.00	0.00	119.716
16	GT8	2	0.0	1	0.04	0.05	0.00	0.00	111.475
17	GT9	2	0.0	1	0.03	0.06	0.00	0.00	115.897
18	GT11	2	0.0	1	0.01	0.02	0.00	0.00	104.357
19	BOCC	2	0.0	1	0.36	3.54	0.00	0.00	1711.496
20	JPPC	0	0.0	0	0.00	0.00	0.00	0.00	0.000
21	JEP1	0	0.0	0	0.00	0.00	0.00	0.00	0.000
22	JEP2	0	0.0	0	0.00	0.00	0.00	0.00	0.000
23	ALCO	0	0.0	1	79.64	34.88	0.00	0.00	3468.801
24	BRLS	0	0.0	0	0.00	0.00	0.00	0.00	0.000
30	JEPn	6	0.0	1	63.33	688.98	0.00	0.00	58647.531
43	GT5N	6	0.0	1	49.17	92.18	0.00	0.00	7937.681
44	G10N	6	0.0	1	53.66	150.88	0.00	0.00	10344.646
45	GT4N	6	0.0	0	0.00	0.00	0.00	0.00	0.000
46	GTAD	2	0.0	0	0.00	0.00	0.00	0.00	0.000
47	NGCC	6	0.0	3	89.64	2756.34	0.00	0.00	105557.656
48	MSD	0	0.0	0	0.00	0.00	0.00	0.00	0.000
49	COCG	1	0.0	1	88.21	873.21	0.00	0.00	27989.785
50	CC#2	2	0.0	0	0.00	0.00	0.00	0.00	0.000
51	PETC	4	0.0	1	88.21	873.21	0.00	0.00	27219.441
52	GTNG	6	0.0	2	86.11	588.39	0.00	0.00	28847.277
53	COAL	1	0.0	0	0.00	0.00	0.00	0.00	0.000
54	LSD	0	0.0	0	0.00	0.00	0.00	0.00	0.000
TOTALS						6497.82			303514.844

SUMMARY OF YEAR 2019

	PLANT NAME	PLANT TYPE	UNIT CAPACITY (MW)	NO.OF UNITS	CAPACITY FACTOR (%)	ENERGY (GWH)	FUEL CONSUMPTION DOMESTIC (TON)	FOREIGN (TON)	GENERATION COSTS (K$)
1	HROR	10	0.0	1	50.67	101.21	0.00	0.00	547.200
2	HSTO	11	0.0	1	0.00	0.00	0.00	0.00	0.000
3	OH1	0	0.0	1	0.75	1.87	0.00	0.00	469.651
4	OH2	0	0.0	1	3.03	15.15	0.00	0.00	1852.911
5	OH3	0	0.0	1	15.21	82.36	0.00	0.00	7966.238
6	OH4	0	0.0	1	29.90	170.50	0.00	0.00	15914.910
7	HB6	0	0.0	1	7.44	42.40	0.00	0.00	4337.131
8	RF1	0	0.0	1	65.69	99.55	0.00	0.00	7770.441
9	RF2	0	0.0	1	41.48	62.87	0.00	0.00	4864.539
10	GT4	2	0.0	0	0.00	0.00	0.00	0.00	0.000
11	GT5	2	0.0	0	0.00	0.00	0.00	0.00	0.000
12	GT10	2	0.0	0	0.00	0.00	0.00	0.00	0.000
13	GT3	2	0.0	1	0.17	0.31	0.00	0.00	157.742
14	GT6	2	0.0	1	0.04	0.05	0.00	0.00	109.996
15	GT7	2	0.0	1	0.13	0.15	0.00	0.00	133.628
16	GT8	2	0.0	1	0.06	0.08	0.00	0.00	117.834
17	GT9	2	0.0	1	0.04	0.08	0.00	0.00	121.532
18	GT11	2	0.0	1	0.06	0.10	0.00	0.00	121.082
19	BOCC	2	0.0	1	0.80	7.79	0.00	0.00	2181.237
20	JPPC	0	0.0	0	0.00	0.00	0.00	0.00	0.000
21	JEP1	0	0.0	0	0.00	0.00	0.00	0.00	0.000
22	JEP2	0	0.0	0	0.00	0.00	0.00	0.00	0.000
23	ALCO	0	0.0	1	81.71	35.79	0.00	0.00	3535.372
24	BRLS	0	0.0	0	0.00	0.00	0.00	0.00	0.000
30	JEPn	6	0.0	1	71.63	779.36	0.00	0.00	63134.148
43	GT5N	6	0.0	1	56.17	105.30	0.00	0.00	8635.528
44	G10N	6	0.0	1	58.95	165.77	0.00	0.00	11090.211
45	GT4N	6	0.0	0	0.00	0.00	0.00	0.00	0.000
46	GTAD	2	0.0	0	0.00	0.00	0.00	0.00	0.000
47	NGCC	6	0.0	3	89.84	2762.25	0.00	0.00	105735.188
48	MSD	0	0.0	0	0.00	0.00	0.00	0.00	0.000
49	COCG	1	0.0	1	88.21	873.21	0.00	0.00	27989.789
50	CC#2	2	0.0	0	0.00	0.00	0.00	0.00	0.000
51	PETC	4	0.0	1	88.21	873.21	0.00	0.00	27219.439
52	GTNG	6	0.0	2	87.61	598.60	0.00	0.00	29259.180
53	COAL	1	0.0	0	0.00	0.00	0.00	0.00	0.000
54	LSD	0	0.0	0	0.00	0.00	0.00	0.00	0.000
TOTALS						6777.93			323264.938

SUMMARY OF YEAR 2020

	PLANT NAME	PLANT TYPE	UNIT CAPACITY (MW)	NO.OF UNITS	CAPACITY FACTOR (%)	ENERGY (GWH)	FUEL CONSUMPTION DOMESTIC (TON)	FUEL CONSUMPTION FOREIGN (TON)	GENERATION COSTS (K$)
1	HROR	10	0.0	1	50.67	101.21	0.00	0.00	547.200
2	HSTO	11	0.0	1	0.00	0.00	0.00	0.00	0.000
3	OH1	0	0.0	1	0.23	0.57	0.00	0.00	321.371
4	OH2	0	0.0	1	1.05	5.27	0.00	0.00	814.895
5	OH3	0	0.0	1	6.50	35.20	0.00	0.00	3613.258
6	OH4	0	0.0	1	15.06	85.88	0.00	0.00	8167.112
7	HB6	0	0.0	1	2.61	14.88	0.00	0.00	1686.035
8	RF1	0	0.0	0	0.00	0.00	0.00	0.00	0.000
9	RF2	0	0.0	0	0.00	0.00	0.00	0.00	0.000
10	GT4	2	0.0	0	0.00	0.00	0.00	0.00	0.000
11	GT5	2	0.0	0	0.00	0.00	0.00	0.00	0.000
12	GT10	2	0.0	0	0.00	0.00	0.00	0.00	0.000
13	GT3	2	0.0	1	0.05	0.09	0.00	0.00	115.566
14	GT6	2	0.0	1	0.01	0.01	0.00	0.00	101.861
15	GT7	2	0.0	1	0.05	0.07	0.00	0.00	114.088
16	GT8	2	0.0	1	0.03	0.04	0.00	0.00	108.614
17	GT9	2	0.0	1	0.03	0.04	0.00	0.00	110.844
18	GT11	2	0.0	1	0.01	0.02	0.00	0.00	103.388
19	BOCC	2	0.0	1	0.25	2.42	0.00	0.00	1586.907
20	JPPC	0	0.0	0	0.00	0.00	0.00	0.00	0.000
21	JEP1	0	0.0	0	0.00	0.00	0.00	0.00	0.000
22	JEP2	0	0.0	0	0.00	0.00	0.00	0.00	0.000
23	ALCO	0	0.0	1	22.13	9.69	0.00	0.00	1613.873
24	BRLS	0	0.0	0	0.00	0.00	0.00	0.00	0.000
30	JEPn	6	0.0	1	53.06	577.30	0.00	0.00	53103.094
43	GT5N	6	0.0	1	16.73	31.37	0.00	0.00	2578.061
44	G10N	6	0.0	1	47.60	133.85	0.00	0.00	9492.180
45	GT4N	6	0.0	0	0.00	0.00	0.00	0.00	0.000
46	GTAD	2	0.0	0	0.00	0.00	0.00	0.00	0.000
47	NGCC	6	0.0	4	89.25	3659.03	0.00	0.00	140264.109
48	MSD	0	0.0	0	0.00	0.00	0.00	0.00	0.000
49	COCG	1	0.0	1	88.22	873.32	0.00	0.00	27992.930
50	CC#2	2	0.0	0	0.00	0.00	0.00	0.00	0.000
51	PETC	4	0.0	1	88.22	873.32	0.00	0.00	27222.115
52	GTNG	6	0.0	2	79.74	544.84	0.00	0.00	27089.383
53	COAL	1	0.0	0	0.00	0.00	0.00	0.00	0.000
54	LSD	0	0.0	1	49.80	125.65	0.00	0.00	8791.980
TOTALS						7074.05			315538.812

SUMMARY OF YEAR 2021

	PLANT NAME	PLANT TYPE	UNIT CAPACITY (MW)	NO.OF UNITS	CAPACITY FACTOR (%)	ENERGY (GWH)	FUEL CONSUMPTION DOMESTIC (TON)	FOREIGN (TON)	GENERATION COSTS (K$)
1	HROR	10	0.0	1	50.67	101.21	0.00	0.00	547.200
2	HSTO	11	0.0	1	0.00	0.00	0.00	0.00	0.000
3	OH1	0	0.0	1	0.53	1.33	0.00	0.00	407.889
4	OH2	0	0.0	1	2.20	10.97	0.00	0.00	1413.673
5	OH3	0	0.0	1	11.65	63.05	0.00	0.00	6180.036
6	OH4	0	0.0	1	23.38	133.33	0.00	0.00	12560.186
7	HB6	0	0.0	1	5.06	28.88	0.00	0.00	3031.570
8	RF1	0	0.0	0	0.00	0.00	0.00	0.00	0.000
9	RF2	0	0.0	0	0.00	0.00	0.00	0.00	0.000
10	GT4	2	0.0	0	0.00	0.00	0.00	0.00	0.000
11	GT5	2	0.0	0	0.00	0.00	0.00	0.00	0.000
12	GT10	2	0.0	0	0.00	0.00	0.00	0.00	0.000
13	GT3	2	0.0	1	0.13	0.24	0.00	0.00	144.816
14	GT6	2	0.0	1	0.03	0.04	0.00	0.00	108.795
15	GT7	2	0.0	1	0.09	0.11	0.00	0.00	124.927
16	GT8	2	0.0	1	0.05	0.07	0.00	0.00	114.825
17	GT9	2	0.0	1	0.04	0.06	0.00	0.00	117.126
18	GT11	2	0.0	1	0.04	0.07	0.00	0.00	114.525
19	BOCC	2	0.0	1	0.59	5.71	0.00	0.00	1952.397
20	JPPC	0	0.0	0	0.00	0.00	0.00	0.00	0.000
21	JEP1	0	0.0	0	0.00	0.00	0.00	0.00	0.000
22	JEP2	0	0.0	0	0.00	0.00	0.00	0.00	0.000
23	ALCO	0	0.0	1	33.48	14.66	0.00	0.00	1979.919
24	BRLS	0	0.0	0	0.00	0.00	0.00	0.00	0.000
30	JEPn	6	0.0	1	61.88	673.28	0.00	0.00	57867.703
43	GT5N	6	0.0	1	25.77	48.32	0.00	0.00	3875.835
44	G10N	6	0.0	1	55.06	154.84	0.00	0.00	10542.976
45	GT4N	6	0.0	0	0.00	0.00	0.00	0.00	0.000
46	GTAD	2	0.0	0	0.00	0.00	0.00	0.00	0.000
47	NGCC	6	0.0	4	89.55	3671.21	0.00	0.00	140629.672
48	MSD	0	0.0	0	0.00	0.00	0.00	0.00	0.000
49	COCG	1	0.0	1	88.22	873.32	0.00	0.00	27992.930
50	CC#2	2	0.0	0	0.00	0.00	0.00	0.00	0.000
51	PETC	4	0.0	1	88.22	873.32	0.00	0.00	27222.115
52	GTNG	6	0.0	2	84.65	578.42	0.00	0.00	28444.137
53	COAL	1	0.0	0	0.00	0.00	0.00	0.00	0.000
54	LSD	0	0.0	1	57.42	144.86	0.00	0.00	10005.555
TOTALS						7377.30			335378.750

SUMMARY OF YEAR 2022

	PLANT NAME	PLANT TYPE	UNIT CAPACITY (MW)	NO.OF UNITS	CAPACITY FACTOR (%)	ENERGY (GWH)	FUEL CONSUMPTION DOMESTIC (TON)	FUEL CONSUMPTION FOREIGN (TON)	GENERATION COSTS (K$)
1	HROR	10	0.0	1	50.67	101.21	0.00	0.00	547.200
2	HSTO	11	0.0	1	0.00	0.00	0.00	0.00	0.000
3	OH1	0	0.0	1	0.18	0.44	0.00	0.00	306.652
4	OH2	0	0.0	1	0.77	3.85	0.00	0.00	665.544
5	OH3	0	0.0	1	4.71	25.51	0.00	0.00	2679.225
6	OH4	0	0.0	1	11.54	65.79	0.00	0.00	6320.066
7	HB6	0	0.0	1	2.00	11.38	0.00	0.00	1352.024
8	RF1	0	0.0	0	0.00	0.00	0.00	0.00	0.000
9	RF2	0	0.0	0	0.00	0.00	0.00	0.00	0.000
10	GT4	2	0.0	0	0.00	0.00	0.00	0.00	0.000
11	GT5	2	0.0	0	0.00	0.00	0.00	0.00	0.000
12	GT10	2	0.0	0	0.00	0.00	0.00	0.00	0.000
13	GT3	2	0.0	1	0.03	0.05	0.00	0.00	109.884
14	GT6	2	0.0	1	0.02	0.02	0.00	0.00	104.614
15	GT7	2	0.0	1	0.04	0.05	0.00	0.00	109.746
16	GT8	2	0.0	1	0.03	0.04	0.00	0.00	109.348
17	GT9	2	0.0	1	0.01	0.02	0.00	0.00	104.304
18	GT11	2	0.0	1	0.00	0.00	0.00	0.00	101.124
19	BOCC	2	0.0	1	0.19	1.82	0.00	0.00	1520.978
20	JPPC	0	0.0	0	0.00	0.00	0.00	0.00	0.000
21	JEP1	0	0.0	0	0.00	0.00	0.00	0.00	0.000
22	JEP2	0	0.0	0	0.00	0.00	0.00	0.00	0.000
23	ALCO	0	0.0	1	17.14	7.51	0.00	0.00	1452.871
24	BRLS	0	0.0	0	0.00	0.00	0.00	0.00	0.000
30	JEPn	6	0.0	1	44.40	483.12	0.00	0.00	48427.141
43	GT5N	6	0.0	1	13.65	25.58	0.00	0.00	2108.479
44	G10N	6	0.0	1	39.96	112.38	0.00	0.00	8417.299
45	GT4N	6	0.0	0	0.00	0.00	0.00	0.00	0.000
46	GTAD	2	0.0	0	0.00	0.00	0.00	0.00	0.000
47	NGCC	6	0.0	5	88.32	4526.03	0.00	0.00	173892.141
48	MSD	0	0.0	0	0.00	0.00	0.00	0.00	0.000
49	COCG	1	0.0	1	88.21	873.18	0.00	0.00	27988.930
50	CC#2	2	0.0	0	0.00	0.00	0.00	0.00	0.000
51	PETC	4	0.0	1	88.21	873.18	0.00	0.00	27218.709
52	GTNG	6	0.0	2	69.34	473.80	0.00	0.00	24223.312
53	COAL	1	0.0	0	0.00	0.00	0.00	0.00	0.000
54	LSD	0	0.0	1	44.48	112.22	0.00	0.00	7943.975
TOTALS						7697.18			335703.531

SUMMARY OF YEAR 2023

	PLANT NAME	PLANT TYPE	UNIT CAPACITY (MW)	NO.OF UNITS	CAPACITY FACTOR (%)	ENERGY (GWH)	FUEL CONSUMPTION DOMESTIC (TON)	FOREIGN (TON)	GENERATION COSTS (K$)
1	HROR	10	0.0	1	50.67	101.21	0.00	0.00	547.200
2	HSTO	11	0.0	1	0.00	0.00	0.00	0.00	0.000
3	OH1	0	0.0	1	0.42	1.05	0.00	0.00	375.556
4	OH2	0	0.0	1	1.74	8.71	0.00	0.00	1175.566
5	OH3	0	0.0	1	9.04	48.91	0.00	0.00	4876.844
6	OH4	0	0.0	1	18.60	106.05	0.00	0.00	10036.384
7	HB6	0	0.0	1	3.99	22.73	0.00	0.00	2434.783
8	RF1	0	0.0	0	0.00	0.00	0.00	0.00	0.000
9	RF2	0	0.0	0	0.00	0.00	0.00	0.00	0.000
10	GT4	2	0.0	0	0.00	0.00	0.00	0.00	0.000
11	GT5	2	0.0	0	0.00	0.00	0.00	0.00	0.000
12	GT10	2	0.0	0	0.00	0.00	0.00	0.00	0.000
13	GT3	2	0.0	1	0.09	0.18	0.00	0.00	132.978
14	GT6	2	0.0	1	0.03	0.04	0.00	0.00	108.584
15	GT7	2	0.0	1	0.08	0.10	0.00	0.00	121.765
16	GT8	2	0.0	1	0.06	0.07	0.00	0.00	115.946
17	GT9	2	0.0	1	0.03	0.05	0.00	0.00	112.662
18	GT11	2	0.0	1	0.02	0.03	0.00	0.00	107.788
19	BOCC	2	0.0	1	0.46	4.48	0.00	0.00	1814.829
20	JPPC	0	0.0	0	0.00	0.00	0.00	0.00	0.000
21	JEP1	0	0.0	0	0.00	0.00	0.00	0.00	0.000
22	JEP2	0	0.0	0	0.00	0.00	0.00	0.00	0.000
23	ALCO	0	0.0	1	27.32	11.97	0.00	0.00	1781.340
24	BRLS	0	0.0	0	0.00	0.00	0.00	0.00	0.000
30	JEPn	6	0.0	1	53.10	577.75	0.00	0.00	53125.414
43	GT5N	6	0.0	1	21.35	40.03	0.00	0.00	3248.813
44	G10N	6	0.0	1	47.15	132.59	0.00	0.00	9428.942
45	GT4N	6	0.0	0	0.00	0.00	0.00	0.00	0.000
46	GTAD	2	0.0	0	0.00	0.00	0.00	0.00	0.000
47	NGCC	6	0.0	5	89.07	4564.59	0.00	0.00	175049.141
48	MSD	0	0.0	0	0.00	0.00	0.00	0.00	0.000
49	COCG	1	0.0	1	88.21	873.18	0.00	0.00	27988.930
50	CC#2	2	0.0	0	0.00	0.00	0.00	0.00	0.000
51	PETC	4	0.0	1	88.21	873.18	0.00	0.00	27218.711
52	GTNG	6	0.0	2	77.25	527.80	0.00	0.00	26402.102
53	COAL	1	0.0	0	0.00	0.00	0.00	0.00	0.000
54	LSD	0	0.0	1	51.60	130.19	0.00	0.00	9078.711
TOTALS						8024.88			355283.000

SUMMARY OF YEAR 2024

	PLANT NAME	PLANT TYPE	UNIT CAPACITY (MW)	NO.OF UNITS	CAPACITY FACTOR (%)	ENERGY (GWH)	FUEL CONSUMPTION DOMESTIC (TON)	FOREIGN (TON)	GENERATION COSTS (K$)
1	HROR	10	0.0	1	50.67	101.21	0.00	0.00	547.200
2	HSTO	11	0.0	1	0.00	0.00	0.00	0.00	0.000
3	OH1	0	0.0	1	0.16	0.40	0.00	0.00	301.557
4	OH2	0	0.0	1	0.64	3.19	0.00	0.00	596.255
5	OH3	0	0.0	1	3.75	20.28	0.00	0.00	2175.273
6	OH4	0	0.0	1	9.22	52.56	0.00	0.00	5110.468
7	HB6	0	0.0	1	1.60	9.13	0.00	0.00	1135.096
8	RF1	0	0.0	0	0.00	0.00	0.00	0.00	0.000
9	RF2	0	0.0	0	0.00	0.00	0.00	0.00	0.000
10	GT4	2	0.0	0	0.00	0.00	0.00	0.00	0.000
11	GT5	2	0.0	0	0.00	0.00	0.00	0.00	0.000
12	GT10	2	0.0	0	0.00	0.00	0.00	0.00	0.000
13	GT3	2	0.0	1	0.02	0.04	0.00	0.00	107.564
14	GT6	2	0.0	1	0.03	0.04	0.00	0.00	108.062
15	GT7	2	0.0	1	0.02	0.02	0.00	0.00	104.408
16	GT8	2	0.0	1	0.03	0.03	0.00	0.00	106.839
17	GT9	2	0.0	1	0.00	0.00	0.00	0.00	101.179
18	GT11	2	0.0	1	0.02	0.03	0.00	0.00	107.648
19	BOCC	2	0.0	1	0.16	1.58	0.00	0.00	1493.031
20	JPPC	0	0.0	0	0.00	0.00	0.00	0.00	0.000
21	JEP1	0	0.0	0	0.00	0.00	0.00	0.00	0.000
22	JEP2	0	0.0	0	0.00	0.00	0.00	0.00	0.000
23	ALCO	0	0.0	1	13.26	5.81	0.00	0.00	1327.833
24	BRLS	0	0.0	0	0.00	0.00	0.00	0.00	0.000
30	JEPn	6	0.0	1	38.21	415.76	0.00	0.00	45083.414
43	GT5N	6	0.0	1	10.42	19.53	0.00	0.00	1617.144
44	G10N	6	0.0	1	36.10	101.51	0.00	0.00	7873.155
45	GT4N	6	0.0	0	0.00	0.00	0.00	0.00	0.000
46	GTAD	2	0.0	0	0.00	0.00	0.00	0.00	0.000
47	NGCC	6	0.0	6	87.22	5363.91	0.00	0.00	206654.531
48	MSD	0	0.0	0	0.00	0.00	0.00	0.00	0.000
49	COCG	1	0.0	1	88.22	873.27	0.00	0.00	27991.518
50	CC#2	2	0.0	0	0.00	0.00	0.00	0.00	0.000
51	PETC	4	0.0	1	88.22	873.27	0.00	0.00	27220.914
52	GTNG	6	0.0	2	62.28	425.53	0.00	0.00	22275.932
53	COAL	1	0.0	0	0.00	0.00	0.00	0.00	0.000
54	LSD	0	0.0	1	41.00	103.45	0.00	0.00	7389.950
TOTALS						8370.54			359428.969

SUMMARY OF YEAR 2025

	PLANT NAME	PLANT TYPE	UNIT CAPACITY (MW)	NO.OF UNITS	CAPACITY FACTOR (%)	ENERGY (GWH)	FUEL CONSUMPTION DOMESTIC (TON)	FOREIGN (TON)	GENERATION COSTS (K$)
1	HROR	10	0.0	1	50.67	101.21	0.00	0.00	547.200
2	HSTO	11	0.0	1	0.00	0.00	0.00	0.00	0.000
3	OH1	0	0.0	1	0.39	0.98	0.00	0.00	367.765
4	OH2	0	0.0	1	1.54	7.68	0.00	0.00	1067.673
5	OH3	0	0.0	1	7.46	40.38	0.00	0.00	4073.653
6	OH4	0	0.0	1	15.27	87.05	0.00	0.00	8264.466
7	HB6	0	0.0	1	3.48	19.86	0.00	0.00	2159.176
8	RF1	0	0.0	0	0.00	0.00	0.00	0.00	0.000
9	RF2	0	0.0	0	0.00	0.00	0.00	0.00	0.000
10	GT4	2	0.0	0	0.00	0.00	0.00	0.00	0.000
11	GT5	2	0.0	0	0.00	0.00	0.00	0.00	0.000
12	GT10	2	0.0	0	0.00	0.00	0.00	0.00	0.000
13	GT3	2	0.0	1	0.08	0.14	0.00	0.00	127.057
14	GT6	2	0.0	1	0.05	0.07	0.00	0.00	114.629
15	GT7	2	0.0	1	0.07	0.09	0.00	0.00	118.201
16	GT8	2	0.0	1	0.07	0.08	0.00	0.00	117.761
17	GT9	2	0.0	1	0.01	0.02	0.00	0.00	105.119
18	GT11	2	0.0	1	0.03	0.05	0.00	0.00	112.162
19	BOCC	2	0.0	1	0.43	4.18	0.00	0.00	1780.488
20	JPPC	0	0.0	0	0.00	0.00	0.00	0.00	0.000
21	JEP1	0	0.0	0	0.00	0.00	0.00	0.00	0.000
22	JEP2	0	0.0	0	0.00	0.00	0.00	0.00	0.000
23	ALCO	0	0.0	1	21.64	9.48	0.00	0.00	1598.080
24	BRLS	0	0.0	0	0.00	0.00	0.00	0.00	0.000
30	JEPn	6	0.0	1	47.41	515.77	0.00	0.00	50048.148
43	GT5N	6	0.0	1	16.79	31.47	0.00	0.00	2563.993
44	G10N	6	0.0	1	45.68	128.44	0.00	0.00	9221.519
45	GT4N	6	0.0	0	0.00	0.00	0.00	0.00	0.000
46	GTAD	2	0.0	0	0.00	0.00	0.00	0.00	0.000
47	NGCC	6	0.0	6	88.48	5441.02	0.00	0.00	208967.938
48	MSD	0	0.0	0	0.00	0.00	0.00	0.00	0.000
49	COCG	1	0.0	1	88.22	873.27	0.00	0.00	27991.516
50	CC#2	2	0.0	0	0.00	0.00	0.00	0.00	0.000
51	PETC	4	0.0	1	88.22	873.27	0.00	0.00	27220.914
52	GTNG	6	0.0	2	70.00	478.29	0.00	0.00	24404.389
53	COAL	1	0.0	0	0.00	0.00	0.00	0.00	0.000
54	LSD	0	0.0	1	48.27	121.77	0.00	0.00	8547.222
TOTALS						8734.55			379519.062

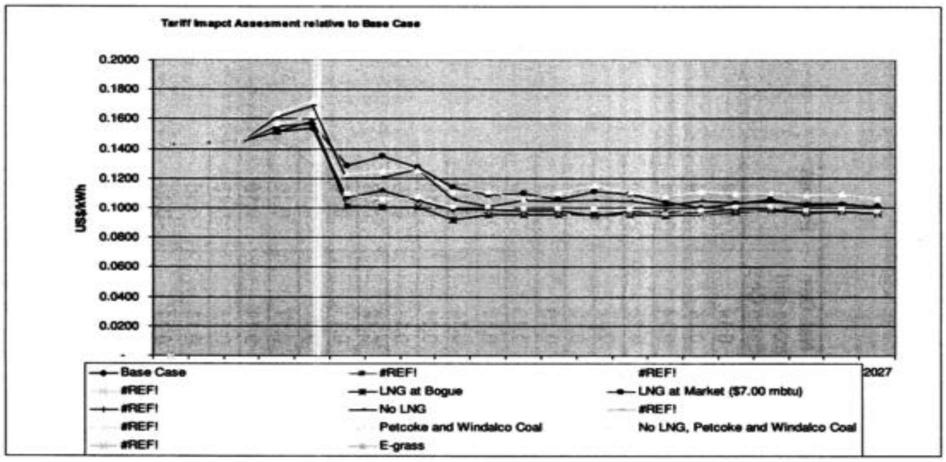
SUMMARY OF YEAR 2026

	PLANT NAME	PLANT TYPE	UNIT CAPACITY (MW)	NO.OF UNITS	CAPACITY FACTOR (%)	ENERGY (GWH)	FUEL CONSUMPTION DOMESTIC (TON)	FUEL CONSUMPTION FOREIGN (TON)	GENERATION COSTS (K$)
1	HROR	10	0.0	1	50.67	101.21	0.00	0.00	547.200
2	HSTO	11	0.0	1	0.00	0.00	0.00	0.00	0.000
3	OH1	0	0.0	1	0.97	2.42	0.00	0.00	531.221
4	OH2	0	0.0	1	3.43	17.14	0.00	0.00	2060.200
5	OH3	0	0.0	1	13.42	72.68	0.00	0.00	7045.215
6	OH4	0	0.0	1	24.52	139.81	0.00	0.00	13133.146
7	HB6	0	0.0	1	6.94	39.55	0.00	0.00	4032.782
8	RF1	0	0.0	0	0.00	0.00	0.00	0.00	0.000
9	RF2	0	0.0	0	0.00	0.00	0.00	0.00	0.000
10	GT4	2	0.0	0	0.00	0.00	0.00	0.00	0.000
11	GT5	2	0.0	0	0.00	0.00	0.00	0.00	0.000
12	GT10	2	0.0	0	0.00	0.00	0.00	0.00	0.000
13	GT3	2	0.0	1	0.25	0.47	0.00	0.00	189.371
14	GT6	2	0.0	1	0.12	0.15	0.00	0.00	133.205
15	GT7	2	0.0	1	0.22	0.26	0.00	0.00	156.085
16	GT8	2	0.0	1	0.17	0.21	0.00	0.00	145.604
17	GT9	2	0.0	1	0.06	0.10	0.00	0.00	124.359
18	GT11	2	0.0	1	0.08	0.13	0.00	0.00	131.792
19	BOCC	2	0.0	1	1.08	10.51	0.00	0.00	2472.222
20	JPPC	0	0.0	0	0.00	0.00	0.00	0.00	0.000
21	JEP1	0	0.0	0	0.00	0.00	0.00	0.00	0.000
22	JEP2	0	0.0	0	0.00	0.00	0.00	0.00	0.000
23	ALCO	0	0.0	1	33.14	14.51	0.00	0.00	1968.778
24	BRLS	0	0.0	0	0.00	0.00	0.00	0.00	0.000
30	JEPn	6	0.0	1	56.10	610.38	0.00	0.00	54745.195
43	GT5N	6	0.0	1	26.91	50.45	0.00	0.00	3950.458
44	G10N	6	0.0	1	52.20	146.79	0.00	0.00	10139.975
45	GT4N	6	0.0	0	0.00	0.00	0.00	0.00	0.000
46	GTAD	2	0.0	0	0.00	0.00	0.00	0.00	0.000
47	NGCC	6	0.0	6	89.16	5482.86	0.00	0.00	210223.562
48	MSD	0	0.0	0	0.00	0.00	0.00	0.00	0.000
49	COCG	1	0.0	1	88.22	873.27	0.00	0.00	27991.516
50	CC#2	2	0.0	0	0.00	0.00	0.00	0.00	0.000
51	PETC	4	0.0	1	88.22	873.27	0.00	0.00	27220.914
52	GTNG	6	0.0	2	78.73	537.94	0.00	0.00	26810.879
53	COAL	1	0.0	0	0.00	0.00	0.00	0.00	0.000
54	LSD	0	0.0	1	55.58	140.22	0.00	0.00	9712.541
TOTALS						9114.33			403466.312

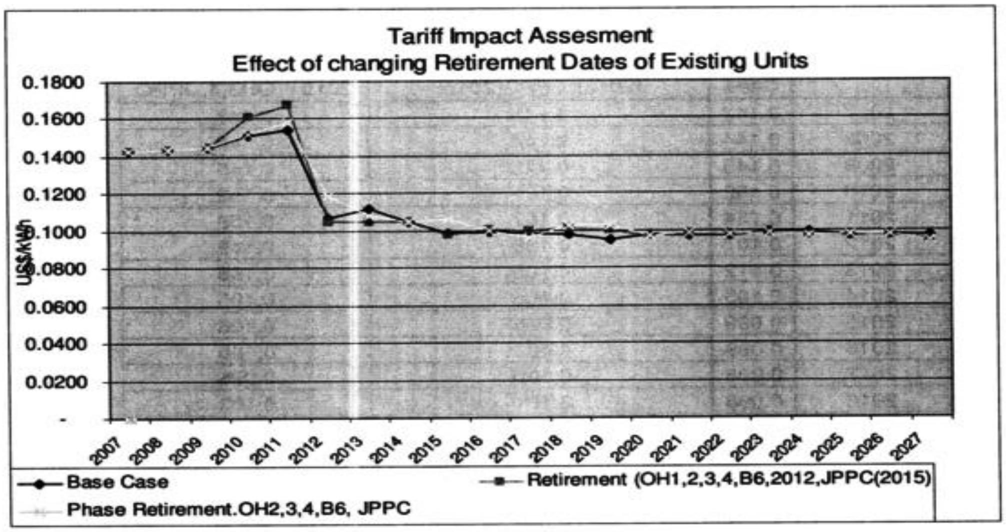
APPENDIX IV

14. APPENDIX IV: TARIFF IMPACT RESULTS

Generation Tariff Impact (US$/kWh)							
Year	Base Case	Natural Gas at Bogue	Natural Gas at Market ($7.00 MBtu)	No Natural Gas	Nat. Gas; Petcoke and Windalco Coal	No Nat. Gas, Petcoke and Windalco Coal	E-grass
2007	0.14	0.14	0.14	0.14	0.14	0.14	0.14
2008	0.14	0.14	0.14	0.14	0.14	0.14	0.14
2009	0.14	0.14	0.14	0.14	0.14	0.14	0.14
2010	0.15	0.15	0.15	0.16	0.16	0.16	0.15
2011	0.15	0.16	0.16	0.17	0.16	0.17	0.13
2012	0.11	0.10	0.13	0.12	0.11	0.12	0.10
2013	0.11	0.10	0.14	0.12	0.11	0.13	0.11
2014	0.11	0.10	0.13	0.13	0.11	0.13	0.10
2015	0.10	0.09	0.11	0.11	0.10	0.11	0.10
2016	0.10	0.10	0.11	0.10	0.10	0.11	0.10
2017	0.10	0.10	0.11	0.11	0.10	0.11	0.10
2018	0.10	0.10	0.11	0.10	0.10	0.11	0.10
2019	0.09	0.10	0.11	0.11	0.10	0.12	0.09
2020	0.10	0.10	0.11	0.10	0.10	0.11	0.10
2021	0.10	0.09	0.10	0.10	0.10	0.11	0.10
2022	0.10	0.10	0.10	0.10	0.10	0.11	0.10
2023	0.10	0.10	0.10	0.10	0.10	0.11	0.10
2024	0.10	0.10	0.11	0.10	0.10	0.11	0.10
2025	0.10	0.10	0.10	0.10	0.10	0.11	0.10
2026	0.10	0.10	0.10	0.10	0.10	0.11	0.10
2027	0.10	0.10	0.10	0.10	0.10	0.11	0.10


Tariff Impact Assessment relative to Base Case
US$/kWh
0.2000
0.1800
0.1600
0.1400
0.1200
0.1000
0.0800
0.0600
0.0400
0.0200
2027
Base Case
#REF!
LNG at Bogue
LNG at Market ($7.00 mbtu)
No LNG
Petcoke and Windalco Coal
No LNG, Petcoke and Windalco Coal
E-grass

	Generation Tariff Impact (US$/kWh)		
Year	Base Case	Retirement: OH1,2,3,4,B6 (2012); JPPC(2015)	Phase Retirement: 2012 – OH1,2,B6; 2015 – OH3,4, JPPC
2007	0.142	0.143	0.143
2008	0.144	0.144	0.144
2009	0.145	0.145	0.145
2010	0.152	0.161	0.152
2011	0.154	0.167	0.158
2012	0.107	0.105	0.119
2013	0.112	0.105	0.108
2014	0.105	0.105	0.105
2015	0.099	0.098	0.106
2016	0.099	0.101	0.100
2017	0.098	0.100	0.096
2018	0.098	0.101	0.103
2019	0.095	0.100	0.102
2020	0.097	0.097	0.097
2021	0.097	0.099	0.099
2022	0.097	0.098	0.098
2023	0.099	0.098	0.098
2024	0.099	0.097	0.097
2025	0.097	0.098	0.098
2026	0.098	0.097	0.097
2027	0.097	0.095	0.094


Tariff Impact Assesment
Effect of changing Retirement Dates of Existing Units
0.1800
0.1600
0.1400
0.1200
0.1000
0.0800
0.0600
0.0400
0.0200
-
US$/kWh
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
Base Case
Retirement (OH1,2,3,4,B6,2012,JPPC(2015)
Phase Retirement.OH2,3,4,B6, JPPC

	Generation Tariff Impact (US$/kWh)														
Year	Base Case	2012: Ret OH1,2,3,4,B6,	Ret. Steam(2012 - 2020)	Ret.OH2, 3,4,B6, JPPC	Nat. Gas at Bogue	Nat. Gas at Market ($7.00 MBtu)	Jamalco	No Natural Gas	Nat. Gas at $6.00 MBtu	Nat. Gas at $5.00 MBtu	Petcoke and Coal available	No Nat. Gas, Petcoke and Coal	JPPC beyond 2015	E-grass
2007	0.142	0.143	0.143	0.143	0.143	0.143	0.143	0.143	0.143	0.143	0.143	0.143	0.143	0.143
2008	0.144	0.144	0.144	0.144	0.144	0.144	0.144	0.144	0.144	0.144	0.144	0.144	0.144	0.144
2009	0.145	0.145	0.145	0.145	0.145	0.145	0.145	0.145	0.145	0.145	0.145	0.145	0.145	0.145
2010	0.152	0.161	0.152	0.152	0.152	0.155	0.147	0.161	0.155	0.155	0.156	0.164	0.152	0.147
2011	0.154	0.167	0.158	0.158	0.158	0.157	0.154	0.169	0.163	0.163	0.162	0.172	0.158	0.130
2012	0.107	0.105	0.119	0.119	0.101	0.128	0.110	0.120	0.119	0.113	0.109	0.123	0.107	0.104
2013	0.112	0.105	0.108	0.108	0.100	0.135	0.107	0.120	0.114	0.110	0.107	0.125	0.101	0.109
2014	0.105	0.105	0.105	0.105	0.100	0.128	0.111	0.126	0.121	0.116	0.107	0.126	0.105	0.103
2015	0.099	0.098	0.106	0.106	0.092	0.114	0.101	0.106	0.108	0.104	0.100	0.111	0.101	0.097
2016	0.099	0.101	0.100	0.100	0.095	0.109	0.097	0.101	0.105	0.102	0.101	0.111	0.100	0.097
2017	0.098	0.100	0.096	0.096	0.095	0.110	0.100	0.105	0.105	0.103	0.100	0.106	0.100	0.096
2018	0.098	0.101	0.103	0.103	0.095	0.106	0.100	0.105	0.103	0.102	0.100	0.111	0.099	0.096
2019	0.095	0.100	0.102	0.102	0.095	0.111	0.099	0.105	0.108	0.102	0.099	0.115	0.099	0.093
2020	0.097	0.097	0.097	0.097	0.096	0.109	0.099	0.104	0.103	0.101	0.099	0.110	0.098	0.096
2021	0.097	0.099	0.099	0.099	0.095	0.104	0.099	0.102	0.099	0.101	0.096	0.108	0.098	0.096
2022	0.097	0.098	0.098	0.098	0.096	0.100	0.098	0.105	0.102	0.101	0.098	0.111	0.098	0.095
2023	0.099	0.098	0.098	0.098	0.097	0.103	0.099	0.104	0.105	0.100	0.101	0.110	0.097	0.098
2024	0.099	0.097	0.097	0.097	0.098	0.106	0.100	0.104	0.105	0.101	0.101	0.110	0.097	0.098
2025	0.097	0.098	0.098	0.098	0.096	0.102	0.098	0.103	0.101	0.101	0.098	0.109	0.099	0.095
2026	0.098	0.097	0.097	0.097	0.098	0.102	0.100	0.103	0.101	0.101	0.100	0.109	0.099	0.096
2027	0.097	0.095	0.094	0.094	0.096	0.101	0.099	0.100	0.100	0.100	0.097	0.106	0.096	0.095