Office of Utilities Regulation

Jamaica Public Service Company Limited

Generation Expansion Plan 2001 - 2004

Decision

OUR

OFFICE OF UTILITIES REGULATION

September 10, 2001

INTRODUCTION

The All Island Electric Licence 2001 provides for JPS to submit long-term plans for system expansion to the Office for approval. It also imposes a duty on the Office, when it is satisfied that the plan represents the least economic costs for system expansion consistent with internationally accepted best industry practice, to recommend such plans to the Minister for approval, who shall on receipt:

a) approve the plan; or
b) return it to the Office for further consideration.

In February 2001, due to an unfortunate series of break down of plant, while one major generating unit was out of service for maintenance overhaul, JPS found that it was completely out of reserve capacity and was unable to meet demand.

The company's management must take full responsibility for this unfortunate deficiency in generating capacity. In fact, the Office had, in each annual report since its inception in 1997, expressed concerns about delays in the development and implementation of a generation expansion plan. In its 1999/200 report the Office wrote -

> "The OUR is of the view that any decision taken at this time to add capacity intended to satisfy demand in 2001/2002 will not be the least cost alternative and may result in less than optimal prices to the consumer".

The ownership structure of the company changed on March 31, 2001 and the new management team has been confronted with a nightmare as far as available capacity is concerned and which has forced it to procure on an emergency basis a 20 MW gas turbine for installation at Bogue. It has also been forced to develop a generation expansion plan to meet short-term needs for the period 2001 – 2004.

The company submitted this plan for the consideration of the Office on May 10, 2001. In conducting the review, the Office has been in discussion with the company, the results of which have been a number of additional submissions in clarification of issues raised by the Office.

DECISION

In accordance with the provisions of Condition 21 of the All Island Electric Licence 2001, the Office sets out its decision on the JPS Expansion Plan 2001 – 2004, hereunder:

The Office has concluded that the choice of Combined Cycle Technology for installation at the Bogue facility, is the most appropriate option to meet the short-term power needs of the country.

The Office therefore has no objection to the company's proposals for capacity additions in accordance with the following timetable:

2001 : 1 x 25 MW (ISO) gas turbine (this approval was communicated to the company by letter dated May 16, 2001).

2002 – 2003 : 120 MW combined cycle installed in two phases:

i. 2 x 40 MW (ISO) gas turbines in 2002

ii. 1 x 40 MW Heat Recovery Steam Generator (HRSG) and Steam Turbine Generator (to complete the combined cycle plant) in 2003.

Additionally, the Office has already issued its decision regarding the methodology for estimating avoided costs for capacity from wind turbines. This will enable the company and Petroleum Corporation of Jamaica (PCJ) to conclude agreements on the Power Purchase Agreement (PPA) for the development of the 20 MW wind farm at Wigton, Manchester. It is a requirement that JPS submits the draft PPA for review by the Office before concluding the Agreement. The Office anticipates that the wind farm will be in commercial operation by late 2003.

The Office is of the view that the assumed growth rate of 4% may be conservative and cautions that, should the growth be higher than the forecasted 4%, the reserve margin in 2004 could fall below acceptable levels. With this in mind, the Office will urge the company to:

1) work on the development of the long term planning procedures as a priority with a view to completing that process within the time frame stipulated in the All-Island Electric Licence 2001; and

2) concurrently, commence detailed evaluation of the Petcoke fired plant proposed by Petrojam with a view to making recommendations to the Office by the end of November 2001.

The Office's thinking on the Petcoke option will be issued separately. Suffice it to say that, from the information available, the Petcoke plant would seem to satisfy all the criteria to make it a suitable candidate for the next tranche of capacity additions (due 2004/2005). However, the decision should be taken in the context of an overall assessment of the power system and in the context of a long-term plan.

Reliability of Supply - based on a loss of load probability which translates into a reserve margin of 20%. This allows JPS to take one large plant (68MW) out of service for maintenance and be able to lose one other (68MW) on forced outage and still be able to satisfy maximum customer demand.

Cost of Capital - 14.89%, the allowable return established by the OUR in the 2000 tariff review.

Existing plant reliability -

i. Availability - 85%
ii. Forced outage rate - 6%

Demand Forecast - 4% growth per annum

The company indicates that its decisions are based on three planning horizons in order to restore system performance to acceptable levels.

1. Restoring existing performance to pre-February 2001 levels.

2. Short term (2001- 2004)
   To immediately restore system reserve capacity in a timely and economic manner to preserve the reliability and meet regulated standards.

3. Medium to long term expansion (2005 - 2010)
   Establish a long-term expansion strategy, which is most cost effective and responds to policy directions of the Government to facilitate lower cost energy for economic growth.

The proposals that have been presented to the Office for consideration deal with the immediate and short-term objectives.

2001	1 x 25 MW (ISO) Combustion Turbine (August)
2002	1 x 40 MW (ISO) Combustion Turbine (First phase of Combined Cycle Plant)

2003	1 x 40 MW (ISO) Combustion Turbine (Second phase of Combined Cycle Plant)
2004	1 x 40 MW HRSG & Steam Turbine Generator (Completing Combined Cycle Plant)

Furthermore, the company is undertaking –

a) to carry out a more detailed and comprehensive review of the capacity alternatives for expansion beyond 2004. This to include a more detailed look at natural gas, solid fuels and Orimulsion,

b) consistent with Government policy to create diversity in the fuel mix, to work with the OUR and PCJ to implement a 20 MW wind farm as an energy substitute for fossil fuel.

The company asserts that some important objective indicators support its demand forecast. These include:

i. the consistent number of applications for new service of approximately 20,000 per annum; and

ii. important point load additions, totalling about 15 MW, expected in the coming year (2002)

However, based on the current economic outlook, the company proposes a growth in demand closer to 4% because:

i. it is of the view that the current growth of 6% cannot continue if economic performance does not improve, particularly in the short term; and

ii. it intends to engage in demand-management strategies that will continue to increase energy consumption at the accustomed rate but at the same time reducing the rate of growth in peak demand.

Its assessment of the Capacity/Demand situation has led the company to conclude that:

i. it does not have sufficient reserve margin to maintain the reliability of service being demanded by customers; and

ii. plant availability is generally in keeping with the standard 85% minimum, with the exception of a few High Impact Low Probability (HILP) Failures that have occurred over the previous 18 months. These forced outages have had a

negative impact on the system forced outage rate with the forced outage rate for the previous year being 12.7% instead of the targeted and desired 6%.

The technology options and the earliest delivery periods were presented as follows:

Technology	Earliest in service date	Delivery (months)
Gas turbine	Mid 2002	12
Medium Speed Diesel	Mid 2002	12
Slow Speed Diesel	Mid 2003	24
Combined Cycle (ADO/Gas)	Mid 2003	24
Steam Plant	Mid 2005	48

The company provided cost data on these candidate plants in its submission.

The plan is to locate the combined cycle plant at Bogue Power Station which will:

- assist in reducing overall transmission losses by 0.25% points
- avoid investment in transmission infrastructure to ensure reliable evacuation and transmission of power across the island.

Based on equipment delivery times, only two technology options can meet the requirement for the short-term expansion – combined cycle and medium speed diesels. The medium speed diesel option would pose some difficulty for siting at Bogue or on the north coast because:

i. there would be need to develop significant heavy fuel oil terminal, handling and storage facilities in Montego Bay;

ii. there would be significant environmental risks.

In locating medium speed diesels on the South Coast there would be need for greater site and transmission infrastructure development.

While it does have the advantage of lower development costs and higher efficiencies than the medium speed diesel, an initial disadvantage for combined cycle is the tax on Automotive Diesel Oil (ADO). To offset the fuel price disadvantage, the company requested and has received from the Minister of Finance a waiver of ADO taxes on fuel used in the combined cycle.

As part of the longer-term plan the company would consider converting the combined cycle plant to liquid natural gas (LNG) when available at acceptable prices.

The combined cycle plant will meet and exceed environmental standards.

Under the short-term expansion plan the capacity situation will be as follows:

	2001	**2002**	**2003**	**2004**
Existing Capacity (MW)	650	670	703	736
Additional Capacity (MW)	20	33	33	35
Total Capacity (MW)	**670**	**703**	**736**	**771**
Demand (MW)	568	590	614	638
Reserve (MW)	102	113*	122	133
Reserve (%)	**17.9**	**19.4**	**19.8**	**20.8**

* OUR adjustment of error (89) in JPS submission.

In addition, the company expects that 20 MW of wind power will be added during the period.

DISCUSSION

The primary concern of the Office in any consideration of the expansions plans is that the solutions chosen must reflect the least cost options, thereby resulting in the least prices to consumers. The objective test in the instant case, therefore, is to determine whether the option chosen by JPS does in fact represent the least cost option, when all the mitigating factors are taken into consideration. The Office has had to be satisfied on a number of issues. These are discussed below.

Expansion planning process

For the purposes of the current exercise, recognising that the long term expansion planning process has not yet been agreed in accordance with Condition 21 of the All-Island Electric Licence 2001, the Office has no objection to the criteria set by the company.

Demand Forecast

The Office has some concerns regarding the adoption of a 4% growth rate for demand. It has noted that the growth in demand over the period 1997 - 2000 has been as follows:

Year	Demand (MW)	Growth (MW)	Rate (%)
1996	431		
1997	468	37	8.6
1998	489	21	4.5
1999	521	32	6.5
2000	546	25	4.8

In raising this concern with the company, the Office commented that the projected demand may be conservative, noting that the company was also expecting approximately 15MW of point load to be added. The OUR asked for details of any demand management strategies that were to be adopted if it were, in fact, intended that these would form an integral part of the investment programme.

In its response, the company acknowledged that the average annual growth rate over the previous 10 years was approximately 6%, but this has been impacted in the last two years by significant point loads that, when taken into consideration, resulted in the real growth in 1999 to be 4.9% and similarly in 2000 to be 3.5%. The significant feature of these point loads is that they did not represent new demand for the country but was really a transfer from previously isolated generation. The company gave the assurances

of its preparedness to accelerate the implementation of the expansion plan should economic growth indicators so dictate.

It should be noted that in its public announcements, since filing the expansion plan with the OUR as well as in subsequent formal meetings with the Office, the company has indicated that it intends to advance the installation plan by 12 months, implying that 2 x 40 MW plant would be installed in 2002.

Although the details are not yet available, every indication is that the load growth will be in excess of 4% for 2001 and this would only be constrained by the regular power cuts that have been features of the electric utility landscape for much of 2001.

The Proposed Expansion 2001 -2004

With the company's proposal to advance implementation of the expansion plan by one year, based on a 4% growth in demand, the capacity/demand situation will be:

	2001	**2002**	**2003**	**2004**
Installed Capacity (MW)	650	670	736	771
Additional Capacity (MW)	20	66	35	
Total Capacity (MW)	**670**	**736**	**771**	**771**
Demand (MW)	568	590	614	638
Reserve (MW)	102	146	157	133
Reserve (%)	**17.9**	**24.7**	**25.6**	**20.8**

If the growth rate approaches the usual 6% per annum, using the accelerated implementation programme that is now proposed, the capacity/demand situation would be:

	2001	**2002**	**2003**	**2004**
Installed Capacity (MW)	650	670	736	771
Additional Capacity (MW)	20	66	35	
Total Capacity (MW)	**670**	**736**	**771**	**771**
Demand (MW)	568	600	636	673
Reserve (MW)	102	136	135	98
Reserve (%)	**17.9**	**22.7**	**21.2**	**14.5**

This signals that the reserve margin in 2004 could be inadequate and that decisions will have to be taken before the end of the 2001/2002 financial year on the medium to long term (2004 – 2008) expansion programme. The Office has made a determination on the methodology for estimating the avoided costs of wind energy. This will enable the company and Petroleum Corporation of Jamaica to reach an early agreement on the introduction of 20 MW (7 MW firm) of capacity from wind turbines. If this capacity is added in 2003, the reserve margin in 2004, based on 6% growth, would be 15.6%.

Technology Choice

The fact that JPS has been recalcitrant in its planning and did not take timely investment decisions has forced the company, the regulator and, by extension, the Government into a position where the choice of technology, to meet the immediate shortfall in capacity, is limited. The reality is that this limitation also implies that the selection of technology to meet the immediate problem will not have represented the least cost of all the options available if the investment decision was being made under circumstances of a less aggressive time horizon.

The company's conclusion that, under the circumstances, the choices are restricted to medium speed diesel or gas turbine (combined cycle) technologies is accepted by the Office.

The Office has some concerns about the operations of combined cycle plant utilising Automotive Diesel Oil (ADO) and has made inquiries of the experiences in other jurisdictions. Evidently the experience is limited, as comparable installations in the region have only been identified in Panama and the Bahamas. In both cases, the experiences have not provided conclusive endorsement but, as the operating conditions do not exactly replicate those which will obtain in Jamaica, it is not considered that this option could justifiably be ruled out.

The company has indicated that it would be examining the feasibility of utilising liquid natural gas (LNG) as a primary fuel for generation in the future. If this were to prove feasible and were, in fact, implemented, the options for generation expansion as well as the operations of existing plant could change dramatically. However, the date at which LNG will become an economic fuel alternative for Jamaica is uncertain. The Office is of the view that detailed assessment should be made of the feasibility of natural gas (LNG or compressed natural gas) as a fuel in Jamaica and urges both the Government and the company to pursue these investigations on an urgent basis.

Site for new Generation

The possible sites for new capacity are either Bogue on the North Coast or Old Harbour or Hunts Bay on the South Coast. The South Coast sites are suitable for either diesel

plant or gas turbines. There are a number of persuasive reasons to restrict Bogue to plant that do not utilise heavy fuel oil, the foremost of these being:

i. The environmental risk in bunkering heavy fuel oil on the North Coast (in any event bunkering is not allowed); and

ii. The additional investment that would be required in infrastructure for handling heavy fuel oil.

In justifying Bogue as the preferred site, the company has generated load flows that establish that:

i. investment of US$10 million in additional transmission line infrastructure to evacuate power from the South to the North Coast will be avoided;

ii. transmission line losses (without the US$10 million investment) will be lower – by the company's estimates the reduction in losses is 0.25%; and

iii. under normal conditions, at peak load, the generation capacity at Bogue will meet the demand of the North Coast.

Average Cost of Electricity

There are a number of factors that will influence the derived average price of electricity. While the analysis places emphasis on deriving the average cost as it relates to the new plant operating at a capacity factor of 80%, it must be appreciated that, in the immediate and long term operating scenario, it is unlikely that the plant will operate on this basis. In the immediate term (the first 12 months) both units will operate as simple cycle gas turbines. The outturn of this operating mode is a derived average price of electricity of US10.70 cents/kWh. In the period when the capacity problems have stabilised, it is unlikely that the new plant (diesels or gas turbines) will operate at an 80% capacity factor. Based on modelling done by the company, at the request of the Office, it appears that they would operate at capacity factors of 58% in the case of the combined cycle and 60% in the case of diesels. In this scenario the average cost of electricity is derived as US7.62 cents/kWh and 8.42 cents/kWh respectively.

In the scenario where the units are operating at 80% capacity factor, the derived cost of electricity with diesels installed on the South Coast or combined cycle installed at Bogue is US 7.37 cents/kWh and 7.04 cents/kWh respectively. The build up of the costs, modelling each scenario described above, is provided at Attachments 1 and 2.

The costs have been developed on the assumption that the Government has granted a waiver of the Ad Valorem and Special Consumption taxes of approximately 40% that

37.8
26.5
11.3

are imposed on ADO. The Office notes that, by letter dated June 12, 2001, the Minister of Finance has granted such a waiver for a period of ten years.

The company has addressed all concerns raised by the Office and although there is a lingering concern about some of the assumptions presented in the analysis the Office has not been able to access data which conclusively refutes any of the assumptions.

Some comparative figures, based on the results of enquiries made in other jurisdictions, are provided at Attachment 3.

It will be seen, from Attachment 3, that the examples of the combined cycle plant are limited.

Information from Panama on operating plant indicate actual variable costs to be -

Combined Cycle - US 4.23 cents/kWh
Diesel Plant - US 3.81 cents/kWh

For the purposes of the analysis, these indicators generally support the JPS position as the comparative figures proposed by JPS are US 5.51 cents/kWh and 4.24 cents/kWh respectively.

CONCLUSIONS

Decisions in respect of system expansion to meet growth in demand for electricity must be taken in a timely manner based on well thought-out and systematic analysis of the options with a view to arriving at the least cost solution.

Under the circumstances, the Office has concluded that the choice of Combined Cycle Technology for installation at the Bogue facility, is the most appropriate option to meet the short-term power needs of the country.

The Office therefore has no objection to the company's proposals for capacity additions in accordance with the following timetable:

2001	1 x 25 MW (ISO) gas turbine (this approval was communicated to the company by letter dated May 16, 2001).
2002 –2003	120 MW combined cycle installed in two phases
	i. 2002 - 2 x 40 MW (ISO) gas turbines
	ii. 2003 - 1 x 40 MW HRSG and Steam Turbine Generator

Additionally, the Office has already issued its decision (August 24, 2001) regarding the methodology for estimating avoided costs for capacity from wind turbines. This will enable the company and PCJ to conclude agreements on the Power Purchase Agreement for the development of the 20 MW wind farm at Wigton, Manchester. The Office anticipates that this facility will be in commercial operation by late 2003.

The Office is of the view that the assumed growth rate of 4% may be conservative and cautions that, should the growth be higher than the forecasted 4%, the reserve margin in 2004 could be below acceptable levels. With this in mind, the Office will urge the company to:

1) work on the development of the long term planning procedures as a priority with a view to completing that process within the timeframe stipulated in the All-Island Electric Licence 2001; and

2) concurrently, commence detailed evaluation of the Petcoke fired plant proposed by Petrojam with a view to making recommendations to the Office by the end of November 2001.

The Office's thinking on this option will be issued separately. Suffice it to say, that from the information available, the Petcoke plant would seem to satisfy all the criteria

to make it a suitable candidate for the next tranche of capacity addition (due 2004/2005).

ATTACHMENT 1

Discount Rate 14.0% 12.0%

Capacity Options for Expansion

Parameter	No. 6 HFO Medium Speed Diesel	No. 2 ADO Combined Cycle #2
FIXED CHARGE ($/kW-yr)	219	108
CAPACITY CHARGE		
Plant Capacity (kW)	120,000.0	120,000.0
Capital Cost ($/kW)	1333.0	650.0
Lifespan (yrs)	25	25
Levelized Capital Cost ($/kW-yr)	204.4	99.7
Annual Capacity Charge ($)	24,523,742.8	11,958,314.2
(c/kWh)	3.89	1.96
FIXED O&M		
Fixed O&M cost ($/kW-yr) 2001	15.00	8.00
Annual fixed O&M charge ($)	1,800,000.0	960,000.0
(c/kWh)	0.29	0.16
TOTAL FIXED CHARGES($)	26,323,742.8	12,918,314.2
(c/kWh)	4.17	2.12
VARIABLE CHARGES		
Plant Capacity Factor	60.0%	58.0%
Annual Energy Production (kWh)	630,720,000.0	609,696,000.0
FUEL CHARGE		
Fuel Type (Unit)	No. 6 (Bbls)	No. 2 (Bbls)
Fuel Heat Content (MBtu/Unit)	6.20	5.81
Base Fuel Price ($/Unit)	20.00	38.00
Escalation Factors	1.00	1.00
Price of Fuel ($/Unit)	20.00	38.00
Price of Fuel Inclusive of Infrastructure ($/MBtu)	3.23	6.54
Landed Fuel Price ($/Mbtu)	3.23	6.54
Plant Heat Rate (Btu/kWh)	8,500.0	7,500.0
Plant Fuel Consumption (Units ie bbls,tons,scf)	864,697	787,043
Plant Fuel Cost ($/kWh)	0.0274	0.0491
Annual Fuel Charge	17,293,935.5	29,907,635.1
(c/kWh)	2.74	4.91
VARIABLE O&M		
Variable O&M cost ($/kWh) 2001	0.0150	0.0060
Annual Variable O&M Charge ($)	9,460,800.0	3,658,176.0
(c/kWh)	1.50	0.60
TOTAL VARIABLE CHARGE ($)	26,754,735.5	33,565,811.1
(c/kWh)	4.24	5.51
TOTAL CHARGES		
Total Fixed Charges ($)	26,323,742.8	12,918,314.2
Total Fixed Charges (c/kWh)	4.17	2.12
Total Variable Charges ($)	26,754,735.5	33,565,811.1
Total Variable Charges (c/kWh)	4.24	5.51
Total Annual Charge ($)	53,078,478.3	46,484,125.3
Average Cost of Electricity (c/kWh)	**8.42**	**7.62**

Note: (1) Tax on No. 2 Fuel included except for the Combined Cycle unit on ADO
(2) Medium Speed Diesel capital cost includes US$40 Million for transmission infrastructure and system losses

ATTACHMENT 2

Capacity Options for Near Term Generation Expansion

	Discount Rate 14.9%	14.9%
Parameter	No. 6 HFO Medium Speed Diesel	No. 2 ADO Combined Cycle #2
FIXED CHARGE ($/kW-yr)	219	108
CAPACITY CHARGE		
Plant Capacity (kW)	120,000.0	120,000.0
Capital Cost ($/kW)	1333.0	650.0
Lifespan (yrs)	25	25
Levelized Capital Cost ($/kW-yr)	204.4	99.7
Annual Capacity Charge ($)	24,523,742.8	11,958,314.2
(c/kWh)	2.92	1.42
FIXED O&M		
Fixed O&M cost ($/kW-yr) 2001	15.00	8.00
Annual fixed O&M charge ($)	1,800,000.0	960,000.0
(c/kWh)	0.21	0.11
TOTAL FIXED CHARGES($)	26,323,742.8	12,918,314.2
(c/kWh)	3.13	1.54
VARIABLE CHARGES		
Plant Capacity Factor	80.0%	80.0%
Annual Energy Production (kWh)	840,960,000.0	840,960,000.0
FUEL CHARGE		
Fuel Type (Unit)	No. 6 (Bbls)	No. 2 (Bbls)
Fuel Heat Content (MBtu/Unit)	6.20	5.81
Base Fuel Price ($/Unit)	20.00	38.00
Escalation Factors	1.00	1.00
Price of Fuel ($/Unit)	20.00	38.00
Price of Fuel Inclusive of Infrastructure ($/MBtu)	3.23	6.54
Landed Fuel Price ($/Mbtu)	3.23	6.54
Plant Heat Rate (Btu/kWh)	8,500.0	7,500.0
Plant Fuel Consumption (Units ie bbls,tons,scf)	1,152,929	1,085,577
Plant Fuel Cost ($/kWh)	0.0274	0.0491
Annual Fuel Charge	23,058,580.6	41,251,910.5
(c/kWh)	2.74	4.91
VARIABLE O&M		
Variable O&M cost ($/kWh) 2001	0.0150	0.0060
Annual Variable O&M Charge ($)	12,614,400.0	5,045,760.0
(c/kWh)	1.50	0.60
TOTAL VARIABLE CHARGE ($)	35,672,980.6	46,297,670.5
(c/kWh)	4.24	5.51
TOTAL CHARGES		
Total Fixed Charges ($)	26,323,742.8	12,918,314.2
Total Fixed Charges (c/kWh)	3.13	1.54
Total Variable Charges ($)	35,672,980.6	46,297,670.5
Total Variable Charges (c/kWh)	4.24	5.51
Total Annual Charge ($)	61,996,723.4	59,215,984.7
Average Cost of Electricity (c/kWh)	7.37	7.04

Notes: (1) Medium speed diesel capital cost includes US$40 million for transmission infrastructure and system losses.

(2) Combined cycle fuel price net of taxes.

ATTACHMENT 3

JPS GENERATION EXPANSION PLAN 2001 - 2004
Comparitive charges

	Medium Speed Diesel No 6 HFO						Combined Cycle ADO		
	JPS without TX infra.	JPS with TX infra.	Carib. Utility	IFC	International Consulting Co.	Wartsila	JPS	Carib. Utility	Wartsila
Capacity charges									
Plant capacity kW	120000	120000	120000	50000	20000	120000	120000	120000	120000
Capital Cost US$/kW	1000	1333	1150	960	750	605	650	1070	450
Capacity charges Usc/kWh	2.19	2.92	2.52	2.11	1.65	1.33	1.43	2.35	0.99
Fixed O&M charges									
Fixed O&M cost US$/kW-yr	0.21	0.21	0.54	3.47	0.38	0.3	0.11	0.71	0.3
Heat Rate									
Heat Rate Btu/kWh	8500	8500	9000	8350	8812	8050	7500	8490	7800
Variable O&M charges									
Variable O&M cost USc/kWh	1.5	1.5	1.25	0.606	0.58	0.54	0.6	0.55	0.2
Total Variable charge USc/kWh	4.24	2.24	4.15	3.04	3.42	3.14	5.51	6.1	5.3
Av. Cost of Electricity USc/kWh	6.64	7.37	7.21	5.75	5.45	4.76	7.04	9.16	6.59

APPENDIX 1

Submission to
Office of Utilities Regulation

On

Jamaica Public Service Company Limited

GENERATION CAPACITY EXPANSION PROGRAMME

May 2001

1.0 SUMMARY

Jamaica Public Service Company as part of its ongoing obligation under its licence, has identified the need to quickly add 145 MW (ISO) of new generating capacity to the system over the next three and a half years to meet the mandated reliability. The Company through its Least Cost Expansion Plan has identified the following programme for immediate implementation.

2001	1x25MW ISO Combustion Turbine (August)
2002	1x40 MW ISO Combustion Turbine (First Phase of Combined Cycle Plant)
2003	1 x 40 Mw ISO Combustion Turbine (Second Phase of Combined Cycle Plant)
2004	1x40 MW HRSG & Steam Turbine Generator (Complete Combined Cycle Plant)

This planned addition of two power plants will re-establish the company's reserve margin to 20% from its current position of 14% and ensure that the company can meet the forecast growth in electricity demand of approximately 20-25 MW (4%) each year.

JPSCo is satisfied that with all factors considered, (timetable for implementation, site development, transmission infrastructure, environmental compliance and future plans for fuel diversity) the proposed strategy in the short term is the best for JPSCo and Jamaica.

The Company therefore seeks the endorsement of the OUR to proceed as follows.

1. Implement the 145 MW of additions as proposed in the plans for 2001-4.

2. Carry out a more detailed and comprehensive review of the capacity alternative for expansion beyond 2004. This includes a more detailed look at Natural Gas, solid fuels and Orimulsion.

3. In keeping with the government's policy to create diversity in the fuel mix, JPSCo is also proposing an approach to work with the OUR and Government to implement a 20 MW Wind-farm in Jamaica as an energy substitute for fossil fuel. The proposal from the company is for the pricing of energy from the project to be based on the Company's long run avoided cost.

The timely ratification of this plan will ensure the JPSCo's ability to restore the high level of operating reliability that the Jamaican customers deserve.

2.0 OBJECTIVES

This document is intended to:

1. Present the Company's least Cost Expansion Plan and the bases for the decisions taken by the company regarding its capacity expansion.

2. Seek endorsement of OUR for Generation Implementation Programme for the years 2001 to 2004 to quickly restore the company's installed generating capacity and reserve margins to acceptable levels.

3.0 PRESENT DEMAND/SUPPLY SITUATION

The plan is being presented against the backdrop of a rapidly dwindling installed reserve margin and significant problems with the reliability of service caused by the coincident forced outage of two of our larger generating units and one IPP unit. This accounts for about 30% of our installed generating capacity.

This adds significance to the need for immediate steps to be taken to address this situation, which currently stands as follows:

1. JPSCo has a Total Gross Installed Capacity of 660 MW. Ongoing capability of 650 MW due to Hydro restrictions based on low stream flows.

2. Peak Demand for electricity is 546 MW that occurred in November of 2000.

3. Over the last ten years the demand for electricity has been growing at a rate of 6% per annum.

Importantly, the reliability of electricity supply for generation is a function of:

a) Existing system availability and forced outage rate and
b) Installed Reserve Margin

To put this into context, the trend over the last 5 years is as follows.

	1996	1997	1998	1999	2000	2001
Capacity (MW)	678	680	650	650	650	650
Demand (MW)	431	468	489	521	546	568*
Reserve Margin (MW)	247	212	161	129	104	82
(%)	57	45	33	25	19	14
System Availability (%)						
- JPSCo	79.7	79.0	88.3	85.6	82.8	-
- IPP	-	87.9	86.5	90.5	89.1	-
- System	79.1	81.3	87.1	87.8	84.5	-
CML Due to Generation	160.8	117.7	83.1	126.0	180.0	-

* ***Forecast Number***

OUR Requirements for customer minutes lost due to generation is: 62 minutes per customer.

4.0 EXPANSION PLANNING PROCESS

JPSCo defines the capacity requirement through a Least Cost Generation Expansion Plan. The objective of this plan is to minimize the overall cost of production for incremental capacity with due consideration for the following constraints and performance criteria.

1. Reliability of Supply – The criteria used is a loss of load probability of 48hrs. per year maximum. This translates to a minimum Reserve Margin of approximately 20% and allows for JPSCo to take one large plant out of service for maintenance (68 MW) and able to lose one other on forced outage.

2. Cost of Capital used in the plan is the allowable return on equity established by the OUR for the Company – 14.89%

3. Siting of other infrastructure development costs (transmission, fuel storage and transportation etc) are also factored into the decision for overall cost. The impact on ongoing cost of operation not directly attributable to the power plant, for example, the cost of losses are also factored into the equation.

4. Environmental compliance Requirement & Cost now have a significant bearing on siting decision. This is so because standards are to be enshrined in law within this year and future non-compliance with these standards will carry punitive sanctions to the Company.

5. Given that the performance of the existing plants are critical to expansion decisions, JPSCo plans with an assumption of existing plant reliability.

    i. Availability of Existing System – 85%
    ii. Forced Outage Rate – 6%

    The Company's capital programme therefore reflects the particular measures that must be implemented to deliver on this performance.

6. JPSCo also responds to Government Policy regarding the energy sector. Our current plan seeks to respond to the call for:

    a) Renewable Energy Development; and
    b) Fuel Diversity.

5.0 DEMAND FORECAST

Demand is forecast to continue with its aggressive growth over the next ten years. The forecast was developed using econometric modeling but is supported by some important objective indicators.

1. Consistent number of applications for new service of approximately 20,000 per year.

2. Important point load additions totaling about 15 MW expected in the coming year.

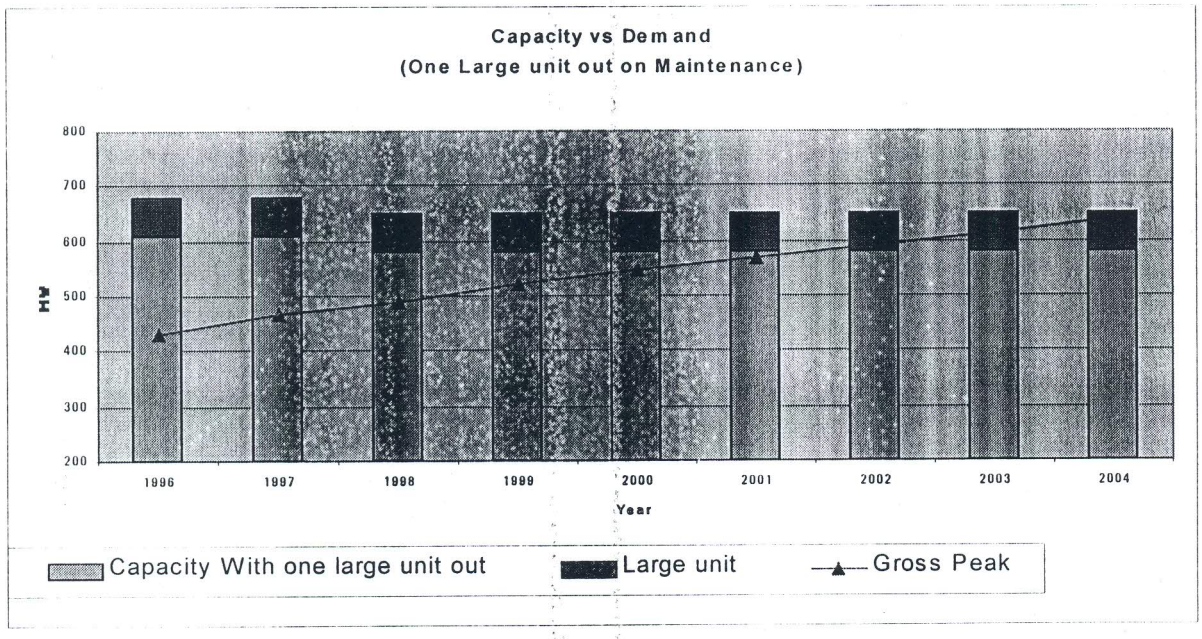
Based on current economic outlook however, JPSCo believes that even though growth will be consistent, the level of growth in demand will be closer to 4%. This is because:

- There is a view that the current growth of 6% cannot continue if the economic performance does not improve. This is so particularly in the short term.

- The Company also intends to engage in demand management strategies that will continue to increase energy demand at the same rate but reducing the rate of growth in peak demand. This include working with OUR, Government and customers to provide correct advice and create the right incentives (through rates and other energy management programmes) to consume electricity efficiently.

OUTLOOK – Capacity/Demand Situation

Based on the existing situation and the criteria established for reliability of performance, the current situation is:



Based on the above, the following conclusions can be drawn.

a) The Company does not have sufficient reserve margin to maintain the reliability of service being demanded by customers.

b) Plant availability is generally in keeping with the standard 85% minimum, with the exception of a few High Impact Low Probability (HILP) Failures that have occurred over the last 18 months. These incidents which have severely affected our ability to deliver reliable service include:

- B6, OH2 - Turbine Failures
- OH3 - Generator Fire
- IPPs - Engine and Turbo Charger Fires, Failed Crank shaft

These forced outages have had a negative impact on the system forced outage rates with the Forced Outage Rate for the last year being 11.7%. As an isolated utility, Forced Outage Rates must be brought down to below 6% to ensure a high level of system reliability.

The proposed expansion plan responds to these issues.

CAPACITY/CANDIDATE OPTION

The plan is broken down into three primary categories.

1. Restoring Existing System Performance

2. Short Term Expansion (2001 – 2004)

    a) Immediately Restore System Reserve in a timely and economic manner to preserve the reliability and meet regulated standards.

3. Medium to Long Term Expansion(2005 – 2010)

    a) Establish a long term Expansion strategy which is most cost effective and responds to the policy directions of Government to facilitate lower cost energy for economic growth.

The technology options considered to fulfil JPSCo's Capacity Requirements and their earliest delivery dates are shown below

Technology	Earliest In Service Data	Delivery (Months)
1. Gas Turbine	Mid 2002	12
2. Medium Speed Diesel	Mid 2002	12
3. Slow Speed Diesel	Mid 2003	24
4. Combined Cycle (ADO/Gas)	Mid 2003	24
5. Steam Plant	mid 2005	48

* *JPSCo has already procured a GT on an emergency basis. The plant is to be installed in 120 days.*

The cost data used for these candidate plants are included in this document as Appendix 2

The WASP simulation package is used to complete the analysis to determine the increment and timing of capacity. The table of data supporting the analysis and the Screening Curve of the options are attached. The plan being presented is based on this information.

The PROPOSED EXPANSION is as follows.

i) Restore Existing Capacity

-	Restore Unit #3	-	May 2001
-	Restore Unit #2	-	August 2001
-	Return of JPPC	-	September 2001

On return of units, JPSCO will work with the IPP's to engage in an accelerated programme of planned maintenance for the units currently in operations to bring the maintenance of these plants up to date.

ii) Short Term Strategy (2001 – 2004)

-	Install 25 MW(ISO) Emergency GT	-	August 2001
-	140 MW Combined Cycle to be installed in 3 phases.		
-	40 MW GT(ISO)	-	MID 2002
-	40 MW GT(ISO)	-	MID 2003
-	40 MW(ISO)	-	MID 2004
-	Install 20 MW of Windpower @ avoided Cost	-	MID 2003

iii) Medium – Long Term (2005 – 2010)

The plan is for an additional 240 MW of Capacity (Base Load) over 6 years. The basic plan is to carefully explore options for:

- Natural Gas
- Solid Fuel
- Orimulsion

IMPORTANT CONSIDERATIONS PARTICULARLY FOR THE SHORT TERM CAPACITY EXPANSION STRATEGY.

1. The plan is to locate the combined cycle capacity at Bogue Power Station. The advantage of this is that it will:

   a) Assist in reducing overall Transmission Losses by 0.25% points.
   b) Avoid investment in Transmission Infrastructure to ensure reliable evacuation and transmission of power across the island.

2. Based on equipment delivery times, only two technology options can meet the requirement for Short Term Expansion. Combined Cycle and Medium Speed Diesels. Medium Speed Diesels would pose some difficulty for location on the North Coast for the following reasons.

   a) There will be the need to develop significant Heavy Fuel Oil terminal, handling and storage facilities in Montego Bay.
   b) Would pose a problem environmentally especially given its NOx and SO2 emissions and fuel oil management.

   Diesels would have to be located on the South Coast and would require greater site and transmission infrastructure development.

3. One disadvantage for combined cycle is the tax on ADO. Its development cost is lower and efficiency is higher than diesels. To offset this fuel price disadvantage, the approach to developing the combined cycle is as follows.

   a) JPSCo will request a waiver of ADO taxes on fuel used in the combined cycle. It is not proposed that it be applied to simple Cycle Gas Turbine operation. This will make the combined cycle competitive.

   b) Combined Cycle on Gas is one of the foremost options for future base load expansion. The plan is to convert this combined cycle to Gas as part of the longer term Expansion Plan. The combined cycle is likely to operate on ADO only for a few years.

4. The combined cycle can ensure that we meet the environmental standards.

Under this Short Term Expansion Programme the capacity situation will be as follows.

	2001	2002	2003	2004
Existing Capacity (MW)	650	670	703	736
Additional Capacity (site)	20	33	33	35
TOTAL CAPACITY (MW)	670	703	736	771
Demand (MW)	568	590	614	638
Reserve (MW)	102	89	122	133
Reserve (%)	17.9%	19.4%	19.8%	20.8%

5. JPSCo also expect to add 20 MW of Windpower, if the policy position on renewable expansion can be quickly resolved. The expectation is that JPSCo will be asked to pay avoided cost and the ratepayers asked to contribute the difference (OUR allowing it to pass through to customer).

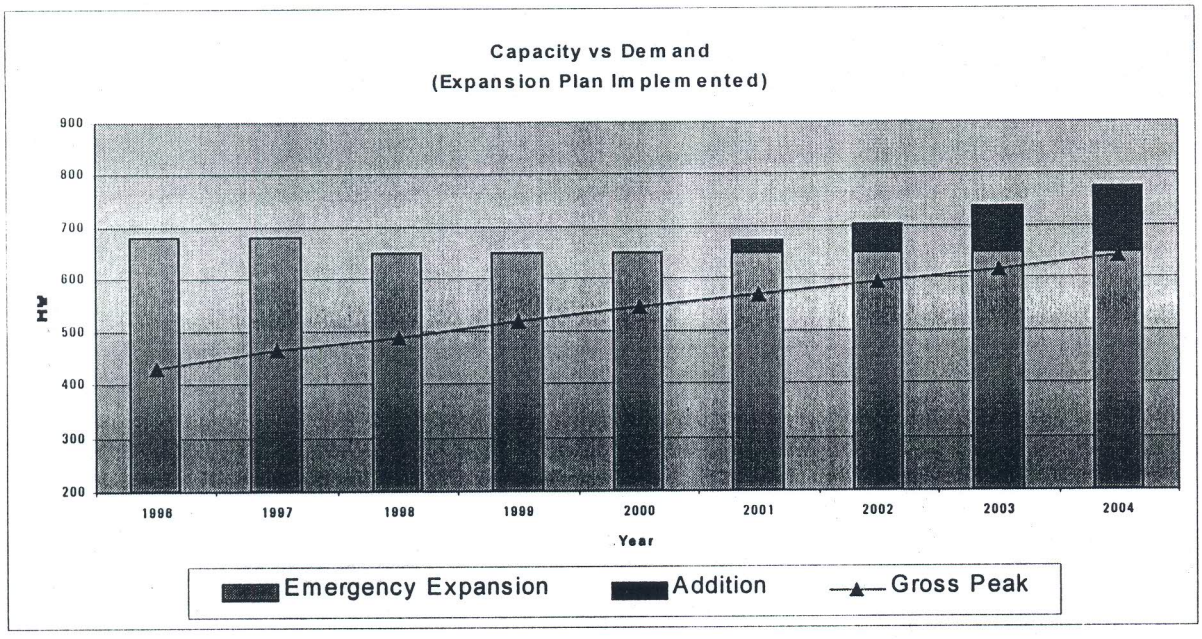
   Given a 20-year contract the avoided cost is to be based on marginal cost of energy over the Planning Horizon based on the company's Least Cost Generation Expansion Plan. This number is to be developed and submitted to the OUR for ratification.

CONCLUSION AND RECOMMENDATION

1. JPSCo is seeking OUR Approval for the addition of 140 MW of New Capacity in the 4 years.

   - 20 MW Emergency Plant
   - 120 Mw Combined Cycle Plant (ADO, without Tax) converted to Gas.

2. JPSCo will complete its review of technology preferences and expansion requirement for years 2005 and beyond to be submitted to the OUR within 12 months.


Capacity vs Demand
(Expansion Plan Implemented)
900
800
700
600
500
400
300
200
MW
1996
1997
1998
1999
2000
2001
2002
2003
2004
Year
Emergency Expansion
Addition
Gross Peak

OFFICE OF UTILITIES REGULATION

3rd Floor, P.C.J. Resource Centre, 36 Trafalgar Road, Kingston 10, Jamaica, W.I.
Tel: (876) 968-6053, 968-6057, Fax: (876) 929-3635, Toll Free: 1 - 888-991-2209

11th September 2001

Hon. Robert Pickersgill, M.P.
Minister of Mining and Energy
Ministry of Mining and Energy
1st Floor, PCJ Resource Centre
36 Trafalgar Road
Kingston 10

Dear Minister,

Re: **Office Decision - Generation Expansion Plan 2001 - 2004**
Jamaica Public Service Company Limited

120 MW Combined Cycle Plant - Bogue, St. James

Enclosed is a document recording the decision of the Office of Utilities Regulation on the plan by Jamaica Public Service Company Limited (JPS) to install a liquid fueled combined cycle plant at Bogue in St. James as the next major investment in generation expansion. The document also reviews the various issues relevant to the decision as well as the factors, which influenced the position adopted by the Office.

The Office does not object to the implementation of JPS' plans to install the 120 MW combined cycle plant in Bogue in accordance with the modules and phasing indicated in the JPS submissions. This is considered to be the most economic generating facility that can be installed within the time limitations, which must be observed if major disruptions of electricity supplies are to be avoided. However, it must also be recorded that the Office is of the strong opinion that the combined cycle technology would not have been the most economic choice had JPS developed and implemented its expansion plans in a timely manner and thereby avoided being forced to make decisions based on expediency rather than sound investment planning. The cost of electricity to the consumer and to the economy at large will therefore be higher than it would have been had JPS been more diligent in discharging its planning responsibilities. The planning horizon is an issue to which detailed attention will be given when JPS presents its Long Term Planning Procedures by the end of September 2001 as is required by the All-Island Electricity Licence 2001.

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Wigton Wind Farm
The Office has already issued its decision on the methodology for calculation of the costs that would be avoided by the utility if electricity from wind were to be purchased from an independent power provider. This decision enables JPS on the one hand and the Petroleum Corporation of Jamaica and its associates on the other to conclude a power purchase agreement. The draft agreement is to be submitted to the Office for review and approval before being made effective.

Yours sincerely,

.....
Winston C. Hay
Director General

c.c. Mr. Godfrey Perkins, Permanent Secretary, Ministry of Mining and Energy
Mr. Charles A. Matthews, President, Jamaica Public Service Company

Enclosure