
Office of Utilities Regulation

The Price of
Jamalco power supply to the National Grid

Determination Notice



OFFICE OF UTILITIES REGULATION

August 3, 2006

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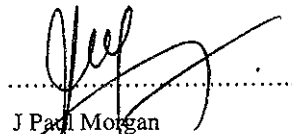
1. PURPOSE OF DOCUMENT

This decision notice sets out the Office's position with respect to the submission on the pricing for electric power (capacity and energy) from the Jamalco Alumina Refinery to the Jamaica Public Service Company under a Power Purchase Agreement.

APPROVAL

This document is approved by the Office of Utilities Regulation and the decisions become effective as of the date hereunder.

On behalf of the Office:



J Paul Morgan
Director General

Date 3rd August 2006.

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1.0 Background

The Electricity sector is governed by a number of instruments including the Office of Utilities Regulation Act 1995 (as amended 2000), (OUR Act) the Electric Lighting Act (“The Act”) and the All- Island Electricity Licence 2001 (“the Licence”) granted to the Jamaica Public Service Company (JPS). The OUR Act provides the Office with the responsibility, among other things, to regulate the provision of prescribed utility services by *licensees or specified organizations*. In doing so the Office shall (S4.3) *undertake such measures as it considers necessary or desirable to (a) encourage competition in the provision of prescribed utility services; (b) protect the interests of consumers in relation to the supply of a prescribed utility service(d) promote and encourage the development of modern and efficient utility services*. The Office (S4.2) *may give directions to any licensee or specified organization with a view to ensuring that (a) the needs of consumers of the services provided by the licensee or specified organization are met and(biii) afford to its consumers economical and reliable service*. The Licence, condition 2, paragraph 3, states that JPS “*shall provide an adequate, safe and efficient service based on modern standards, to all parts of the Island of Jamaica at reasonable rates so as to meet the demands of the Island and to contribute to economic development*”.

Both condition 18 of the Licence and the Office’s regulatory guidelines as set out in the document (Ele 2005/08.1) “**Guidelines for the Addition of Generating Capacity to the Public Electricity Supply System**” provide, inter-alia, for competitive tender to be the normal process by which generating capacity above 15 MW is added to the system. The regulatory guidelines provide for exceptions to this principle as the Office has to be guided by Government of Jamaica (GOJ) policy and specific directives in allowing exceptions in specific circumstances.

Jamalco is planning to double the production of alumina at its Refinery from the current 1.3 million metric tons per year (MTPY) to 2.6 million MPTY. The expansion is expected to result in the creation of up to 3,500 construction jobs in Jamaica, additional industrial and professional employment at the Jamalco Refinery, as well as securing the long term employment of the current contractors and employees at the Jamalco Refinery. The Government sees this as a vital opportunity to grow the economy as a whole.

The Office has been advised by both the GOJ and Jamalco that the project is only possible because of the collaboration between the Governments of Jamaica and Trinidad and Tobago to bring Liquid Natural Gas (LNG) to Jamaica for supply to the Jamalco Refinery at a price fixed, by way of the government to government long term agreement, at less than the “market price”.

Initially, as part of the expansion programme, Jamalco proposed that it could offer to JPS approximately 45 MW of cogeneration capacity derived from the consequential expansion of its power plant to meet the increased requirements for process steam for the expansion of the refinery operations. Subsequently Jamalco modified its proposal to

provide 85MW of capacity. The Minister has approved the waiver of competitive tender for the addition of this tranche of capacity.

The cost of electricity purchased from Independent Power Producers (IPPs) is passed through directly to consumers subject to modifications in the Jamaica Public Service Company Ltd's (JPS) fuel clause. The Office therefore must approve prices paid to IPPs in order to ensure reasonableness and prudence.

This decision notice sets out the Office's position with respect to the pricing for power supplied to JPS from the Jamalco Alumina Refinery Expansion.

2.0 Least Cost Expansion Plan

The Licence, Condition 21, sets out the procedure for the preparation and approval of the Least Cost Expansion Plan. It provides for the Office to review proposals submitted by JPS and once satisfied as to the integrity of the proposal to submit its recommendation to the Minister, who either

- 1) approves the plan or
- 2) returns it to the Office for further consideration.

Accordingly, the Office submitted the Least Cost Expansion Plan dated October 24, 2004 along with the addendum No. 1 dated March 8, 2005 to the Minister of Commerce, Science and Technology with Energy. This called for:

- Expansion of the existing Jamaica Energy Partner's barge mounted diesel plant located at Old Harbour by 49 MW in 2005/6 (already agreed).
- Installation of 2 x 38 MW gas turbine plants in 2006.
- Addition of JAMALCO 40MW cogeneration in 2007 (already agreed).
- Conversion of the 2 x 38 MW gas turbines (installed in 2006) to a 115 MW combined cycle plant burning LNG by adding a Heat Recovery Steam Generator in 2008.
- Addition of a second 115 MW combined cycle plant burning LNG in 2010.
- Conversion of all of JPS Oil-fired steam plants (Hunts Bay B6 and Old Harbour Units 1-4) as well as Hunts Bay GT10 to burn LNG in 2008.
- Addition of the first in a series of 115 MW Coal fired steam fired plants in 2012.

This Plan was predicated on a Demand Forecast predicting an annual growth rate of 4.56% over the planning period and the assumption that LNG would be available arising

from the aforementioned agreement between the Governments of Jamaica and Trinidad and Tobago.

In his approval of the LCEP, dated January 12, 2006, the Minister advised the Office of the Government's decision that the first coal-fired plant scheduled for commissioning into service in 2012 is to be brought forward to 2009 in view of the intangibles surrounding negotiations between the Government of Jamaica and Trinidad and Tobago for the supply of LNG.

The Office was also directed that, in light of this decision, the 2006 update of the LCEP should take these decisions into account and address issues of efficiencies of existing plants.

In order to avoid the possibility of capacity shortages in 2008, the Government also advised of its decision to vary its policy that the addition of capacity after 2004 be acquired through a competitive process.

Accordingly, it directed that sole source arrangements be employed to acquire new capacity between 2006/2008.

The Office advised JPS of the Government's Decision by way of a Directive dated January 17, 2006.

Against this background, Jamalco proposed an amendment to its original proposal of 45 MW (which had been previously approved) offering the installation of a combined cycle cogeneration plant with a nameplate capacity of 140 MW capable of producing the required steam for the refinery, and approximately 85 MW of firm power to the national grid as well as an additional 20 MW of "as available" power. This plant is expected to come on line in 2008/9.

Accordingly, Jamalco made a submission to the Office for a "fair price" of US\$63.4/MWh for the total electricity generation to be made available to JPS on a 24 hour basis and as a 'must run' plant not subject to the normal merit order dispatch criteria.

3.0 Jamalco's proposal

Jamalco is proposing the installation of a combined cycle cogeneration plant with a nameplate capacity of 140 MW, capable of producing the required steam for its own process, and approximately 85MW of firm capacity to the national grid as well as an additional 20 MW of "as available" power.

Jamalco submitted that its proposed price was developed in the context of the following;

- The refinery and power plant is an integrated operation making precise cost allocation difficult
- A combined cycle gas turbine was used as a proxy to determine costs
- The next best alternative available for electricity generation without the availability of LNG is a coal plant using “clean coal” technology.
- Costs are amortized over 20 years
- Fuel charge will move with the delivered price of LNG as per contract
- Revisions to earlier proposals were necessary due to a rapid rise in cost of construction in recent years.
- Firm quotations (*for plant, equipment and services*) were used as a basis for developing the costs

Jamalco, in support of its qualifications to operate a utility grade service, provided a reference list of other utility undertakings that are currently being operated by Jamalco affiliated companies.

Table 1 below shows the Jamalco’s calculation of its proposed prices and that of an alternate coal fired plant

**Table 1
Summary of Jamalco Proposal**

		120 MW CFB	140 MW CCCT
Facility EPC Cost	(\$/kW)	\$1,710	\$1,167
Soft Costs	(\$/kW)	\$400	\$240
Total Project Cost	(\$/kW)	\$2,110	\$1,407
Fuel Charge	(\$/MMBtu)	\$2.64	\$3.50
Average Net Plant Heat Rate	(Btu/kWH)	8,820	8,099
Cost of Generation			
Capacity Charge	(\$/MWH)	\$42.99	\$29.91
O&M Charge	(\$/MWH)	\$11.48	\$5.54
Fuel Charge	(\$/MWH)	\$23.07	\$27.95
Total First Year COG	(\$/MWH)	\$77.54	\$63.40

Footnotes:

Solid Fuel Charge	(\$/Tonne)	\$70.00
Solid Fuel Heating Value	(Btu/lb)	12,030

4.0 Analysis of Jamalco's Proposal

The Office's objective is to ensure that the pricing structure proposed by Jamalco represents a price that does not put electricity consumers at a disadvantage and is therefore no worse than what the alternative would be if the project does not materialise.

The project to expand the refinery is deemed critical to enable Jamaica to secure agreement with the Government of Trinidad and Tobago to supply LNG at preferred rates to Jamaica, to be used in alumina production and electricity power generation for the national grid. The Office has taken the following decisions on the presumption that the Government of Jamaica (GOJ) and Jamalco agree on the wider plant expansion project, the supply of LNG at less than "market rates" is realized and other directly related issues.

The Office has been guided by the following principles in its consideration of Jamalco's proposal

1. Jamalco's expansion would have benefit to the wider economy which may outweigh the impact of any additional cost to be borne by electricity consumers. The Office recognizes that even in its narrow remit for utility regulation, it must have regard to the wider economic and social issues facing the country and that its own decisions while not compromising prudent regulatory practice must at the same time complement the wider policy and development objectives of the government.
2. The securing of LNG through the government to government arrangement would lower the cost of generation from existing plant and provide the opportunity to add new capacity utilising combined cycle gas turbine (CCGT) technology using LNG and which would in turn bring further benefit to consumers.
3. Notwithstanding the above, the Office has no remit to agree prices that are higher than the avoided costs as this would not benefit consumers. Should this situation arise the Office would require a specific directive from the Government, that having regard to the wider policy imperatives, to impose the incremental premium on electricity to consumers
4. The Office would use updated avoided cost calculations based on the 2006 revision of the Least Cost Expansion Plan.
5. The projected in-service date of 2008 represents the earliest possibility for capacity to be delivered to meet demand

Since the Jamalco plant has been deemed as critical to securing LNG, the review was based on a consideration of what would be the best alternative if an agreement for LNG is not reached. The Office has concluded that this alternative would be a coal fired plant of 120MW capacity using 'clean coal' technology.

The Office had expected that JPS would have submitted a revised LCEP, in accordance with its Licence, which would be used as the basis to update the avoided cost calculation.

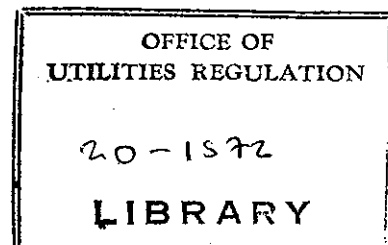
This revision has not, to date, been received but due to the urgency of the matter the Office did a proxy calculation of the avoided cost based on the following assumptions

- If an agreement on the expansion of the Jamalco alumina refinery and the power plant is not consummated then the LNG at the preferred rate from Trinidad and Tobago would not be available
- If the above is the case then the candidate plant for providing new capacity would be a 120 MW coal fired plant using Circulating Fluidised-bed (CBF) technology
- Coal handling facilities would be developed for a minimum of two coal plants with the ability for further expansion over the planning horizon
- The relevant avoided cost for this tranche of capacity would therefore reflect a position of not having the LNG from Trinidad available
- LNG will be available at the price negotiated between the Governments of Jamaica and Trinidad and Tobago.

4.1.1 Calculation of avoided cost

The Office has not been able to access any recent cost data for the construction of a coal plant using Circulating Fluidised-bed technology to be delivered in the 2008-9 time period. It therefore used as its base for benchmarking the "Projected Costs of generating Electricity" 2005 update published by the Nuclear Energy Agency, The International Energy Agency and the Organisation for Economic Co-operation and Development (OECD). The reported costs were adjusted to reflect recent increases in construction costs, soft costs including interest during construction and local economic conditions and to reflect 2006 US dollar terms.

The reported costs showed substantial variations reflecting local conditions for investment and construction in particular countries. The Office performed the analysis based on optimistic and pessimistic scenarios to provide a reasonable and prudent range over which to assess the proposal by Jamalco (see Table 2, Table 3 and Table 4).



4.1.2 Computation of Annual Levelised investment cost

Table 2
Summary of Annual Levelised Investment Cost

	Best case scenario	Worst case scenario	Unit
Breakout of Total Capital Cost (\$/kW)			
Plant Cost (EPC + soft costs)	1650	1900	\$/kW
Normalised infrastructure cost of Port	104	104	\$/kW
Total Cost	1754	2004	\$/kW
Maximum Capacity rating	120,000	120,000	kW
Fixed charge rate	14.0%	14.0%	
Annualised Investment Cost	29.47	33.67	M\$/yr
	20.47	23.38	\$/kW-Mo
Capacity Factor	88.0%	88.0%	
Energy produced by plant	925,056	925,056	MWh/yr
Annualised Investment Cost	31.86	36.40	\$/MWh

4.1.3 Computation of Annual Levelised Fuel Cost

Table 3
Summary of Annual Levised Fuel Cost

	Optimistic scenario	Pessimistic scenario	Unit	
Coal Price Breakout (\$/ton)				
FOB price	39	46	\$/ton	
Transportation	8	9	\$/ton	
Total	47	55	\$/ton	
Heating Value of coal	25.0	25.0	Mbtu/ton	
Conversion Factor	1,055,056	1,055,056	(kJ/MBtu)	
Fuel Price	1.88	2.2	\$/Mbtu	
Fuel Price escalation	1.0%	1.0%		
Cost of Capital	12.0%	12.0%		
Evaluation Period (plant life)	30	30	yrs	
Capital Recovery Factor	0.1241	0.1241		
Levelising Factor	1.0778	1.0778		
Average Life Cycle Equivalent Heat Rate	10,278	10,278	kJ/kWh	(efficiency of 35%)
MCR	120000	120000	kW	
Capacity Factor	88.0%	88.0%		
	925,056	925,056	MWh/yr	
Annual Levelised fuel cost	18.2599	21.3680	M\$/yr	
Annual Levelised fuel cost	19.74	23.10	\$/MWh	

4.1.4 Computation of Total Annualised Cost of Generation

**Table 4
Total Annualised Cost of Generation**

	Optimistic scenario	Pessimistic scenario	Unit
Total O&M	9.5	9.5	\$/MWh
Fuel	19.74	23.10	\$/MWh
Investment Cost	31.86	36.40	\$/MWh
Total Cost of Generation	61.10	69.00	\$/MWh

5.0 Decision

This decision notice sets out the Office's position with respect to the submission on the pricing for power from the Jamalco Alumina Refinery Expansion. The decision is set out in the normal price control format of existing PPA's. The Jamalco pricing proposal is reproduced at Appendix 1

- On the basis of the current cost of installation of a coal plant with 'clean coal' technology and the expected price of coal over the next 20 years the Office has determined that a range of US 6.1- 6.9 cents per kWh, as the avoided cost, is reasonable and prudent based on pessimistic and optimistic scenarios.
- The Office is satisfied that the price being offered is within the range of pessimistic and optimistic scenarios of the best alternative - a 120 MW coal plant using "clean coal" technology.
- This decision should not be seen as a signal to the Generation market that the price determined for the capacity outlined herein is a benchmark for any future capacity. It should be noted that this determination applies to this plant only as the future dynamics of fuel supply and plant type will be affected by this decision.
- The availability of LNG under the government to government agreement also has the potential to reduce the cost of existing and/or future generation and thus further influence the downward trend in electricity prices to consumers.

The Office hereby approves the pricing structure set out below.

1. Supply of Electricity.

Upon the completion and commissioning of the Power Plant, Jamalco will supply, and JPS will take and pay for:

- (a) 85MW of capacity at an minimum availability of 93% at the price set forth in Section 2 below, plus
- (b) Purely on an as-needed basis, subject to JPS' then-applicable merit order dispatch, up to an additional 20 MW of electricity at the price set forth in Section 2(b) below.

2. Price of electricity.

- (a) On the basis of Dependable Capacity of 85MW (i.e. availability of 93%)
 - 1) A monthly capacity charge of US\$21.8320/kW.
 - 2) Fixed O&M charge of US\$0.6205/kW-month

- 3) Variable O&M charge of US\$4.69/MWh
- 4) Base fuel rate of US\$27.95/MWh

(b) The price per MWh for electricity sold and delivered under Section 1(b) above will be:

Fuel*	US\$ 27.95
O&M (fixed & variable)	US\$ 5.54
Capacity	US\$ 0
Total	US\$ 33.49

* Fuel charge adjusted as set forth below

The fuel component of the pricing structure will be modified in accordance with the following equation to address variations from a Jamalco assumed base price of \$3.50/MMBtu delivered natural gas price as per Jamalco's proposal.

$$\text{"Fuel Cost with LNG"} = (\text{US\$}27.95 + ((\text{actual fuel costs} - \text{\$}3.50/\text{MMBTU}) \times 8.099))$$

In the event that the plant begins operation before LNG becomes available, it is expected that diesel fuel will be used in the interim. The fuel charge will then be as follows

Distillate Oil Fired Operation

The price for electricity sold and delivered under Section 1(a) above will be:

Fuel*	US\$ 49.37
O&M (fixed & variable)	US\$ 6.35
Capacity	US\$ 21.8320kW-month

* Fuel charge is calculated on the basis of distillate oil delivered to Jamalco at US\$ 6.12/MMBTU, and will be adjusted for the actual delivered price as indicated below

The price per MWh for electricity sold and delivered under Section 1(b) above will be:

Fuel*	US\$ 49.37
O&M (fixed & variable)	US\$ 6.35
Capacity	US\$ 0
Total	US\$ 55.72

* Fuel charge adjusted as set forth below

The fuel component of the pricing structure will be modified in accordance with the following equation to address variations from the assumed \$6.12/MMBtu delivered distillate oil price.

Fuel Cost = (US\$49.37 + ((actual fuel costs - US\$6.12/MMBTU) x 8.128)

There is no provision for escalation in the capacity and O&M charges as these are levelised charges with escalation already factored in.

The pricing will be subject to a crediting mechanism for any shortfall below the 85 MW of capacity actually supplied by Jamalco. These principles are to be reflected in the Power Purchase Agreement to be entered into between Jamalco and JPS.

Appendix 1

JAMALCO Pricing Proposal

1. **Supply of Electricity.** On the basis of a 31-day month consisting of 744 hours, upon the completion and commissioning of the Power Plant, Jamalco will supply, and JPS will take and pay for:

- (a) 58,813 Megawatt-hours (MWh) of electricity (85 MW x 744 hours x 93%) at the price set forth in Section 2(a) below, plus
- (b) Up to an additional 4,427 MWh of electricity (85 MW x 744 hours x 7%), also at the price set forth in Section 2(a) below; and
- (c) Purely on an as-needed basis, subject to JPS' then-applicable merit order dispatch, up to an additional 20 MW of electricity at the price set forth in Section 2(b) below.

2. **Price for Electricity.**

- (a) The price per MWh for electricity sold and delivered under Section 1(a) and (b) above will be:

Fuel*	US\$ 27.95
O&M (fixed & variable)	US\$ 5.54
Capacity	US\$ 29.91
Total	US\$ 63.40

* Fuel charge is calculated on the basis of natural gas delivered to Jamalco at US\$ 3.50/MMBTU, and will be adjusted for the actual, delivered price

- (b) The price per MWh for electricity sold and delivered under Section 1(c) above will be:

Fuel*	US\$ 27.95
O&M (fixed & variable)	US\$ 5.54
Capacity	US\$ 0
Total	US\$ 33.49

* Fuel charge adjusted as set forth above

Monthly, JPS will pay a capacity charge consisting of the Capacity plus the O&M amounts as set forth above on the basis of 85 MW times the number of actual hours in a month (e.g. 744 hours in a 31-day month; 720 hours in a 30-day month; 696 hours in a 29-day month; and 672 hours in a 28-day month), and will pay an energy charge for actual amount of MWhs supplied as set forth above.

Distillate Oil Fired Operation

The price per MWh for electricity sold and delivered under Section 1(a) and (b) above will be:

Fuel*	US\$ 49.37
O&M (fixed & variable)	US\$ 6.35
Capacity	US\$ 29.91
Total	US\$ 85.63

* Fuel charge is calculated on the basis of distillate oil delivered to Jamalco at US\$ 6.12/MMBTU, and will be adjusted for the actual, delivered price as indicated below

The price per MWh for electricity sold and delivered under Section 1(c) above will be:

Fuel*	US\$ 49.37
O&M (fixed & variable)	US\$ 6.35
Capacity	US\$ 0
Total	US\$ 55.72

The fuel component of the pricing structure will be modified in accordance with the following equation to address variations from the assumed \$6.12/MMBTU delivered distillate oil price

$$\text{“Fuel Cost”} = (\text{US\$}49.37 + ((\text{actual fuel costs} - \text{US\$}6.12/\text{MMBTU}) \times 8.128))$$