Office of Utilities Regulation

Jamaica Public Service Company Limited

Electricity Wheeling Framework

Determination Notice

OFFICE OF UTILITIES REGULATION

July 9, 2013

DOCUMENT TITLE AND APPROVAL PAGE

1. **DOCUMENT NUMBER:** 2013/ELE/009/DET.002

2. **DOCUMENT TITLE:** Jamaica Public Service Company Limited – Electricity Wheeling Framework Determination Notice

3. **PURPOSE OF DOCUMENT**

This document sets out the Office's decisions on the framework for the wheeling of electricity in Jamaica.

4. **APPROVAL**

This document is approved by the Office of Utilities Regulation and the Determinations therein become effective on **July 10, 2013**.

On behalf of the Office:

……..
Maurice Charvis
Director General

Date: July 9, 2013

Abstract

An amendment to the *Amended and Restated All-Island Electric, Licence 2011* (the "Licence") in August 2011 included, among other things, a provision for the wheeling of electricity across the national grid. The main objective of this new provision is to encourage greater competition in the electricity sector.

Condition 12 of the the Licence stipulates that the Jamaica Public Service Company Limited ("JPS") should within a 12-month period, which ended in August 2012, submit to the Office of Utilities Regulation ("OUR") proposed wheeling charges for approval. According to the provisions of the Licence, these wheeling charges should be based on a cost-of-service study conducted by the company within the 12-month period prior to the stipulated date for the submission of the wheeling tariffs for approval. JPS made a rate submission but the application failed to satisfy certain critical criteria, such an analysis informed by a new cost-of-service study.

Against this background, the OUR proceeded to conduct a Cost-of-Service Study, and developed the electricity wheeling framework, which involved consultations with JPS and other key stakeholders. The OUR was supported by consultants PPA Energy (the "Consultant"). The OUR met with stakeholders and two public consultation meetings were held to ensure that the issues pertaining to wheeling were fully aired and feedback received as to how best to shape the framework.

This Determination concludes the conceptual developmental phase of wheeling, and sets out the decisions made with respect to the main features of the framework and the methodologies applicable for the construction of wheeling charges.

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Definitions

"Base Exchange rate" means the reference foreign exchange rate at which Wheeling Charges are established on an annual basis, expressed in terms of the Jamaican dollar equivalent to one US dollars.

"Billing Exchange rate" means the daily weighted average exchange rate at which financial institutions in Jamaica sell the US dollar on the spot market in the given billing month.

"Consultant or PPA Energy" means Power Planning Associates, UK consultants engaged by the OUR.

"Cost-of-Service Study" means an in-depth analysis of the utility cost structure in order to identify the cost of providing service to various rate classes or a specific category of customer as a function of load and service characteristics.

"Force Majeure" means as stated in the Licence "any event or circumstance or combination of such events or circumstances that (i) occurs inside Jamaica, except as provided in clause (h) below; (ii) is outside the reasonable control of the Licensee; (iii) cannot be prevented or overcome by the exercise of reasonable diligence; and (iv) materially and adversely affects the performance by the Licensee of its obligations under this Licence, to the extent that such event(s) or circumstance(s) meet the foregoing requirements (i) through (iv), including:

(a) acts of God, fire, explosion, chemical contamination, earthquakes, flood, lightning, drought, tsunami, torrential rain, storm, cyclone, typhoon, or tornado, pestilence or other natural catastrophes, epidemics or plague, or any strikes, work to rule, go-slows or other labour disturbances that directly affect the Assets of the Licensee;

(b) any failure or inability by the Licensee to obtain or renew any licences (other than this Licence), concessions or permits or other Governmental Requirements that are necessary for the Licensee to conduct its business on terms and conditions at least as favourable as those contained in the original licence (and not this Licence), concession or permit after the submission of an application that fulfils all the applicable requirements of the relevant Government Requirements and the exercise of due diligence to obtain such licence (other than this Licence), concession or permit;

(c) any strikes, work-to-rule, go-slows or other labour disturbances that extend beyond the Assets of the Licensee, are widespread or nationwide or are of a political nature, including labour actions associated with or directed against a ruling political party, or those that are directed against the Licensee (or its contractors or suppliers) as part of a broader pattern of labour actions against companies or facilities with foreign ownership or management;

(d) expropriation, requisition, confiscation, nationalization or compulsory acquisition by a Governmental Authority of the Licensee or any substantial portion of the Assets;

(e) acts of war (whether or not declared), invasion, blockade or embargo;

(f) acts of threats of terrorism or threat from terrorists, widespread riot, widespread violent demonstrations, widespread armed insurrection, widespread rebellion or revolution;

(g) the closing or drastic reduction in capacity of public harbours, ports, docks, canals, roads, airports or other infrastructure, the rationing thereof or any import or export restrictions; or

(h) to the extent that they result in disruption of the Licensee's ability to receive shipments of fuel, major equipment or critical spare parts, any strikes, work-to-rule, go-slows or other labour disturbances that occur outside of Jamaica".

"*Foreign Exchange Adjustment Factor*" means the factor used by JPS in adjusting the Wheeling Charges computed at the Base Exchange rate to the Billing Exchange rate in a given month. This factor reflects the proportion of foreign-related cost in its total non-fuel cost.

"GDP" means gross domestic product. This is a measure of the total economic output of an economy over a one-year period.

"Grid or National Grid" means an interconnected network of transmission and distribution facilities for the delivery of electricity from suppliers to consumers.

"IPP" means Independent Power Producer. This refers to an entity that owns electricity generation facility and is licensed to sell its output exclusively to the operator of the National Grid.

"Jamaica Public Service Company Limited or JPS" means the Licensee under the *Amended and Restated All-Island Electricity Licence, 2011* which has been granted the right to generate, and the exclusive right to transmit, distribute and supply electricity for public and private purposes in all parts of the island of Jamaica.

"Licence" means the *Amended and Restated All-Island Electricity Licence, 2011* which authorizes JPS to generate, transmit, distribute and supply electricity in Jamaica.

Load Loss Factor (LLF) means the ratio of average power loss over power loss at maximum demand.

"LV" means low voltage and refers to secondary distribution voltage levels below 12kV.

"Modern Equivalent Asset (MEA)" means a notional asset that would provide similar functions and equivalent utility if used to replace an existing asset should the firm be deprived of it in the normal course of business.

"MWh" means Megawatt-hours, which is the unit of energy used for electricity production or consumption. A MWh is the product of electrical power and time.

"MV" means medium voltage and refers to primary distribution voltage classified at the 24kV, 13.8kV and 12kV levels.

"MW" means Megawatt, which is the unit of electrical power equivalent to one million watts.

"Office " means the statutory constituted policy and decision-making body within the Office of Utilities Regulation and is comprised of the Director General and the Deputy Directors General.

"Off-Peak load condition" means the period of the day during which minimum demand occurs on the electricity grid. This typically occurs on the Jamaican grid between 10:00 p.m. and 6:00 a.m.

"On-peak load condition" means the period of the day during which maximum demand occurs on the electricity grid. This typically occurs on the Jamaican grid between 6:00 p.m. and 10:00 p.m.

"OUR" means the Office of Utilities Regulation as created and defined by the OUR Act.

"OUR Act" means the Office of Utilities Regulation Act, 1995 and amendments thereto.

"O&M" means the activities associated with Operation and Maintenance of the utility plant which is necessary to ensure the safe and reliable supply of electricity.

"Partial-peak load condition" means the period of the day during which demand on the electricity grid is between the minimum condition and the maximum condition. This typically occurs on the Grid between 6:00 a.m. and 6:00 p.m.

"Regulatory Fee" means an annual amount payable to the OUR by the Self-Generator to recover costs associated with the provision of user information, its enforcement, as well as policy and rule making.

"***Self-Generator***" means a legal entity that owns a generation facility and electricity demand installations that are located on separate sites, and wishes to supply its demand exclusively from its generation facility to one or more load facilities making use of the JPS transmission and/or distribution network(s) for the purposes of so doing.

"Self-Generator Licence" means a formal permit issued by the Minister with responsibility for the electricity sector to Self-Generators authorizing access to the Grid for the purpose of electricity wheeling.

"System Losses" means the difference between total net generation (including IPPs) and energy sales on the system expressed as a percentage of net generation.

"Transmission and Distribution (T&D) system" means poles, lines, transformers, insulators, substations along with protective devices and monitoring equipment, for overhead and underground installations, owned by the utility company and are actively engaged in the movement of electric power from generating stations to consumers. The transmission and distribution system does not include equipment or plant employed in power generation, general administration or customer service.

"Weighted Average Cost of Capital (WACC)" means the opportunity cost of capital proportionally weighted to reflect the expected return on debt and equity.

"Wheeling" means the transportation of electricity across the Grid by an independent party other than the owner or operator of the Grid.

"Wheeling Charges or Wheeling Rates" means the amount that the Office determines that is to be charged by JPS for the transportation of electricity across the Grid by an independent party other than JPS.

"Wheeling Code" means a document which sets out the enabling provisions that cover technical and commercial criteria, processes and actions required for wheeling to take place.

1.0 Legal and Regulatory Framework

1.1 The OUR is a multi-sector regulatory agency which was established pursuant to the OUR Act. Section 4(1) of the OUR Act specifies the functions of the Office. Pursuant to Section 4(1)(a) of the OUR Act, the OUR has regulatory authority over prescribed utility services. "Prescribed utility services" is defined in the First Schedule of the OUR Act as the provision of services in the telecommunications, electricity, water and sewerage and the transportation (road, rail and ferry) sectors.

1.2 Section 4(3) of the OUR Act provides, inter alia, that the Office in the performance of its functions thereunder may *"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;
c) encourage the development and use of indigenous resources; and
d) promote and encourage the development of modern and efficient utility services…"

1.3 Section 4(4) of the OUR Act provides:

"*The Office shall have power to determine, in accordance with the provisions of this Act, the rates or fares which may be charged in respect of the provisions of a prescribed utility service."*

1.4 The Licence is the instrument that establishes the legal framework within which JPS operates. Under Condition 2(3) of the Licence, 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 contribute to economic development."*

1.5 Condition 2(4) of the Licence provides that the generation of electricity may be carried out by several players in the industry. Condition 2(4)(a), of the Licence provides as follows: *"…the Licensee shall have the right together with other outside person(s) to compete for the right to develop new generation capacity."* However, JPS, the sole owner of the National Grid, has exclusive right to transmit, distribute and supply electricity island-wide until 2027.

1.6 Condition 2(4)(b) of the Licence stipulates as follows:

> *"The exclusive right specified herein shall be as follows: …the Licensee shall have the exclusive right to transmit, distribute and supply electricity throughout Jamaica… until July 8, 2027.*
>
> *Provided that no firm or corporation or the Government of Jamaica or other entity or Person shall be prevented from providing a service for its or his own exclusive use."*

1.7 Notwithstanding, Condition 12 of the Licence mandates JPS to provide open access for Self-Generators to the Grid on such terms and conditions as are approved by the OUR. Condition 12 provides:

> *"The Licensee shall permit Electric Power Wheeling Services in accordance with the terms and conditions approved by the Office."*
>
> *The Licensee shall prepare its charges for use of the System or top-up or standby supplies, including but not limited to Electric Power Wheeling service, on a basis which is cost reflective and consistent with tariffs and Price Controls as approved by the Office". With regard to Electric Power Wheeling, the charges for this service shall additionally be guided by the results of a cost-of-service study conducted by the Licensee, which results shall be submitted to the Office for approval. The cost-of-service study shall be conducted within twelve (12) months of the date hereof."*

1.8 Within the context of the legal and governance regime outlined above, the OUR has sought to establish a framework that will allow open access to the transmission and distribution network to enable self-generators to wheel power to locations remote to the point of generation through a process that is transparent, a methodology that is appropriate and charges that are fair and cost reflective.

2.0 Executive Summary

2.1 The development of the Wheeling Framework in Jamaica has its basis in the Licence which makes specific provisions for the wheeling of electricity by Self-Generators across the Grid. The intent of the Licence provision is to increase the degree of competition in the electricity market.

2.2 The OUR, over the past year and a half, has sought to ensure through a programme involving a series of consultations with stakeholders, the construction of a wheeling model and the development of additional regulatory instruments, that the introduction of wheeling service is executed in an orderly and expeditious manner.

2.3 Consistent with the thrust to create a more competitive electricity sector and in keeping with the provisions of Condition 12 of the Licence, the Office, after taking into account the peculiarities of the Jamaican electricity industry, feedback from two rounds of consultation and the views of key stakeholders in the sector, has determined that:

1) The MW-km Load flow-based methodology shall be used to determine Wheeling Charges on the transmission network.
2) The Postage Stamp methodology shall be used to determine Wheeling Charges on the distribution network.
3) The Modern Equivalent Asset Valuation technique shall be used to determine the transmission cost in the calculation of Wheeling Charges.
4) The distribution costs derived from the OUR's Cost-of-Service analysis shall be used to determine the distribution cost in the calculation of Wheeling Charges.
5) The distribution cost derived from a JPS' Cost-of-Service Study at the time of each 5-year Tariff Review shall be adjusted annually by the same factor applicable to non-fuel rate under the PBRM specified in the Licence.
6) To encourage the optimal use of the transmission network by Self-Generators, the MW-km Load Flow-based methodology shall incorporate zero charge for branches of the network for which the transaction reduces the overall load flow on the given branch.
7) To take proper account of losses impacting wheeling transactions in the calculation of:
    a) Transmission losses shall be done by the modeling of the load-flows.

b) Distribution losses shall be based on technical losses of 1.8% on the primary distribution circuits, and where applicable technical losses of 4.0% and non-technical losses of 7.7% on the secondary distribution circuits.

The calculation of distribution losses shall be based on the latest System Losses Spectrum and the prevailing System Loss Target established by the OUR.

8) Self-Generators shall be billed monthly in Jamaican dollars for wheeling and other associated services. Bills shall be subject to the same Base Exchange rate, Billing Exchange rate and foreign exchange adjustment factor applicable to JPS' regular customers**.**
9) In order to minimize the amount of reactive power produced on the network by the Self-Generator, an individual/organization involved in wheeling shall have the capability of producing full rated MW output at a power factor between 0.8 lagging and 0.99 leading, in keeping with the JPS' Generation Code.
10) The regulatory instruments that constitute the Wheeling Framework shall be:
    a) The Self-Generation Licence
    b) The Wheeling Code
    c) The Wheeling Contract
    d) A set of Supplementary Contracts consisting of:
        i. A Top-up and Stand-by Supply Contract
        ii. An Excess Energy Supply Contract
11) The duration of the Self-Generation Licence shall be ten (10) years and it shall attract an initial Self-Generation Licence Processing Fee of $20,000 and thereafter an annual Regulatory Fee of $10,000. These fees are payable to the OUR and may be adjusted from time-to-time by the Office.
12) Qualified individuals and organizations may apply to the Minister through the OUR for Self-Generation Licences as of July 15, 2013.
13) JPS shall review, refine and, where it is deemed necessary, extend the outlines of the Wheeling Code, the Wheeling Contract and the Supplementary Contracts and submit them to the OUR for approval and finalization by August 12, 2013.
14) To qualify for wheeling services the applicant for the service must be a Self-Generator and possesses a minimum power export and import capacity at each connection point related to the Self-Generator's production and consumption facilities of 25kVA.

15) Transmission wheeling rates are locational and specific to each Self-Generator. Consequently, the actual Wheeling Charge for a transaction must be derived by modelling the load flows through the transmission network. Wheeling charges for each client must therefore be determined by JPS based on the model established for this purpose. These charges are to be approved by the OUR before they take effect.

16) For wheeling that occurs exclusively on the distribution network, the charges are non-locational as they are based on the Postage Stamp methodology, the charges are as follows:

    a) Primary Distribution (MV) – US$105,312 per MW

    b) Secondary Distribution (LV) –US$53,545 per MW

17) Wheeling rates shall be updated annually and shall coincide with JPS' annual tariff adjustment exercise. In this regard JPS shall:

    a) submit to the OUR the required data in the prescribed format pertaining to the AC load flows, costs, demand and other relevant information necessary to update and verify the wheeling model by March 31 each year.

    b) update the wheeling model and submit the same to the OUR for verification by April 30 each year.

The above decisions shall become effective on **July 10, 2013.**

3.0 The Establishment of Wheeling

3.1 Introduction

3.1.1 In August 2011, the All-Island Electricity Licence, 2001 was amended and restated to include, among other things, specific provisions for electricity wheeling. While there are multiple players engaged in the generation of electricity in the electricity sector, the national grid along with 69% the industry's production capacity is owned by the vertically integrated company, JPS. It is therefore envisaged that power wheeling will pave the way for a more competitive electricity sector.

3.1.2 Condition 12 of the Licence stipulated that by August 2012, JPS should submit for approval to the OUR wheeling charges based on a cost-of-service study conducted within the preceding twelve (12) months.

3.1.3 JPS submitted the proposed wheeling charges to the OUR for review. However, the company failed to satisfy the stipulated condition of the specified twelve-month period which the cost-of-service study should capture. Furthermore, the submission did not reflect any of the established methodologies used worldwide for the calculation of wheeling rates.

3.1.4 Acting on the need for mechanisms and institutions beyond the calculation of wheeling charges stated in the Licence, the OUR contracted to procure the services of UK Consultants, PPA Energy, to provide support for the development of a wheeling framework and assist in the regulatory capacity building required to manage the new market feature. Given the weaknesses of JPS' submission, PPA Energy was given the additional task of conducting a cost-of-service study based on the latest information available.

3.1.5 The OUR took the view that it was important to engage industry stakeholders in the development of the framework as they would:

- bring to the discussion wide range perspectives informed by their experience and commercial environment; and
- through their participation, provide technical depth to the evaluation of options that would be essential to the development of robust policies.

3.1.6 Therefore, as a part of the development process, the OUR met with relevant key stakeholders and facilitated two public consultations.The first public consultation, which was held in January 2013, examined the methodologies used for the

development of wheeling charges with a view of identifying a suitable approach for the Jamaican electricity sector.

3.1.7 The second public consultation, held in May 2013, explored the institutional features required for the framework to operate efficiently, such as the wheeling licence and contracts, and the Wheeling Code.

3.1.8 This document reflects the outcome of a rigorous process of analyses of wheeling models and institutional options employed internationally with the objective of establishing a framework that is practical and relevant to the Jamaican electricity market. The document also incorporates the insights gathered in the public consultations and the opinions of experts within the industry. The resulting Determinations herein set out the Wheeling Framework for the electricity sector.

3.2 The Wheeling Mandate

3.2.1 The Licence in its present form represents the outcome of the renegotiation of the *All-Island Electricity Licence, 2001* between the Government of Jamaica and JPS. Theoretically, it has been argued that greater competition tends to lead greater allocative efficiency within markets. This has been supported by numerous empirical studies of the market. Increased allocative efficiency means that value lost to the society as a whole because of high prices are reduced.

3.2.2 In real terms, the contribution of the manufacturing sector to GDP has declined from 15.8% in 2002 to 8.6% in 2012. This has had a major impact on Jamaica's economy which has grown at an average annual rate of less than 1% over the period. Manufacturers have over the last decade and a half identified high electricity prices as one of the major factors behind their lack of competitiveness. It is in this context that the development of a wheeling framework is viewed positively by the manufacturing sector seeking to survive in an increasingly global environment. Electricity wheeling offers creative possibilities for reconfiguring businesses to take advantage of energy solutions that are absent in the existing market structure.

3.2.3 JPS, on the other hand, has expressed deep concern about the introduction of wheeling, particularly at this point in time. The company asserts that it is "*of the firm conviction that this is out of schedule with rate-based service, [it] is not contemplated by the Licence and is contrary to the performance-based rate making mechanism*." The OUR rejects this argument on the grounds that Condition 12 of the Licence

specifically mandates the company to submit to the OUR Wheeling Charges for approval. The fact that such Wheeling Charges are to be informed by a Cost-of-Service Study conducted during a 12-month period which ended August 8, 2012 makes that presumption unreasonable. Further, in the context that the renegotiated Licence was to provide for a more competitive market, it is clear that the agreed wheeling reform should not await the programmed Rate Review in 2014.

3.2.4 Further, since a cost-of-service study always forms the basis for a Rate Review exercise it would be pointless for the Licence to require that such a study be done mid-term, and moreso if the idea was for implementation of wheeling to be delayed for several years. Universally, it is the accepted practice that the setting of rates should be predicated on the most recent information available since it has implications for the efficacy of cost recovery.

3.2.5 It should also be pointed out that wheeling service is not the sale of electricity and it differs fundamentally from any of the services offered under the Performance Based Rate-making Mechanism (PBRM). Wheeling is essentially the rental of the Grid operator's infrastructure for the transportation of electricity. Consequently, the basic assumptions of the PBRM remain intact. The suggestion proffered by JPS that the PBRM should be rebalanced to capture the effects of wheeling 'ex ante' as opposed to 'ex post' is inconsistent with procedures and principles upon which the PBRM is constructed. The Licence requires that the PBRM be calibrated on a 'Test Year' for the reason that the costs employed in the computation of rates should pertain to assets and effects that are 'used, useful and known' and not merely the outcome of speculation.

3.2.6 As it relates to the submission of Wheeling Charges, these were presented to the OUR by JPS on August 8, 2012. However, the company's submission was not supported by the time-specific Cost-of-Service Study as mandated in the Licence. The OUR therefore, in a letter dated September 6, 2012 pointed out to JPS that it was in breach of its Licence. The OUR further indicated that given the regulatory imperative of wheeling, it would be pressing ahead to get the Cost-of-Service Study done. JPS was therefore asked to cooperate in provision of the required inputs.

3.2.7 The OUR notes that while JPS has provided commendable support in relation to the technical information required for the modeling of the network, the company

was very tardy and not very cooperative in providing relevant cost data for the calculation of Wheeling Charges.

3.2.8 JPS only submitted the required Cost-of-Service Study on June 10, 2013. This was too late for inclusion in the Wheeling Charges calculation since the OUR, after pushing critical deadlines to the limit, had constructed the wheeling model and computed the Wheeling Charges using other relevant data that was submitted by JPS. This Determination therefore does not include any data from JPS' June 10, 2013 submission.

3.3 Wheeling Pricing Principles

3.3.1 The OUR is of the view that the formulation of the price component of the framework must be informed by certain core regulatory principles. These principles include:

- **Promoting efficiency:** this involves sending appropriate price signals to Self-Generators and their loads. In this regard, correct price signals tend to improve the efficiency of investment and enhance competition.
- **Recovering costs:** each pricing methodology has a different orientation to the treatment of cost. For example, historic cost methodologies tend to ensure the full recovery of present cost, while more forward-looking methodologies emphasize a marginal cost approach for which there is no guarantee of full cost recovery. Cost recovery requires that the investor recoups the economic cost of the investment involved in a transaction.
- **Ensuring transparency and predictability:** this requires a pricing mechanism that is consistent in its output and observable to stakeholders. Transparency and predictability tend to inspire confidence in the regulatory framework and encourage new market participants.
- **Promoting fairness**: this means the equal treatment of network users who have the same impact on the system.
- **Facilitating simplicity of administration**: this means that the methodology employed should not be too complex so that it does not create a barrier to new market participants and presents significant computational challenges.

3.3.2 The OUR is aware that trade-offs between these principles may be necessary since they may embody conflicting objectives. For instance, stable and predictable wheeling charges may run counter to the objective of efficient pricing which may

require that wheeling charges change hourly reflecting the load dynamics of the network. These considerations have informed the process of selecting the methodology used for wheeling in the Jamaican electricity market.

4.0 Wheeling Methodologies

4.1 Introduction

4.1.1 In constructing the Wheeling Framework, various methodologies were examined and the following issues were deemed critical:

1) Is simplicity in the administration of Wheeling Charges more appropriate in the Jamaican context than efficient price signaling?
2) Should Wheeling Charges be constructed based on a historic cost methodology or a future cost approach?
3) How serious would the problem of congestion be on the Grid and what would be the best approach to its management?
4) Given the level of losses on the Grid, how could it be reasonably addressed in the construction of Wheeling Charges?

4.1.2 These issues were raised in the Electricity Wheeling Methodologies: Consultation Document (Document No. 2012004_CON001) published on December 31, 2012 and further explored in a consultation meeting held on January 22, 2013.

4.1.3 The various methodologies examined and their relative complexity is shown in Table 1 below.

Table 1 – Historic & Forward Wheeling Methodologies versus Relative Complexity

	Historic Cost Techniques	Forward Look Techniques
Degree of Complexity →	Postage Stamp	Short Run Marginal Cost
	Contract Path	Short Run Incremental Cost
	MW-km (Distance-based)	Long Run Marginal Cost
	MW-km (Load Flow-based)	Long Run Incremental Cost
	Nodal Pricing	

4.1.4 Of the methodological approaches identified above, four are considered to merit more than cursory examination, either because they were considered candidates

for the model building exercise or they yielded insight into the degree of sophistication that may be attained in wheeling pricing.

4.2 Postage Stamp Methodology

4.2.1 The postage stamp approach is generally regarded as the simplest to implement. The methodology allocates network costs between users on the basis of their share of total peak load on the grid. It therefore results in a flat wheeling charge per unit of demand equal to the total network costs divided by peak load. The postage stamp method is often supported with reference to the fact that, in power transactions, electrons do not actually travel from the seller to the buyer and the system is operated on an integrated basis.

4.2.2 Among the advantages associated with this methodology are its simplicity, transparency and the degree to which it facilitates the investor's recovery of historic cost. On the other hand, this methodology is inefficient at price signalling since it does not reflect the actual usage of the network by each wheeler. Furthermore, since all users face the same wheeling tariff, the postage stamp methodology discriminates against low-cost transmission users in favour of higher-cost users.

4.3 MW-km (Distance-based) Methodology

4.3.1 This methodology is an extension of the concept behind the postage stamp except that it introduces the notion of distance in the formulation. Distance travelled by the energy transmitted under a specific transaction is assumed to be either on a 'straight-line' basis between the points of entry and exit to the network, or on a contract path basis agreed by the parties involved. The MW-km of the transaction is then determined and the ratio of this to the total system MW-km determined. This ratio is then used to determine the cost of the transaction.

4.3.2 As an enhancement of the postage stamp method, this methodology enjoys the majority of the former's advantages. It is strong on cost recovery. In addition, the relatively simple and clear nature of the methodology makes it easy for the users to understand the system of wheeling prices. However, the actual operation and costs incurred on the system are not fully considered in the development of prices. Although the distance between the delivery and receipt does provide some indication of actual use of the system, it still fails to take account of the flow of electricity through the network. Thus the distance-based approach does not

provide the correct economic signals to users, leading to reduced allocative efficiency and discrimination between users.

4.4 MW-km (Load Flow-based) Methodology

4.4.1 The load flow-based MW-km methodology reflects, to some extent, the actual usage of the power system. Wheeling prices are determined in relation to the proportion of the network used by individual transactions, as determined by load-flow studies.

4.4.2 In determining wheeling rates based on this methodology, a power flow model is used to calculate the flow caused by the transaction on each circuit of the transmission and distribution system. The ratio of the power flow due to the transaction and the circuit capacity is then determined. This ratio is multiplied by the circuit cost to obtain a cost for the transaction on each circuit. The share of the total system costs for the transaction is the sum of the costs for each circuit.

4.4.3 While this approach is not as simple as the previous methodologies discussed, it is a transparent and practical way of calculating network charges. In addition, the problems of prices not being cost-reflective which is common to the distance-based methodology is reduced by making users face prices that more closely relate to their use of the network. Consequently, this results in decreased discrimination between users and increased allocative efficiency.

4.4.4 Notwithstanding, the load flow-based MW-km approach will fail to signal the costs of future investment caused by individual users' decisions if it is based on the recovery of historic costs. Additionally, congestions attributable to wheeling may be priced by way a refinement of the basic load flow model. This facilitates proper signalling to generators relative locational efficiency of the siting of plants.

4.5 Nodal Pricing Methodology

4.5.1 The nodal pricing methodology is based on the premise that a node can be any point in the network. This is often seen as the economically 'ideal' network pricing system as wheeling rates are calculated to accurately reflect the costs imposed on the system by the transaction. The difference in charges at each node on the system (which is equal to the network charge between these nodes) is set on the basis of the marginal cost of losses and congestion at that node. In other words, wheeling

prices are derived from the cost of injecting one additional unit of energy at that node. Nodal prices obviate the issue of which assets are used for wheeling purposes by not defining the path followed by flows between nodes. Instead, prices are set on the basis of the marginal impact on the system as a whole.

4.5.2 The Nodal Pricing methodology is the most sophisticated and accurate approach to pricing signalling on a network. For nodes located in areas with surplus generation there will be a comparatively high cost for adding additional generation, and conversely for nodes located in areas with a deficit of generation the price for adding additional load will be high. In this regard, entities considering electricity trading can obtain an indication of the price of power transfers between nodes on the network. Similarly, potential investors in transmission lines can obtain an indication of the returns they might make on investments in different parts of the network.

4.5.3 In its simplest form, nodal pricing system solves the dispatch problem in a decentralised market by ensuring the marginal cost at all supplying nodes is equal to the marginal benefit at all consuming nodes. This results in users consuming electricity up to the point where their marginal value of power is equal to the marginal cost of supply, the nodal price, ensuring that both allocative and dynamic efficiency are maximised.

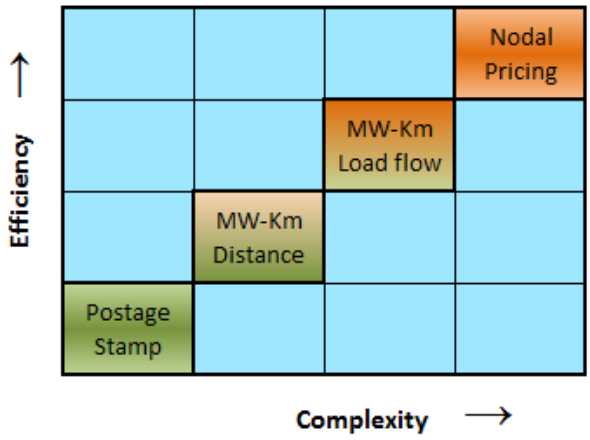
4.5.4 Although Nodal Pricing methodology leads to maximum efficiency benefits, there are two major issues associated with it that has resulted in the system being rarely adopted in practice. First, this methodology may result in under-recovery of fixed costs, as pricing is a function of marginal costs.

4.5.5 Second, to set the prices, the transmission system operator would require constant real-time information about all loads, generators, bids and the condition of all equipment. Prices would not only vary over different nodes, but also over time as elements such as supply, demand and transmission constraints change. This creates significant instability and complexity in implementation, requiring advanced information technology and communications, often resulting in countries adopting different pricing systems or simplifications of full nodal pricing.

4.6 Methodologies Selected

4.6.1 After assessing the methodologies available for wheeling, the OUR has taken the view that the principle of efficient price signalling should be assigned a high priority with due recognition to simplicity in administration. Notwithstanding, it is recognised that there might be constraints to the methodology that may be adopted given the underlying structure of the network. For instance, the transmission system is a highly meshed network but detailed information is available on the physical dimensions and power capacity of the main components of the assets that make up the system. The distribution system on the other hand, is essentially a collection of radial networks for which information is available at the aggregate level but not with the degree of granularity which would easily allow for the pricing of specific wheeling transactions.

Figure 1- Comparison of Wheeling Methodologies
Efficiency versus Complexity



4.6.2 As shown in Figure 1, Nodal pricing is the most efficient currently available, however, it is extremely complex. Furthermore, given the existing structure of the Jamaican electricity market and the absence of real-time data required for the proper functioning of this methodology, the implementation of nodal pricing would not be feasible. At the other end of the spectrum, we find the Postage Stamp methodology to be simple but inefficient.

4.6.3 The MW-km methodology represents a plausible balance between efficiency and simplicity. Additionally, it is capable of full cost recovery and is fairly good at price signalling based on the use of the network by the wheeler. Thus, in keeping with the OUR's technical analysis and the views expressed by most of the stakeholders in the consultation process, the MW-kw load flow approach was deemed the most suitable methodology on the transmission system.

4.6.4 JPS in its submission asserted that according to Condition 14 of the Licence, the MW-km Load Flow-based methodology is not allowed under the Licence. JPS argued that since wheeling tariffs will be a regulated tariff approved by the OUR, it would be against the Licence to apply the MW-km Load Flow-based methodology based on location, to set wheeling rates.

4.6.5 Condition 14 (1) of the Licence provides:

> *"The Licensee shall, save where it enters into special contracts with customers for the Supply of electricity pursuant to Section 14 of the OUR Act,* ***charge its customers for such a Supply*** *according to published tariffs, approved by the Office, as updated from time to time. Such published tariffs shall be cost-reflective unless otherwise directed by the Office. Each tariff category will apply uniformly across the Island and there will be no discrimination to customers on the tariff charged based on location. (emphasis added)*

4.6.6 Condition 14 of the Licence provides that tariffs for the "Supply" of electricity should be cost-reflective and each category of tariff should be non-discriminatory in the sense that it is uniformed in its application across the island, i.e. the prices are not locational. "Supply" is defined in the Licence as "*the business of the Licensee in selling electricity to customers*". Given the definition of "Supply", the provisions of Condition 14(1) of the Licence are strictly applicable in the context of the sale of electricity to customers.

4.6.7 Since wheeling service and the resulting charges do not involve the sale of electricity, Condition 14(1) of the Licence is not applicable to the provision of power wheeling service. Therefore, wheeling charges may have a degree of locational variation.

Determination 1

The MW-km Load Flow-based methodology shall be used to determine Wheeling Charges on the Transmission network.

4.6.8 As pointed out in Section 4.7.2 below, the tagging of cost to specific elements of the distribution circuits presents a challenge, primarily because of the aggregate way both network and cost data are captured in JPS' records. Consequently, the MW-km Load Flow-based cannot be applied in the same way as done for the transmission network.

4.6.9 In addition, unlike the transmission network for which the wheelers are expected to be large companies, more individuals and small businesses are likely to use the distribution network. In this regard, simplicity of administration assumes greater importance on the distribution network, since large companies would have engineering departments and are better able to understand load-flow analyses than smaller entities.

Determination 2

The Postage Stamp methodology shall be used to determine Wheeling Charges on the Distribution network.

4.7 Cost Recovery

4.7.1 One of the key principles involved in the development of rates is the concept that the utility should be compensated fairly for the service it provides. Traditionally, the calculation of rates based either on historic cost or the replacement cost is regarded as the appropriate method for ensuring fair compensation.

4.7.2 In the review of JPS' asset register and network data base, two things were evident:

1) The main components of the transmission network can be clearly identified. However, the tagging of the cost associated with each component could not always be done.

2) It is not possible to disentangle the distribution asset in a way that allows for the clear identification and costing of the main components of the circuit. However, cost information, exists in aggregate form based on JPS' 2008 Cost of Service Study.

4.7.3 To resolve the problem of cost allocation, consideration was given to the modern equivalent asset (MEA) valuation. This approach allows for the assignment of cost on the basis of a notional asset that would provide similar functions and

equivalent utility, if used to replace an existing asset were the firm to be deprived of it in the normal course of business. Pricing based on MEA valuation does not guarantee that the investor will get back exactly the original value of the assets. Cost recovery, more or less, might be dependent on the actual market trajectory of the specific asset. If the market price of the asset has increased over time then a MEA valuation would reflect a higher cost. If market price, on the other hand, has declined over time the MEA valuation would be lower. Consequently, the investor is compensated in a way that affords the replacement of the specific asset at today's price.

4.7.4 In this respect, MEA valuation looks back at the physical assets and their functionality but it also looks forward by recognising that the price of these assets are not static and provides the compensation required for the investor to fulfil long term commitments to customers.

Determination 3

The Modern Equivalent Asset Valuation technique shall be used to determine the transmission cost in the calculation of Wheeling Charges.

4.7.5 While it would have been desirable to apply the MEA approach to the costing of the distribution network, it was not possible to determine comprehensively all the components in the circuitry. Thus, the MEA technique was ruled out in the computation of Distribution Wheeling Charges. It therefore may be argued that the aggregate cost of network derived from the Cost-of-Service Study is a satisfactory alternative and should be coupled with the Postage Stamp approach to determine Distribution Wheeling Charges.

Determination 4

The distribution costs derived from the OUR's Cost-of-Service analysis shall be used to determine the Distribution cost in the calculation of Wheeling Charges.

4.7.6 Given that Wheeling Charges are to be updated annually in keep with the practice now applicable to electricity tariffs in Jamaica, a mechanism is required to ensure that the Cost-of-Service Study from which these charges are derived keep pace

with foreign exchange movements and inflation. In addition, since wheeling will take place over the same Grid that JPS sells electricity to customers, the same efficiency and quality of service adjustments applicable annually to other customers should be applied to wheelers.

Determination 5

The Distribution Cost derived from a JPS' Cost-of-Service Study at the time of each 5-year Tariff Review shall be adjusted annually by the same factor applicable to non-fuel rate under the PBRM specified in the Licence.

4.8 Congestion Management

4.8.1 The issue of congestion is related to power flow difficulties across branches of the network. In this respect, the relative location of generators vis-à-vis consumption points, impacts power flow on various segments of the transmission grid. Congestion on transmission interconnectors therefore has implications for transmission pricing and market operation, and as such needs to be considered carefully in terms of its treatment in relation to wheeling.

4.8.2 Transmission congestion has several principal impacts on the system and market operation:

- it can affect the dispatch of generation, resulting in "out of merit" generation being required to counteract bottlenecks on the transmission network and to avoid system overloads;
- it can require procedures to be developed for giving access to transmission circuits for specific transactions, including the management of "Available Transmission Capacity"; and
- it can lead to the separation of an electricity market into different physical zones for the purposes of defining market prices (so-called "market splitting").

4.8.3 The presence of congestion can be signalled relatively simply in transmission pricing. This is accomplished by allowing charges to reflect the direction of the load-flow. If a wheeling trade, for example, is proposed that runs counter to the main power flow, it could be argued that this should not face as high a charge as one that adds to the existing flow. The way that transmission prices are determined under any of the methods outlined above is essentially an ex ante

process. It requires prices to be published ahead of electricity trading taking place, and therefore calculations would need to be based on a predicted base case of power flows. The resulting signals relating to congestion can only therefore be approximated.

4.8.4 Under a more dynamic approach, the possible existence of congestion is predicted and managed through the splitting of a market into zones, or even nodes, at which separate prices are calculated. The ability to do this depends on the sophistication of the electricity market and the existence of some form of short-term market in which the costs of electricity varies with time. The Nodal-Pricing methodology is superb for handling markets with serious congestion concerns.

4.8.5 The complexity of the congestion management approach is unlikely to be justified for the situation of wheeling energy between self-generators, such as will be the case in the Jamaican market in the short to medium term. Consequently, the MW-km Load flow-based methodology is completely appropriate within the Jamaican context. Nevertheless, it is important to signal to Self-Generators the impact of their exports on the network, in order to encourage optimum utilisation of the transmission network assets. This may be accommodated under the MW-km Load Flow-based by assigning cost on the basis of the direction of the load flow.

Determination 6

To encourage the optimum use of the transmission network by Self-Generators the MW-km Load Flow-based methodology shall incorporate zero charge for branches of the network for which the transaction reduces the overall load flow on the given branch.

4.9 The Treatment of Losses

4.9.1 Although there are instances where system losses may be reduced by wheeling activities, in general, losses on a power transaction tend to occur when electricity is moved across the Grid. It therefore means that if losses occur in the process and a wheeler consumes exactly the same amount of electricity that he places on the Grid, the gap caused by losses would have to be filled by the Grid operator. It may therefore be argued that a Self-Generator should compensate the Grid operator for replacing his electricity losses. On the other hand, in the event that the wheeler, by

virtue of his transaction, contributes to the reduction of system losses, he should be compensated by the Grid operator.

4.9.2 The practise of assigning the cost of losses to the wheeler and interconnector is accepted in many countries. For example, in the Nord Pool[1] transmission losses are recovered by a standard trading fee and in Ireland it is done by way of a Transmission Loss Adjustment Factor.

4.9.3 Total system losses in Jamaica currently stand at approximately 25% of net generation (see Table 2). However, a 17.5% regulatory ceiling is placed on losses and as such the cost of losses in excess of this limit is absorbed by JPS. The latest system losses spectrum for JPS indicates that 9.8% of total losses are attributable to technical while the remaining 15.2% is caused by non-technical factors such as theft and billing errors.

Table 2 – Technical & Non-technical System Loses

System Segment	Losses (%)		
	Technical	Non-Technical	Total
Transmission Network	2.7	-	**2.7**
Primary Distribution Lines	1.8	-	**1.8**
Distribution Transformers	1.3	-	**1.3**
Secondary Distribution Lines	4.0	7.7	**11.7**
Losses at Regulatory Target	**9.8**	**7.7**	**17.5**
Losses absorbed by JPS	-	7.5	**7.5**
Total Losses	**9.8**	**15.2**	**25.0**

4.9.4 Therefore it may be argued that if a Self-Generator wheels electricity on the Grid there is no way that the wheeler can be insulated from the losses on the system. However, the losses on the transmission lines can be calculated from the power transactions. These calculations are based on the DC load-flow modelling which uses inputs from JPS' AC load-flows simulations.

[1] Nord Pool covers six countries in Europe: Denmark, Finland, Sweden, Norway, Estonia and Lithuania.

4.9.5 Regarding distribution losses, an unbiased calculation of the losses requires that technical and non-technical losses should be taken into account up to the 17.5% regulatory ceiling.

4.9.6 This means that 1.8% technical losses is to be assigned to wheeling on the primary distribution circuits, and 4.0% technical losses and 7.7% non-technical losses are to be allocated on the secondary distribution circuits.

Determination 7

To take proper account of losses impacting wheeling transactions the calculation of:

- ***a) Transmission Losses shall be done by the modeling of the load-flows***
- ***b) Distribution Losses shall be based on technical losses of 1.8% on the primary distribution circuits, and where applicable technical losses of 4.0% and non-technical losses 7.7% on the secondary distribution circuits.***

In addition, the calculation of distribution losses shall be based on the latest System Losses Spectrum and the prevailing System Loss Target established by the OUR.

4.10 Billing

4.10.1 While Wheeling Charges are to be adjusted annually, for consistency with the current billing practice, it seems only reasonable that Self-Generators should be billed monthly in Jamaican dollars.

4.10.2 Further, to avoid rate shocks attributable to foreign exchange volatility, it would not be prudent to have significant time lapses between the reconciliation of a Base Exchange rate and the market exchange rate in any billing exercise. Therefore, it may be argued that the monthly bills prepared by JPS for the use of the Grid by Self-Generators should incorporate the same foreign exchange adjustment mechanism applicable to monthly bills now rendered by company to its regular electricity customers.

Determination 8

Self-Generators shall be billed monthly in Jamaican dollars for wheeling and other associated services. Bills shall be subject to the same Base Exchange rate, Billing Exchange rate and foreign exchange adjustment factor applicable to JPS' regular customers.

4.11 Reactive Power

4.11.1 The issue of reactive power caused by the operation of Self-Generators on the Grid was raised in a public consultation meeting and merits consideration. Active power measured in MW is what is actually consumed. However, the Self-Generators and their associated loads are likely to create reactive power demand on the Grid. Reactive power uses up capacity on the Grid but is not consumed. Consequently, it is important to minimize the level of reactive power produced by Self-Generators.

4.11.2 In this regard, it seems only reasonable that the range of operation for Self-Generators be consistent with the existing norm as prescribed by the existing JPS Generation Code.

Determination 9

In order to minimize the amount of reactive power produced on the network by the Self-Generator, an individual/organization involved in wheeling shall have the capability of producing full rated MW output at a power factor between 0.8 lagging and 0.99 leading, in keeping with the JPS' Generation Code.

5.0 Wheeling Framework

5.1 Introduction

5.1.1 Deciding on the methodology was critical to the computation of Wheeling Charges, but an equally important dimension to the implementation of this market reform is the institutional component of the Wheeling Framework. Essentially, the framework sets the rules and provides the necessary structure within which transactions take place.

5.1.2 The key issues related to the institutional dimension of wheeling relates to:

1) What are the additional instruments required for wheeling to work?
2) If it is accepted that a Self-Generation Licence is necessary, what should be the duration of such an instrument?
3) What are the qualifying criteria for participating in wheeling?
4) How should infeasible transactions be managed?

5.1.3 These issues were raised at a consultation meeting held on January 22, 2013 and further explored in the Electricity Wheeling Framework - Second Consultation Document (Document No. 2013/004/ELE/CON/002) published on May 9, 2013.

5.2 Additional Regulatory Instruments

5.2.1 The Electricity Lighting Act, the OUR Act and the Licence are the main institutional pillars upon which the electricity sector rests. At present, the sector is characterized by a vertically integrated company, JPS, that owns the Grid and accounts for 69% or 637.3 MW of the total generating capacity. The remaining 31% of the capacity is provided by three independent power producers.

5.2.2 It is evident that within the context of the present market configuration, competition is limited in the Jamaican electricity industry. With the introduction of wheeling, approved self-Generators will be able to use the grid to transport electricity from their generation sites to points of consumption, provided that the generation sites and consumption points are owned by the same individual or entity. The new Wheeling Framework is expected to stimulate competition by way of attracting a greater share of self-generation in national energy production. In addition, it is envisaged that it will increase the options available to existing Self-Generators to effectively meet their energy needs while operating in multiple-locations.

5.2.3 Consequently, changes in the current market arrangement through additional regulatory instruments are required to ensure that this emergent market operates in an orderly and efficient manner. Against this background, the OUR proposed the following additional instruments:

1) A Self-Generation Licence;
2) A Wheeling Code;
3) A Wheeling Contract; and
4) A set of Supplementary Contracts, namely;
   i. Top-up Supply and Stand-by Contract
   ii. Excess Energy Sale Contract

These instruments are discussed in more detail below.

5.3 The Self-Generation Licence

5.3.1 The Self-Generation Licence is to protect the public good by ensuring that individuals and entities involved in wheeling comply with the codes and standards that are critical to the proper functioning of the Grid. Such licences will be issued by the Minister with portfolio responsibility for the electricity sector and confer to licensees the right to access the Grid in order to move electricity from where it is generated to well defined points of consumption. The Self-Generation Licence will set out the key provisions and obligations of the wheeler. It also identifies the set of codes that must be observed by the wheeler to be allowed access to the Grid.

5.3.2 One of the concerns raised by stakeholders relates to the duration of the Licence. It was argued that the duration should be reasonably long since investors interested in wheeling would be acquiring assets that are long term in nature and a short term Licence would not boost market confidence. The OUR, on the other hand, considered it necessary to strike a balance given that this was the beginning of wheeling in a rapidly evolving market. The discussion in relation to the duration was taken into consideration when arriving at the determination.

5.4 The Wheeling Code

5.4.1 The Wheeling Code is the document that encapsulates the technical and commercial provisions required to enable wheeling to take place. This code will address technical definitions, qualification criteria, the application process, interconnection and metering protocol, as well as wheeling connection and charging principles. Of necessity, the code will be compatible with the provisions of other regulatory documents which form part of the overall legislative and licensing regime.

5.5 The Wheeling Contract

5.5.1 The Wheeling Contract sets out the elements of commercial undertaking between JPS and the individual or entity engaged in wheeling. It is the basis for the Self-Generator's access to the Grid and the provision of wheeling service by JPS. Although the contract will follow a standard format, it will contain site and plant specific schedules that reflect the technical nature of the relationship between the Self-Generator and JPS. Among other things, the contract will specify the

maximum wheeling capacity, the generator and load connection points, as well as provisions for the treatment of metering arrangements and line losses. An important provision in the Wheeling Contract makes reference to the right to buy and sell electricity to JPS by way of various supplementary contracts, since the production of electricity by the Self-Generator will not be at all times perfectly synchronized with the demand.

5.6 Supplementary Wheeling Contracts

5.6.1 Given the dynamic nature of generation and consumption, the Self-Generator's electricity production will not perfectly match the demand on a continuous basis. In this regard, the Supplementary Wheeling Contracts cover the commercial arrangements in relation to the Self-Generator's surplus energy and power deficits. These contracts are as follows:

1) *A Top-up Supply and Standby Supply Contract:*
   i. The *Top-up Supply component* addresses situations in which the Self-Generator's Generating Plant is producing less power than is being consumed by the Self-Generator's load facilities, in which case the topping-up of supply is required.
   ii. *Standby Supply Component:* addresses situations in which the Self-Generator's generating plant is unavailable due to an outage resulting from a fault or scheduled maintenance, in which case a standby supply is required.

2) *An Excess Energy Sale Contract:* addresses situations in which the Self-Generator's Generating Plant is producing more power than is being consumed by the Self-Generator's load facilities, in which case the excess energy may be sold to the grid operator at a price approved by the OUR.

5.6.2 However, this right to sell electricity to JPS is not to be interpreted as an opportunity for the Self-Generator to operate as an IPP. It is intended to enhance the efficient use of energy through the seamless matching of production and demand by the Self-Generator.

5.6.3 Stakeholders raised no objections to the proposed instruments and the OUR has incorporated them into its decision.

Determination 10

The regulatory instruments that constitute the Wheeling Framework shall be:

- ***a) The Self-Generation Licence***
- ***b) The Wheeling Code***
- ***c) The Wheeling Contract***
- ***d) A set of Supplementary Contracts consisting of:***
  - ***i. A Top-up and Stand-by Supply Contract***
  - ***ii. An Excess Energy Supply Contract***

5.6.4 The Office has also determined the duration of the Licence as well as the level of the application and regulatory fees for the Self-Generation Licences.

Determination 11

The duration of the licensee shall be ten (10) years and it shall attract an initial Self-Generation Licence Processing Fee of $20,000 and thereafter an annual Regulatory Fee of $10,000. Both fees are payable to the OUR and may be adjusted from time to time by the Office.

Determination 12

Qualified individuals and organizations may apply to the Minister through the OUR for Self-Generation Licences as of July 15, 2013.

5.7 Time Table for Finalization of the Instruments

5.7.1 Apart from the Self-Generation Licence which is a permit to be issued by the Minister with responsibility for the sector, the finalization of all the other instruments requires JPS' further involvement.

5.7.2 A timetable is therefore necessary to facilitate the connection of Self-Generators to the Grid within the next three (3) months. The Office has therefore determined that JPS shall review and amend, if necessary, the outlines of the Wheeling Codes, the Wheeling Contract and the Supplementary Contracts provided in the Appendix herein for approval and finalization by August 12, 2013.

Determination 13

JPS shall review, refine and, where it is deemed necessary, extend the outlines of the Wheeling Codes, the Wheeling Contract and the Supplementary Contracts and submit them to the OUR for approval and finalization by August 12, 2013

5.7.3 The final Self-Generation Licence and the outlines of the other wheeling instruments are in the Appendix.

5.8 Qualification Criteria

5.8.1 To qualify for a Wheeling Licence, the potential wheeler must satisfy a number of critical legal and operational criteria. These are discussed below.

5.8.2 Condition 2, paragraph 4 (b) of the Licence grants JPS "the exclusive right to transmit, distribute and supply electricity throughout Jamaica" until July 8, 2027. Condition 12, on the other hand, states that JPS "shall implement an Electric Power Wheeling service in accordance with such terms and conditions as approved by the Office." Taken together, these two conditions of the Licence mean that the wheeling of electricity cannot be for the use of any other party other than the generator of the power, since JPS is the only entity that can supply electricity in Jamaica.

5.8.3 In this regard, for an applicant to be qualified as a wheeler, the organization/individual must be a single legal entity that owns both generation equipment and load facilities. It will be the responsibility of the OUR in recommending the granting of the Wheeling Licence to establish that the facilities used to generate and consume wheeled energy are in the ownership of the same legal party.

5.8.4 From a practical perspective, identifying a threshold for wheeling is a balance between making wheeling available to a greater number of customers, and managing the associated administrative costs and technical complexities that could impair the efficient roll-out of the service. Precedent internationally tends to indicate that wheeling of power is usually in the order of MWs of capacity. Notwithstanding, there are instances, such as Great Britain, where LV connected

generators with capacity in the order of a few kW can wheel power across the distribution network.

5.8.5 At this introductory stage, the OUR proposed a wheeling threshold of 25kVA. Some stakeholders were of the view it was too high. In fact, one stakeholder argued that setting the threshold at 25KVA was not adequate for the encouragement of competition, the protection of the interest of consumers and the development of indigenous resources. Instead he proposed a threshold of 2KVA.

5.8.6 The OUR is not opposed to a threshold lower than 25KVA. However, the OUR is of the view that the real impact of wheeling on the Grid should be first studied with a smaller number of wheelers, before opening the facility to greater number of players. The OUR is mindful that dynamic stability is critical to the operation of the Grid and the introduction of new players has implications for the availability of power on the network as a whole. Consequently, a phased approach which allows time to probe into the robustness and dynamics of the Grid is the approach adopted.

Determination 14

To qualify for wheeling services the applicant for the service must be a Self-Generator and possess minimum power export and import capacity at each connection point related to the Self-Generator's production and consumption facilities of 25kVA.

5.9 Feasibility of wheeling trades

5.9.1 It is important to note that there is nothing in the wheeling process that actually assures Self-Generators of the technical feasibility of wheeling at a given time of day or for particular periods of the year. The feasibility of wheeling, in terms of ensuring that access to the networks is available in particular demand and generation conditions, or in contingency/outage situations, will need to be checked by JPS as part of the normal system dispatch/operation process.

5.9.1 In particular, in the event of a natural disaster, force majeure conditions may be applicable in which event, wheeling may not be possible. It should be noted that capacity based wheeling charges are independent of the down time associated with infeasible trading conditions.

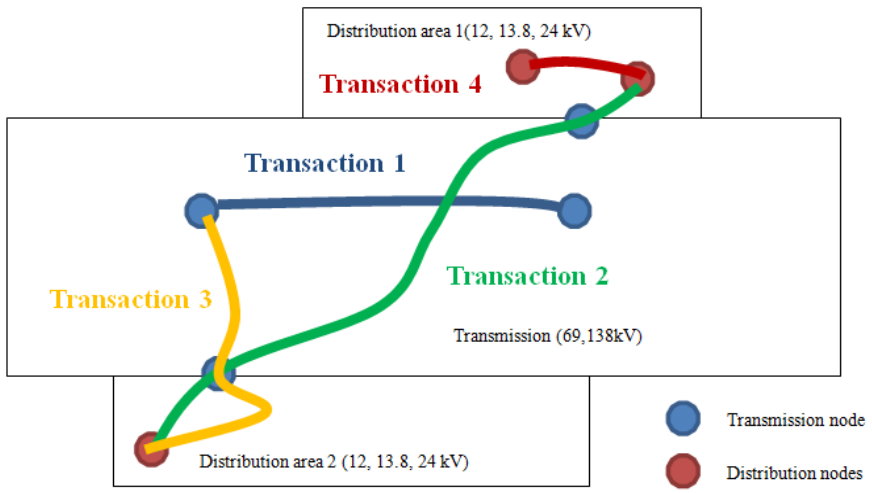
6.0 Computation of Wheeling Charges

6.1 Introduction

6.1.1 When the use of the transmission and distribution network is taken into account there are four ways in which a wheeling transaction may be configured from locational perspective as indicated in Figure 2 below:

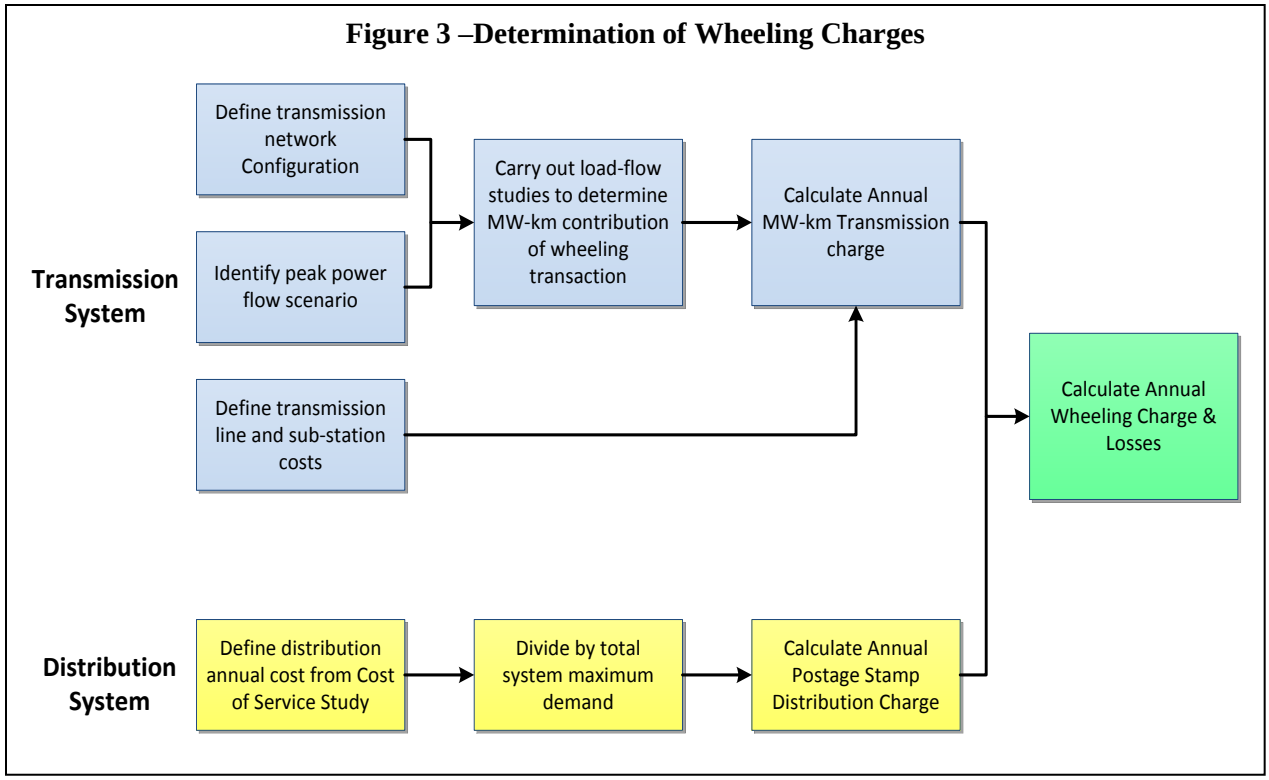
- *Transaction #1*: services for which only the transmission lines are involved.
- *Transaction #2*: services for which the Self-Generator and the load are at the end of distribution lines, but the transmission lines must also be used to move power between the two points.
- *Transaction #3*: services for which either the Self-Generator or the load (but not both) are at the end of distribution lines and of necessity transmission lines must be used. This is so because either the Self-Generator or the load is at the end of a transmission line.
- *Transaction #4*: services for which both the Self-Generator and the load are at the end of distribution lines and no transmission lines are required for transportation of power. Therefore wheeling takes place exclusively on distribution lines.

Figure 2 – The Four Different Types of Locational Transactions



6.1.2 Consequently, depending on the path the transaction takes, the computation of associated wheeling charge may involve either the MW-km Load Flow-based calculation or a Postage Stamp computation or both (see Figure 3).

Figure 3 –Determination of Wheeling Charges



Capacity based charges

6.1.3 An important feature underpinning the calculation of Wheeling Charges relates to their application to Self-Generators on the basis of the capacity being wheeled. Capacity is the key criterion that determines the quantity of network assets that is required for the transportation by the conductors and transformers on each circuit. Consequently, the Wheeling Charges that are calculated are applied on the basis of US Dollars per MW per year (USD/MW/yr), and related to the capacity that is reserved by the Self-Generator in the process of entering into a wheeling contract at the start of each year.

6.2 Transmission Calculation

6.2.1 The transmission calculation may be summarized as follows:

- Full AC load flow data from three cases submitted by JPS, representing On-peak, Partial-peak and Off-peak load conditions are used to determine the maximum MW load on each transmission line and transformer. The maximum MW on the respective lines and transformers is used as the denominator in the calculation of the proportional load imposed by the wheeling trade. This information is to be updated annually by JPS.
- DC load flow analysis is employed to identify power flows through the transmission network associated with the specific transaction.
- The cost based on the MEA.
- JPS' AC load flow data is used to find the maximum power flow on each branch.
- The product of cost (based on the MEA approach) and power flow on each relevant branch of the network is aggregated to arrive at the transmission wheeling charge. In should be noted that a transaction load flows on any branch that help reduce power flow on the network, by virtue of their negative directionality, are rewarded with zero cost.

6.2.2 The transmission cost of wheeling is calculated based on the equation below.

Equation 1

$$\textbf{Wheeling Transmission Cost} = \sum \textbf{(Branch Cost * Portion of branch used for Wheeling)}$$

6.3 Transmission Cost

6.3.1 The transmission cost based on the MEA value as developed by PPA Energy is shown in Table 3 below.

6.3.2 The actual MEA value for the components of the transmission system above have been annuitized, so that they are either in the form USD/km/year for circuits, or USD/year for substation assets. The following are the underlying assumptions:

- The asset depreciation life for transmission assets is 25 years.
- O&M cost of 2% of the original capital cost is added. This is based on typical relationship which exists between these costs in the electricity industry.
- A real Weighted Average Cost of Capital of 11.14% is applied to the original capital cost, consistent with the 2009 Rate Review. This is predicated on the average inflation rate of 8.6% registered over the period 2010 -2012.

Table 3 - Annualized Modern Equivalent Value of JPS Transmission Assets

Description	Unit	Cost (USD)
69kV OHL (single circuit)	km	202,500
138kV OHL (single circuit)	km	232,500
138kV OHL (double circuit)	km	307,500
69kV UGC	km	1,012,500
69kV feeder bay	each	795,000
138kV feeder bay	each	1,335,000
138/69kV 30 MVA transformer	each	1,550,000
138/69kV 40 MVA transformer	each	1,700,000
138/69kV 60 MVA transformer	each	1,960,000
138/69kV 80 MVA transformer	each	2,330,000

Determination 15

Transmission wheeling rates are locational and specific to each Self-Generator. Consequently, the actual wheeling rate for a transaction must be derived by modelling the load flows though the transmission network. Wheeling Charges for each client must therefore be determined by JPS based on the model established for this purposed. These charges are to be approved by the OUR before they take effect.

6.3 Distribution Calculation

6.3.1 The calculation of wheeling charges on the distribution network involves two components:

- Postage Stamp charge on the primary distribution circuits: this is the charge for wheeling on the 12KV, 13.8KV or 24 KV circuits.
- Postage Stamp charge on the secondary distribution circuits: this is the charge for wheeling on the distribution circuits at voltage levels below 12KV.

6.3.2 The annual charges are derived by dividing the cost of service for the relevant segment of the distribution circuit by the system peak demand.

6.3.3 The cost of wheeling for each segment of distribution circuits calculated based on the equation below:

Equation 2

$$\text{Distribution Charge} = \frac{\text{Cost of Service}}{\text{Peak Demand}}$$

6.4 Distribution Cost

6.4.1 As previously indicated, JPS was extremely tardy in providing the 2012 Cost-of-Service data. The OUR therefore took the decision to proceed with the computation of Postage Stamp charges based on the approved 2009 revenue requirement associated for the primary and secondary distribution service adjusted up to 2013 in line with the annual tariff adjustment factors. This was done to ensure that the effect of inflation and foreign exchange movements are captured in the costs of these services.

6.4.2 Table 4 below shows the Postage Stamp Charges based on the Cost-of-Service data used in JPS 2009 Tariff Review adjusted by the Annual Tariff price cap index.

Table 4 – Determination of Wheeling Charges

	2009 Annual Revenue Requirement (J$)	Annual Cost to be Recovered (US$)		Peak Demand (MW)	Postage Stamp Charge (US$/MW)
		2009	2013		
Primary Distribution (MV)	5,532,445,505	63,591,328	66,957,665	635.8	105,312
Secondary Distribution (LV)	2,812,888,438	32,332,051	34,043,614	635.8	53,545

Determination 16

For wheeling that occurs exclusively on the distribution network, the charges are non-locational as they are based on the Postage Stamp methodology, the charges are as follows:

a) Primary Distribution (MV) – US$105,312 per MW

b) Secondary Distribution (LV) –US$53,545 per MW

6.5 Calculation of Losses

6.5.1 For the purpose of transmission wheeling the calculation of losses is based on the weighted average of the load conditions of the circuit at the On-peak, Partial-peak and Off-peak period. Consequently, the cost of transmission losses might be expressed as:

Equation 3

Cost of losses = 8760 * Peak Losses * Load loss factor * Average electricity price

Where the Peak Losses (in MW) is the maximum increase in transmission losses calculated with the wheeling transaction; and the Load Loss Factor is:

Equation 4

$$\text{Load Loss Factor} = 0.7 * (\text{Load factor})^2 + 0.3 * (\text{Load factor})$$

6.5.2 The Load Loss Factor (LLF) is the ratio of average power loss over power loss at maximum demand. The LLF above is a generic formula used by the World Bank and other organizations internationally in this type of calculation.

6.5.3 As it relates to distribution losses, it is assumed that losses are experienced by each transaction wheeled on the primary and secondary distribution circuits. Consequently, while the computation of the cost of losses and the LLF are the same as shown in Equations 3 and 4 above, the Peak Losses (in MW) is assumed to be the product of the maximum capacity registered by the Self-Generator and the technical losses (in percentage terms) linked to that segment of the distribution network. This may be expressed as follows:

Equation 5

$$\text{Peak Losses} = (\text{Maximum Capacity}) * (\%\text{Technical Losses})$$

6.5.5 In keeping with the existing system loss target of 17.5%, the losses imputed to wheeling on the primary and secondary segments of the distribution network are 1.8% and 5.3% respectively. To these levels of technical losses, non-technical losses should be added.

6.6 Annual Wheeling Charge Adjustments

6.6.1 Consistent with the existing tariff regime which requires annual adjustments to electricity prices and comprehensive review of the underlying utility cost structure every five (5) years, the same procedure shall be applied to Wheeling Charges.

Determination 17

Wheeling rates shall be updated annually and shall coincide with JPS' annual tariff adjustment exercise. In this regard JPS shall:

a) submit to the OUR the required data in the prescribed format pertaining to the AC load flows, costs, demand and other relevant information necessary to update and verify the wheeling model by March 31 each year.

b) update the wheeling model and submit the same to the OUR for verification by April 30 each year.

6.7 Wheeling Charge Scenarios

6.7.1 Table 5 below shows wheeling scenarios based on the 2012 billing data for fourteen (14) actual JPS customers. The Table compares the total wheeling charge each customer would pay with the current demand charge (with and without fuel payments). While the locations are hypothetical, it indicates the degree to which Wheeling Charges may vary depending on the wheeling capacity and the locations of the generator and the load. For example, Client A wheels a total of 4.16 MW to Kingston from Ocho Rios and Montego Bay and the associated annual wheeling charge is US$339,700 per MW. Client C, on the other hand wheels 4.51 MW (a little more than A) from Orange Bay to Mona, yet his charge is US$629,900 per MW, which is 85% more than A. Interestingly, the rate to wheel one (1) MW from Maggotty to Montego Bay would be only US$83,000 per year. This demonstrates that in the use of the transmission lines, location is critical since it determines the flow path and direction which influences the cost.

6.7.2 In the case of Client L and M the Wheeling Charge per MW is same US$105,300 annually since these transactions only take place on the primary distribution lines which results in a Postage Stamp charge which is independent of distance. It should be noted that these charges would have to be adjusted to reflect losses.

Table 5 – Wheeling Scenarios

Client	Trans. No	Wheeling MW	Location		Voltage connected (KV)		Current Demand Charge		Wheeling Charge (Excl. Losses) (US$'000/yr)			
									Transm	Postage	Total	Charge Per MW
			Gen.	Load	Gen.	Load	(Excl. Fuel)	(Incl. fuel)	Load-flow	Stamp		
A	1	2.081	Montego Bay	Kingston	12	12	1,774.4	8,683.2	975.4	438.2	1,413.6	339.7
	2	2.081	Ocho Rios	Kingston	12	12						
B	1	3.272	Orange bay	Mamee Bay	69	12	1,444.0	7,213.4	533.2	344.6	877.8	268.3
C	1	4.513	Orange bay	Mona	12	24	1,666.7	7,398.9	2,367.8	475.3	2,843.1	629.9
D	1	2.585	Spanish Twn	Hunts bay	12	12	1,097.7	5,359.5	120.6	272.2	392.8	152.0
E	1	2.271	Cardiff Hall	Norm Manly Hwy	69	69	988.4	4,896.8	555.6	-	555.6	244.7
F	1	2.196	Rio Bueno	Runaway Bay	69	24	965.1	4,807.8	161.3	231.3	392.5	178.7
G	1	1.985	Copperwood	Lucea	13.8	13.8	925.8	4,766.1	-	209.0	209.0	105.3
H	1	1.848	Maggotty	Montego Bay	69	69	835.3	4,226.8	153.6	-	153.6	83.1
I	1	2.372	Annotto Bay	Montego Bay	69	69	1,482.3	6,855.5	265.4	149.4	414.8	174.9
	2	1.419	Montego Bay	Harbour view	12	12						
J	1	2.367	Constant Spr.	Mona	69	69	845.8	3,655.8	139.7	249.3	388.9	164.3
K	1	1.545	Negril	St Anns Bay	12	12	667.0	3,286.8	785.3	162.7	948.0	613.5
L	1	1.660	Greenwich Rd	Kingston	24	24	645.9	2,976.8	-	174.8	174.8	105.3
M	1	1.417	Spring Mt	Mamee Bay	69	12	600.2	2,924.2	166.0	149.2	315.2	222.5
N	1	0.023	Bloody Bay	Negril	12	12	548.8	2,609.0	-	2.4	2.4	105.3

7.0 Conclusion

An essential element of the OUR's mandate is that of encouraging competition. The introduction of wheeling represents a market reform that will increase the options available to electricity consumers to lower priced energy. This document lays out the methodology and framework that will facilitate the fair and orderly execution of wheeling transactions which become effective on July 10, 2013.

APPENDICES

APPENDIX A - SELF-GENERATION AND WHEELING LICENCE

THE ELECTRIC LIGHTING ACT

[INSERT NAME OF ENTITY]
SELF-GENERATION AND WHEELING LICENCE, [20]

1. SHORT TITLE

This Licence may be cited as "[insert name of entity] "Self-Generation and Wheeling Licence, 20..].

2. INTERPRETATION

2.1 In this Licence -

"**ELA**" means the Electric Lighting Act.

"**Excess Energy Contract**" means the contract that addresses the issue of surpluses and deficits between the Generator(s) and Load(s) and JPS, and outlines the terms and conditions of the sale of electricity by the Licensee to JPS.

"**Generator**" means an organization/individual that is a single legal entity that wholly owns both the generation equipment and the Loads.

"**JPS**" means the Jamaica Public Service Company Limited.

"**JPS Licence**" means the Amended and Restated All-Island Electric Licence, 2011 and any amendments thereto after the date of this Licence.

"**Licensee**" means [name and description of entity], and [address of entity].

"**Licensed Business**" means the self-generation and transportation of electricity across the National Grid to be carried out in accordance with the terms and conditions of this Licence and any other licence required by Jamaican law.

"**Loads**" means the demand facilities.

"**Minister**" means the Minister with the portfolio responsibility for electricity.

"**National Grid**" means public electricity supply system and includes the

network used for the transmission and distribution of electricity to individual members of the public.

"**Office**" means the Office of Utilities Regulation established pursuant to the OUR Act.

"**OUR Act**" means Office of Utilities Regulation Act, 1995.

"**Power Purchase Agreement**" means the agreement for the purchase of power concluded between the Licensee and JPS or its successor or assign operating the National Grid.

"**Prescribed Utility Service**" means the supply of electricity.

"**Self-Generator**" means a legal entity that owns a generation facility and electricity demand installations that are located on separate sites, and wishes to supply its demand exclusively from its generation facility to one or more load facilities making use of the JPS transmission and/or distribution network(s) for the purposes of so doing.

"**Standby Contract**" means a contract outlining the terms and conditions on which the Licensee will purchase electricity from JPS due to the unavailability of Licensee's generating plant.

"**Top-up Contract**" means a contract outlining the terms and conditions on which the Licensee will purchase electricity from JPS due to the Licensee's generating plant producing less power than what is being consumed at the Licensee's Loads.

"**Wheeling or wheel**" means the transportation of electricity across transmission and distribution grid by an independent party other than the owner or operator of the National Grid.

"**Wheeling Code**" means a document which sets out the enabling provisions that cover technical and commercial criteria, processes and actions required for wheeling to take place.

"**Wheeling Contract**" means a contract that sets out the elements of commercial undertaking between JPS and the Licensee, which forms the basis for the Self-Generator's access to the Grid and the provision of wheeling service by JPS.

2.2 This Licence shall be read and construed, subject in all respects to the provisions of the ELA, the OUR Act, the JPS Licence, and any other applicable legislation, regulations, rules, guidelines, codes, standards,

licences (or any statutory modification, consolidation or re-enactment thereof after the date of this Licence) and to the terms and conditions herein specified.

3. GRANT OF LICENCE

3.1 The Minister pursuant to the Section 3 of the ELA, Section 4A of the OUR Act and Condition 12 of the JPS Licence, hereby grants the Licensee a licence authorizing the said Licensee to:

(a) generate electricity from the generating plant which it wholly owns and wheel this to the wholly owned Loads using the National Grid, subject to the terms and conditions specified herein;

(b) purchase supplies of top-up and standby energy from JPS for its own use, subject to the terms and conditions of a top-up and standby contract to be entered into with JPS, and approved by the OUR;

(c) sell any excess energy of over generated over and above its own load requirements to JPS under the terms specified in a Power Purchase Agreement for intermittent energy entered into with JPS, and approved by the OUR.

3.2 For the avoidance of doubt, an organization/individual that has registered its generator(s) and Load(s) under the terms of a Self-Generation Licence does not require any other licences to generate and wheel electricity for its own exclusive use.

3.3 This Licence shall become null and void if the Licensee within twelve (12) months of the date of issuance of the Licence fails to install the necessary infrastructure required to comply with the terms of the Licence.

4. THE LICENSEE

(i) The Licensee must be a Self-Generator.

(ii) The Licensee shall own the Generator of capacity rating of **……**

located at **……**

……
and Load(s) each with a capacity rated at 25MW or above located at:

a) .....

.....

b) .....

.....

c) .....

.....

for the purposes for which Licence has been granted.

5. DURATION

Subject to the provisions contained herein, the Licence shall have full force and effect from the date of execution by the Minister. This Licence shall be valid for a term of five (5) years, and the Licensee shall be required to renew the Licence at least three (3) months prior to the expiration date of the issuance of the Licence.

6. LICENCE PROCESSING FEE & REGULATORY FEES

6.1 The Licensee shall pay a licence processing fee of _____ to the OUR to obtain a Licence.

6.2 The Licensee shall pay to the Office an annual regulatory fee of [ ]. The first and each subsequent regulatory fee shall become due and payable on the anniversary date of the issuance of this Licence.

7. CERTIFICATION OF FACILITIES

The Licensee shall ensure that its generation installations and demand facilities are inspected and certified by the Government Electrical Inspectorate.

8. WHEELING CONTRACT & SUPPLEMENTARY CONTRACTS

8.1 The Licensee shall enter into a Wheeling Contract with JPS to enable the Wheeling of electricity on the National Grid. The Licensee shall negotiate provision of interconnection to the National Grid with JPS and these provisions shall be included in the Wheeling Contract.

8.2 The Licensee shall enter into a Stand-by and Top-up Contracts as well as an Excess Energy Contract with JPS.

9. DISPUTE RESOLUTION

In the event of any difference or dispute arising between the Licensee and JPS regarding the Wheeling Contract or any other operations on the National Grid that the parties fail to resolve amicably and expeditiously, either party may refer the dispute to the OUR for resolution of the issue(s).

10. COMPLIANCE WITH CODES

10.1 The Licensee is obliged as a condition of this Licence to operate safely and to comply with the terms of the following Codes and Agreements:

a) the Generation Code;

b) the Wheeling Code;

c) the Connections Code that is in effect;

d) the Transmission and Distribution Code;

e) the JPS Line Extensions Policy Document (Updated 1 July 2008);

f) the JPS Standard Terms and Conditions; and

g) the Wheeling Contract with JPS.

11. SUSPENSION OF LICENCE

11.1 The Minister may, on the recommendation of the Office at any time suspend or revoke this Licence by not less than thirty (30) days' notice in writing (the "Notice of Revocation") to the Licensee:

(a) if it shall have been determined that the Licensee has failed to comply with any term or condition of this Licence or to carry out in good faith and with reasonable diligence the activities referred to in this Licence, including compliance with directives, orders, memorandum, or determinations issued by the Office which determination shall specify in exact detail the respects in which the Licensee so failed, provided that such failure shall have continued for a period of thirty (30) days and shall have impaired the Licensed Business;

(b) if the Licensee is insolvent or bankrupt or has gone into

compulsory or voluntary liquidation or enter into any agreements with their creditors for relief of debt or take advantage of any law for the benefit of debtors, other than for the purpose of amalgamation or reconstruction;

(c) if any fee or financial obligation payable under this Licence or in relation to any related statute or any fine imposed by a court of law is unpaid thirty (30) days after it has become due and after the expiration of this thirty (30) day period it remains unpaid for a further period of thirty (30) days after the Office has given the Licensee notice that the payment is overdue; or

(d) if the Licensee or any principal officer of is convicted of a criminal offence by a court of law, which offence has impaired the Licensee's obligations under this Licence.

11.2 Prior to the recommendation for the suspension or revocation of this Licence pursuant to Clause 11.1, the Licensee shall within a thirty (30)-day notification period be given an opportunity to be heard, including making written submissions to the Office as to why this Licence should not be suspended or revoked.

12. AMENDMENT OF LICENCE

This Licence may be modified at any time during the term of its continuance by agreement between the Licensee and the Minister, on the advice of the Office.

13. NOTICES

13.1 Any notice, document or other instrument required or permitted to be given or delivered to any person under any provisions of this Licence shall be in writing and may be delivered or given by registered mail addressed to the person to whom the notice is to be given, or delivery is to be made, at its usual or last known address and if so given by mail shall be deemed to have been given or delivered five (5) days after the date on which it is deposited in the mail as registered mail.

13.2 If notice is given or any document delivered other than by registered mail, as provided in the preceding sentence, such notice shall not be deemed to have been given or document delivered until it is actually received by the person to whom the notice is given or delivery is made.

13.3 Any person may change its address for the purposes of this clause by giving notice of such change by hand delivery, or registered mail, which

change shall not become effective until it is actually received by the person to whom the notice is addressed.

14. **WAIVER**

Neither the failure nor any delay on the part of the Minister or the Office to exercise any right, remedy, power or privilege under the Acts or this Licence shall operate as a waiver thereof, nor shall any single or partial exercise of same preclude any other or further exercise of the same or of any other rights with respect to any occurrence be construed as a waiver of such rights, remedies, powers or privileges with respect to any other occurrence.

Dated this…… day of ……. [20…].

……
Phillip Paulwell
Minister of Science, Technology, Energy and Mining

APPENDIX B –WHEELING CODE

WHEELING CODE

Overview

The Wheeling Code needs to define the principles and key steps that are to be followed by Wheeling Entities and JPS in entering into an agreement for utilising the Wheeling Service.

The key provisions that the Code needs to address are:

- the **Definition of Self-Generation** (as it is only Self-Generators who will be able to undertake wheeling activity under the proposed Wheeling Service);
- the **Qualification Criteria** to be met by those parties seeking to enter into a Wheeling Contract for Self-Generation;
- the **Application Process**, i.e. the procedure to be followed by potential wheeling entities in seeking a Wheeling Contract with JPS;
- the **Interconnection and Metering Protocol** that is to be adopted, governing the technical and commercial basis on which connections between the Wheeling Entity's generation equipment and its demand facilities are to be developed, and the technical criteria that the metering and meter data collection systems are to comply with;
- the **Connection Charging principles** that will apply to the calculation of the costs of new generator and/or load connections; and
- the **Wheeling Charging principles** to be adopted in charging for the use of the transmission and distribution systems.

Proposals for each of these key provisions are contained in the following sections.

Definition of Self-Generation

"**Self-Generator**" means a legal entity that owns a generation facility and electricity demand installations that are located on separate sites, and wishes to supply its demand exclusively from its generation facility to one or more load facilities making use of the JPS transmission and/or distribution network(s) for the purposes of so doing.

[It is important to note that under the legal interpretation of the JPS Licence, the ownership of demand and generation by different subsidiaries of the same corporate entity is not permitted.]

Qualification Criteria

The key qualification criteria for inclusion in the Wheeling Service offered by JPS relate to the size of the electricity demand and generation that is being utilised by the wheeling entity and the voltage level at which these installations are connected to the transmission and distribution networks.

Wheeling Services may be entered into by self-generators that meet the following criteria:

a) a minimum power export and import capacity of [25kVA] at each connection point related to the self-generator's production and consumption facilities;
b) connection points defined on the 138kV, 69kV, 24kV, 13.8kV and 12kV systems as well as at the 220V delta and 415/240V star systems.

Application Process

The application should be sent to JPS and copied to the OUR.

Parties will be required to submit the following information as a minimum:

a) Name and company registration number of the company wishing to wheel power.
b) Name and full addresses of the generating facilities that are to export wheeled energy.
c) Name and full addresses of the load facilities that are to import wheeled energy.
d) Confirmation of the names and company registration numbers of the companies owning the generation and load facilities at each location.
e) Details of the ownership structure of the relevant company/companies, to confirm qualification as a Self-Generator.
f) Maximum Export Capacity for wheeled generation at each location (MW).
g) Estimated monthly energy production from each generation facility.
h) Maximum Import Capacity for wheeled load at each location (MW).
i) Estimated monthly energy consumption at each load facility.

Interconnection and Metering Protocol

Connections between the Self-Generator's generation equipment and the transmission or distribution network, as applicable, will be planned and constructed in accordance with the connection process defined in the relevant Codes and in accordance with the provisions in the JPS Licence.

The Self-Generator is required to comply with the conditions defined in the following regulatory documents in respect of new connections to both generation and consumption sites:

- [the Connection Code – when this is issued];
- [the Transmission and Distribution Code – when this is issued];
- the JPS Line Extensions Policy Document (Updated 1 July 2008);
- the JPS Standard Terms and Conditions applying to Electric Service and Rates in the Entire Territory served by the Company;
- the Generation Code, in respect of the technical specifications of generation that is to be connected to the transmission and distribution systems.

The default arrangements in the JPS Standard Terms and Conditions raise a number of points that require clarification and/or amendment in relation to the Wheeling Service. There is, however, a general question about the applicability of the Standard Terms and Conditions to both generation and demand, since the conditions described are drafted broadly in terms of consumers of electricity rather than generators. It is proposed that the most relevant clauses from the Standard Terms and Conditions be adopted in the Wheeling Code, as discussed below.

Application for Service

The application for service in relation to wheeling should specify clearly the identity of the generation installation and the load installation(s) that are to enter into a Wheeling Contract. The Standard Terms and Conditions are cast in terms of a "consumer" making an application for connection, however in the case of the Wheeling Service there will be both consumer and generator connections required.

Applications for connection to the JPS transmission and distribution networks from Self-Generation companies will need to state that a Wheeling connection is being applied for. JPS will be responsible for accounting for the production and consumption of Self-Generators from the viewpoints of metering and billing.

JPS shall be responsible for the record keeping associated with the registration of self-generators, with the OUR recording the issue of Self-Generation Licences.

The nature of generator connections is such that special connection designs are often required. JPS shall therefore be required assess each design by JPS on a case by case basis.

Deposits

Financial deposits will be required from Self-Generators to cover two types of costs:

(a) any down-payment necessary in respect of new connections to the JPS transmission or distribution networks for new generation and/or load installations, to enable JPS to purchase equipment and mobilise engineering resources as required;
(b) security amounts required to cover JPS's exposure to costs in the event of payment defaults by Self-Generators receiving wheeling services and/or top-up/standby supply services.

In line with current practice, Self-Generator shall be required to pay a deposit that deposits equivalent to three (3) months' estimated payments for Wheeling Charges, Top-up supplies and Standby supplies to JPS prior to the commencement of wheeling service.

Application of Rates

Rates will need to be agreed between the Self-Generator and JPS for the purchase of top-up and standby energy from JPS by the Self-Generator and the sale of excess energy to JPS by the Self-Generator. The terms of these agreements will be negotiated outside the scope of the Wheeling Code and subject to regulatory oversight by the OUR.

Character of Service

In the normal course of self-generation activities, losses will occur in the transformer windings at the generation and load substations. Responsibility for these should rest with the owner of the transformer equipment, and in most cases it would be expected that this would be the Self-Generator.

It is proposed that JPS will both provide Top-up and Standby supplies to the Self-Generator's load(s) in the event that generation is inadequate or out of service, and that JPS will purchase excess energy generation from the Self-Generator in situations where excess energy is being produced compared with the demand.

Energy metering will be required at the interface points between the Self-Generator's generating plant and load facilities and the transmission/distribution networks, as appropriate.

Point of Delivery

In situations where JPS is purchasing energy from the Self-Generator, it is assumed that JPS will take responsibility for the network losses associated with the generation export, whilst the Self-Generator is responsible for losses in the step-up transformer. This will require metering of the power export at the point of interconnection of the generation installation with the network, which would normally be on the high voltage side of the step-up transformer. In the event that metering is placed on the low voltage side of the step-up transformer, a loss adjustment factor will need to be agreed between JPS and the Self-Generator to correct the volume of energy exported to the high voltage side of the transformer.

Where the self-generator is purchasing energy from JPS, the energy consumption will need to be metered at the point of connection with the JPS network, which would normally be on the high voltage side of the step-down transformer. JPS will be responsible for the losses incurred in delivering top-up and standby energy to the load installations of the Self-Generator, with the Self-Generator being responsible for losses in the step-down transformer. In the event that metering is placed on the low voltage side of the step-up transformer, a loss adjustment factor will need to be agreed between JPS and the Self-Generator to correct the volume of energy imported to the high voltage side of the transformer.

The point of delivery for energy flowing to or from the Self-Generator is therefore defined as the high voltage side of the main transformer bank, in accordance with the stipulation for high voltage supplies in the Standard Terms and Conditions.

Metering

The metering requirements specified in the Standard Terms and Conditions make reference to metering of 2% accuracy at consumer installations. Beyond this, however, there is no reference to the integration period or the frequency with which meter readings are to be obtained.

Main and check metering should be provided to an accuracy of 2% with the capability to communicate with meter reading systems operated by JPS.

Four-quadrant metering of real and reactive power and energy is required at all the Self-Generator's sites covered by the terms of the Wheeling Contract.

Meter data should be integrated on an [hourly] basis at generation and demand sites covered by the Self-Generator's wheeling contract. JPS will collect the meter readings and reconcile these on a [monthly] basis to determine the totals of top-up and standby energy and/or excess generation for which payment is to be made, where for each hour the Self-Generator is determined to have been in either a net importing or net exporting position. (Imports and exports are to be reconciled in each hour and not netted across the month.)

The choice of an integration period for the meter data reconciliation has been recommended on the basis of practical considerations of the volume of meter data that requires processing in any future market platform, were it to be the case that electricity trading were to be opened more widely to other generators and customers. Electricity markets typically operate on an hourly or half-hourly settlement period, seeking to balance the commercial sensitivity of bidding and pricing with the operational characteristics of the market. In the early stages of developing commercial trading of electricity, it is important to avoid over-complicating the settlement process.

Considerations for market settlement periods include the costs associated with data retrieval, handling and aggregation, which are driven by the volume of metered data. Markets with half-hourly trading periods include the Australia National Electricity Market (NEM), the New Zealand Electricity Market, the Single Electricity Market (SEM, Ireland and Northern Ireland), the National Electricity Market of Singapore (NEMS), and the British Electricity Trading and Transmission Arrangements (BETTA, Great Britain). Markets with hourly trading periods include Nordpool, PJM (Pennsylvania, Jersey, Maryland, in the United States), the Ontario Electricity Market (Canada) and the Colombian Electricity Market. In some instances, market operators calculate prices every five minutes, which are then averaged over a half-hour / hour period. These are markets that operate closer to real-time, e.g. the Australia spot market and the PJM real-time market. This international practice therefore supports the proposal for hourly settlement in Jamaica.

Notwithstanding the above, given that current practice in Jamaica allows for the settlement of energy transactions on the basis of 15-minute metering data in the case of IPPs, a settlement period of 15 minutes for wheeling trades could be considered. It would also be feasible to install metering that is capable of 15-minute integration, but to combine values into hourly readings in settling wheeling-related energy transactions for an interim period, until decisions are taken about any future broadening of energy trading under a market-based approach.

Use of Energy by the Consumer

This clause contains a number of technical requirements that are likely to form part of the Connections Code or Transmission & Distribution Code in the future.

The clause shall be redefined as "Production and Use of Energy by the Consumer" and contain a cross-reference to the Generation Code regarding the required performance of the Self-Generator's generating plant as well as any restrictions on the use of motor loads etc. that are considered necessary in the above codes.

Fluctuating and low power factor loads

The range of operation shall require that generators be capable of producing full rated MW output at a power factor between [0.8 lagging] and [0.99 leading] would be appropriate, as per the Generation Code.

Unusual facility requirements

This section of the Wheeling Code could extend the coverage of the Standard Terms and Conditions to specify the specific technical requirements for generating plants and equipment that will be necessary to ensure the correct operation of the power system, in terms of control and communications equipment, metering and other technical matters. Alternatively, reference could be made to the Connections Code, the Generation Code or the Transmission & Distribution Code to cover these points.

Line Extensions

There is an overlap between the provisions of the Standard Terms and Conditions and the Line Extensions Policy Document in relation to the way that payments are made for line extensions to connect customers' equipment to the transmission and distribution networks. Consequently, this statement regarding line extension for Self-Generators should be clear.

The Standard Terms and Conditions give two options for payments for line extensions and further stipulation that the consumer is required to contract for a volume of electricity from JPS that will pay on aggregate 40% of the cost of the connection in each of two years. This provision will clearly not work in the case of Self-Generators, since they will not be guaranteeing to purchase any minimum quantities of electricity from JPS even under the terms of top-up and standby contract arrangements. The costs of connecting generation and demand installations to the network that are part of a self-generation arrangement will

therefore need to be recovered through a mechanism that is fully independent of any future energy sales.

The two options for funding connections that are described differ in the way that the cash flow associated with connection equipment is handled. The customer seeking connection is required to pay either:

(a) a non-refundable contribution of 50% of the total estimated cost of the line extension or system upgrade (excluding metering costs and with the netting off the retirement value of any existing equipment); or
(b) a refundable deposit equal to the total estimated cost of the line extension (again excluding metering costs and after netting off the retirement value of any existing equipment), with a refund being calculated based on energy, customer and demand charges over three years being netted off up to the value of the refundable deposit.

Additional options for paying for connection infrastructure are presented in the "Design and Build" alternative proposed in the Line Extensions Policy Document. Connection assets installed under this arrangement can be constructed by the customer, using materials supplied by JPS, and would be adopted as part of the JPS network, subject to a number of technical conditions being fulfilled. The cost options presented are variations on the principles from the Standard Terms and Conditions, under which the customer pays either 50% of the project cost as a non-refundable payment, or for the cost of materials on the project which is then refunded as energy, customer and demand charges are accrued over 3 or 5 years.

The principle of a Self-Generator being able to construct the connection to either its generation plant or to its load installation is entirely appropriate; as in the case of the Standard Terms and Conditions, however, it will not be possible to apply the refund mechanisms to a self-generator that would apply to a conventional JPS customer, since there is not a guaranteed energy purchase from JPS by the Self-Generator.

In the light of the above, a connection charging process is required that can be separate from the wheeling charges, but which can make it clear which assets are being paid for and on what basis. It is proposed that in the Wheeling Code this is dealt with under a separate Connection Charges clause, which considers the important question of whether connection charges are "deep" or "shallow", in terms of how the costs of reinforcements remote from the generation or consumption site are recovered.

Connection Charges

The development of Wheeling Charges enables the costs of the transmission and distribution networks as a whole to be recovered in an equitable way from wheeling parties. Network costs are also recovered from consumers as an integral part of the tariff structure. These charges relate to the recovery of the costs of network assets remote from the site of connection of generation and demand.

In order to address the situation in which new Self-Generators may wish to come forwards and connect to the network, a concept of "Shallow Connection" charging for both the generation and load connections should be adopted. This means that the Self-Generator would only pay for the connection assets that are needed to link its generation and consumption sites to the nearest point of the existing distribution and transmission network, as per the line extension concept. Any deep reinforcements that are required to cater for increased line flows resulting from wheeling transactions then become part of the JPS network that is remunerated through the wheeling charges.

Two potential developments flow from this proposed approach:

(a) a need to ensure that connection costs are fully recovered from Self-Generators, independently of any energy purchases from JPS. This is most appropriately achieved through the charging of up-front connection fees based on published schedules of charges for equipment, with adjustments for complex connections as required;

(b) the possibility of a more formalised approach to facilitating what is called in some jurisdictions "competition in connections", under which elements of the connection can be constructed by the Self-Generator to standards specified by JPS. Some of those assets may then become adopted by JPS as part of the wider transmission and distribution system.

The conditions for the maintenance of service

Continuity of the wheeling service is a key requirement to enable investors in Self-Generation plants to be assured of their energy imports and exports over the long term.

JPS, as the Grid Operator, is required to prioritise the dispatch of Self-Generators at levels declared by them in advance to meet their own load requirements. The proposed exports from Self-Generators' power plants should be scheduled by JPS as part of the overall scheduling and dispatch process described in the Generation Code.

All plants connected to the JPS transmission and distribution networks are currently subject to central dispatch and there is no minimum level above which central dispatch applies at present. Existing practice is understood to prioritise:

a) the available production from renewables and intermittent energy sources; and;
b) the production of cogeneration plants as determined by the plant owner.

There may, however, be circumstances in which network constraints arising from faults or maintenance outages may mean that Self-Generators cannot be dispatched as scheduled. In these situations, the generator may be "constrained off" the distribution or transmission system by the Grid Operator. The OUR shall be responsible for monitoring the frequency of occurrence with which Self-Generators are constrained off the system, to ensure that they are not being unfairly disadvantaged by JPS's dispatch decisions.

The commercial conditions applicable to wheeling shall ensure that there is a financial penalty associated with the unavailability of the transmission system and distribution system or its inability to accept wheeling generation or supply wheeling demand in normal or contingency situations. In situations where an energy market is operational, the costs of network constraints are typically handled through the market itself, with payments related to generators' loss of profit or specific payments for additional energy production shall be handled under the market rules.

In the case of wheeling charges, where there is no energy market operational as such, then the most direct mechanism of dealing with instances in which a Self-Generator is prevented from generating power onto the network, or from absorbing power from the network, is by the adjustment of the wheeling charges that are payable in these circumstances.

In the event that the wheeling service is constrained or curtailed, except as a result of a fault with the Self-Generator's Generating Plant or Load Facilities, the following approach is adopted:

a. For the periods when the Self-Generator is prevented from accessing the network due to system outages or constraints, once a Wheeling Contract has been signed for a given level of capacity, then the Self-Generator should receive a rebate of its wheeling charge pro-rated for the relevant period.
b. In the event that the Self-Generator is required to reduce its output below the agreed level of wheeling due to network constraints, a rebate on the wheeling charge applicable for the amount by which the generation capacity has been reduced should be provided.

c. JPS shall forgo any payment for Standby energy if this is supplied to meet a Self-Generator's demand due to the inability of JPS to make sufficient wheeling capacity available on the transmission and distribution networks.
d. In circumstances where the Self-Generator is prevented from consuming energy due to a network outage, JPS shall be required to accept the energy that is nevertheless generated by the Self-Generator, or to pay compensation for the costs incurred by the Self-Generator if the constraint lasts beyond a pre-defined period.[2]

The termination of service (voluntary and forced)

The Self-Generator may terminate the Wheeling Service [6 months] after giving appropriate notice to JPS, copied to the OUR.

JPS may similarly terminate the Wheeling Service [6 months] after giving appropriate notice to the Self-Generator, copied to the OUR.

In the event that the Self-Generator's generation installation or load facilities cease to comply with the technical requirements of the Generation Code, the Connections Code or the Transmission and Distribution Code and any of the related standards, JPS may invoke the disconnection provisions contained in the relevant code(s) and disconnect the Self-Generator's equipment until such time as the non-compliance is rectified.

[2] It is recognised that any policy in this area would require harmonisation with any compensation arrangements, that are payable in respect of tariff customers in the event of a prolonged power failure.

APPENDIX C –PRO-FORMA WHEELING CONTRACT

PRO-FORMA WHEELING CONTRACT

If wheeling is to be developed significantly, then template contracts for signature by generators and consumers (or a single contract covering the connection conditions for generation and consumption elements of the same self-generator's business) will be required to make the implementation of bilateral wheeling arrangements more straightforward.

A Pro-forma Wheeling Contract is therefore require and it would sit alongside the other regulatory documents forming part of the set that supports wheeling. This should address the key issues set out in the following sections.

Preamble

This should set out the identities of the parties entering into the wheeling contract, which will comprise JPS as the network operator and the Self-Generator, as a single legal entity possessing both generation and load facilities. The addresses of the Registered Offices of these entities should be recorded, as well as the addresses of the locations of the Self-Generator's Generator Facility and Load Facility/Facilities.

Definitions

The definitions required should include terms that are sufficient to cover the technical and commercial details required in the contract. Key definitions include:

Maximum Wheeling Capacity: the maximum export from the Self-Generator's power plant, expressed in MW.

Wheeling Entity: the Self-Generation company that is engaged in wheeling electricity.

Generator Connection Point: the electrical location at which the Self-Generator's generating plant is connected to the transmission or distribution system, as applicable.

Load Connection Point(s): the electrical location(s) at which the Self-Generator's load facility/facilities[3] are connected to the network.

Generating Unit: apparatus capable of generating electricity.

Generating Plant: a facility owned by the Self-Generator capable of generating electricity comprising one or more Generating Unit(s).

Load Facilities: one or more industrial or commercial installation(s) owned by the Self-Generator that absorbs electricity.

Term

The Wheeling Contract shall be entered into for a period of ten (10) years, with Wheeling Charges to be reviewed annually and can be terminated on the expiry of six (6) months' notice given by either party.

Right to Be Connected and to Remain Connected

Subject to the terms of the Wheeling Contract the Self-Generator shall have the right for its Generation Plant and Load Facilities to be connected to the transmission and/or distribution systems, as appropriate, for the purposes of wheeling electricity from its Generating Plant to its Load Facilities.

These rights will be dependent on:

a) the Self-Generator retaining a Self-Generation Licence;
b) the Self-Generator remaining the owner of the Generating Plant;
c) the Self-Generator remaining the owner of the Load Facilities;
d) the Self-Generator complying at all times with the conditions of the Wheeling Code, [the Generation Code and the Transmission and Distribution Code];
e) the Self-Generator continuing to pay the Wheeling Charges due under this contract

Right to use the Transmission and Distribution Systems

The Self-Generator shall have the right to use the Transmission System and the Distribution System for the purposes of wheeling electricity from the Generating Plant to the Load Facilities in accordance with this Contract.

[3] Note: it is envisaged that wheeling could take place between a single generation installation and one or more load installations under the same contract.

Nothing in this Contract shall give the Self-Generator the right to supply electricity for use by third parties.

Rights to Buy and Sell Electricity

The Self-Generator shall also have the right to sell electricity to JPS at the Connection Point associated with the Generating Plant and to purchase energy from JPS at the Connection Point(s) of the Load Facilities. The terms under which Top-up and Standby supplies are sold by JPS and under which excess energy will be purchased by JPS will be determined under separate agreements.

Connection Points

The Generator Connection Point and the Load Connection Point(s) shall be defined in this clause, together with the requirements relating to the safe operation of the connection.

If a new connection is required to be constructed either for the Generating Plant or for one or more Load Facilities then the arrangements for the construction of this connection shall be covered by a separate Connection Construction Agreement.

Arrangements for operating the connections between the Self-Generator's Generating Plant and Load Facilities and the transmission and distribution networks and ensuring the safe operation of JPS's and the Self-Generator's equipment are defined in the Transmission and Distribution Code and in the following documents:

a) a Site Responsibility schedule defining ownership boundaries for equipment at the connection point;
b) agreed Site Drawings;
c) site specific Safety Rules;
d) details of site-specific electrical protection arrangements;
e) the commissioning, testing and certification process to be followed in respect of the relevant Connection Point(s).

Scheduling and Dispatch

The output of the Generating Plant will be scheduled and dispatched in accordance with the procedures defined in the Generation Code.

The Self-Generator is required to adhere to the processes and procedures described in the [Transmission and Distribution Code] to provide accurate and

timely information to JPS regarding its anticipated levels of generation and demand.

Reactive Power

The Self-Generator will operate its Generation Plant in accordance with the power factor conditions specified in the Wheeling Code. The power factor of the Load Facilities will be maintained within the limits specified in the Top-up and Standby Contract between the Self-Generator and JPS.

It is proposed that these power factor limits be imposed under a technical/administrative arrangement whereby JPS is permitted to monitor the power factor of Self-Generator's load installations using the four-quadrant metering that is proposed. In the event that persistent operation outside this power factor range is detected, JPS will be entitled to request that power factor correction equipment is installed as a condition of continuing to provide the wheeling service.

In the event that a Self-Generator refuses to comply with this requirement, its load connection may be de-energised and ultimately disconnected, or the wheeling service may be withdrawn and the Self-Generator required to return to being a tariff customer with a maximum demand charge based on its kVA of consumption.

Metering Arrangements

Metering will be provided in accordance with the specifications defined in the Wheeling Code. The Self-Generator shall be responsible for the maintenance of the metering and ensuring its testing and certification on an annual basis.

Wheeling Charges

Wheeling Charges shall be payable by the Self-Generator at the rates shown in Schedule 1. These shall be calculated by JPS and approved by the OUR annually.

The annual Wheeling Charges shall be calculated on the basis of the declared Maximum Wheeling Capacity and shall be payable in twelve equal monthly instalments.

JPS will issue invoices to the Self-Generator in respect of Wheeling Charges on a monthly basis.

Losses

The costs of power and energy losses associated with the energy wheeled will be estimated on an annual basis by JPS, based on:

a) network calculations of the additional losses imposed on the network by the wheeling trades; and
b) the prevailing marginal costs of power and energy.

Other provisions

Standard provisions will be required relating to serving of notices, applicable law, force majeure etc., in accordance with Jamaican legal practice.

APPENDIX D – PRO-FORMA TOP-UP AND STANDBY SUPPLY CONTRACT

PRO-FORMA TOP-UP AND STANDBY SUPPLY CONTRACT

A Pro-forma Top-up and Standby Supply Contract shall be developed that can be entered into by Self-Generators and JPS to cover the situation in which either:

(a) the Self-Generator's Generating Plant is producing less power than is being consumed by the Self-Generator's load facilities, in which case a Top-up Supply is required; or

(b) the Self-Generator's Generating Plant is unavailable due to an outage resulting from a fault or scheduled maintenance, in which case a Standby Supply is required.

This agreement would be signed by the Self-Generator in parallel with entering into a Wheeling Contract.

Given that this contract is essentially a variant on a standard customer supply contract, the Standard Terms and Conditions applicable to such contracts should be cross-referenced in the Top-up and Standby Supply Contract.

Preamble

This should set out the identities of the parties entering into the Top-Up and Standby Contract, which will comprise JPS as the network operator and the Self-Generator, as a single legal entity possessing both generation and load facilities. The addresses of the Registered Offices of these organisations should be recorded, as well as the addresses of the locations of the Self-Generator's Generator Facility and Load Facility/Facilities.

In the event that any distinction were to evolve between the business functions of JPS in the future, for the avoidance of doubt this contract would be entered into with the part of JPS that is responsible for supplying energy to consumers.

Definitions

The definitions required shall include terms that are sufficient to cover the technical and commercial details required in the contract. Key definitions include:

Top-up Capacity: capacity supplied by JPS that is regularly utilised by the Self-Generator's Load Facilities in addition to the capacity supplied by the Self-Generator's generating plant.

Standby Capacity: capacity supplied by JPS during a scheduled or unscheduled outage of the Self-Generator's Generating Plant to replace capacity that is normally provided to the Self-Generator's Load Facilities by the Self-Generator's Generating Plant.

Top-up Energy: energy supplied by JPS that is regularly utilised by the Self-Generator's Load Facilities in addition to the energy supplied by the Self-Generator's generating plant.

Standby Energy: energy supplied by JPS during a scheduled or unscheduled outage of the Self-Generator's Generating Plant to replace energy that is normally provided to the Self-Generator's Load Facilities by the Self-Generator's Generating Plant.

Generator Connection Point: the electrical location at which the Self-Generator's generating plant is connected to the transmission or distribution system, as applicable.

Load Connection Point(s): the electrical location(s) at which the Self-Generator's load facility/facilities[4] are connected to the network.

Generating Unit: apparatus capable of generating electricity.

Generating Plant: a facility owned by the Self-Generator capable of generating electricity comprising one or more Generating Unit(s).

Load Facilities: one or more industrial or commercial installation(s) owned by the Self-Generator that absorbs electricity.

Term

The Top-up and Standby Contract shall be entered into for a period of [five] years, and can be terminated on the expiry of [six months'] notice given by either party.

[4] Note: it is envisaged that wheeling could take place between a single generation installation and one or more load installations under the same contract.

Top-up Supply Charges

The Top-up Supply rate will apply to all capacity made available by JPS to the Self-Generator during a month and to all energy supplied by JPS to the Self-Generator during the month.

The Top-up Supply rate consists of two parts:

a) a Top-up Capacity Charge in JMD/kW/month, relating to the maximum capacity that is made available by JPS to the Self-Generator for top-up purposes; and
b) a Top-up Energy Charge in JMD/kWh for the energy supplied by JPS to the Self-Generator for top-up purposes.

The energy charge may be differentiated by time of day, reflecting the cost to JPS of supplying energy during different dispatch scenarios.

Determination of Top-up Capacity and Energy

A Self-Generator's Top-up Capacity Requirement is calculated as the maximum difference in any month between the power demand associated with the Self-Generator's Load Facilities and the power export of the Self-Generator's Generating Plant.

During periods when the Self-Generator's Generating Plant is out of service, the Top-up Capacity Requirement is determined as the difference between the power demand associated with the Self Generator's Load Facility and the Standby Capacity contracted with JPS as defined in Section _.

The Top-up Capacity Requirement is paid for on a monthly basis in arrears, at the prevailing Top-up Capacity Rate, based on the maximum Top-up Capacity that is required in the month.

A Self-Generator's Top-up Energy Requirement is determined as the difference between the energy consumed by the Self-Generator's Load Facilities and that generated by the Self-Generator's Generating Plant in any [hour]. These quantities are calculated with reference to meter data obtained from demand and generation sites and processed by JPS.

The Top-up Energy Requirement is paid for on a monthly basis in arrears, at the prevailing Top-up Energy Rate for each hour in which Top-up Energy has been consumed.

Determination of Standby Capacity and Energy

A Self-Generator's Standby Capacity Requirement is defined as the maximum power demand required by the Self-Generator's Load Facilities when the Self-Generator's Generating Plant is out of service due to planned or forced outages. The Self-Generator may request a Standby Capacity of up to the predicted maximum demand of its Load Facilities, though it may elect to contract for a lower level of demand if it is able to carry out demand reduction in the event of a Generating Plant outage.

The Standby Capacity Requirement is paid for on a monthly basis in arrears, at the prevailing Standby Capacity Rate, based on the level of Standby Capacity contracted with JPS.

A Self-Generator's Standby Energy Requirement is defined as the total energy consumed by the Self-Generator's Load Facilities during any [hour] in which the Self-Generator's Generating Plant is out of service.

The Standby Energy Requirement is paid for on a monthly basis in arrears, at the prevailing Standby Energy Rate for each hour in which Standby Energy has been consumed.

Power Factor

The Self-Generator is required to operate its Load Facilities at a power factor of between [unity] and [0.9 lagging].

Metering Arrangements

Metering will be provided in accordance with the specifications defined in the Wheeling Code. The Self-Generator shall be responsible for the maintenance of the metering and ensuring its testing and certification on an annual basis. JPS will have the right to witness tests if required.

Other provisions

These should be as per a conventional supply contract with JPS.

Standard provisions will be required relating to serving of notices, applicable law, force majeure etc., in accordance with Jamaican legal practice.

PRO-FORMA EXCESS ENERGY SALES CONTRACT

A Pro-forma Contract is required to cover energy sales by the Self-Generator to JPS in situations where the Self-Generator's Generating Plant is producing more energy than is required by the Self-Generator's Load Facilities.

This contract is optional in that there is no compulsion for JPS to enter into such an agreement.

The key coverage of the agreement is indicated in the following sections.

Preamble

This should set out the identities of the parties entering into the Excess Energy Sales Contract, which will comprise JPS as the network operator and the Self-Generator, as a single legal entity possessing both generation and load facilities. The addresses of the Registered Offices of these organisations should be recorded, as well as the addresses of the locations of the Self-Generator's Generator Facility and Load Facility/Facilities.

In the event that any distinction were to evolve between the business functions of JPS in the future, for the avoidance of doubt this contract would be entered into with the part of JPS that is responsible for purchasing energy and supplying end consumers.

Definitions

The definitions required should include terms that are sufficient to cover the technical and commercial details required in the contract. Key definitions include:

Excess Energy: energy produced by a Self-Generator's Generating Plant that exceeds that which is consumed by the Self-Generator's Load Facilities in any [hourly] period.

Contract Price: the price in JMD/kWh that will be paid by JPS in respect of each kWh of Excess Energy generated by the Self-Generator's Generating Plant. This price may vary during the day, with rates as agreed in this contract between the Self-Generator and JPS.

Generator Connection Point: the electrical location at which the Self-Generator's generating plant is connected to the transmission or distribution system, as applicable.

Load Connection Point(s): the electrical location(s) at which the Self-Generator's load facility/facilities[5] are connected to the network.

Generating Unit: apparatus capable of generating electricity.

Generating Plant: a facility owned by the Self-Generator capable of generating electricity comprising one or more Generating Unit(s).

Load Facilities: one or more industrial or commercial installation(s) owned by the Self-Generator that absorbs electricity.

Determination of Excess Energy

Excess Energy shall be determined as the difference in each [hour] between the energy generated by the Self-Generator's Generating Plant and that consumed by the Self-Generator's Load Facilities, as calculated from the meter readings from the Generating Plant and the Load Facilities obtained by JPS, in those [hours] where a positive difference is calculated.

Sale of Excess Energy

Subject to the terms of this contract, the Self-Generator will sell Excess Energy produced by the Generating Plant to JPS and JPS will purchase Excess Energy produced by the Generating Plant from the Self-Generator.

Energy Payments

Energy payments will be made by JPS in respect of each kWh of Excess Energy received from the Generating Plant at the following rates:

Weekdays:	0000 – 0100:	xxx JMD/kWh
	0100 – 0200:	yyy JMD/kWh
	0200 – 0300:	zzz JMD/kWh etc.

[5] Note: it is envisaged that wheeling could take place between a single generation installation and one or more load installations under the same contract.

Saturdays:	0000 – 0100:	xxx JMD/kWh
	0100 – 0200:	yyy JMD/kWh
	0200 – 0300:	zzz JMD/kWh etc.
Sundays:	0000 – 0100:	xxx JMD/kWh
	0100 – 0200:	yyy JMD/kWh
	0200 – 0300:	zzz JMD/kWh etc.

Metering Arrangements

Metering will be provided in accordance with the specifications defined in the Wheeling Code. The Self-Generator shall be responsible for the maintenance of the metering and ensuring its testing and certification on an annual basis.

Other provisions

These should be based on those contained in the Standard Offer Contract for the Purchase of As-Available Energy from Intermittent Renewable Energy Facilities up to 100kW.

Standard provisions will be required relating to serving of notices, applicable law, force majeure etc., in accordance with Jamaican legal practice.

APPENDIX F – WHEELING APPLICATION PROCESS