


“JAMAICA NET BILLING PROGRAMME UPDATE”

KNect365 – ENERGY CARIBBEAN Conference
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BACKGROUND



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Energy Status

- Caribbean - 97% dependent on **fossil** fuel resources.
- **Unlimited solar resources.**
- **Abundant but site specific wind resources.**
- Abundant **hydropower** resources on larger islands and Guyana.
- Good but challenged **biomass** resources (primarily larger land masses with sugar industry). Limited **biofuel** production.
- Excess **geothermal** resources but in Eastern archipelago (Lesser Antilles).
- Site specific **wave, ocean-thermal and current** energy resources (no current applications).
- Similar energy need – **GREATER ENERGY SECURITY AND INDEPENDENCE.**



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RENEWABLE INVESTMENTS


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Electricity Sector RE Investments

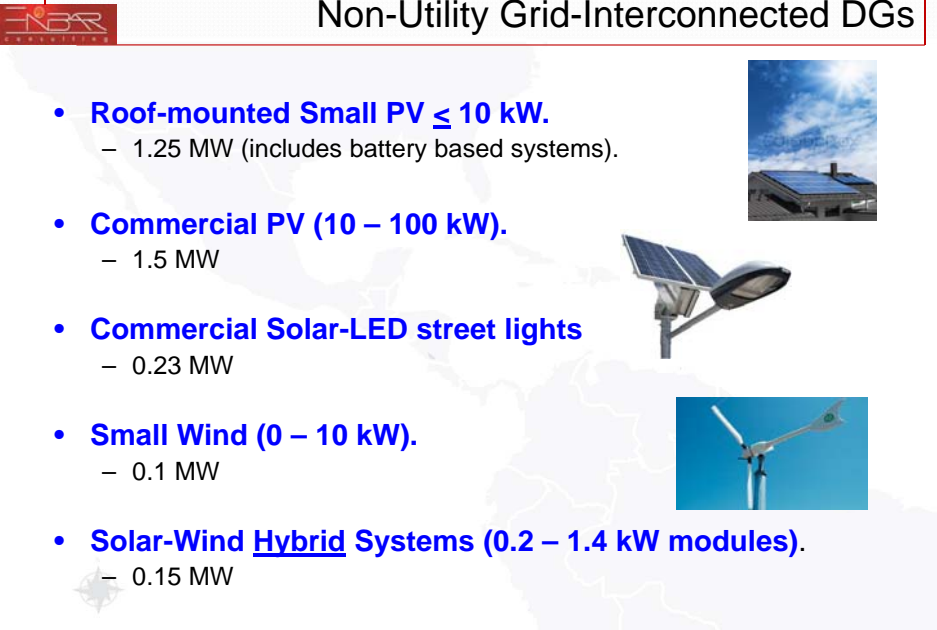
- Over **120 MW** of installed RE generation capacity.
- Various RE power investments (including biodiesel) is approx. **US\$435 million**.
- Additionally **US\$ 30 million** for approx. 2.24 million gallons of SWH.




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Non-Utility Grid-Interconnected DGs





- **Roof-mounted Small PV ≤ 10 kW.**
 - 1.25 MW (includes battery based systems).
- **Commercial PV (10 – 100 kW).**
 - 1.5 MW
- **Commercial Solar-LED street lights**
 - 0.23 MW
- **Small Wind (0 – 10 kW).**
 - 0.1 MW
- **Solar-Wind Hybrid Systems (0.2 – 1.4 kW modules).**
 - 0.15 MW



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Utility Scale Grid-Interconnected Systems

- **Wind - WWFL/JPS/BMR**
 - 101.3 MW
 - ✓ 34 MW wind (BMR)
 - ✓ 24 MW wind (WWFL III)
- **Solar – WRB & Palladium.**
 - ✓ 20 MW solar (WRB)
 - ✓ 1.6 MW (*Palladium*)
- **Hydropower.**
 - 31 MW.
- **Biomass Cogeneration**
 - 15 MW
- **Biodiesel**


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Solar Water Heaters

- **Solar Hot Water Heaters**
 - 2.24 M gallons hot water storage.
 - 20,000 – 45,000 units.




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Projected 2016 RE projects

- 33 MW solar (EREC) preferred bidder for remaining 37 MW RE RfP.
- Projections of 6 – 30 MW of commercial solar projects(> 500 kW) .



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ENABLING ENVIRONMENT



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Enabling National Opportunities

- The annual electricity demand growth rate of **2 – 3 % per annum**.
- Traditionally high electricity costs @ **US\$0.38/kWh** (temporarily @ US\$0.25/kWh).
- New GoJ RE projects due to elevated IMF pressures to reduce high GoJ energy expenditure.

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Enabling Policy and Legislative Changes


- National Energy Policy (2009 – 2030).
 - Yr-2009 - 20 % target for RE in the national energy mix.
 - Yr 2012 – 30 % RE for electricity production.
- GoJ – launched initiatives aimed at accelerating RE and clean energy development with wide scale participation of the electricity sector stakeholders.
 - Legislative and regulatory changes.

Net Billing.	Auxiliary interconnection	Power Wheeling
115 MW RfP.	Grid Study (IRP)	
 - Independent Regulator (OUR).

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Enabling Market

- Newer technologies (e.g. Micro inverters).
- Competition from more suppliers.
- Lower system and installation prices;
 - Prefabricated racking and other system components.
 - Competition.
- Customs duty and tax breaks.
- Professional and academic capacity building (VTI/ NCTVET/UWI/ UTECH/JSEEE/Vector Institute).



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New Renewable Energy Financing

- OPIC (VP Biden)
 - 20 MW Solar Farm.
 - 10% of National energy mix.
- Other USA originated clean/green energy funding.
- Spanish Green Energy Facility/IDB.
- Roof-top lease model being explored.

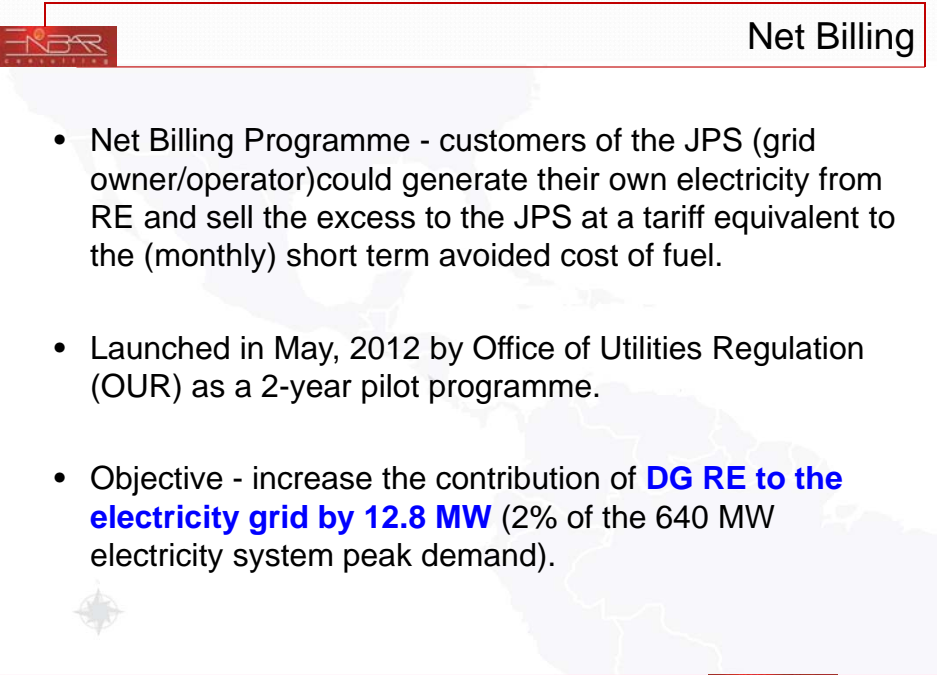
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NET BILLING

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Net Billing

- Net Billing Programme - customers of the JPS (grid owner/operator) could generate their own electricity from RE and sell the excess to the JPS at a tariff equivalent to the (monthly) short term avoided cost of fuel.
- Launched in May, 2012 by Office of Utilities Regulation (OUR) as a 2-year pilot programme.
- Objective - increase the contribution of **DG RE to the electricity grid by 12.8 MW** (2% of the 640 MW electricity system peak demand).

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Net Billing Design

•Net Billing:
*A variation of net metering with **differing tariffs** for purchasing electricity from utility (at higher retail rate) or exporting excess electricity to utility (at lower tariff “wholesale” rate).*

1 dual meter or 2 x meters.

Utility ← M M → Utility
 Utility purchases at a wholesale rate Utility sells at the retail rate
 Consumer

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Grid-Tie PV Line Diagram (Residential)

(Jamaica)

- Supply directly from JPS Distribution Transformer
- Wiring requirement – National Building Code or **National Electric Code (NEC) 2008.**

JPS UTILITY POLE WITH DISTRIBUTION TRANSFORMER (POLE# / SIZE - KVA)

UTILITY DISCONNECT SWITCH (200 A) [OWNED BY JPS]

BI-DIRECTIONAL 3-WIRE METER (OR 2 METERS) [SELF-CONTAINED SOCKET]

CUSTOMER'S LOAD

(Over-Current Protection Device)

MAIN OCPD

INVERTER OCPD

MAIN SERVICE PANEL

GROUNDING ELECTRODE

PV MODULE 1

PV MODULE 2

PV MODULE ..n

COMBINER

DC DISCONNECT

INVERTER

AC DISCONNECT

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Tariff Structure

Item/ Sub-Item/ Component	Symbol	Unit	Amount
Energy Payments:	E_{pi}	\$JA	2,865.13
Total Fuel Cost (JPS & IPP)	TFC	JA\$'000	6,333,524
System Net Generation (JPS & IPP)	SNG	kWh	338,104,901
Energy Output (kWh) from Qualified Facilities	EO _{mi}	kWh	133.00
System Net Generation Net of Supplier		kWh	338,104,768
Short Term Avoided Cost		JA\$/kWh	18.732
Short Term Avoided Cost including 15% Premium	SAC_{mi}	JA\$/kWh	21.542
Billing Exchange Rate	IER	JA\$/US\$	98.8865

(OUR 2013)

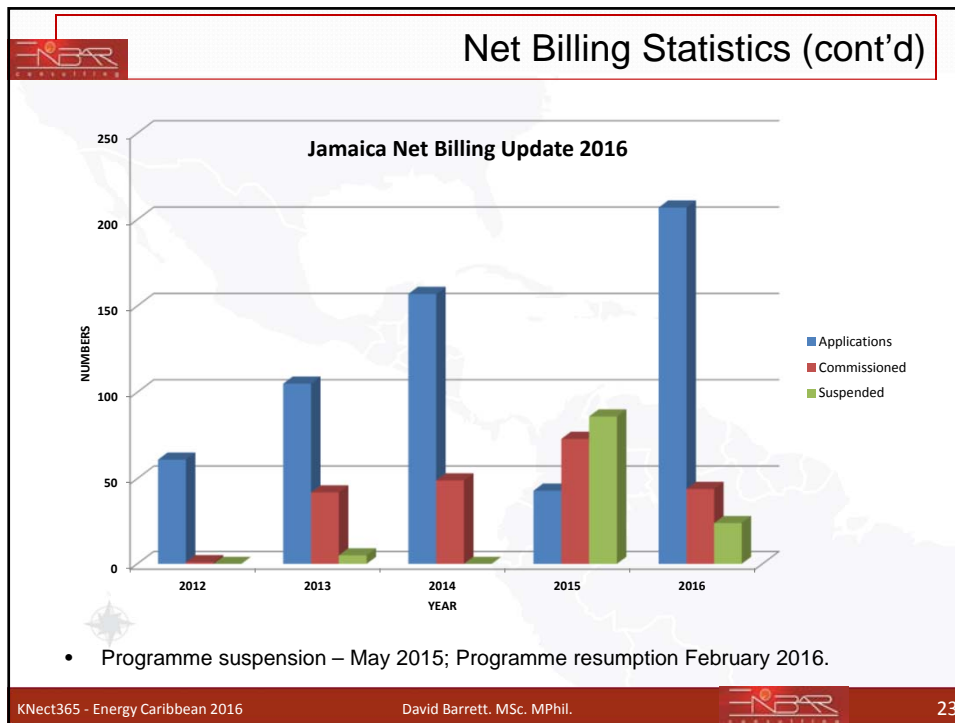
- Rooftop RE at point of consumption = approx. **US\$ 0.15/kWh** all-in-cost (retail tariff rate approx. US\$ 0.38/kWh).

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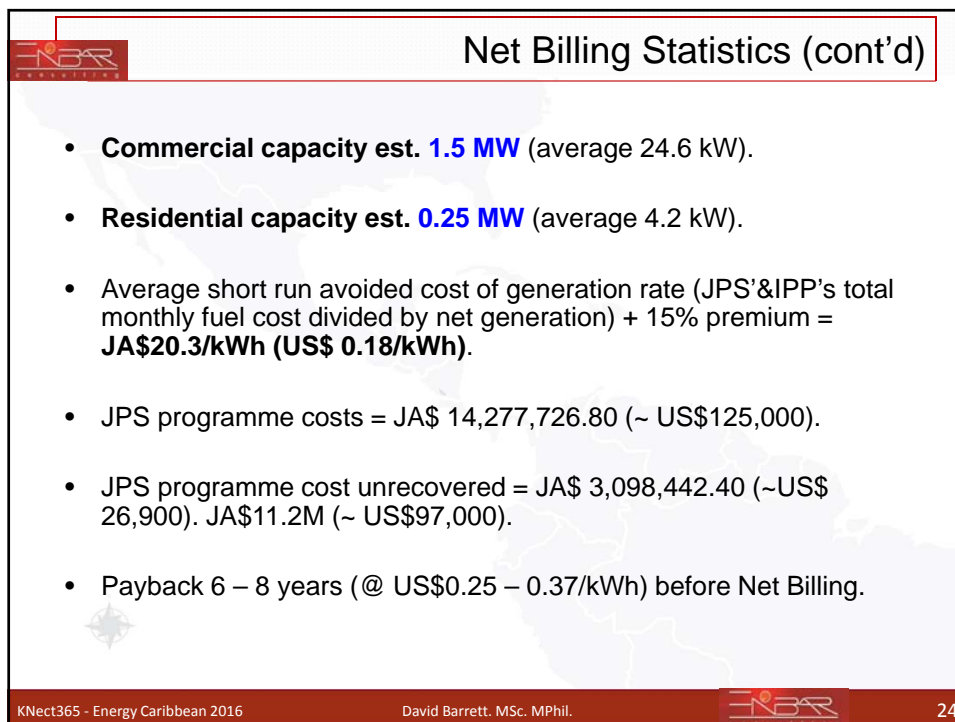
Net Billing Statistics

- **209 systems interconnected/commissioned (May 2012 - September 2016)**(36% of total applications).
 - Interconnected commercial customers = 99 (47%) (Sept 2016).
 - Interconnected residential customers = 110 (53%) (Sept 2016).
- **Total registered capacity => 2 – 3 MW (< 0.3% of peak; < 0.004% of total generation capacity) (May 2015).**

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BARRIERS AND CHALLENGES

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Barriers/Challenges


- Inconsistency of utility and government following Net Billing rules/procedures (NESOL/PCJ/Solar Mill).
 - Schools programme (unlicensed and non-NB).
 - Hospital programme (unlicensed and non-NB).
 - Utility accelerated programme and separate meter.
- Fair Trade issues – utility customers charged on their bill and marketed by regular mail (>600,000).
- Quality and performance standards desired of utility.
 - Also influenced by utility, regulator and ministry readiness.
- Mid-stream standards changes (e.g. Switch for AC wires to DC wires)


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Barriers


- Special effort to procure industrial **generation from fossil fuels** **only** created gap in energy sector (unsupportive to RE).
- Generation Procurement Entity (“**GPE**”) appointed by Cabinet (Condition 18A (2) of the Electricity Licence, 2016) did not improve the gap.
- Electricity Act Approved but not Regulations; new legislations created gaps and anomalies (e.g. Auxiliary interconnections).
- Long-term and defined administrative leadership needed.
- Regulator less independent.
- Bilateral communications of key stakeholders –unhelpful for synergy.

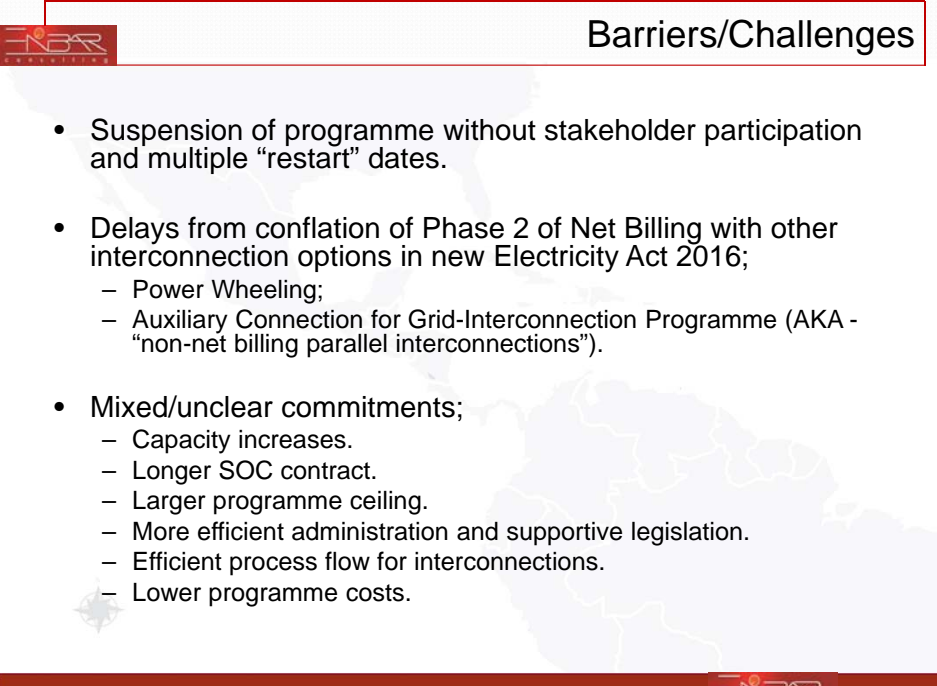
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Barriers/Challenges


- Net billing, electric power wheeling or other arrangement with the Single Buyer (JPS) required to pay a non-refundable processing fee of \$40,000.00 (Sections 9(4) and 9(1) (b) of the Act).
- Computation of “System Charge” to the Single Buyer.
- Other processing charges.
- Insurance coverage required of commercial QFs (dropped for residential QFs).


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Barriers/Challenges

- Suspension of programme without stakeholder participation and multiple “restart” dates.
- Delays from conflation of Phase 2 of Net Billing with other interconnection options in new Electricity Act 2016;
 - Power Wheeling;
 - Auxiliary Connection for Grid-Interconnection Programme (AKA - “non-net billing parallel interconnections”).
- Mixed/unclear commitments;
 - Capacity increases.
 - Longer SOC contract.
 - Larger programme ceiling.
 - More efficient administration and supportive legislation.
 - Efficient process flow for interconnections.
 - Lower programme costs.

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NET BILLING PROGRAMME EVALUATION –NREL

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NREL Objectives

- Assess the effectiveness of the national Net Billing pilot program at the end of the trial period (May 2012 – May 2014).
- Qualitative Evaluation.

Desk-top Analysis

Site-visits.

Interviews.

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NREL Stakeholder Participation

Authors - National Renewable Energy Laboratory (NREL).

Funding – US Agency for International Development (USAID).

Authority – Office of Utilities Regulation (OUR).

Key Participants:

- USAID.
- OUR.
- JPS.
- JSEA and other solar installers.
- MSTEM.
- NEC.
- Commercial utility customers.
- BSJ.
- GEI.
- Meister Consultants Group.

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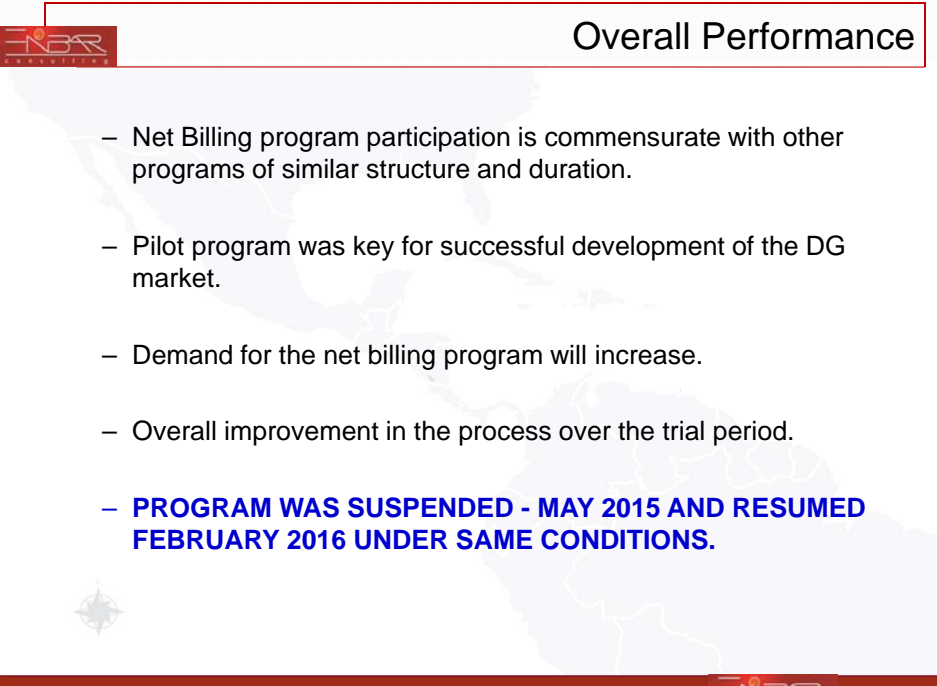


FINDINGS & RECOMMENDATIONS

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Overall Performance


- Net Billing program participation is commensurate with other programs of similar structure and duration.
- Pilot program was key for successful development of the DG market.
- Demand for the net billing program will increase.
- Overall improvement in the process over the trial period.
- **PROGRAM WAS SUSPENDED - MAY 2015 AND RESUMED FEBRUARY 2016 UNDER SAME CONDITIONS.**


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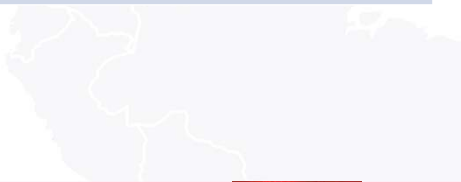
System Sizes


CURRENT PRACTICE	BEST PRACTICE & NREL SUGGESTION
10 kW for residential. 100 kW for commercial	Size cap = 120% of average 12 month historic annual kWh (billing). Alternatively size cap = 120% of estimated load per sq ft.
Aggregation of systems in communities > 10% on single feeders (anecdotal). 	Study needed to determine potential impacts of higher inputs of DG on the national grid stability.

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Programme Cap

CURRENT PRACTICE	BEST PRACTICE & NREL SUGGESTION
Program cap is 2% of generation capacity.	Maintain 2% (12 MW) net billing program cap with stage-gate points for program review (best practice 5% or unlimited). Create and publish a plan for program after 2% cap is satisfied.
Catalogued systems estimated at 0.2% of generation capacity.	Develop and maintain inventory of (all) grid-interconnected systems.
SOC term 5 years	Extension of SOC period (20 years is best practice).

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Interconnections


CURRENT PRACTICE	BEST PRACTICE & NREL SUGGESTION
<p>Various interconnection practices.</p> <p>Only net billed systems go through a clear interconnection process.</p> <p>Other interconnections are "unregulated" and inconsistent.</p>	<p>Establish 2 separate & clear Interconnection guidelines, processes and rules for <u>ALL</u> Net Billing clients and <u>ALL</u> other interconnections.</p> <p>Establishing additional interconnection guideline & process for systems <u>up to 2MW</u> for power flow management on the grid and increase safety and reliability.</p> <p>Consider large systems applications on a case by case basis by the JPS & post processes, roles and expected timelines on JPS' website.</p> <p>Catalogue <u>ALL</u> types of interconnections for JPS system planning.</p>

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Interconnection (cont'd)


CURRENT PRACTICE	BEST PRACTICE & NREL SUGGESTION
License required.	<p>Remove license requirement for all small interconnections (=> not IPPs).</p> <p>Alternatively – license at the end of the application and inspection process <u>ONLY</u> for net billing.</p>
License required before SOC	<p>BSJ > GEI > JPS interconnection application package > interconnected & energized (57 days). <u>ALL</u> interconnections</p> <p><u>Net Billing application form</u> > MSTEM license > SOC; JPS tests, commissions, engage 2-way meter and interconnects (20+ days).</p> <p>Non-net billing clients can participate at any time via the above procedure.</p>


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Agency Performance


CURRENT PRACTICE	BEST PRACTICE & NREL SUGGESTION
Duplication of roles & processes by agencies	Realign various agency roles and responsibilities.
<ul style="list-style-type: none"> •MSTEM policy and strategy. •OUR regulator, licensor, arbiter, programme manager. •JPS as programme implementer. 	<ul style="list-style-type: none"> •MSTEM – goals, policy, strategy and license. •OUR – strategy, regulation, enforcement, tariffs and costs, and arbiter. •JPS, BSJ, GEI programme implementers (applications, SOC, approvals, inspection, cost recovery).
BSJ approves inverters after reverse engineering	Adopt Australian Clean Energy Council list or IEC 62109 for inverters suitable for Jamaican grid voltage and frequency.
Approved list updated for new applications.	Expand approved inverter list.


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Agency Performance (cont'd)

CURRENT PRACTICES	BEST PRACTICE & NREL SUGGESTION
Insufficient GEI inspectors.	Training & certification of installers and inspectors .
Inconsistent quality of installations and inspections.	
10 – 18 months for interconnection.	3 – 5 months for interconnection (all-in =147 days).



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Programme Costs	
CURRENT PRACTICE	BEST PRACTICE & NREL SUGGESTION
3 month equivalent deposit. If exceeded, customer must replenish within 20 days.	Reduce or eliminate additional deposit requirement for interconnected customers. Alternatively make deposit refundable if customer adheres to (process) timelines.
Application fee paid to OUR at beginning of process. JPS/QF pays the cost of the Net Billing Meter J\$47,192 (US\$410). Monthly program fees.	Waive interconnection fees for <25 kW. "Interconnection study fee" levied by JPS on larger systems for utility system engineering costs. JPS finances meter. Proportionate investment/cost recovery for stakeholders should be considered. Reduce programme cost to RE QFs and spread across all non-participating rate payers.

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Holistic Grid Planning	
CURRENT PRACTICE	BEST PRACTICE & NREL SUGGESTION
Small systems interconnection process is disjointed from other grid connections.	Set Net Billing and DG goals as part of national RE goals.
	Develop stakeholder driven integrated resource plan (IRP) and other studies as grid penetration increases for scenario analysis.
	Create, through amnesty or registration, a full understanding of current DG capacity on the grid for longer term planning.
	Policy-makers to set clear long-term goals for small DG, community scale and utility scale systems on the grid.

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Other	
CURRENT PRACTICE	BEST PRACTICE & NREL SUGGESTION
Inconsistent quality of installations	Training and Certification of installers and inspectors by BSJ and GEI. Establish an endorsed installer's list.
Uncertainty of next steps after 5-yr license period.	Engage 2nd phase. Make licenses 20 years

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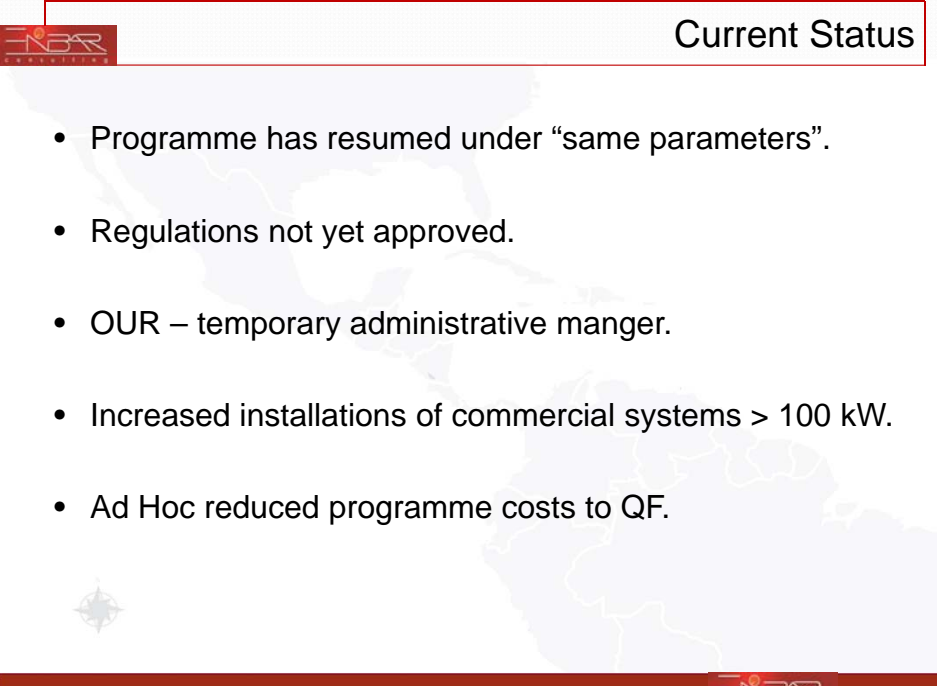
CURRENT STATUS AND CONCLUSIONS

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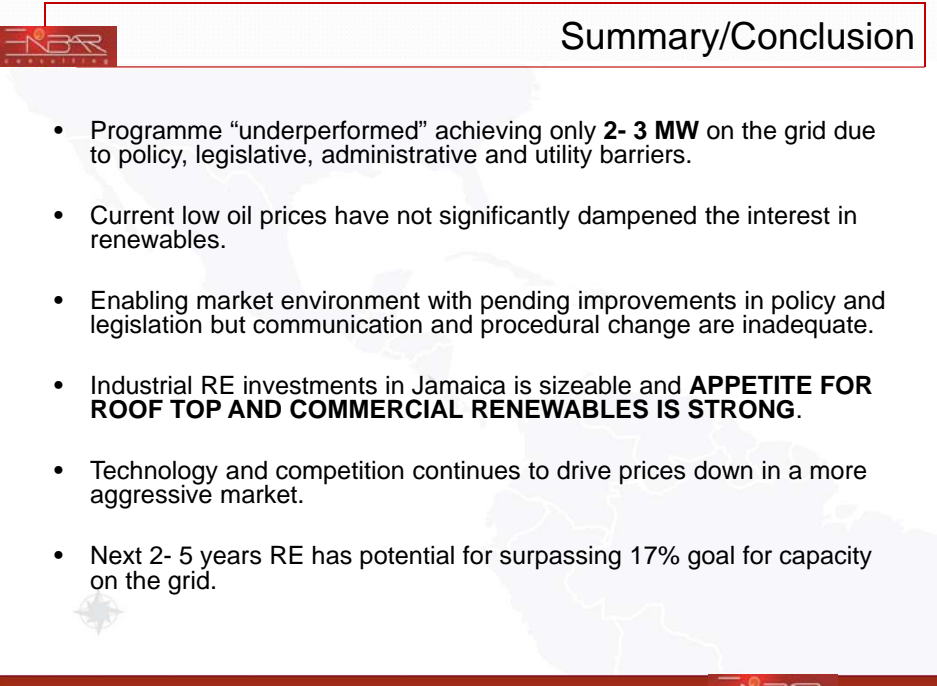
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Current Status


- Programme has resumed under “same parameters”.
- Regulations not yet approved.
- OUR – temporary administrative manger.
- Increased installations of commercial systems > 100 kW.
- Ad Hoc reduced programme costs to QF.

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Summary/Conclusion


- Programme “underperformed” achieving only **2- 3 MW** on the grid due to policy, legislative, administrative and utility barriers.
- Current low oil prices have not significantly dampened the interest in renewables.
- Enabling market environment with pending improvements in policy and legislation but communication and procedural change are inadequate.
- Industrial RE investments in Jamaica is sizeable and **APPETITE FOR ROOF TOP AND COMMERCIAL RENEWABLES IS STRONG.**
- Technology and competition continues to drive prices down in a more aggressive market.
- Next 2- 5 years RE has potential for surpassing 17% goal for capacity on the grid.

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Programme Costs

- Insurance Coverage = US\$ 1,000 per annum (>10 kW).
- Utility Disconnection Switch = US\$ 250 - 300 (one time cost).
- JPS New meter cost = US\$ 500 - 600 (one time cost).
- JPS Administration cost = US \$ 84 per annum.
- Inverter testing BSJ = US\$ 300 (one time system cost).
- GEI inspection = US\$ 250 (one time fee).
- Deposit Upgrade = 3 x average monthly billing.
- Miscellaneous cost = \$??



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