Response to the National Electricity Sector Policy for Bermuda
Consultation Document – February 18th 2015

Overall Concerns:

We believe that this new Energy Policy will create a solid platform for the future, however we have some remaining concerns:

- The emphasis remains on "cost-effective" energy without suggesting a mechanism to account for hard-to quantify costs and benefits, for example: long-term risk (e.g. uncertainty in the cost of fossil fuel) or environmental and social externalities (e.g. the positive multiplier effect of investing in renewable energy).
- The Aspiration Matrix is based on unfeasibly precise cost estimates calculated out 20 years, as well as a number of questionable assumptions; including the implied assumption that fossil fuel-based generation will remain the cheapest source of energy for the next 20 years. We recommend that the Aspiration Matrix be developed in the IRP process with input from all stakeholders, and revisited at least every 5 years.
- The Electricity Utility is given special treatment because of its current vertically integrated structure which includes generation, as well as transmission, distribution, and retail. This puts disproportionate weight on a historical structure and does not provide enough flexibility for the electricity system of the future.

We would like the opportunity to see the final draft before it is presented to Cabinet.

Specific feedback on the Consultation questions:

Box 3.1: Reflecting on Objectives:

The Policy recommends that decisions be made on cost-benefit analysis: If the Objectives are equal then the policy needs to state how the objectives "Environmentally Sustainable", "Secure", and "Affordable" are going to be included in any calculation. For example: it is impossible to value the "economic damage to the local and global environment" so Hawaii when assessing renewable resources understates their cost by 20% when comparing them with other resources, as a simple way to include environmental externalities.

In addition – there are other times when an order of priority will *have* to be assessed – for example, in loading order of electricity sources. California in 2003 legislated a "*loading order*" for energy resources which requires the utility to use energy efficiency and demand response as its first option; followed by renewable energy and distributed generation; then clean fossil-fueled sources and infrastructure

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improvement. Thus we believe that the order of priority of the objectives will have to be decided at the policy level, otherwise any cost-benefit analysis *de facto* prioritizes least-cost first.

Box 4.1: Reflecting on the Vision:

The description of each scenario assumes that costs are well defined and fixed out to 2035, which is very hard to defend. Issues to consider:

Cost of Energy (Reference Table B.1):

- Calculating precise costs over 20 years to 2035 is misleading: for example the cost of renewable energy sources has dropped exponentially over the last 20 years and continues to fall; given the pace of technology change there is no reason to believe that historical prices are a good indication of future prices, and there are likely to be discontinuities as technology changes. It would make more sense to provide a version of this table (with uncertainties) in 5 year tranches.
- There is no comparison of the cost LNG (or diesel fuel oil) prices in this table. In addition, fossil fuel prices are notoriously volatile, but the costing in Scenario's A, B and C are all given as a single precise number – implying long-term certainty in the cost of LNG (and the other energy sources).

Assumptions in the Aspirational Matrix (Reference Table 4.1):

- Energy efficiency is taken as a one time achievement of 5.2% over the next 5 years and thereafter demand continues to rise without further efficiencies being achieved. Efficiency gains are continuous – for example, if Bermuda changes the building code to include efficiency standards then over time more and more buildings will meet that standard. 10 US States have set efficiency goals for their utilities of >2% *per year* – indefinitely; so over 5 years that would give an efficiency saving of >10%, and while it may not continue at that pace there will still be some slow accumulation over the next 20 years.
- The assumption in the table is for a single investment in utility scale solar PV (8MW) before 2020 and nothing after that. This seems very unlikely and skews the cost results, because current trends suggest that a second investment in 5-10 years will be considerably cheaper than an investment today.
- Renewable energy is given at a constant capacity factor (17% for solar, 38% for wind) without the expectation that investment in energy storage (e.g. compressed air storage, or new battery technology) at some point in the next 20 years will significantly increase the capacity factor of intermittent renewables. Aruba is expecting to be able to achieve 100% renewable energy by 2020 by combining various short and medium term storage option with heavy investment in wind and solar energy.

There is no discussion in the document of the impact of changing the shape of the demand curve. BELCO current builds to the 'peak of peaks' demand plus a margin for reliability. It is possible to shave the peak (through mechanisms such as demand management and variable tariffs) which would require a lower overall capital investment in baseload (LNG or OTEC) reducing the overall cost to consumers. (This is discussed in the document in section 9.1.) How is this taken into account in the cost estimates?

Our recommendation is that the aspirational matrix be developed during a collaborative IRP process (see Box 6.1) and revisited at least every 5 years.

Questions:

We cannot answer the question as written: the question should not be "which scenario do you prefer" but: how robust are the assumptions behind each scenario? How do we factor in hard to quantify costs and benefits (e.g. the well-documented multiplier effect of using local labor to install solar panels)?

After these questions are accounted for it then makes sense to ask which scenario is preferred. We prefer a Scenario which puts much more emphasis on energy efficiency, which takes into account staged investment in renewable energy and which minimizes investment in LNG by employing mechanisms to shave the peak.

Box 5.1: Reflecting on the Ministry Responsible for Energy

As well as creating an enabling environment for major electricity infrastructure projects outside Government, we would expect the Ministry to be responsible for coordination on energy matters with other Government Departments, for example liaise with the Department of Planning on Building Energy Efficiency Standards, and the connectivity requirement for Occupancy Permits.

Box 5.2: Reflecting on the Regulatory Authority

Yes, the Regulatory Authority should serve as an independent advisor to the Ministry

Yes, we believe the utility should be compelled to provide its own analysis of the costs and benefits associated with each policy alternative – *taking into account the Government Policy on including hard to quantify costs and benefits (see Box 3.1)*

The Regulatory Authority should also be responsible not only for approving the revenue requirement of the Utility, but also for deciding on the appropriate rate structure: for example we hope the Regulatory Authority will consider a rate structure which provides an incentive for the Utility to active pursue energy efficiency (both in operations and in the rate base) by decoupling tariffs from the volumetric sales (see further discussion under Box 8.1). Decoupled rate structures are being used or are proposed in 15 US states, as well as other jurisdictions.

Box 5.3: Reflecting on the Electric Utility

We agree that transmission, distribution and retail are natural monopolies in Bermuda, but we support the accounting separation between the Electric Utility's generation and transmission, distribution and retail businesses. This transparency is vital to a fair and competitive generation sector. (See further discussion under Box 5.4 IPPs.)

Box 5.4: Independent Power Producers

The Definition of IPPs should include all sources of energy: even using the phrase 'alternative energies' is a value judgment that presupposes that we have established energy, and marginal energy providers.

Given modern technology and the emphasis elsewhere in the policy on cost-benefit analysis, all energy producers should be treated the same and should face the same hurdles.

We believe that demand response aggregators (DMA) should be included as IPPs – for example the State of Vermont has an 'efficiency utility' which is regulated under the same rules as other IPPs. (Note that both the monopoly energy 'retailer' and a DMA will need to have contact with electricity end-users, and this may require modifications to the IPP license for a DMA).

Box 5.5: Reflecting on End Users

In a modern electricity sector (and indeed in Bermuda) 'end users' are not just 'energy sinks' but also power producers through distributed generation, and may participate through demand management. Therefore we believe that 'end users' should be included as important stakeholders from the beginning of the IRP process (see under Box 6.1)

Box 5.6: Reflecting on Distributed Generators

Distributed Generators (DGs) should not be restricted to renewable energy (for example, a hotel or condo complex may include a small natural gas generator as part of their energy portfolio). It would probably make sense to categorize DGs by the amount of power they are likely to feed into the grid (as many large homes or commercial properties may use almost all power on site).

The second question has been phrased is such a way to lead the answer: When asking which approach should be used to set the FIT for energy, the paragraph starting "Setting the FIT at the retail rate for the ~1MW of solar currently installed imposes approximately … BMD 13 per ratepayer per year" suggests that the 'correct' cost is the first (avoided fuel cost) and doesn't take into account other factors which affect cost, for example the time of day at which the energy is supplied (potentially displacing expensive 'peak' electricity) or the benefits of distributed energy through reducing transmission costs. Given the above we believe that a fair FIT in equal to the retail rate charged by the Electric Utility for energy purchased from the grid.

Box 6.1: Reflecting on Utility Scale Generation

The IRP should be written by the distribution, transmission and generation utility, as this is the only part of the sector which is a natural monopoly and therefore can be held accountable for the best interests of the end-users (rather than shareholders).

We believe that the IRP process should include stakeholder input (IPPs, DGs and end users) *prior* to submitting it for regulatory review. This process would be a good setting for the development of the Aspirational Matrix, which would allow the RA to recommend appropriate policy targets to Government after input from all stakeholders.

No, we do not think that the RA should have a role in the procurement process, beyond setting the requirement that any procurement should be measured against the objectives the Government has set for the electricity sector.

It is misleading to ask for an acceptable "price premium" for renewable energy: it would be more neutral (and more informative) to ask "how should we account for economic impact which is currently treated as an externality in the price" (this would include for example: energy security, risk reduction, reduced environmental impact). Given the reframing of the statement, and with the example of Hawaii cited earlier (see under Box 3.1), we would recommend a premium for locally produced renewable energy of 20%.

Box 7.1: Reflecting on Distributed Generation

We believe this has already been covered by the questions in Box 6.1 (yes, offer a price premium for renewable energy) and Box 5.4 (define who is eligible in tranches, and design licensing requirements, interconnection agreements etc, appropriate to each tranche).

Box 8.1: Reflecting on Transmission, Distribution, and Retail

Mechanisms for the Government to consider to ensure that the Electric Utility operates efficiently:

- Decouple the rate structure so that recovering the revenue requirement of the utility through electricity tariffs is separated from volumetric portion of the bill
- Report on all sources of power outages (e.g. wind, grid failure, engine failure) and provide a cost-benefit analysis on ways to maintain reliability. For example: could investment in a 'smart-grid' which potentially reduces grid-based sources of power outages reduce the need for the current N-3 engineering rule when planning the size of the central plant? (NB: this would also reduce the reliability requirement of all other energy providers).
- The establishment of an 'Efficiency Utility' (for example, Efficiency Vermont) which supplied electricity through 'nega-watts' (See further discussion in the following section)

Box 9.1: Reflecting on End Use

While we agree that most energy efficiency (EE) technologies save money without any subsidies, our experience (including through Greenrock's Savings for Seniors programme) and documented experience in other jurisdictions suggest that end-users are very slow to adopt new technologies, even those which save a significant amount of money and do not require any behavioral change. Take-up is further diluted in Bermuda where less than half of residential and commercial properties are owner occupied. Based on 2010 Census data, 49% of all Bermuda households were owner-occupied. Landlords tend not to invest in EE in their buildings unless they directly reap some financial benefit. Tenants tend not to invest in EE unless they are confident they will see a return on their investment within their current lease period, and even then gaining permission from landlords to implement EE changes can present challenges. Therefore active intervention can make a dramatic difference in uptake

Specific Energy Efficiency Programs:

- Establish an Energy Utility: for example Energy Vermont, their approach is bottom up and highly focused; they identify barriers to energy efficiency, and areas of high potential, and then target those through initiatives such as providing local information on energy use and demand, conducting energy leadership challenges, providing small-scale funding for energy efficiency

investment (which is then repaid via electricity rates). They are funded through a small surcharge on electricity bills which is then factored into their cost of energy 'production'.

- Set building efficiency standards: California first set building efficiency standards in 1974, and in 2008 set '4 Bold Goals', including that all new commercial and residential buildings will be zero net energy by 2030 and 2020 (respectively). California has seen falling energy demand on a per capita basis since 1974.
- Government should lead by example (and save money, and reduce pressure on the grid) by setting efficiency standards for all Government buildings, conducting energy audits and updating EMS and HVACs and retro-fitting lighting, pumps, lift mechanisms. For almost all buildings in almost all cases these retro-fits have a payback period of less than 3 years.
- Ban the import of incandescent lightbulbs, and all appliances which have no *ENERGY STAR* or a low *ENERGYGUIDE* rating. Provide tax relief or customs relief for energy efficiency equipment and services. Increase customs or taxes on equipment and services which are NOT energy efficient.
- Create or support, and publicize financing for private sector and residential retro-fits (e.g. add-on to mortgages, recouping via electricity bill, or land-tax incentives)
- Insist on easy-to-read utility bills with transparent pricing. Knowledge is power. Greenrock polls suggest fewer than 5% of residential consumers understand their *standard format* Belco electricity bill, and we have yet to meet a consumer who can reconcile their *net-metered* bill.
- Stop rewarding consumers for using MORE electricity. The current Belco pricing to major hotels follows a the-more-you-use-the-less-you-pay model.
- Rethink our electricity tariff structure, for example introduce time-of-day pricing to reduce peak demand. Off-peak pricing won't directly reduce the amount of energy used at the consumer level BUT it can cut peak demand and help make the island be more energy efficient (by reducing base load requirements).(see under Box 8.1 for further discussion)
- For more EE recommendations, refer to Govt's 2011 Energy White Paper.

Box 10.1: Reflecting on New Legislation, Licensing and Permitting

We believe it would be helpful for the new Energy Policy if Figure 5.1 show separate boxes for the Utility which generates energy with fossil fuel, and the Utility responsible for Transmission, Distribution and Retail (TD&R). This does not mandate that they are separate entities, but does illustrate that they should be treated differently. This was acknowledged in Section 5.3: TD&R is a natural monopoly, while the other 'boxes' represent entities that are not. We believe that making this distinction visually is an important tool in planning new legislation and licenses. Similarly we believe that DMA (Demand Response Aggregators) should be included as a separate box in the system, as this function will become increasingly important over the next 20 years (the horizon for the document), and the direct relationship of DMAs with end-users means that once again the visual distinction will be helpful in long-term planning for legislation and licenses.