

Tariff Setting and Compensation Mechanisms for Renewable Energy Fed into the Grid ©

Roland R Clarke PhD

Renewable Energy Design Laboratory, REDLab, Univ of Hawaii, Manoa
Clarke Energy Associates, Barbados

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Objectives of This Presentation

1. Review of the history of pricing mechanisms for RE
2. Case Study – Barbados
3. Draw a conclusion

Clarke Energy Associates

- Recent advisory services
 - Energy Policy Review - Caribbean
 - Solar PV site evaluations, PPA's, procurement
 - Energy audits – water and waste water
 - Energy policy – legislative reform of the power sector
 - Training in financial analysis and using RETScreen
- Past clients include
 - USAID
 - Government of Barbados
 - Econoler (Canada)
 - Government of Canada, RETScreen International
 - World Bank

Historically 4 Mechanisms

1. Avoided Cost Payments
2. Feed-In Tariffs
3. Net Metering - Net Billing
4. Fiscal Incentives

Other Mechanisms

- 5. Green Energy Purchasing
- 6. Production Tax Credits
- 7. Renewable Energy Certificates
- 8. Subsidies

1978 – Avoided Costs - PURPA Started it All

- Public Utilities Regulatory Policy Act, PURPA of 1978, USA
 - Required utilities to interconnect with and buy energy from
 - “Qualifying Facilities,” e.g RE plants, Co-gen
- At the incremental or avoided costs of production, e.g.
 - Avoided Capacity
 - Avoided Energy
 - Avoided Variable O&M
 - Avoided Losses for Inside-the-Fence QF’s

Avoided Costs - Definition

http://www.energycentral.com/reference/glossary?alphabet_start=21&

- Costs avoided by utility by purchasing power from an independent producer (IPP), rather than generating power themselves
- A Public Utility Commission calculates avoided costs for each utility. This forms the basis upon which IPP's are paid for the electricity
- There are two parts to an avoided cost calculation:
 - the avoided capacity cost of constructing new power plants and
 - the avoided energy cost of fuel and operating and maintaining utility power plants.

PURPA in California

- Implementation involved standardized long-term contracts
 - with fixed and, in some cases, escalating payments for all or part of the term of the contract
 - Costs recovery through higher electric rates to customers
 - Contract Periods – 15 to 30 years for wind
 - Designed to be bankable and
 - to provide a hedge against expected rising oil prices

Mid 1990's – Disaster Struck

- Restructuring of Power Industry
 - Utilities required to divest generation
 - But stranded with long term contracts with QF's
- Oil prices did not increase as expected
 - 1999 - \$10 per barrel
- Resulting in significant slow down in US RE industry

1990 – Feed-In Tariffs

- Germany and later Denmark
- Utilities required to allow interconnection of RE
- Utilities required to purchase RE electricity generated at **fixed prices**
- Prices set at 80-90% of market price
- Sometimes, prices are set higher than market prices
 - To encourage investment
 - By late 2000's RE industry is the largest employer in Germany

Early 2000's Feed-In Tariff

- Payments are usually guaranteed over a specified period of time
 - But **decrease** according to a schedule
 - To encourage **cost reduction** by manufacturers
- Cost Recovery through **higher rates** to customers
- Not all Feed-In Laws have been successful
 - Tariffs must be high enough to cover costs and encourage investment
 - They also must be **guaranteed** for a time period long enough to assure investors of a high enough rate of return

Feed-In Tariff - Definition

http://www.ren21.net/Portals/0/documents/Resources/GSR/2013/GSR2013_lowres.pdf

- Feed-In Tariff (also called feed-in policy, or FIT).
 - A policy that
 - (a) sets a fixed, **guaranteed price** over a stated fixed-term period when renewable power can be sold and fed into the electricity network, and
 - (b) usually **guarantees grid access** to renewable electricity generators.
 - Some policies provide a **fixed tariff** whereas others provide **fixed premium** payments that are added to wholesale market- or cost-related tariffs.
 - Other variations exist (e.g. Barbados), and Feed-in Tariffs for heat are evolving.

Net Metering/Billing - Definition

http://www.ren21.net/Portals/0/documents/Resources/GSR/2013/GSR2013_lowres.pdf

- **Net Metering:** A regulated arrangement in which utility customers who have installed their own generating systems pay only for the net electricity delivered from the utility (total consumption minus on-site self-generation)
 - Meter runs backwards (e.g. mechanical rotary meters)
 - Disadvantage – lost of data
- **Net Billing:** A variation on net metering that employs two meters with differing tariffs for purchasing electricity from the grid, and exporting excess electricity off-site to the grid
 - Could have one meter with two registers
 - Case Study - Jamaica

Fiscal Incentives – Definition

http://www.ren21.net/Portals/0/documents/Resources/GSR/2013/GSR2013_lowres.pdf

- Provides actors (individuals, households, companies) with a **reduction** in their contribution to the public treasury
 - via income or other taxes,
 - or with direct payments from the public treasury in the form of rebates or grants.
- Case Study – Barbados Solar Hot Water Industry
 - 1960's - Local research at Bellair Research Institute (affiliated with McGill University, Quebec, Canada)
 - 1974 - Start-up local manufacturer (by a Salesman, a Priest & a Technician)
 - 1980 – Fiscal incentives introduced
 - 2015 – **40% penetration** in residential sector (40,000)

Green Energy Purchasing – Definition

http://www.ren21.net/Portals/0/documents/Resources/GSR/2013/GSR2013_lowres.pdf

- **Voluntary** purchase of renewable energy—usually electricity, but also heat and transport fuels—by residential, commercial, government, or industrial consumers, either
 - **directly** from an energy trader or utility company, from a third-party renewable energy generator, or
 - **indirectly** via trading of renewable energy certificates (RECs, also called green tags or guarantees of origin).

Investment Tax Credit - Definition

http://www.ren21.net/Portals/0/documents/Resources/GSR/2013/GSR2013_lowres.pdf

- A taxation measure that allows investments in renewable energy to be fully or partially deducted from the tax obligations on income of a project developer, industry, building owner, etc.

Production Tax Credit – Definition

http://www.ren21.net/Portals/0/documents/Resources/GSR/2013/GSR2013_lowres.pdf

- A taxation measure that provides the investor or owner of a qualifying property or facility with an annual **tax credit** based on the amount of renewable energy (electricity, heat, or biofuel) **generated** by that facility.

Renewable Energy Certificate - Definition

http://www.ren21.net/Portals/0/documents/Resources/GSR/2013/GSR2013_lowres.pdf

- A certificate awarded to certify the **generation** of one unit of renewable energy (typically **1 MWh** of electricity, but also less commonly of heat)
 - In systems based on RECs, certificates can be accumulated to meet renewable energy **obligations** and also provide a tool for **trading** among consumers and/or producers.
 - It is also a means of enabling purchases of voluntary green energy.

Subsidies - Definitions

http://www.ren21.net/Portals/0/documents/Resources/GSR/2013/GSR2013_lowres.pdf

- Government measures that **artificially** reduce the price that consumers pay for energy or reduce production costs
 - Typically to ensure a target return or payback

Marginal Cost Pricing – Definition

http://www.energycentral.com/reference/glossary?alphabet_start=21&

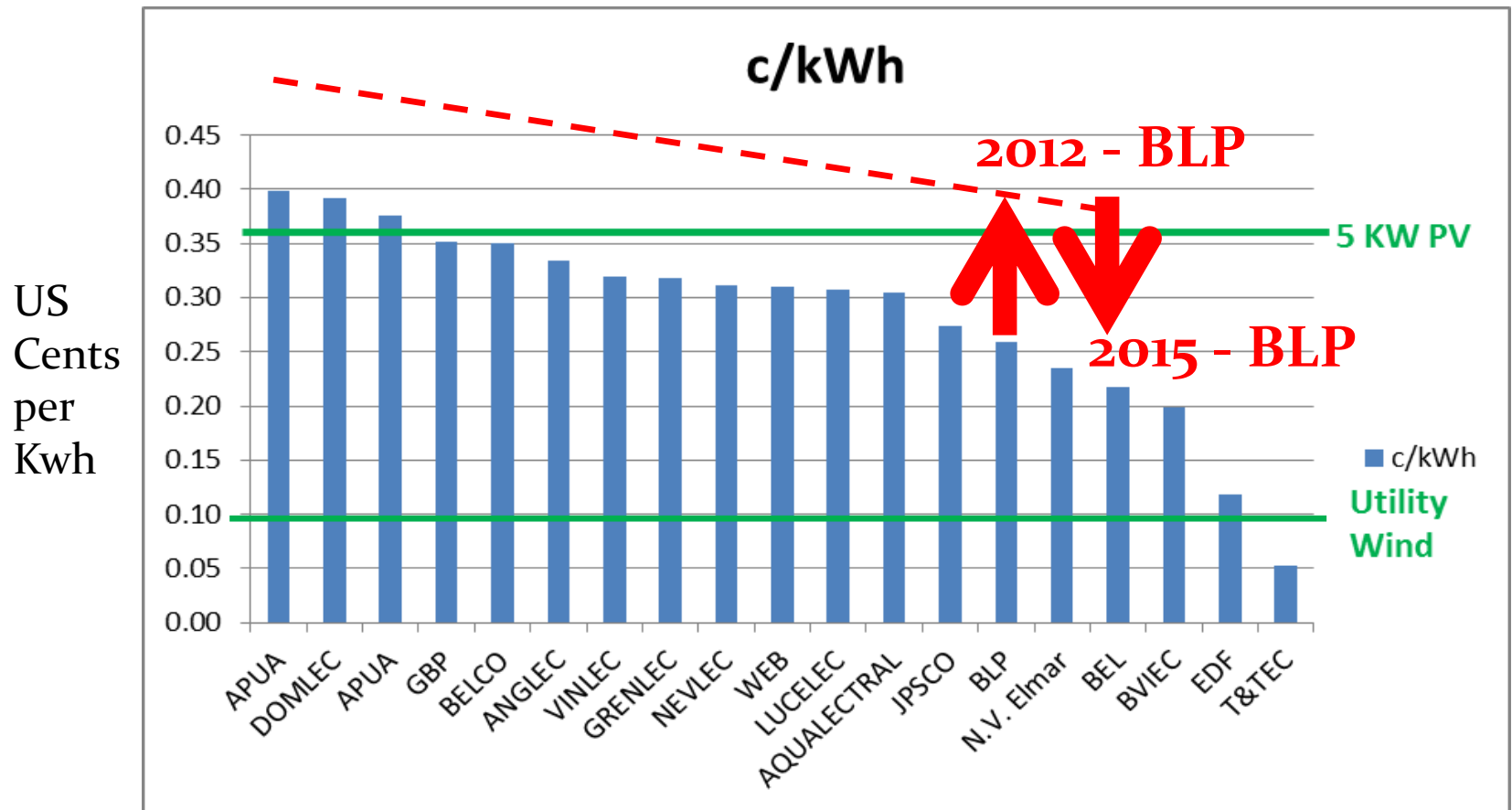
- **Marginal Cost** : The sum that has to be paid the next **increment** of product or service. The marginal cost of electricity is the price to be paid for kilowatt-hours **above and beyond** those supplied by presently available generating capacity (sunk costs).
- Examples
 - Dynamic Pricing – at or close to real time, e.g. hourly
 - Time-of-Use Rates – On/Off Peak Rates

Case Study - Barbados



Grid Parity & Avg. Utility Industrial Tariffs 2010 – 2015 in the Caribbean

Source - <http://www.carilec.com/services/Tariff2010.pdf>



Policy and Regulation in Barbados

- **2006** – Draft National **Energy** Policy of Barbados
- **2009 - 2011** – Draft National **Sustainable** Energy Policy
 - Target – 29% RE by 2029
 - Target – 22% EE by 2029
- **2010** – BLPC **voluntary** RE Rider (Feed-In Tariff) Pilot
 - 2010 - FIT = 1.8 x FCA (Fuel Clause Adjustment)
 - 2013 – FIT = 1.6 x FCA
 - 2013 – Rider granted permanency by regulators
- **2010** – Rate increase granted by regulators, plus a 10% return on weighted costs of capital – about 16% return on equity
 - 2012 - Canadian utility invests and doubles the share price offer overnight!

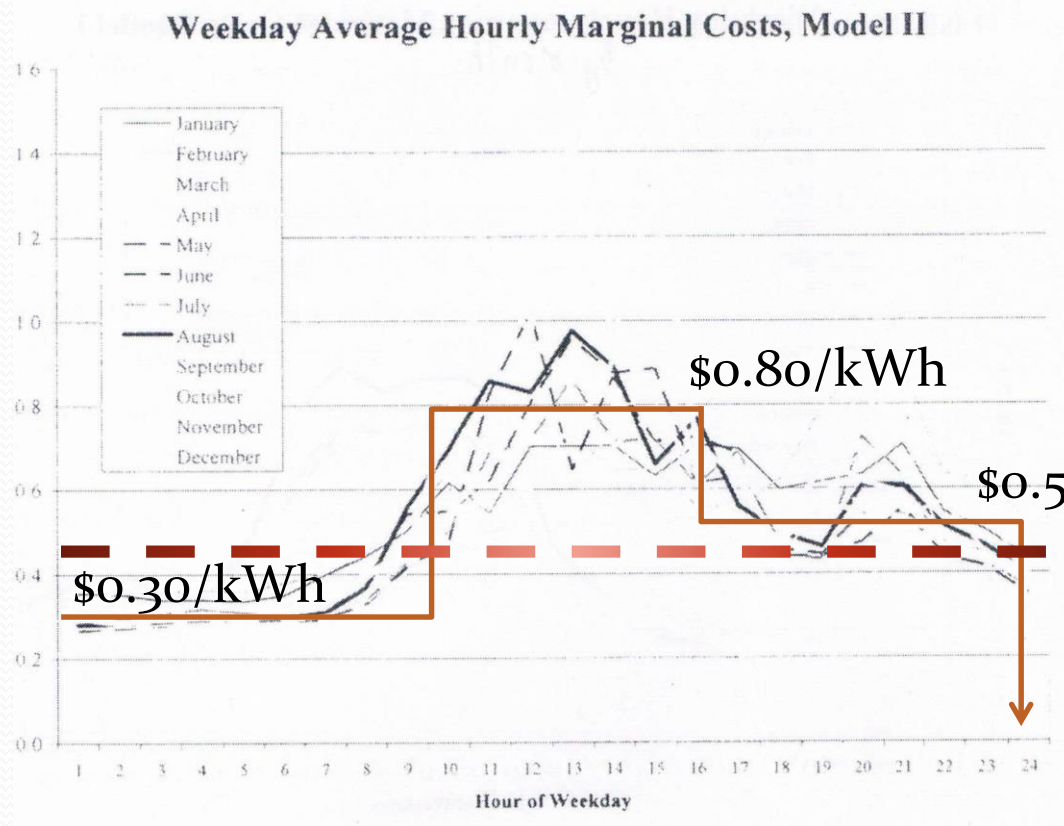
Proposal by Clarke

Time-of-Day (TOU) Feed-in Tariff

June 2015 - \$55 per BBL, FIT = 1.6×0.26 = BDS \$0.41 or US \$0.21 / KWh

BDS
\$/kWh

\$1 US =
\$2 BDS



BLPC IRP

- 2012 – Integrated Resource Plan, IRP by Barbados Light and Power Company, BLPC
 - 2012 – 160 MW peak, 250 MW installed
 - 2016 - Landfill Gas – 1.5 MW X
 - 2016 – Wind – 2 MW X
 - 2016 - Solar PV – 8 MW ✓

BLPC Grid Penetration Study

- **2015 February** - Maximum penetration **without** mitigation measures under existing grid
 - 20 MW of distributed PV
 - 15 MW of Wind
 - 20 MW of Central PV
- TOTAL = 55 MW or 34% of peak load

Mitigating Measures

- To maintain grid reliability and security
 - Increased spinning reserves to counteract variability in wind and solar
 - Automatic Generation Control (AGC) for improved frequency regulation
 - Frequency and voltage ride through capability
 - Governor droop response from thermal and renewable plants
 - Improved voltage control on distribution feeders

Current Expectations by BLPC

- 07 July 2015 – 100% clean energy in the next two or three decades
 - 9 MW PV currently connected to the grid
 - 20 MW PV expected by end of 2015
 - 40 MW by PV by end of 2016
 - 50,000 electric vehicles expected between 2029 and 2045
 - BLPC to become a smaller more nimble utility

Summary

- Having the cooperation and cooptation of the utility is the key to success!

Thank You

- Contact

Roland Clarke PhD

2335 Kalakahua Ave, Suite 110-548, Honolulu, HI 96815 USA
Clarke Energy Associates, Welchman Hall, St. Thomas, BARBADOS

<https://www.linkedin.com/in/rolandclarke>
clarkeenergy@aol.com

Tel: 617 313 6643 USA, 786 246 8809 M USA,
246 251 0298 Bdos