OFF-GRID SOLAR CASE STUDY AND OPPORTUNITIES IN KENYA

J.M.P. MBITHI

Deputy Director, Renewable Energy

MINISTRY OF ENERGY AND PETROLEUM

PRESENTATION SUMMARY

- Introduction-Power situation in Kenya
- Off-grid solar systems
- Solar hybrid systems and mini-grids
- Case study-Lodwar town
- Conclusion

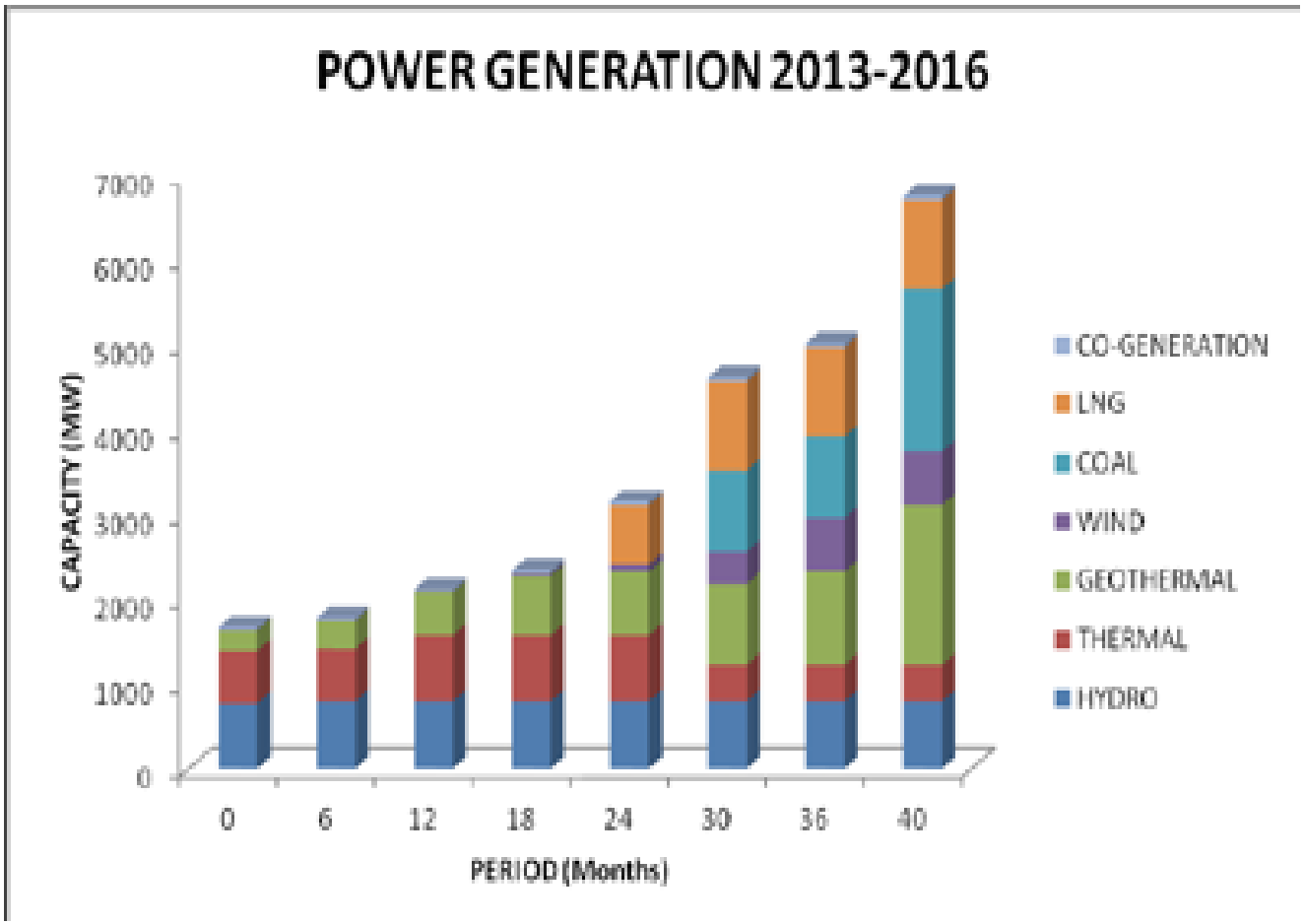
Power Situation in Kenya

- Kenya's installed generation capacity was 1773 MW as of May 2014 and the effective capacity 1710, leaving a reserve margin of 63 MW, far below the recommended reserve margin of 30%.
- Peak demand increased from 1,236 MW in 2011/12 to 1354 MW In 2012 / 2013 and 1453 MW in 2013 /2014(as of May 2014)
- The peak load is projected to grow to 2,511MW by 2015 and 15,026MW by 2030
- The number of customers connected to electricity increased by 400,000 in 2014 from a total of 1,877,418 to 2,287,065

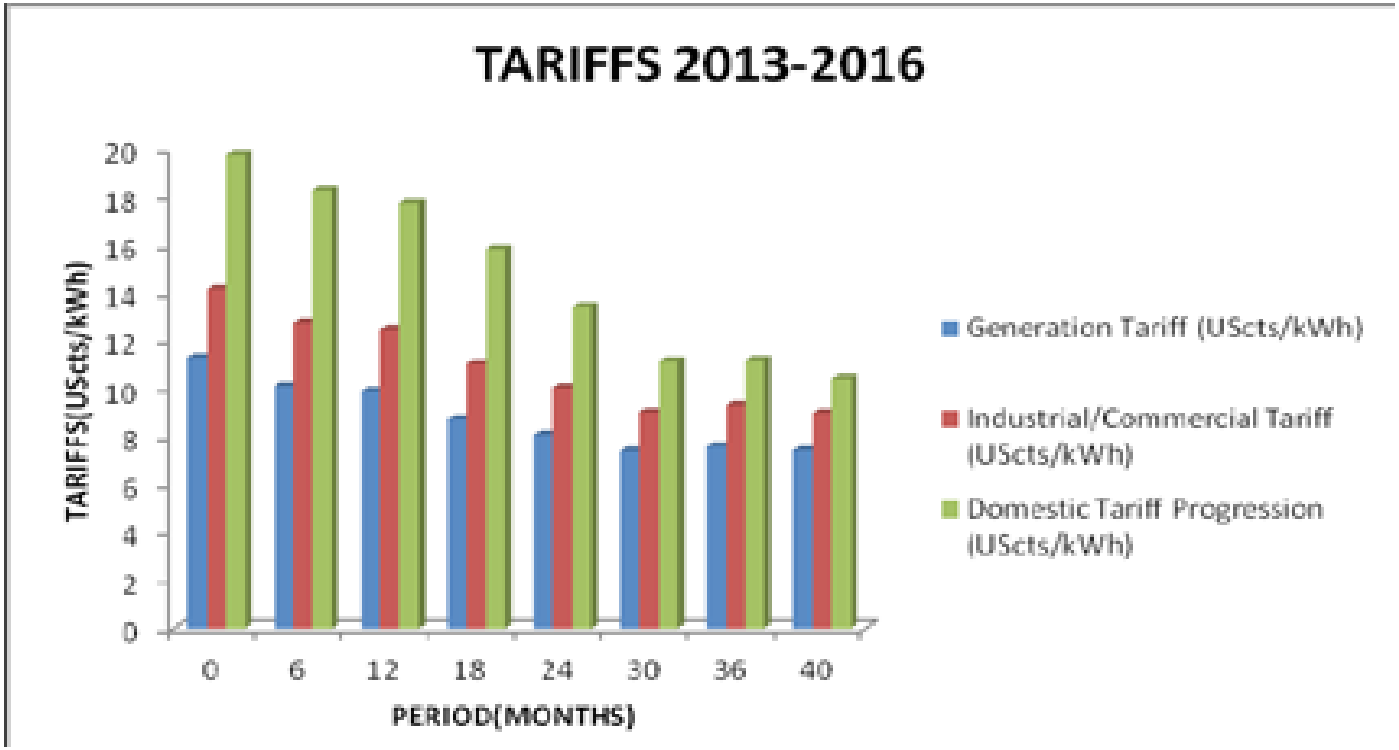
Power Situation in Kenya

- The Government has embarked on an ambitious plan (project 5000+MW) to raise generation capacity to slightly over 6,700 MW by 2016
- The 5000+MW capacity will be developed from Geothermal 1,646 MW, Natural Gas 1,050 MW, Wind 630 MW and Coal 1,920 MW, through government power utilities and IPPs under the PPP framework.
- Through this road map the generation in US$ cents is projected to reduce from 11.30 to 7.41, commercial / industrial tariff from 14.14 to 9.00 and domestic tariff from cents 19.78 to 10.45

Power Situation in Kenya



Power Situation in Kenya



Off-Grid Solar

Off- grid systems are established where power line extensions are not economically viable because of:

- Distance
- Demand
- Customers ability to pay

Off-Grid Solar

- ***Solar PV (Photovoltaic)***: used widely in the country in off-grid electrification (lighting, powering electronic equipment, telecommunications, water pumping, refrigeration and electric fencing).
- Annual market for solar PV panels estimated at 500 kW and projected to grow at 15%
- One company (UBBINK in joint venture with Chloride Solar) has set up assembly plant for solar panels in Naivasha, Nakuru County with estimated production of 100 kW peak annually

Off-Grid Solar

- The Solar PV System installation in institutions, has resulted in the installation of off-grid solar PV systems in about 1,000 institutions across the country at a total of KShs.2 billion. The total output of installed solar PV systems in public institutions is 2 MW_p
- Currently the government has projected to install electricity and solar PV (in areas far from the grid) in all primary schools to provide power for the Laptop Programme
- Mandatory Solar PV Regulations have been gazetted and will soon become enforceable. In the meantime licensing of solar PV technicians, contractors solar PV practitioners continues as per regulations to build capacity.

Solar Hybrid Systems and Mini-grids

- Currently there are 18 operational micro grids operated by Kenya Power with a total installed capacity of 19MW
- 7 of these have operated for more than 30 years
- 11 have been developed in the last six years
- 11 more are currently being developed
- In Kenya there are also some private micro grids – mainly diesel and small hydro as well as private home systems – mainly solar

Solar Hybrid Systems and Mini-grids

- Two of the 18 off grid sites in Kenya have wind generation with installed capacity of 50 and 500kW while six sites have solar generation with installed capacities of 10, 30, 50,60, 60 and 300kW
- There are plans to expand these as well as hybrid all the diesel stations
- Solar hybrids at Lodwar (60kW), Hola (60kW), Merti (10kW), Elwak (50kW)
- Solar/Wind hybrid at Habaswein (50kW wind, 30kW solar)

Case Study of Lodwar

- Lodwar is a small town located in the N.W. part of Kenya. It has a population of about 20,000 people
- Lodwar town is located about 200 Km from nearest grid lines at Turkwell- 220 KV transmission lines
- Electricity generation is through Solar-Diesel hybrid, at Lodwar generating Station
- Lodwar off- grid station has been in operation since 1976
- The solar component was introduced in April 2012, turning it into a PV (solar)- diesel hybrid station in April 2012

Case Study of Lodwar

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Case Study of Lodwar

- At Lodwar, there are 4 Diesel generators installed, with a capacity of 1x240 and 3x400 KW , hence a total installed capacity of 1440KW
- The power generated- by both the solar and diesel sources, is directly injected to the Lodwar power grid via the 415V to 11KV step up transformer
- Due to high cost of storage batteries, grid-tie solar generation (directly injected to grid)
- The introduction of renewable energy via use of PV solar panels has reduced the fuel costs of the diesel generators by 1.4 million per month (US $ 17,000)

Case Study of Lodwar

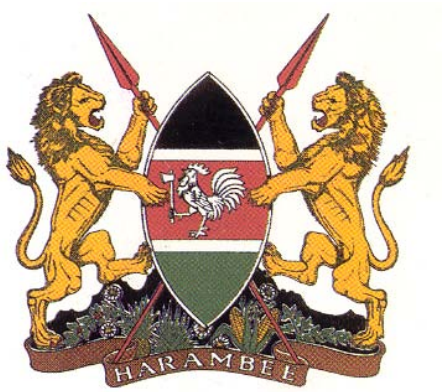
- The 4 generators in Lodwar consume an average fuel of 109,121litres in a month at a cost of approx. KSh 13,100,000 (US $154,000)
- The initial cost of set up for the solar panels was KSh 35,023,506 (US $ 412, 000)
- The future plan is to expand the solar generation of Lodwar station by 250KW by the end of year 2014.
- This may further reduce the current fuel costs of diesel generation by approximately Ksh7.8 million per month (US $ 91,700)

Conclusion

- The cost savings on fuel costs for the 6 off grid stations that have introduced solar so far is approximately KSh. 9 million (US $ 110,000) per month
- Expand solar generation in off-grid areas from current 610kW to 6,150kW in the next two years
- There are plans to hybrid all the micro-grids in Kenya and expand the existing RE plants so as to increase the saving on fuel costs
- Once all are operational, the solar and wind power projects will help Kenya Power reduce use of fuel that runs the off grid diesel generators, thereby saving an estimated Shs.50 million (US $ 600,000) annually

Other off-grid projects

- Solar Lanterns – distribution of solar lanterns – 1500 lamps at KShs 4.5 million (pilot)
- Solar Demonstration Kit: 490 pieces each comprising 2 solar panels each of 100W and BOS components donated by the Peoples Republic of China
- Private solar home systems, institutional installations through NGOs, CBOs, and donor support



Thank you for your Attention !!!