RENEWABLE ENERGIES IN TANZANIA

"Opportunities and Challenges"

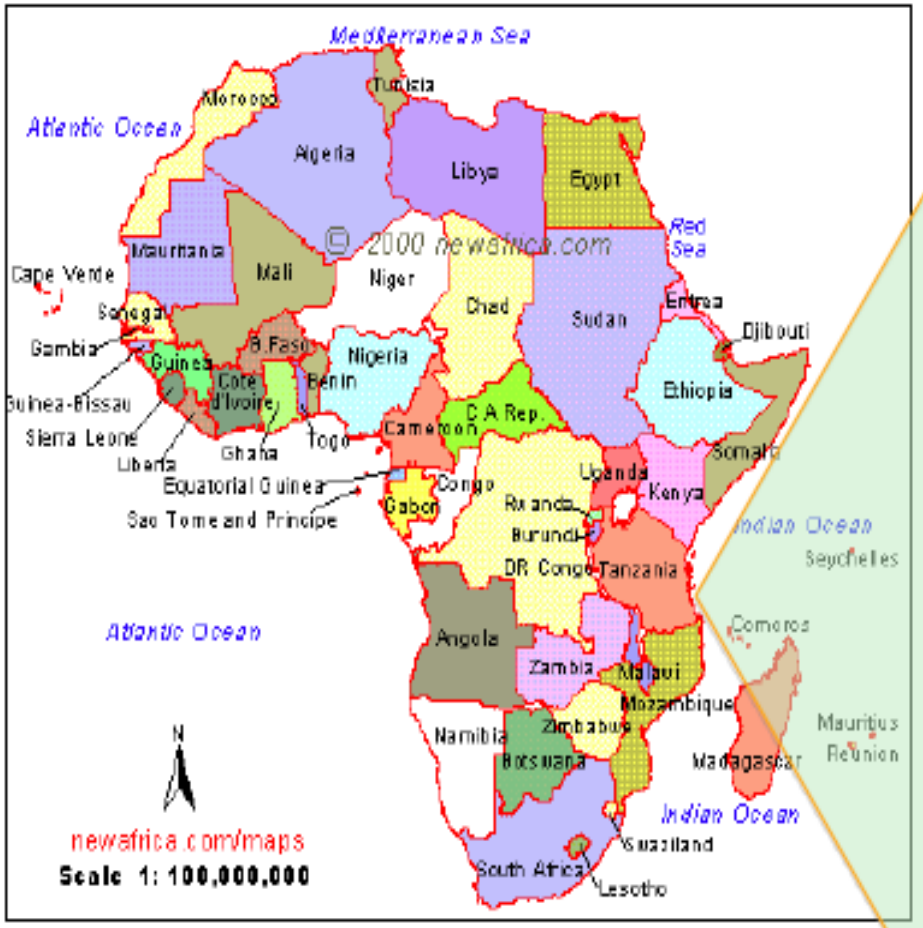
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Tanzania Private Sector Foundation-TPSF

TO

ITALIAN BUSINESS COMMUNITY ROME, ITALY

June 6th, 2014

Where is Tanzania





Tanzania Facts

Population:
44.9 Million (2012.)

Population Growth Rate 2.7 %(2012)

GDP Per Capita
$ 652 (2012)



Annual Average Real GDP Growth Rate 7.0% (2003 - 2012)

Annual Average Inflation Rate 8.6 % (2003 -2012)

Agriculture Employs 80% of the Workforce

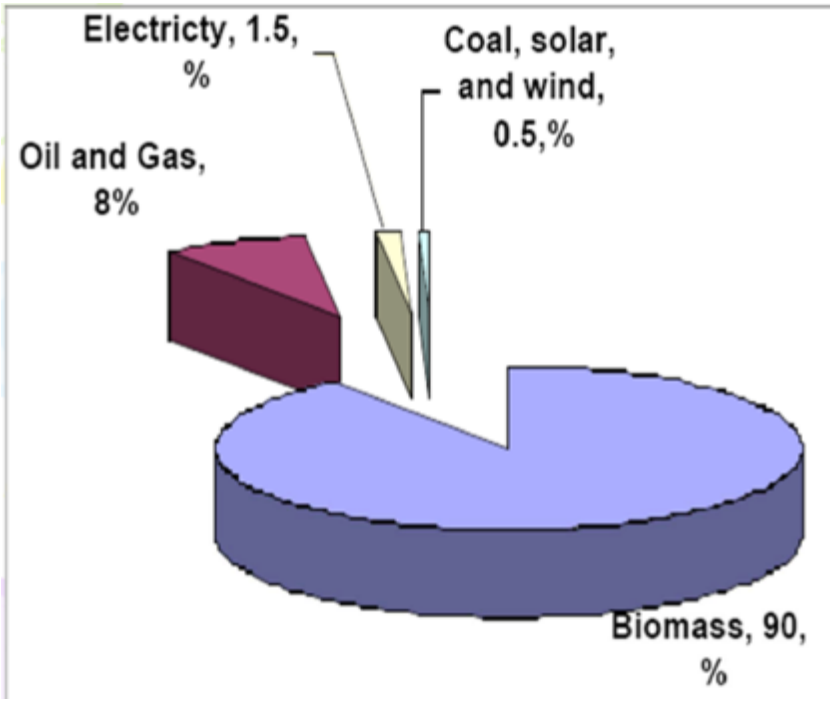
Main imports:
Capital goods (i.e.. machinery and equipment),vehicles, petroleum products, agricultural inputs, raw materials and other consumer goods

Main exports:
Agricultural products,(such as cashew nuts, tea ,coffee, cotton),cut flowers & vegetable, minerals, fish and manufactured goods.

Tanzania Energy Situation…

* Access to Electrification is still low
  * Only 21% out of a total population of 47million.
* Energy consumption per annum >22 million tones of oil equivalent (TOE) per annum or 0.7 TOE per capita;
* Per capita electricity consumption: 150 KWh (versus 500 KWh required for quality life);
* Low Income Population spend 35% of their income on energy
* Energy Underutilization and Potential
  * Hydro: 4.7 GW (only 12% developed);
  * Coal: 1.2 billion tones of which 304 million tonnes are proven;
  * Natural Gas: > 45 billion cubic meters;
  * Others: Solar, Biomass, Wind, Geothermal
  * Petroleum/Oil: Prospecting activities on-going.

Tanzania Energy Situation…





Electricity Power capacity

Category/Source	Total Capacity MW
TANESCO	884
Independent Power Projects (IPPs)	292
Emergency Power Projects (EPPs)	317
Small Power Projects (SPPs)	26
Isolated Grids	81
Imports	14
Total	**1,614**

Electricity Access (National Connectivity 21 %)

Urban 39%;

Rural 7%.

Electrification Targets by 2015

National Connectivity 30%

Rural: 15%.

Generation and Transmission Status

Generation

Through Hydro
Thermal (Diesel)

Consumption 5740MW
Generation-1521MW

Transmission
(43grid substations interconnected by transmission lines)

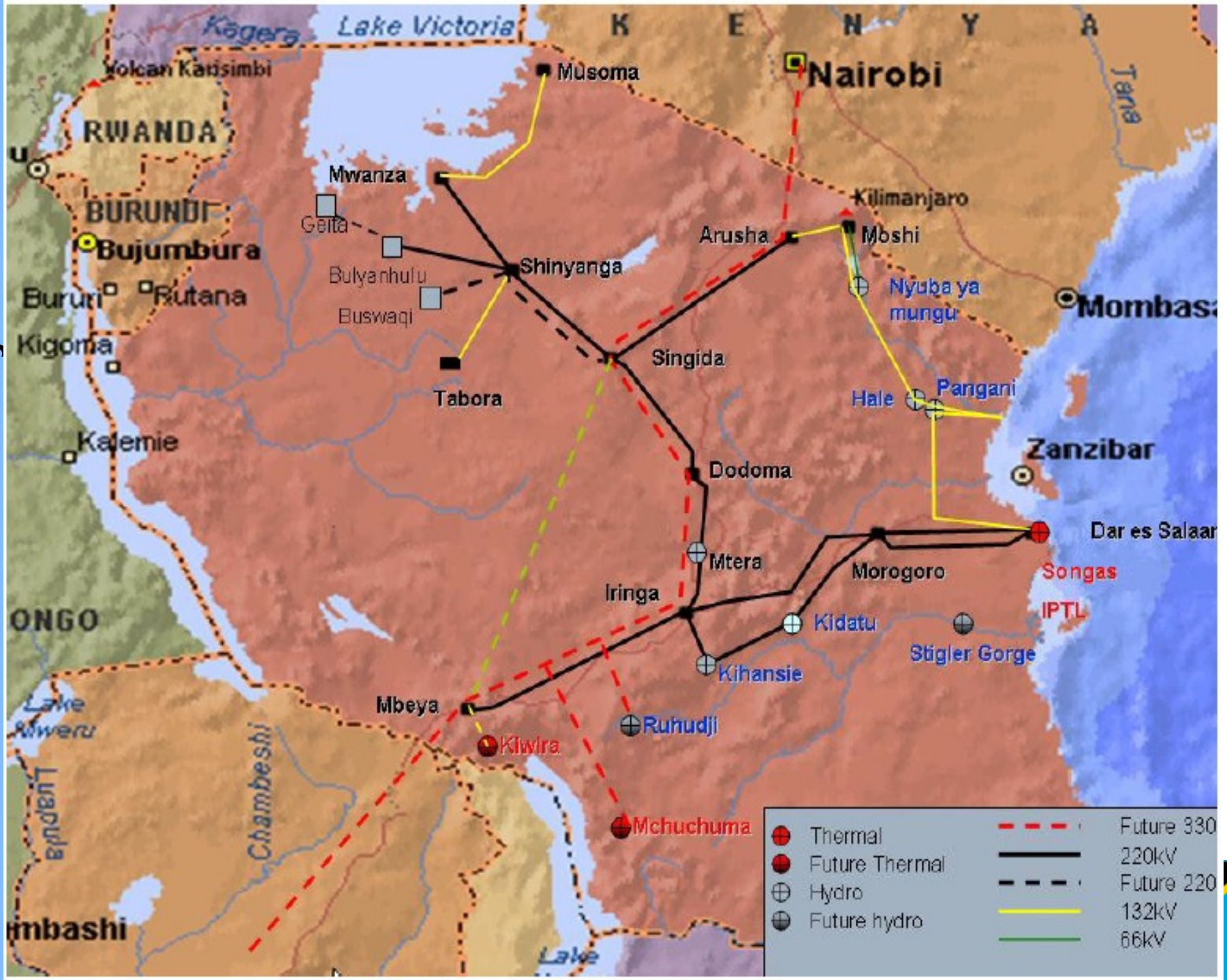
18 lines 220kV
16 lines 132kV
5 lines 66kV
38 Grid Primary Sub Stations
(Total length-4816.86km)

Thermal-17%
Hydro-37%
IPP(Thermal)-41%
Isolated Grid (Thermal-4% and Import 4%)

Major HEP Plants
Kidatu (204 MW),
Kihansi (180 MW),
Mtera (80 MW),
New Pangani Falls (68 MW),
Hale (21 MW),
Nyumba ya Mungu (8 MW)

- Gas fired power plants (Natural natural gas)
  - DSM- Ubungo I (100 MW), Ubungo II (105 MW), Tegeta (45MW).
  - Mtwara/Lindi-(18MW), Somanga (7.5MW)
- Isolated Grids (Thermal) at 33 KV and 11 kV
- IPPs (100MW using HFOs), Songas (189 MW using natural gas)
- SPPs-TPC (9 MW, TANWAT 1.5 MW , Mwenga 4 MW)

Tanzania Grid System



Tanzania Energy Potentials

Hydro	• 4.7 GW (only 12%)
Coal	• 1.2 bil tons of which 304 m tones are proven reserve
Nat. Gas	• 41 Trillion cubic feet proven reserve; More than 120 TCF estimated reserve
Petr/Oil	• Prospecting activities on-going
Solar	• More than 1GW potential
Bio Fuels	• More than 500 MW potential
Wind	• More than 600MW potential
Geo thermal	• More than 1GW Potential

RE Potential and Devt Status



Renewable Energy

- Solar (3,500hrs of sunshine/yr)
  - IC-6 MWp (OffGrid)
  - Grid-1,800 MWh
- Large HEP
  - IC-562 MW
  - Potential -4,000 MW,
- Small HEP
  - IC-15 MW
    - Potential -480 MW
- Geothermal
  - Potential-650 MW
- Wind (9.9 miles/s)
- Potential-100 MW
- Biomass Residues-15 MTPY

Biomass Potential(In MTPY)
Sugar bagasse-1.5,
Sisal-0.2
Coffee husk-0.1, Rice husk-0.2,
Municipal solid waste-4.7
Forest residue-1.1





RE Potential and Devt Status…

* Solar
  * Between 2800 -3500 hours of sunshine per year with a global radiation between 4 -7kWh/m2/day.
  * Average solar flux in some parts based on 24 hours can be as high as 300W/m2 or more.
  * However only about 1.8 MW is installed.
* Wind:
  * Makambako in Njombe region,
  * Kititimo in Singida
  * Mkumbara in Kilimanjaro region.
* Geothermal:
  * Estimated potential of up to 600 MW
  * Mbeya Area
  * Lake Rukwa
  * Lake Nyasa
  * Lake Manyara, Lake Eyasi, Lake Natron,
  * Rufiji Basin,
  * Musoma
  * Mt. Kilimanjaro
  * Mt. Meru



Government Recognition of RE in supply of electricity in Tanzania

For quite some time, the country has faced repeated and prolonged drought that has impacted severely the hydro generation capabilities, coupled with limited capacity of gas processing and transmission infrastructure, hence resulting in power rationing, especially in the areas served by the Main Grid, resulting into power rationing. In such situation, Emergency Power Producers are usually hired to bridge the deficit.

Efforts are being made to increase power generation from the local available resources namely natural gas, coal, and ***renewable energy sources namely geothermal, solar, wind and biomass***



DEVELOPMENT OF SMALL POWER PROJECTS (SPP) IN TANZANIA

Small Power Producer

…an opportunity for energy contribution in Tanzania…

- Makes an application and gets a letter of intent (support) to develop a power plant.
- The power plant will use a renewable resource or waste heat
- Signs a Small Power Purchase Agreement (SPPA)
- Builds a Small Power Plant (SPP)
- Gets paid at the Small Power Purchase Tariffs (SPPTs)
- Continues to own and operate it for a long period (15 years) on a renewable basis

Potential SPP Technologies

- Small hydropower
- Biomass (wood and agro industry waste)
- Municipal or industrial waste
- Wind energy
- Industrial cogeneration and waste heat recovery
- Solar energy
- Geothermal energy

SPPs– What are they?

* The framework is being developed pursuant to the Electricity Act, 2008.
* The framework will reduce negotiation time and cost, and opens the possibility of implementing rural electrification projects.
* Eligiblility
  * **100 kW** to **10 MW** utilizing ***renewable energy source,***
  * Intended to supply commercial electricity to the National Grid or isolated grid in Tanzania.
  * Interconnected to main grid or to an existing or new isolated mini-grid
  * If main grid-connected then must be renewable energy or cogeneration
    * "renewable" means < 25% fossil fuel (hybrid generator)

Four Key Elements of Tanzania's SPP Program

* SPP Regulatory framework developed by EWURA
  * More complete than anywhere else in Africa. Goal: Light-handed regulation
  * Process as well as prices. (Kenya versus Tanzania)
* Grants through the REA
  * Connection grants (US $500 per new connection)
  * Grants for studies (business plans and environmental assessments)
* Availability of financing (loans from local commercial banks supported by a US $25 million WB line of credit)
* Technical assistance for developers, the REA and the electricity regulator (side-by-side assistance not reports)

Types of SPPs

		Location of Generation	
		Connected to Isolated Mini-grid	Connected to Main Grid
Nature of Customers	Selling Retail to End Customer	Case 1	Case 3
	Selling Wholesale to Utility	Case 2	Case 4

SPPs can be combinations of these cases (e.g., Cases 3 & 4)

Status of SPPs in Tanzania

Project	Case	Pdn (MW)	Sale to DNO (MW)	Status of SPPA
TPC Sugat-Moshi	1	17.5	9	Signed
TanWat-Njombe	1	2.5	1.4	Signed
Mwenga-Mufindi Tea (Biomass)	1&3	4	3	Signed
St Agness Hydro Songea	4	3.3	3.3	Signed
NextGen PV	3	2	2	Signed
Ngombeni-Mafia	3	1.4	1	Signed
Sao Hill-Mufindi	1	15.75	10	Signed
Kitonga Hydro	4	10	7	In Discussion
Mapembasi Hydro	4	12	9	In discussion
Ndola Hydro	4	10	9.5	In discussion
Kilombero Sugar (Biomass)	4	3	2	In discussion
Lumama Hydro	4	0.3	Isolated	In discussion
Katani Ltd (Biomass)	4	0.3	Isolated	In discussion
Symbion-Tunduru (Biomass)	4	3.3	3.3	Signed

LUMAMA hydropower project





- 300 kW – remote mini-grid
- Target 1400 customers
- Mawengi village, Njombe, Tanzania

LUMAMA hydropower





	Mini-grid	Main grid
Retail	Case 1	Case 3
Wholesale to utility	Case 2	Case 4

- 300 kW – remote mini-grid
- Target 1400 customers
- Mawengi village, Njombe, Tanzania

Mwenga 4 MW hydro

electricity to 4000 households in 15 villages & sells to the grid



Mwenga 4 MW hydro

electricity to 4000 households in 15 villages & sells to the grid

	Isolated mini-grid	Main grid
wholesale to utility	Case 1	Case 3
retail	Case 2	Case 4

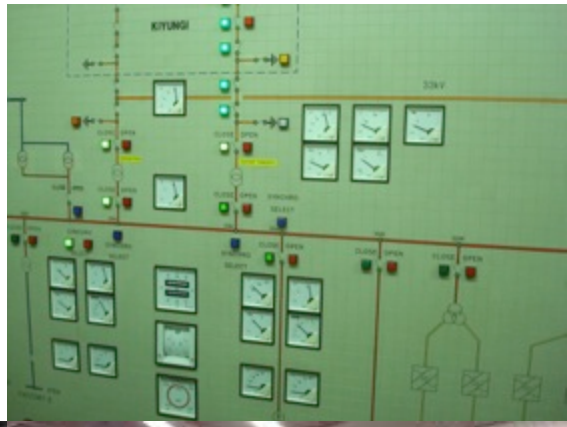


TPC, Moshi

17.5 MW – selling 9 MW to main grid

Cogeneration
Sugarcane bagasse









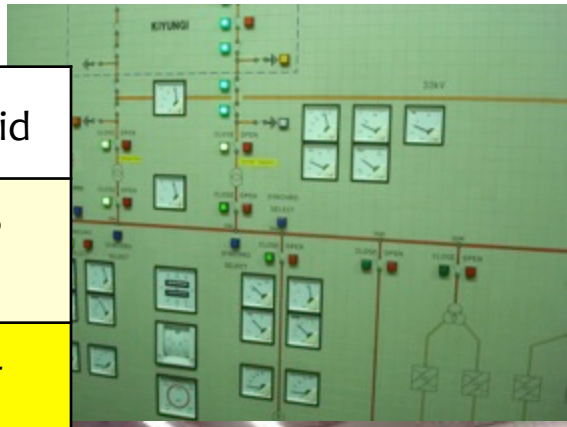
TPC, Moshi

17.5 MW – selling 9 MW to main grid

Cogeneration
Sugarcane bagasse



	Mini-grid	Main grid
Retail	Case 1	Case 3
Wholesale to utility	Case 2	Case 4







Key Features of SPP framework (cases 2 and 4)

- Small Power Purchase Agreement (SPPA)
  - Buyer "must take" SPP's output if SPP is connected to the main grid
  - Term – 15 years
  - SPPA type depends on context: (1) selling to an existing isolated mini-grid; (2) selling to main grid
  - Isolated SPPA switches to Main grid SPPA upon interconnection with main grid
- Standardized Tariff Methodology
  - Avoided Costs of the Utility
  - Local Currency Denomination
  - Reflect Seasonality (Main Grid)
  - Floor and Cap Prices
  - Technology Neutral
  - Technology-specific feed-in tariffs

SPPT PUBLIC NOTICE
ON
PROPOSED STANDARD POWER PURCHASE TARIFF FOR SMALL POWER PROJECTS FOR YEAR 2014
Issued on June 6, 2014

* The Government of Tanzania (GoT) through the Ministry of Energy and Minerals (MEM) and in collaboration with the World Bank has embarked on accelerating electricity access to the Tanzanian population.
* Delivered by Tanzania Energy Development and Access Project (TEDAP) initiative, the GoT is expediting the development of renewable energy sources in Tanzania by promoting private sector participation in the power sector through the development of Small Power Projects (SPPs).

Main –Grid Connection Standardized Small Power Purchase Tariff TZS/kWh

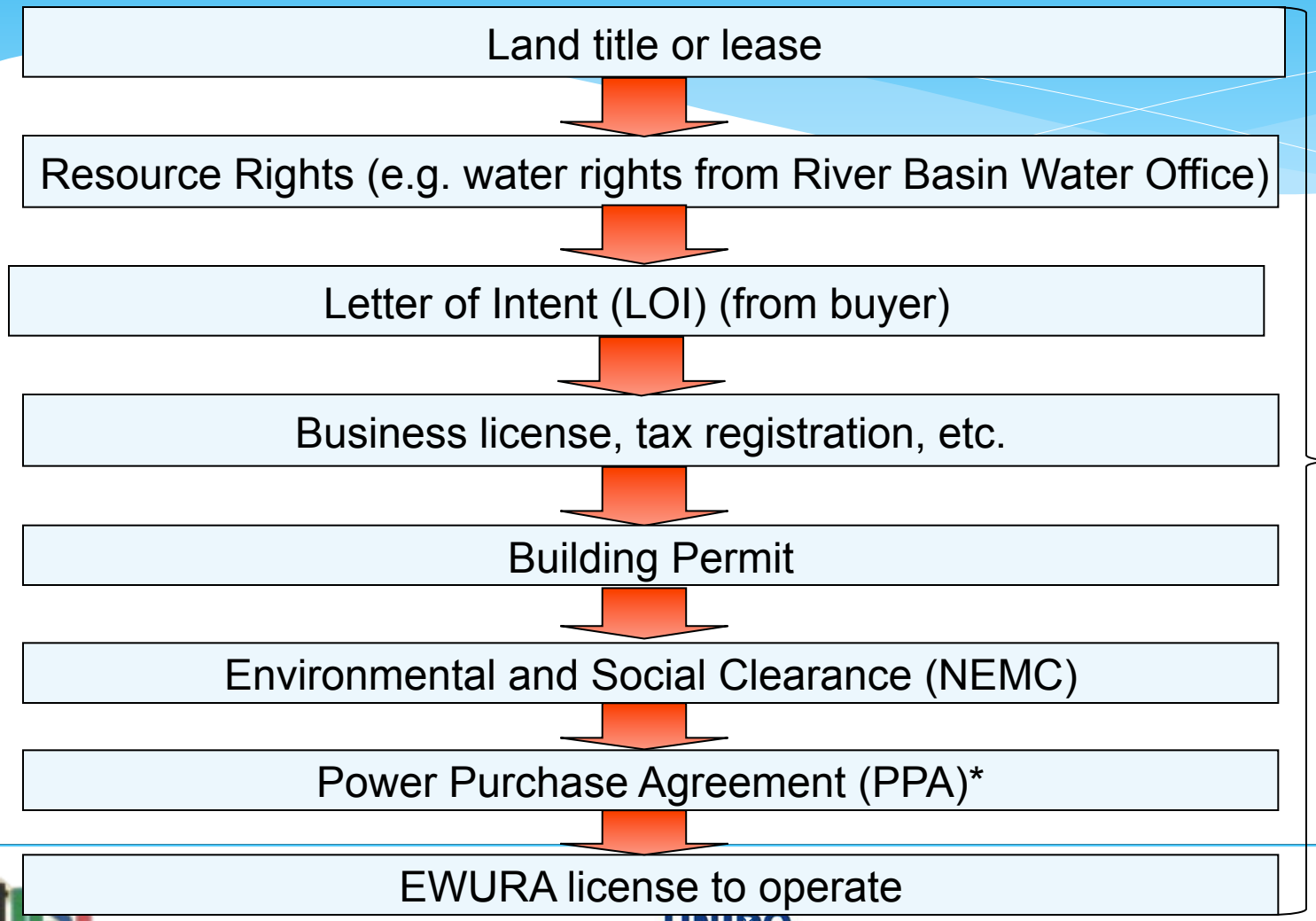
Description		Prevailing Tariff 2013	Proposed Tariff 2014
Standardized Small Power Purchase Tariff		174.89	197.31
Seasonally adjusted Standardized SPP Tariff Payable in	Dry season	209.87	236.78
	Wet season	157.40	177.58

Off-grids Connection Standardized Small Power Purchase Tariff TZS/kWh

Description	Prevailing Tariff 2013	Proposed Tariff 2014
SPP Standardized Mini-Grid Tariff for the year 2011	490.50	**482.64**

* Pursuant to Section 19(2)(b) of EWURA Act, Cap 414, interested parties who wish to submit their views, either in writing or otherwise, on the reasonableness of the above proposed rates are invited to do so by **18th June 2014**

Necessary permits, clearances and procedures for application



Sequence is important to avoid competing claims on project sites

EWURA's rules relating to retail sales

* Legal right to sell electricity at higher-than-national uniform tariff
* Tariffs may take into account ability to pay of customers
  * For example, charging small residential customers below-market rates and higher tariffs to commercial customers
* Retail tariff structure proposed by SPP is not limited to 'standard' kWh tariff types
  * Flat tariffs, power-tariffs, etc. are allowed. But to be accepted by the Authority, any tariff must reflect prudently incurred costs and reasonable efficiency.

Principal changes proposed in second generation SPP rules

Provisional license	• Optional • Covers preparatory activities for studies, financial arrangements, land acquisition, construction
Tariffs for backup power	• Only energy charge (no peak demand charge) if SPP's power import load factor is < 15%
When big grid connects to little grid	• Right to convert to a "Small Power Distributor" (SPD), to sell wholesale to the main grid, or both.
Very Small Power Projects (VSPPs)	• Streamlined and simplified rules for projects under 100 kW • For VSPPs no prior approval of retailed tariffs required.

Other Information

Electricity Standards

* All electrical works and goods installed or operated in Tanzania are required to comply with certain acceptable standards that EWURA has a responsibility to monitor. TANESCO prepares technical and operating guidelines known as the Engineering Instructions to facilitate standard construction and operation within the power system networks. These are to be approved by EWURA before coming into effectiveness.

Standards for Solar energy engineering

* **EAS 362:2005, *Solar photovoltaic power systems***
  * Specifies terms of elements (solar cells and solar cell modules), equipments (power conditioner and storage batteries) and photovoltaic systems used in relation with photovoltaic power generation.
  * ICS 01.040.27; ICS 27.160 HS 8541.40.00 EQV: IEC 61836/TR 30 pages PGr 4
* **EAS 363-1:2005, *Solar photovoltaic power systems — Test procedures for main components — Part 1: Photovoltaic modules***
  * This Part 1 of EAS 363 specifies test procedures for photovoltaic modules for use in photovoltaic systems as envisaged in EAS 389. The object of the test procedures is to verify compliance with the requirements specified in of EAS 389 for photovoltaic modules, panels and arrays.
  * ICS: 27.160 HS 8541.40.11 EQV: IEC 61215:1993; IEC 61646:1996 10 pages PGr 2
* For more information, please refer the document
* http://www.eac.int/trade/index.php?option=com_docman&task=doc_download&gid=31&Itemid=124

Reporting Systems

* Section 15(4) of the Electricity Act, 2008 requires every licensee to submit to the Authority, all data and information required by the Authority, relating to performance of its functions.
* Furthermore, section 15(5) of the Electricity Act, 2008 requires that every licensee shall, annually or within a prescribed time, submit a report to the Authority on its licensed activities, which report shall include technical, financial and service delivery level, based on the customer service charter.
* EWURA requires the web-based Electricity Regulatory Information System (ERIS) and Assets Register (AR) to be used by electricity service providers.
* The Assets Register is an important tool for EWURA during tariff setting, as it provides a good foundation for valuing the regulatory asset base of a utility in tariff determination.
* The ERIS and AR packages can be used by service providers and other key stakeholders, including the Ministry of Energy and Minerals, for decision making.

Licences Granted 2013/14

No.	Licensee	Project Area / License coverage	Capacity (MW)	Type of Licence/ Duration	Date Issued
1	M/S E.A Power Ltd	Kiwira, Rungwe Dist.	10	Generation1 36 months	19/9/2012
2	TANESCO Ltd	Tanzania Mainland	964	Generation 25 Years	1/3/2013
3	TANESCO Ltd	Tanzania Mainland	100	Distribution 25 Years	1/3/2013
4	TANESCO Ltd	Tanzania Mainland	7.5	Transmission 25 Years	1/3/2013
5	TANESCO Ltd	Tanzania Mainland	18	Supply 25 Years	1/3/2013
6	TANESCO Ltd	Tanzania Mainland	2.4	Cross Border Trade 25 Years	1/3/2013
7	Lake Cement Ltd	Kimbiji, Temeke Dist.	10	Generation2 24 months	21/3/2013
8	Tangulf Express Ltd	Nakatuta Falls Songea District	10	Generation3 24 months	21/3/2013
9	Kitonga Electric Power Company Ltd	Kilolo District	150	Generation4 24 months	1/7/2013
10	Tanzania Cigarette Company Ltd	Dar es Salaam	1.8	Standby 1 Generation	1/3/2013
11	North Mara Gold Mine Ltd	Tarime	18	Standby 2 Generation 5Years	1/3/2013
12	Pangea Minerals Ltd	Biharamulo	6	Base Load 3 Generation 5Years	1/3/2013
13	Mwenga Hydro Limited	Mufindi District	3.36	Generation 25 Years	1/1/2013
14	Kilwa Energy Company Ltd	Somanga	210	Generation1 30 months	3/1/2013
15	Geo Wind Power Tanzania Ltd	Singida	100	Generation5 30 months	20/12/2012
16	Bulyanhulu	Kahama	24.5	Standby 4 Generation 5Years	1/3/2013

TANESCO's Approved Emergency Tariff

Customer Category		Component	Approved Tariff
D1	Domestic Low Usage	Basic Charge	0
		Energy Charge (0-50 kWh)	60
		Energy Charge (above 50 kWh)	273
T1	General Use	Basic Charge/Month	3,841
		Energy Charge	221
T2	Low Voltage Supply	Basic Charge/Month	14,233
		Energy Charge	132
		Demand (kVA)	16,944
T3	High Voltage Supply	Basic Charge/Month	14,233
		Energy Charge	118
		Demand (kVA)	14,520
T5	ZECO	Basic Charge/Month	14,233
		Energy Charge	106
		Demand (kVA)	12,079

List of Tenders

* **PPRA Tenders**
  * http://tender.ppra.go.tz/index.php?home=home&view=tender&opt=&t=o
* **Provision of individual consultancy services to design, supervise the construction and commission of biogas plant at itakaJKT**
  * **TENDER Nº: AE/HQ/008/2013-14/HQ/C/51 (Deadline passed-May 15, 2014)**
* **Provision Of Consultancy Services For Training on Renewable Energy Technologies and Business Plans Preparation to Prospective Energy Project Developers**
  * **TENDER Nº: AE/HQ/008/2013-14/HQ/C/28 (Deadline April 2014)**
* **Procurement of Sustainable Solar Market Packages (SSMP)**
  * **ICB No:AE/008/2012-13/HQ/ G/74 (deadline exppired Sept 2013)**

The Rural Energy Fund-REF

* REF was established by The Rural Energy Act, 2005 for the purpose of providing grants to qualified project developers.
* The Fund Provides resources for:
  * Grants towards the capital costs of projects implemented by private and public entities, co-operatives, and local community organizations.
  * The provision of technical assistance, training and other forms of capacity building to qualified developers by qualified experts related to the planning and preparation of a project prior to an application for a grant.
  * The provision of financial assistance. Co-financing investments in innovative pilot and demonstration projects and applications for renewable energy when development partners make special purpose funds available for that purpose.
* The Fund does not provide grants towards the operating or debt service costs of any project or developer.
* **Funding Sources**
* Government, in an annual budgetary allocation;
* A s contributions from international financial organizations, multilateral and bilateral agencies and other development partners;
* From levies of up to five percent (5%) on the commercial generation of electricity to the national grid;
* As fees in respect of programmes, publications, seminars, consultancy services and other services provided by the REA;
* As development partners' contributions to Special Purpose Funds for rural energy;
* As interest or return on investments.



THANK YOU