



ENERGY WEEK 2016 SUPPLEMENT

LET'S EMBRACE RENEWABLE ENERGY TECHNOLOGIES, TO ACHIEVE A MIDDLE INCOME STATUS

Biomass remains a predominant source of energy and the majority of our population relies on this source to meet their basic household and commercial energy needs. This important resource should be utilized using modern biomass technology. The resource on privately owned land is projected to be depleted by 2030. However the biomass on protected and reserve national forests will increase but this is not accessible for biomass energy production.

Biomass-energy based fuels such as firewood, charcoal, agriculture waste, municipal solid wastes are widely used for cooking in rural areas, most urban households, institutions and commercial enterprises. It is also the source of energy for small and medium industries. According to National Biomass Energy Strategy (NBEST). Since biomass will continue to play a crucial role in Uganda's economy in the foreseeable future, this is therefore a call for all Ugandans to plant and protect trees for biomass energy production.

Biomass energy supply and demand situation

The increasing population coupled with the inefficient usage of biomass like the traditional three stone firewood stoves which is about 10% efficient has led to rapid depletion of the country's biomass resources. The current rate of consumption of woody biomass is estimated to be about 28% above the sustainable yield. This undesirable situation is associated with a range of adverse ecological and environmental consequences in the whole Country and particularly the "cattle corridor" districts such as Mbarara, Isingiro, and Nakasongola where most of the biomass is harvested for charcoal production

Government's initiatives to address clean cooking

To address the deteriorating biomass energy situation in Uganda, the Ministry of Energy and Mineral Development has embarked on:

- Construction of demonstration institutional cook stoves in schools. These institutional stoves save up to 60% of wood fuel they are using. They are faster and easier to use, they produce little or no smoke and even cook faster. The energy saving stoves can use charcoal, fire wood or briquettes. For example Lango College was consuming six trips of firewood per term but reduced to three trips per term after installation of institutional cook stoves.
- The Ministry is also promoting biogas which is generated by breaking down of organic matter such as cow dung, chicken waste, pig dung, human waste, sewage and food waste. The biogas produced is used for cooking, lighting or for electricity generation.
- Implementing Green Charcoal Project in cattle corridor districts of Mubende, Nakasongola,

Kiryandongo, and Nakaseke where over 2 million trees have been provided for planting for biomass, twelve briquetting machines have been availed to groups for production of charcoal from forest harvests, demonstrate charcoal production and develop the technical capacity of the districts and artisans.

- The Ministry has built partnerships in the area of briquette production with various organizations to develop and sustain fuel the biomass resources. Key among these are; SNV UNDP, GIZ, WWF and many CBO and NGOS.
- The Ministry is supporting the private companies dealing in biomass (Biomass Energy Efficient Technologies Association - BEETA) and these companies are obliged to provide high quality biomass stoves for homes and institutions. BEETA works closely with UNACC to promote clean cooking in Uganda. Clean cooking involves little or no smoke, reducing cases of smoke related diseases and conditions like eye infections, cough, asthma and cancer, especially among women and children.
- Biogas Solution Uganda with SNV and the Ministry are promoting biogas digester for biogas generation and slurry usage to improve agriculture. This offers many benefits to farmers. We encourage everybody to construct biogas digester so that they can save money and the environment.
- The Ministry is developing the Biofuels Bill. This legislation aims to promote legislation on the blending of biofuel with petroleum products. This is therefore to call upon Ugandans to actively engage in bio fuel production and other related value chain



An improved institutional stove and a modern kiln for charcoal production

Characteristics of Biomass Efficient homes, schools, Hospitals, and Institutions desirable for Uganda:

1. They must have three dustbins for waste collection for green waste (biodegradable materials –banana peels, plants materials, Red waste for plastic and other color for glass and metal.
2. Must be using energy saving stoves, and should own woodlot where they can harvest cut firewood to meet their energy needs on seasonal basis like acacia species, eucalyptus, caliantra, and many tree species recommended by Ministry of Water and Environment.
3. Should have biogas digester which is fed by animal waste which feed on the biomass material generated at home supplemented by other food stocks

SOLAR ELECTRICITY SYSTEM AVAILABILITY IN UGANDA

Prices of Solar Equipments have drastically dropped internationally and locally as a result of improvement in production technology and massive production Worldwide making solar PV technology affordable both in urban and rural areas. Solar PV can be used by clients to connect on the national grid using an inverter to invert the 12V DC (direct current) to 220VAC.

The innovative way of connecting solar PV on a grid - connected building is using the existing wiring in the building which also lowers the cost of acquisition of the solar systems.

It is estimated that over 250,000 households and institutions are using solar energy and the future target is to have about 1.5 million houses by 2022. Solar energy is used for a wide range of applications like lighting, water heating, water pumping and low power consuming electrical appliances (including phone charging) among others to increase on the rate of electrification and provision of sustainable energy solutions for Ugandans.

The solar sub sector is liberalized in Uganda. Solar solutions on market range from small scale domestic solar systems to medium and large scale solar systems for institutions and other commercial purposes. These can be obtained from solar vendors, solar companies and dealers around Kampala and other parts of the country.

Genuine solar products can be obtained from various solar company registered with the Uganda Solar Energy Association (USEA).

The Ministry calls upon solar companies to register with Uganda Solar Energy Association to strengthen and improve the quality of solar energy systems in the field. The benefits will include

training, participation in government programmes, lobbying forum, and self-regulation.

Various delivery models have been put in place to create an enabling environment for uptake of the solar products so that more people can afford it.

Solar loans through financing institutions; The Uganda Energy Credit Capitalization Company (UECCC) housed at the Ministry of Energy and Mineral Development is responsible for credit support to companies and end users. Many credit financing models have been put in place by the UECCC to enable end users access credit for financing solar projects.



(Up) Large solar PV at Seroma Christian High School and (Down) solar kit for lighting

A Renewable Energy Department has been established in the Ministry to promote and answer questions regarding renewable energy. The department is staffed with technical officers who are always available to give information regarding these technologies.

For more information, please contact
Ministry of Energy and Mineral Development
Office of Commissioner Renewable Energy Development
Amber house,
Plot 29/33, Kampala road
P.O Box 7270 Kampala, Uganda
Tel: +256(0)414341494
www.energyandminerals.go.ug



ENERGY WEEK 2016 SUPPLEMENT

ACHIEVING MIDDLE-INCOME STATUS THROUGH POWER GENERATION

The Ministry of Energy and Mineral Development is mandated to: "Establish, Promote the Development, Strategically Manage and Safeguard the Rational, Sustainable Exploitation, Utilization of Energy and Mineral Resources for Social, and Economic Development."

Our Vision is to become "A Model of Excellence in Sustainable Management and Utilisation of Energy and Mineral Resources," which is aligned with the Vision 2040 and National Development Plan (NDP) theme of "Growth, Employment and Socio-Economic Transformation."

In line with Vision 2040, which recognizes energy as the key driver for socio-economic transformation, the Ministry will continue to provide policy guidance in the development and exploitation of the Energy, Mineral, Oil and Gas resources, and creation of an enabling environment in order to attract investment in the development, provision and utilisation of energy and mineral resources.

The Ministry of Energy and Mineral Development is divided into three Directorates, namely:

- Energy Resources, comprising of the electric power, new and renewable, efficiency, and nuclear energy; and other related Agencies and Institutions
- Petroleum, comprising of upstream, midstream, and downstream; and
- Geological Survey and Mines.

Medium Term Priorities

Over the medium term, the Energy and Mineral Sector will continue to implement the following priority areas:

- Increase electricity generation capacity and expansion of the transmission and distribution networks;
- Increase access to modern energy services through rural electrification and renewable energy development;
- Promote and monitor petroleum exploration and development in order to increase the reserve base;
- Develop petroleum refining, pipeline transportation, and bulk storage infrastructure.
- Streamline petroleum supply and distribution;
- Promote and regulate mineral exploration, development, production and value addition; and;
- Inspect and regulate exploration and mining operations.

Other priorities include: -

- Promotion of efficient utilisation of energy; and
- Monitoring geo-tectonic disturbances and radioactive emissions.

Achievements:

Development of Power generation infrastructure

Government is committed to improving electricity generation, transmission and supply to support industrialization as well as ensuring universal access to affordable, reliable and modern energy services. It is against this that Government is developing various projects that include Karuma Hydropower Project (600MW) Isimba Hydropower Project (183MW) and other renewable power generation sites in the country.

Karuma Hydropower Project (600 MW): Construction works have progressed with

excavation works on the various tunnels almost complete and excavation works on the underground power house has been completed.

Overall, 48% of the works have been completed and the project is targeted to be commissioned in December 2018.



A completed Ventilation shaft at Karuma HPP

Isimba Hydropower Project (183 MW): The project is progressing in accordance with the schedule of works and overall construction progress stands at 53%. The project is expected to be commissioned in August 2018.



Construction works at the dam site of Isimba HPP

Global Energy Transfer Feed-in Tariff (GETFIT) Programme (156.5MW): The GETFIT Portfolio is supporting 17 renewable power generation projects developed by the private sector to generate about 156.5 MW.

A bagasse based power plant at Kakira (20 MW) was commissioned in 2015. A total of 36.44 MW is expected from six small hydropower plants that have commenced construction activities. These projects are Siti I (5 MW), Waki (4.8 MW), Muvumbe (6.5 MW), Nyamwamba (9.2 MW), Rwimi (5.54 MW) and Lubilia (5.4 MW). In addition, a 10 MW Solar grid-connected power plant is under construction in Soroti.

Other projects anticipated to commence construction during Financial Year 2016/2017 are, Sindila (5.2 W), Kikagati (16 MW), Siti II (16.5 MW), Ndugutu (4.8 MW) and Tororo Solar Power Plant (10 MW).

Agago-Achwa hydropower projects (83MW): The project is being developed by private sector consortium of PAC SPA and Berkerly Energy. The Developer commenced construction in December, 2015 using the developer's equity, pending financial closure of the project.

Muzizi Hydro Power Project (44.7MW): Government concluded negotiations with KfW and French Development Agency (Afd) for a loan to develop this project. This project is being implemented as a public project by Uganda Electricity Generation Company Limited (UEGCL).

Implementation of the Resettlement Action Plan (RAP) is already underway.

Nyagak III Hydro Power Project (5.4MW): The project is being developed as a Public Private Partnership (PPP) venture. The main civil works will commence upon the project achieving financial closure expected in February, 2017.

Development of Power transmission infrastructure

Government has continued to expand the power transmission network through the implementation of transmission lines and substations projects:

Construction is on-going for the following Transmission Lines, to be commissioned during the Financial Year 2016/17: Bujagali switchyard upgrade to 220kV to be commissioned during 2016; Bujagali-Tororo-Lessos 220kV, 127km line; Mbarara – Mirama – Birembo 220kV, 66km line; Tororo – Opuyo – Lira 132kV, 260km line; Mbarara – Nkenda 132kV, 160km line; and Kawanda – Masaka 220kV, 137km line, and Nkenda-Fort Portal-Hoima 220kV, 226km line.

Contracts have been signed by various contractors for construction of the following power transmission projects: Industrial Parks focusing on development of four substations, namely Namanve South, Luzira, Mukono and Iganga; Isimba-Bujagali Interconnection project 132kV, 41km line; Karuma Interconnection project, comprising of Karuma-Kawanda 400kV, 248.2km; Karuma-Olwiyo 400kV, 54.25km; and Karuma-Lira 132kV, 75.5km and associated substations and Upgrade of Queensway substation.

Financing for Mirama-Kabale (132 kV) has been concluded and the project is ready for implementation. Funds for Lira-Gulu-Nebbi-Arua 314km (132kV) are pending Parliamentary approval.

Funding for the following transmission lines is being mobilized: Hoima-Kinyara-Kafu (220kV), Nkenda – Mpondwe – Beni (220kV), Ayago Interconnection project, Opuyo-Moroto (132kV); Bulambuli (Atari) - Mbale Industrial Parks (132kV); Kikagati – Mirama-Nsongezi 132kV, 38km line; Gulu-Agago 132kV, 82km line; Mutundwe-Entebbe 23.5km (132kV) and Masaka-Mbarara 135km (400kV) and Masaka-Mwanza 85km (220kV).

The development of transmission infrastructure does not only support bulk power supply to load centers but is also designed to spur social - economic development of areas traversed by this infrastructure. Kawanda –Masaka Transmission Line being developed under the project code named Electricity Sector Development Project (ESDP) provides the best example.

The development objective of ESDP is to facilitate improvements in the power supply to the south western region of Uganda. However, the project also supports several social development activities such as construction of Street and Market lighting in Masaka Municipality, electrification of Peri – Urban areas within the 5km radius along the Kawanda – Masaka 220 KV transmission line whereby over 8000 households are expected to be connected on the national grid free of charge. Good Progress has been registered on the ESDP social development activities. Under Peri- Urban activity for example, the Ministry submitted a batch of 1499 potential customers to UMEME to be connected under this project and so far

707 customers have been connected. Construction of street and market lighting in Masaka Municipality is on schedule and construction progress of 34% has so far been achieved. This activity will support provision of over 500 street and market lighting points on selected roads and municipal markets.



State Minister for Minerals Hon. Peter Lokeris launching peri-urban electricity at Matugga in Wakiso District

Promotion and Development of Nuclear Energy

Government in cooperation with the International Atomic Energy Agency (IAEA) is promoting the peaceful use of nuclear energy in Uganda. The cooperation between Uganda and IAEA is implemented within the Country Programme Framework (CPF) 2014 – 2018.

This mutual agreement matches nuclear technology to national priorities for sustainable development and focuses on cancer management, food safety assessment, tsetse fly control, improving agricultural productivity, water resources management, strengthening the national nuclear and radiation safety infrastructure, uranium exploration and evaluation, and feasibility studies for nuclear power projects.

Within the framework of the Nuclear Power for electricity generation, the Nuclear Power Development Strategy 2014 -2016 was approved by Cabinet in April 2015 and a Standing Cabinet Committee on Nuclear Energy was constituted.

The strategy identifies key infrastructure issues related to Policy & legal framework, regulatory infrastructure, human resource development, technology assessment and siting for nuclear power development.

As part of the implementation of this strategy, pre-feasibility studies that provide recommendations for addressing key infrastructure issues for nuclear power development are ongoing. MEMD together with other participating Ministries, Departments and Agencies (MDAs) have concluded a study on integrating nuclear power into the generation capacity plan 2015-2040 and identified nuclear power to play a role in the future energy mix.



Stakeholders' Workshop with Local leaders of Nakasongola District during ground follow-up



ENERGY WEEK 2016 SUPPLEMENT

GEO THERMAL ENERGY, THE NEXT ENERGY SOURCE FOR UGANDA

Growth in the human population and energy use, as well as the consequent environmental impacts have led to interest in finding new energy resources that are renewable and have reduced greenhouse gas emissions. Geothermal energy is a versatile resource that can be used in many situations to meet these goals.

In its effort to address ongoing power shortages, Uganda is making geothermal technology a viable option to solve energy problems and has taken a strategic decision to develop available energy sources in the country.

According to Kato Vincent, the Asst. Commissioner Geothermal Resource Department in the Ministry of Energy and Mineral Development, geothermal energy will solve problems pertaining to energy reliability and security, economic development and air quality.

What is geothermal energy?

Geothermal Energy is heat derived from the earth. It manifests as hot springs and warm pools at surface. Geothermal energy is ubiquitous, abundant, and inexhaustible. "It has been present for 4,500 million years and will be present for billions of years into the future. It flows through the earth constantly, 24 hours a day, 7 days a week, rain or shine, eon upon eon," Kato explains.

The interior of the Earth is expected to remain extremely hot for billions of years to come, ensuring an essentially limitless flow of heat and energy. Geothermal energy can be used for commercial power production and many other diverse applications. It has been used to produce power for more than a century.



Ugandan scientists working in collaboration with GDC Consultants from Kenya to leverage on Kenya experience and expertise in geothermal development

Abundance of geothermal energy in Uganda

Geothermal energy is present everywhere beneath the earth's surface, although the highest temperature, and thus the most desirable, resources are concentrated in regions of tectonically active or geologically young volcanoes like in the western rift valley in Uganda.

Geothermal power is generated by using steam to turn a turbine-generator set to produce electricity. To date, geothermal energy has played virtually no role in Uganda's energy mix yet the potential of geothermal energy is vast.

Despite the abundant hydropower resources, there has historically been little development of the geothermal resource in Uganda. Fortunately however, the Ministry of Energy and Mineral Development has come up with the Renewable Energy and Geothermal Policy bill to help improve the utilization of the resource.

This was in consultation with all stakeholders and in collaboration with Climate Technology Center and Network (CTCN). This policy is expected to attract public and private investment in the geothermal sector.

The Assistant Commissioner for Geothermal Resources Mr. Vincent Kato says, if widely used, geothermal energy can play a major role in Uganda's energy sector.

"Several geothermal energy resource sites have been identified in Uganda. Slot of Geothermal Reservoirs have been indicated at Kibiro (Hoima) and Panyimur (Nebbi) and drilling is yet to be confirmed. The resource was estimated by J.R McNitt to be 450MW but could even be more. The development of 50MW geothermal power plant is equal to developing of 500,000 barrels of oil per year," Kato says.

Geothermal exploration surveys

There has been interest in geothermal exploration in Uganda since 1954 and although in recent years the question of security of energy supply has given the development greater impetus, a higher emphasis on the use of renewable energy generally needs to be instituted prior to further progress.

Government led exploration has resulted in accumulation of huge data sets which is spurring interest in geothermal development. In addition, Government is supporting Private developers in their early phase exploration activities.



Installing micro-seismic survey equipment in Kibiro, Hoima District

Benefits of geothermal energy

According to Kato, the use of geothermal steam for electricity production is a proven technology dating back in 1904 when the first demonstration was done in Italy.

"Geothermal energy is considered a renewable energy source because the heat emanating from the interior of the earth is essentially limitless. The interior of the earth is expected to remain extremely hot for billions of years, ensuring an essentially limitless flow of heat. Geothermal power plants capture this heat and convert it to energy, in the form of electricity," Kato says.

A secure and sustainable energy mix is one of the central challenges which Uganda faces in the years ahead, as the whole world responds to the challenges of climatic change, energy security and economic competitiveness.

Geothermal energy seems to be the answer; it is a major resource and potential source of low-emission renewable energy, suitable for base load electricity generation and direct use application.

Uganda's generation capacity is expected to more than double in the next four to five years after the completion of the 600MW Karuma hydro power plant and other power projects. It is also expected that power tariffs will drop from the current 11 cents per unit – the highest in the region.

Kato says, geothermal a versatile energy form as it can be used to produce power in utility scale facilities or for a wide variety of direct use applications such as spas, swimming pools, baths, heating green houses and dehydrating agricultural products," says Kato.

In addition to environmental benefits, the industry could also create jobs and boost local revenue through royalties and taxes.