

Policy Brief: Towards 100% Renewable Energy by 2050 for Uganda

1.0 Introduction

This Policy Brief is based on the Uganda 100% Renewable Energy Scenario and Plan by 2050 prepared by Uganda Coalition for Sustainable Development and the International Network for Sustainable Energy (INFORSE) as part of the *East African Civil Society for Sustainable Energy and Climate Action Project (2019 -23)*.

The Plan provides a general overview of the Ugandan situation regarding energy supply and demand, and presents a scenario for how Uganda can move into a 100% renewable energy economy in 2050 and also move from a lower income country into an upper middle income country while sustainably harnessing its biomass resources along with other renewable energy sources.

In the Plan, a basic analysis of the current total energy demand and supply patterns for Uganda is shown. Secondly a renewable energy scenario; universal access to modern energy services by 2030 (Sustainable Energy For ALL) is elaborated. Thirdly, a course of action is proposed which outlines how Uganda can contribute to the Paris Agreement's long-term temperature goal of reducing global greenhouse gas emissions by 2050 through its Nationally Determined Contributions (NDC).

Within Uganda's NDC, a focus on energy through introduction of improved biomass cook stoves and biogas is already highlighted. As part of securing a more ambitious NDC in line with the Paris Agreement, Uganda needs to take this to another level, through scaling up adoption of improved biomass cook stoves as well as their efficiency through Research and Development efforts.

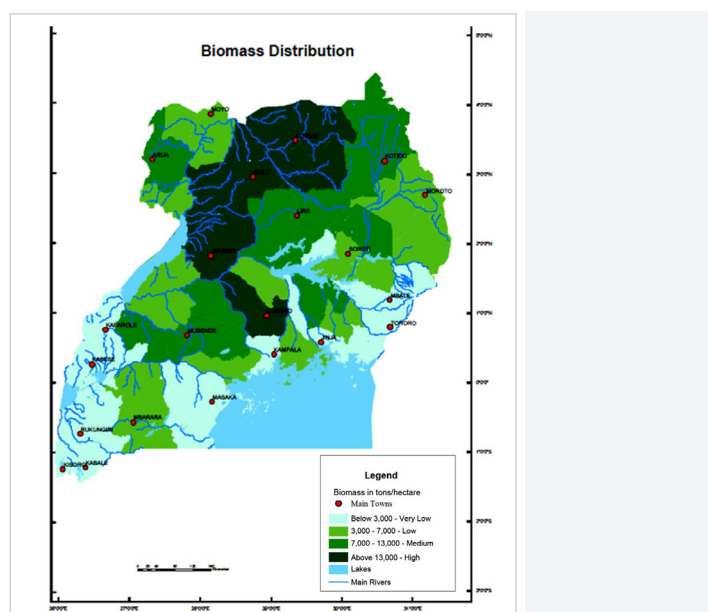
The Plan underscores that for Uganda, achieving universal energy access is as important as achieving a 100% renewable energy production target. It also recognizes that to be sustainable, the renewable energy solutions presented must address poverty and other social needs as outlined in Agenda 2030 / Sustainable Development Goals.

2.0 Energy Status in Uganda

Uganda is endowed with abundant Renewable Energy Sources that include biomass, water, geothermal energy, sun and wind. What is required is to fully utilize this potential to make renewable energy a driver and shaper of the country's economic transformation.

Energy Source	Estimated Renewable Electrical Potential (MW)
Hydro	4100 MW large and 400 MW small
Geothermal	1500 MW (large)
Biomass cogeneration	1650 MW (medium scale)
Solar	no practical limit, all scales
Wind	above 1000 MW (medium scale)

Fortunately, the transformation towards a 100% Renewable Energy system is already under way internationally. The last decade has seen the cost of renewable energy decline continuously, making it cost-competitive compared to conventional energy in many parts of the world. Since 2009, the module prices for solar photovoltaic (PV) have fallen by around 80%, while wind turbine prices have declined by 30-40%, making the business case for renewable energy stronger than ever before (IRENA, 2017).



Uganda's Policy direction is poised for a renewable energy Future. The Sustainable Energy for All (SE4All) goals for Uganda 2030 are: more than 98% of population with electricity access, more than 99% of population with access to modern cooking solutions, a yearly improvement in energy intensity by 3.5% and renewable share in final energy consumption for power to at least 90%. (Fische 2014).

Similarly, ambitions set in “Uganda Vision 2040” (NPA 2007) include increase in access to electricity services, improve natural resource management (e.g. forests, biodiversity, water resources), development of road and transport infrastructure. Also, one of the NDP III’s 18 programs is the Energy Development Programme: which aims to increase access to and consumption of clean energy.

Uganda, like the other East African countries faces some of the world’s most significant development hurdles — including poverty, high maternal and child death rates, and low rates of literacy and education. Lack of a grid connection or unreliable power supplies are underlying contributors to these challenges (WRI, 2019). Even those that are able to have access to electricity experience sporadic service provision which is also costly.

Hence, there is a need to exploit all the available energy sources to increase energy access for all Ugandans, since the country has one of the lowest electrification rates in Africa, with a current access rate of 28% (Draft Energy policy, 2019). In addition, there is low access to modern energy sources and services, e.g. solar home systems, LPG, biogas and improved cook stoves, for lighting, heating and clean cooking.

The reliance on biomass as a key source of energy has a negative impact on both the environment and people’s health. As of 2019, biomass contributed 88% of the total primary energy consumed through firewood, charcoal and crop residues; electricity contributes approximately 2%; while fossil fuels (oil products) account for 10% of the national energy mix (Draft Energy Policy, 2019). There is limited productive use of electricity especially in rural areas which negatively affects demand growth, affordability and uptake.

3.0 Future Energy Efficiency and Energy Demands

The Plan is a result of literature review, key informant interviews and **Energy Modeling (use of INFORSE’s spread sheet model for development of energy balances 2000 – 2050 and the Energy Plan model with analysis of variations hour by hour of energy flows and of costs for the years 2030 and 2040.**

The analysis considered four **main** demand sectors namely: **households, service sector, industry, and transport.**

Household cooking demands are today responsible for two-third of Uganda’s primary energy supply, including direct use of wood and other biomass, as well as charcoal production for cooking. Of the biomass demand, households are responsible for 90% of the demand for wood and residues, and also for two-thirds of the charcoal demands. While the cooking will increase with increasing population, there are large potentials to increase efficiency of cooking, thereby lowering the energy demand for cooking.

Electricity use is rapidly increasing in Uganda’s households, mainly with increasing wealth. With efficient lamps (as LED), electric light is possible with affordable levels of energy

consumption for many Ugandans. In addition to increased wealth, electricity is also replacing kerosene for light. At the same time, the efficiency of electricity use has increased with efficient lamps and efficient equipment.

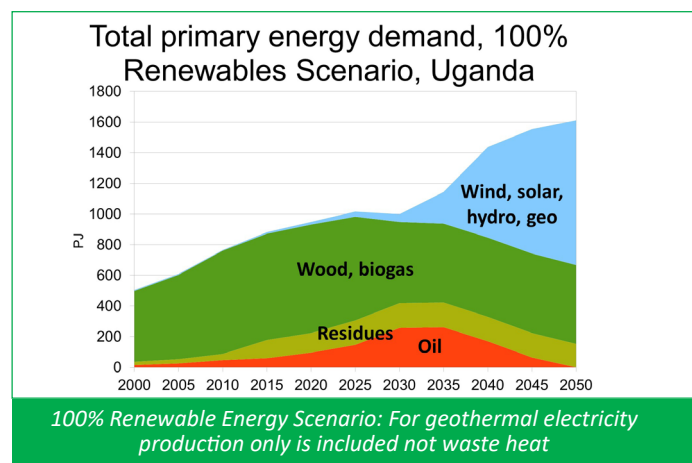
While the **cooking will increase with increasing population, there are large potentials to increase efficiency** of cooking, thereby lowering the energy demand for cooking. Whereas improvement of efficiency has already started with improved cook stoves, there are still large potentials for increasing the efficiency with massive dissemination of improved cook stoves, new, high-efficient cook stoves, super-efficient electric cooking, biogas, and more efficient charcoal production. This is considered in the 100% Renewable Energy Scenario

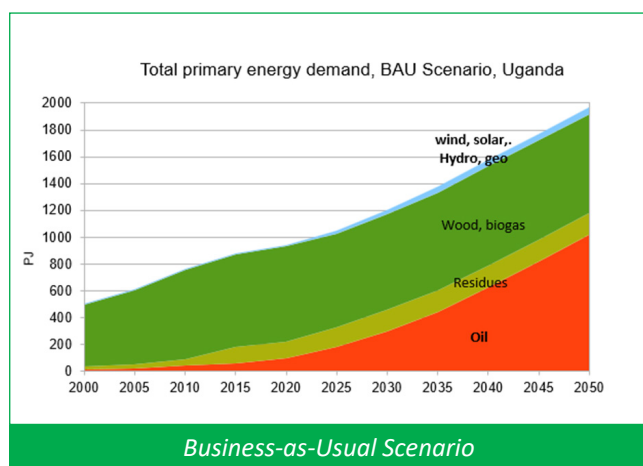
Regarding the development of the **service sector’s cooking demand**, we estimate that the growth in the service sector cooking demand follows growth in population and that the change to high-efficient electric cooking and high efficient biomass cooking follow the same patterns as in households for both Business As Usual and 100% Renewable Energy Scenarios.

The sustained **industrial growth** aspired to by the Vision 2040 will require steady energy supply and matching infrastructure investments. Several areas gazetted as industrial parks have limited or unstable electricity supply leading to suppressed demand in industries and inability to expand output and increase demand. There is generally inadequate financing of energy programmes and commercial banks have limited involvement in the provision of long-term lending for energy projects (Draft Energy Policy, 2019).

4.0 The Renewable Energy Use and the Scenarios

Both the 100% renewable energy in 2050 and the BAU scenarios are developed with the INFORSE model and the Energy Plan model. In the BAU scenario, fossil fuels in the form of oil continues to fuel the transport sector and increasingly the industry sector. Another larger difference between the 100% renewable energy scenario and the BAU scenario is that in the 100% renewable energy scenario, 25% of cooking is made with highly efficient electric pressure cookers in 2050, which is not the case in the BAU scenario. While in the BAU scenario, CO₂ emissions from fossil fuels (though small today) will continue to grow, in the 100% renewable energy scenario, they will gradually be reduced until 2050.





In the **Business as Usual (BAU)** scenario, use of renewable energy is only increased following existing plans while in the 100% renewable energy scenario, renewable energy supply is increased to meet demands (based on assumptions). In the current **100% Renewable Energy scenario (RE)**, this will only happen in 2050, but it could happen earlier, if a stronger implementation is included both in renewable energy expansion and in transitions in the energy demands towards electricity and energy efficiency.

5.0 Key Challenges to the attainment of 100% RE Scenario

Political will: if political will is low or is lacking, attainment of the 100% Renewable Energy Scenario remains in balance. The key question here is how the Government is committed to attainment of a Renewable Energy (RE) Future in the long run? For example, a steady allocation of public finance alongside private inflows will be needed to ensure an increase the share of renewable energy in the national energy mix for the country, in the run up to 2050.

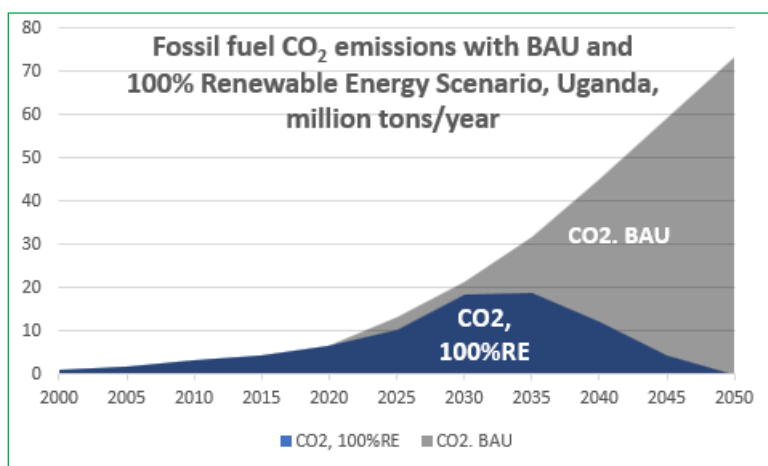
The Purchasing Power of Households: the purchasing power of households remains very low – according to the Centre for Development Alternatives domestic customers of electricity increased by 17% from 2015 to 2016 while electricity sales grew by only 5% during the same time. The low purchasing power of households is tagged to their income levels, economic issues requiring an economic solution.

Technological Challenges: Though rarely discussed, SID (2019), brings out this issue pointing out that East African countries still use 19th century models and are poised to industrialising using 20th century models just when the global energy system is changing to renewable energy base 21st century models.

Environmental Degradation: In Uganda the current rates of deforestation and Environmental Degradation are quite alarming. Reducing biomass use is key to stop this.

6.0 Policy Recommendations

We believe that this Plan is a crucial planning tool for Uganda to pursue in a low carbon energy development pathway.



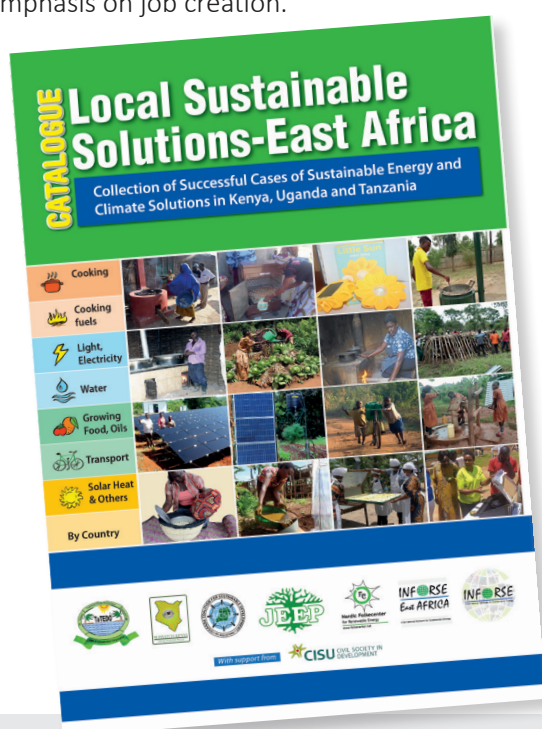
In the medium term perspective (up to 2030) it outlines energy demand and supply issues linked to the realisation of Sustainable Energy for All (SE4All) ambitions and Agenda 2030 (Sustainable Development Goals especially SDG7).

It will therefore be useful as a contribution to, among others, Uganda's Energy Policy review, the NDC enhancement and development of the Country's Long-Term Emission Reduction Strategies (LTS) that are underway.

In order for Uganda to move towards **100% RE by 2050**, there needs to be a supportive agency and structure, which requires the following:

1. Development of plans with a **multistakeholder approach** to get the 100% RE Plan implemented at all levels from the grassroots (Local Councils) to the national level
2. **Grassroots communities need to be involved and sensitised** from the initial stages of energy projects to increase their participation in and contribution to the projects, as well as minimise the potential of conflicts or rejection of the energy technologies.
3. **Foster an enabling environment for private sector to play the crucial role** of investing capital and other resources into the energy sector, producing and selling energy technologies and products, consuming energy and thus generating government revenue.
4. **Civil society including non-governmental organisations (NGOs), the media and community-based organisations, play a critical role** in creating awareness, disseminating information, and serving as intermediaries for communicating needs, expectations, capabilities and culpability between society, government and the private sector should be highlighted and enabled. Civil society is instrumental in ensuring that social, economic and political obligations are met and any shortcomings brought to the limelight. Civil society helps in developing, implementing, monitoring, evaluating and reviewing the socio-economic and environmental impacts of the energy sector plans and programmes.
5. **The role of media to publicize information and articulate issues on the energy sector** should be supported so that they enable the population to understand issues related to the energy sector and to communicate these objectively, clearly and accurately.

6. **Research organizations and academia should** keep abreast of research developments regionally and internationally, and adopt best practices that are customised for the local situation.
7. **Local governments should take full responsibility for close supervision and monitoring of energy projects.** They should take full responsibility for promotion and implementation of government energy programmes such as energy efficiency programmes. They shall coordinate and supervise all energy utilities working in their localities to ensure good service delivery to the community. Leaders need to regularly report back to communities on their efforts to promote RE as part of development plans (often there is a communication gap).
8. **Government, CSOs and other actors should incorporate a sustainability plan in tree growing** - based on management objective / purpose (indigenous trees, fruit trees for nutrition purposes, etc.).
9. **Explore funding options** including climate funding and carbon credits in tree growing and efficient stoves
10. **Central government should promote the efficient and sustainable use of energy in the country.** The government will create more favourable conditions for local enterprises to do energy business in the country including ensuring transparency and equity. For example, the legal and regulatory framework for developing energy activities and projects will be streamlined to attract more local private investors and operators, promote new energy projects and encourage innovative ideas.
11. **The Government should set up and ensure full implementation of standards for all energy systems, products and services.** It will ensure adherence to the standards for quality service.
12. **The Government should promote innovation and creative ideas in the energy sector.** It will enforce local manufacturing and appropriate fiscal policies promoting local manufacturing of systems and components, with emphasis on job creation.



13. **Development Partners should help the government through guidance and funding** to develop, implement, monitor, supervise and evaluate the policy.
14. **The Government should seek funding from development partners for specific programmes and/or projects** especially in areas less attractive to the private sector and complement self-help groups and private sector efforts in rural electrification projects.
15. **The development partners should be encouraged to provide or establish financial facilities for financing energy related projects at minimal interest rates** especially for renewable energy and energy efficiency projects.
16. **Multilateral agencies and processes need to focus on poverty reduction**, one way is through promotion of decentralised off-grid electricity in Uganda.
17. **Enable financial support to CSOs and other development partners to get the local solutions in more areas** (field demonstrations) across the country, especially interventions to counter the biomass over use.

7.0 Key References

- a) **INFORSE's Global Vision: 100 % Renewable Scenarios, Overview, Description, Brochure:**
<https://www.inforse.org/europe/VisionWorld.htm>
https://www.inforse.org/europe/pdfs/Vision_W_INFORSE_Poster.pdf
https://www.inforse.org/europe/pdfs/INFORSE_Brochure_Vision-2012.pdf
- b) **INFORSE's 100 % Renewables Scenarios in Africa**
<https://inforse.org/africa/Vision2050.htm>
- c) **Catalogue of Local Sustainable Solutions in East Africa:** <https://localsolutions.inforse.org/>
- d) **Uganda 100 % Renewable Energy Scenario and Plan by 2050, January 2023.** By Uganda Coalition for Sustainable Development:
https://www.inforse.org/africa/pdfs/PUB_Plan_for_100_Renewable_Energy_Scenario_Uganda.pdf
 & at UCSD: <http://ugandacoalition.or.ug/content/resources>

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