ACCELERATE UPTAKE OF SOLAR ROOFTOP SYSTEMS THROUGH PROVISION OF FINANCIAL INCENTIVES

TECHNOLOGY DESCRIPTION

TECHNICAL DESCRIPTION: TNA ENERGY MITIGATION

Solar rooftop systems consist of solar panels mounted on the roof of a residential or commercial building, which convert sunlight into electricity. It is the most suitable technology used in remote and rural areas, which are not served by the electricity grid. The system components include; PV panels, charge controller, inverter (to enable AC appliances or equipment to be operated), battery pack, mounting racks, Array DC Disconnect. These components, as well as the appliances operated by the solar rooftop, are interconnected by the balance-of-system components (cables, switches, plugs and installation material). In some cases, the electricity from a solar module can be used directly; in other cases, the energy must be stored. In big solar rooftop systems, it is often necessary to be able to convert the direct current produced by the PV module into an alternating current. Then there is need for a DC/AC converter. In the smaller PV systems, there is usually not a DC/AC converter. Very small systems often operate without a charge regulator.

Solar technologies perform better in regions and seasons with the highest sun intensity and long sunlight hours. Prior to the installation of a large number of solar panels, it is important to ensure a roof's structure is strong enough to hold their weight. Accessibility for maintenance should also be planned for. It is recommended that preventive inspections and maintenance be carried out every 6 to 12 months. Inspection includes checking for signs of damage, dirt build-up or shade encroachment. The crucial condition of PV applications is that the locations must be exposed directly to sunlight and are not shaded. The reason is that PV modules, crystalline silicon technologies in particular, are very sensitive to shading.. Preventive measures include periodic maintenance to clean the surface of the modules (e.g., accumulated dust and/or bird droppings). In the tropical regions, especially in the regions near the equator, flat-mounted PV panels provide the best yield. However, the flat-mounted PV panels will result in poorer self-cleaning performance and tend to accumulate dust, which in times causes shading to the cells and diminishes the system's outputs. A slight inclining angle of 3 to 5 degrees, to allow rainwater to be properly drained off and promote self-cleaning, is useful and acceptable (Climatetechwiki, 2020).

CURRENT TECHNOLOGY READINESS LEVEL OR COMMERCIAL READINESS INDEX

The current commercial readiness index for the solar technology in Uganda stands at level 4 – supported commercial. There are multiple commercial applications locally although some are still subsidized majorly by donors and Government. The subsidy is intended to reduce the high upfront costs that are required to acquire and install solar rooftop systems. High upfront costs were the major barrier identified that hinders the deployment and diffusion of this technology.

CLIMATE RATIONALE OF THE TECHNOLOGY

The average solar radiation is 5.1 kWh/m2/day and it is the renewable energy (RE) resource on the market with the highest adoption rate in Uganda. Existing solar data clearly indicates that the solar energy resource in Uganda is high throughout the year with a variation of only about maximum 20% (from 4.5 to 5.5 W/m2).

Opportunities within the solar PV sector are underlined by the government's ambitious target to increase electricity supply to 60% by 2025 (NPA, 2020) and 80% by 2040 (NPA, 2013). Most of the off-grid schools, health centers and households, who can afford use petrol or diesel generators to provide electricity to run their equipment and provision of light. These generators generate greenhouse gas emissions. The most appropriate mitigation option is use of solar energy. Uganda has an average more than 8 sunshine hours per day.

Solar energy is one of the clean mitigation technologies, which can be used to reduce on the greenhouse gas emissions that would otherwise be produced from combustion of fossil fuels in the non-electrified households, institutions and other commercial settings. Solar energy enables students to study at night for longer time in households and educational institutions, instead of using paraffin lanterns and wick candles, which generate smoke and soot while burning. Some Health centers use candles or kerosene lanterns in the maternity and other wards, which is an undesirable environment because these sources of light contribute to indoor air pollution within the health facilities. There are cases where candles burn schools when students use them to study when there is power failure or load shedding.

AMBITION OF THE TECHNOLOGY

SCALE FOR IMPLEMENTATION AND TIME-LINE

The ambition is to install 65MW of solar PV (assuming an average of 8 sunshine hours per day) represented by; 63 MW for 140,000 off-grid households, 0.9MW for 300 schools and 0.9MW for 200 Health Centers IIIs by 2030. Health Centre IIIs provide basic preventive, promotive and curative care and support supervision of the community and Health Centre IIs under their jurisdiction. There are provisions for laboratory services for diagnosis, maternity care and first level referral for the sub-county. According to Ministry of Health, a HC III serves about 20,000 people and should have about 18 staff, led by a senior clinical officer.

AMBITION FOR TECHNOLOGY READINESS LEVEL OR COMMERCIAL READINESS INDEX

The current commercial readiness index for the solar technology in Uganda stands at level 4 – supported commercial. The ambition for this technology anticipates accelerated uptake of solar roof top systems by the households, schools and health centres based on subsidies from Government and development partners.

EXPECTED IMPACTS OF THE TECHNOLOGY

- Attracting investments into the country hence increased economic growth
- Job creation for importers, distributors and retailers of solar rooftop systems and accessories; and those in the business value chain such as those involved in sourcing of components, assemblers and installers, marketing and sales and providers of after-sales services The implementation of solar charging stations provides opportunities for new businesses that are environmentally friendly. Solar lighting extends the workday and allows merchants longer time periods to sell their goods.

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  r considerations: Both men and women are engaged in the sale of solar rooftop systems
- Improved health due to the fact that the systems do not emit and can also be used to provide light in the rural off-grid health facilities
- Better education as students can learn for longer hours in the evenings
- Improved skills/capacity due to training opportunities especially for solar technicians
- Improved quality of lives due to increased information flow and entertainment in the homes (televisions, radios, phones)
- Increased home safety as it reduces fire hazards that would have resulted from using candles or kerosene lamps
- Improves the security and reduces crime, which occurs after nightfall.
- Reduced GHG emissions
- Reduced air pollution due to replacement of kerosene, diesel and other fossil fuels. PV systems create less pollution than traditional lighting sources and production impacts are far outweighed by environmental benefits, silent energy supply hence no noise pollution.

POLICY ACTIONS FOR TECHNOLOGY IMPLEMENTATION

EXISTING POLICIES IN RELATION TO THE TECHNOLOGY

1. The National Climate Change Bill, 2020
2. Third National Development Plan, 2020/2021 – 2024/2025
3. The Energy Policy Uganda 2002, revised 2019
4. The Uganda Green Growth Development Strategy 2017/18 – 2030/31
5. Uganda Vision, 2040
6. Uganda National Climate Change Policy, 2015
7. Uganda's Determined Contribution (NDC), 2015
8. Uganda Second National Communication to the United Nations Framework Convention on Climate Change, 2014

PROPOSED POLICIES TO ENHANCE TECHNOLOGY IMPLEMENTATION

1. Policy on provision of financial incentives such as tax exemptions and subsidies to off-set the high upfront costs which is a major deterrent to the deployment and diffusion of the technology.
2. Policy on institutional development in the solar sector to ensure strong institutional frameworks and proper coordination among stakeholders
3. Policy on skills development to build the capacity of the solar sector workforce
4. Policy and regulations for standards and quality of off-grid solar systems
5. Policy on innovation and technology to encourage local production of solar components; this is expected to reduce the high upfront costs

COSTS RELATED TO THE IMPLEMENTATION OF POLICIES

The ambition is to install 140,000 units of roof top solar systems in households, 300 units in schools and 200 units in Health Center IIIs in different parts of the country. The total of procurement of equipment and installation is USD 82,400,000 as stated in the barrier analysis. The costs related to implementation of the policies to achieve the ambition is USD 460,000.

USEFUL INFORMATION

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LINKS TO TNA REPORTS

https://tech-action.unepdtu.org/country/uganda/