



POLICY FRAMEWORK FOR SOLAR MINI-GRID PV SYSTEM IN LIBERIA

TECHNOLOGY DESCRIPTION

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The technology involves installation of 1000 kW grid tied PV system. In contrast to solar thermal electricity generation, solar photovoltaic electricity generation converts solar energy directly into electrical energy. The PV system uses numerous arrays of ground-mounted, fixed-tilt PV modules which directly convert incident solar radiation into DC electricity, which can then be inverted to AC. Each of the small solar units will produce more or less 1000 kW and may be suitable in off-grid areas for small communities as well as for commercial enterprises.

Solar PV mini-grids consist of a solar PV array for generating electricity, a battery bank for storage of electricity (in some business models), power conditioning unit consisting of charge controllers, inverters, AC/DC distribution boards and necessary cabling and local low-tension power distribution network. Moreover, this system produces no pollution to the environment.

CURRENT TECHNOLOGY READINESS LEVEL OR COMMERCIAL READINESS INDEX

The current Technology Readiness Level (TRL) for the solar mini-grid PV system in Liberia can be considered as TRL 1, 2, 3, 6 and 7. This TRL status of the solar mini-grid PV system covers the EU-HLG Technological Research (*pillar 1*) and the KET pilot line and demonstration projects (*pillar 2*). Below are the details / equivalence of the TRL *Technology Readiness Levels (TRL)*:

- *TRL 1 – basic principles observed*
- *TRL 2 – technology concept formulated*
- *TRL 3 – experimental proof of concept*
- *TRL 6 – technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies)*
- *TRL 7 – system prototype demonstration in operational environment*



CLIMATE RATIONALE OF THE TECHNOLOGY

The solar mini-grid PV system, like other technologies prioritized for mitigation is environmentally friendly as it contributes to the reduction of GHG emissions. Solar panels offset about 50 grams of CO₂ for every kilowatt-hour of power produced. The deployment of the technology will allow for quality supply electricity and ensure access by the people in poorer and remote regions. With new supply of electricity, and consequent access, it may be used for all kinds of economic and domestic uses including lighting.

The objective and target of the solar mini-grid PV system deployment is to increase access to electricity and reduce household use of wood, charcoal, and petroleum fuels.

AMBITION OF THE TECHNOLOGY

SCALE FOR IMPLEMENTATION AND TIME-LINE

The Technology Action Plan for the solar mini-grid PV system is to be implemented for a period of ten years (2021- 2031). It is highly recommended that, by the end of 2031, the TAP be reviewed and updated in accordance with the current/prevaling future situation, following a needs assessment and gap analysis. The scale of implementation is at the national level across the country. The activities of the technology will initially give priority to the most vulnerable communities.

AMBITION FOR TECHNOLOGY READINESS LEVEL OR COMMERCIAL READINESS INDEX

The current Technology Readiness Level (TRL) for the solar mini-grid PV system in Liberia can be considered as TRL 1, 2, 3, 6 and 7 which correspond to the EU-HLG Technological Research (*pillar 1*). The ambition for the deployment and diffusion of the solar mini-grid PV system in Liberia is to address the growing needs faced by the population regarding electricity nationwide and significantly help to reduce the country’s GHG emissions. It is expected and recommended that the TRL for solar mini-grid PV system by the target year of implementation to be at least TRL 6. *TRL 6 = technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies).*





EXPECTED IMPACTS OF THE TECHNOLOGY

Relatively, the deployment of solar mini-grid PV systems will have a positive impact on the lives of the population that are vulnerable to accessing electricity. There will be creation of jobs and the establishment of new enterprises. Additionally, the process of women’s empowerment will be better served as with new access to electricity. This will lessen their need to gather firewood and enhance security and safety conditions.

POLICY ACTIONS FOR TECHNOLOGY IMPLEMENTATION

EXISTING POLICIES IN RELATION TO THE TECHNOLOGY

National Disaster Management Policy of Liberia (NDMP, 2012) establishes an overall framework for disaster management in the country. It specifies an integrated risk identification and reduction process for the overall feasibility studies for establishing the various power plants. To implement this technology, it is proposed that capacity be built in the Energy Sector, with a focus on the deployment of solar mini-grid PV systems and an improved institutional and legal framework with a focus on Power Purchase Agreements, regulatory framework, and unbundling the energy sector.

The National Climate Change Policy and Response Strategy (NCCPRS, 2018) is meant to guide national climate change response measures. The strategy also outlines how to effectively integrate climate change issues into national development planning processes at the national, county, district, and local levels. Additionally, it lays out strategies and policies for adaptation and mitigation in key sectors of the country.

Nationally Determined Contribution of Liberia (NDC, 2021): The Liberia’s revised NDC is the nation’s 5 years commitment submitted to the UNFCCC in 2021. The NDC indicates Liberia’s commitment to climate change mitigation targets for nine key sectors: Agriculture, Forests, Coastal zones, Fisheries, Health, Transport, Energy, Industry and Waste; as well as cross-cutting targets for urban green corridors.



COSTS RELATED TO THE IMPLEMENTATION OF POLICIES

The capital cost of solar mini-grid PV system for Liberia for projects in the range 500 to 1000 kW range is estimated at US\$ 2,700/kW. The Rural Energy Strategy and Master Plan (RESMP) for Liberia until 2030 specifies renewable energy targets of 150 MW of grid generation capacity from renewables other than large hydropower and at least 60 MW of solar energy on the national grid.

USEFUL INFORMATION

CONTACT DETAILS

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LINKS TO TNA REPORTS

- 1) This link is Liberia's sub-page on the TNA website <https://tech-action.unepdtu.org/country/liberia/>
- 2) The following link is the Environmental Protection Agency of Liberia's website <https://www.epa.gov.lr/>
- 3) The next line is Liberia's Environmental Knowledge Management System website <https://ekmsliberia.info/>
- 4) The following link provides diversified information for the country <https://www.emansion.gov.lr/>