Malawi energy storage for demand response

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Malawi"s energy supply is dominated by biomass (firewood, charcoal, agricultural and industrial wastes) accounting for 84% of the total primary energy supply. The total installed electricity capacity is currently at 351 MW with around 98% Hydro on the shire river.

The country"s reliance on wood and charcoal use for cooking is highly unsustainable and has highly contributed to destruction of natural forests across the nation. This has led to increased siltation of the shire river thereby negatively affecting power generation.

Realizing that it is risky to have all power plants on one river and from one source, Malawi has plans to diversify its energy source to other sources like solar, wind, geothermal etc. Currently, feasibility studies for wind, solar, cogeneration and other potential hydro power sites on other rivers are in progress.

On top of this, the country has a remarkably low national electrification rate at around 10% as compared to her SADC counterparts. While electricity has reached almost 25% of urban households, rural electrification lies only at 5%. Roughly 85% of country"s total population still uses fuel wood for cooking.

In terms of electricity access rate, even though Malawi has one of the lowest electricity access rates in the SADC region, but nevertheless the access rate has been gradually rising over the last decade due to among other factors expansion of MAREP and the proliferation of other renewable energy technologies more especially solar. The table below shows the gradual increase in electricity access rate for Malawi from 2010 to 2018.

Furthermore, the current suppressed electricity demand is around 400 MW against the total generation capacity of 351 MW. The deficit in electricity supply is around 49 MW.

The Integrated Resource Plan (IRP) 2017 projects that the demand for electricity will increase to in excess of 800MW, 1200MW and 2500MW by 2020, 2025 and 2035 respectively as given in the figure below

In order to meet the growing demand for electricity in the country, the IRP 2017, sets out an optimal generation plan, with a mix of diverse sources of energy which among others includes the following: Kam"mwamba coal power plant-phase 1 & 2 (320MW) by 2020, Tedzani IV hydro power plant (163MW) by 2019 and Kapichira III hydropower plant (804MW) by 2020. The table below presents some power generation projects to be implemented from 2018 to 2022 as one way of meeting targets of the IRP in the short and medium term.

On the transmission front, the IRP recommends the following projects: constructing a (400kV) Mozambique -

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Malawi interconnector to enable both exports and imports of power, and a new double circuit 132kV overhead line from Nkhoma substation in Lilongwe via substations in Salima, Nkhotakota, Dwangwa to Chintheche substation in Nkhatabay.

Other projects include, energy efficiency projects, which are initiatives aimed at managing demand and reducing losses on the system. These efforts are also planned to be undertaken during the short, medium and long term implementation periods. It is envisaged that demand side management and loss reduction initiatives will save about 40MW.

In a similar vein, Government through ESCOM intends to address possible capacity challenges that may be caused by drought through diversification in alternative energy sources such as coal, solar, electricity imports and natural gas. The plan is to reduce the contribution from Hydro generation to less than 50% from the current 82% and secure the rest from alternatives sources such as coal, solar and imports.

In order to mitigate the demand-capacity gap, Government through ESCOM plans to mitigate the capacity shortage by implementing demand side management and energy efficient measures through provision of efficient lighting technologies, the banning of incandescent bulbs, tariff incentives and penalties for use of non-efficient equipment. It is estimated that a saving of around 80 MW will be achieved in the short term.