Central africa microgrid energy storage

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To achieve universal electricity access by 2030 as envisaged in the SDGs, 110 million connections are needed each year. Robust decentralised and off-grid solutions could play a pivotal role in bridging the electricity access gap, especially in areas of low density where grid expansion would be uneconomically expensive.

Microgrids offer several advantages over traditional main-grid technology. Traditional grid expansion cost up to ?17,500 per km for transmission presenting significant financial costs in areas of low density. To recover these costs, utilities often need to implement high tariffs, most of which are typically unaffordable for most rural households.

Microgrids provide an easier way of integrating renewable and cleaner energy sources into the energy landscape. Globally, fossil fuels still account for 80 per cent of the energy supply. Africa possesses a lot of potential from renewable energy sources. Solar power potential for example is estimated to provide the continent with 660,000 TWh of electricity a year. Microgrids can help harness some of this potential more easily and at a faster pace.

Reliability of microgrids, especially those based on renewable energy sources require investments in energy storage systems. However, despite costs relating to storage systems having gone down over time, they still present substantial initial and maintenance costs.

In addition, microgrids face challenges in attracting finance and investment due to their relative novelty and therefore limited examples of effective business models and higher perceived risk. As such, scaling of microgrids is challenging. Since microgrids tend to be geared at remote and underserved communities, ensuring sustainability requires a balanced mix between household users and productive users as well as access to infrastructure and financing for productive users to enable their sustainability.

The disposal of energy storage devices and other components has raised environmental concerns. Challenges associated with recycling devices like batteries can have adverse impacts on the environment. For instance, solar panels waste is projected to be 78 million tonnes by 2050 and can lead to the leaching of dangerous chemicals into the ground. Furthermore, land use for microgrid infrastructure such as wind turbines or solar panels can adversely impact local ecosystems and habitats.

Environmental regulations and standards that prioritise environmental concerns are key to development of environment-friendly microgrids. One way of incentivising safe disposal of solar panels is to place a fee on their purchase which would internalise the cost of safe removal and disposal. Channelling the disposal fee into a disposal fund managed by state or local government for recycling or removal of waste has been shown to be an economical solution in some contexts.

Addressing knowledge gaps through research can play a pivotal role in facilitating the expansion and scaling of sustainable microgrids but they offer a huge potential to meet Africa''s energy needs in a sustainable way.

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Note: The graph plots the number of people without access to electricity as of 2022. In 2022, 80% of the people without access to electricity lived in sub-Saharan Africa. Source: IEA, 2022

To achieve universal electricity access by 2030 as envisaged in the SDGs, 110 million connections are needed each year. Robust decentralised and off-grid solutions could play a pivotal role in bridging the electricity access gap, especially in areas of low density where grid expansion would be uneconomically expensive.

Microgrids offer several advantages over traditional main-grid technology. Traditional grid expansion with costs ranging from US$ 19,000 to US$ 22,000 per km for transmission and US$ 9000 per km for distribution, grid expansion pose significant financial costs in areas of low density. To recover these costs, utilities often need to implement cost-reflective tariffs, most of which are typically unaffordable for most rural households.

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