

POWER FOR ALL RESEARCH SUMMARY

US\$220 billion needed to build mini-grids for half a billion people



19,000

NUMBER OF MINI-GRIDS
GLOBALLY IN 2019

210,000

NUMBER OF MINI-GRIDS BY
2030

\$220 billion

MINI-GRID INVESTMENT
NEEDED TO ACHIEVE SDG 7

The World Bank's Energy Sector Management Assistance Program (ESMAP) recently conducted the most comprehensive mini-grid study to date, based on a large data set of 19,000 mini-grids globally, providing much needed data and insights on electrification pathways, costs, profit potential, financing and policy implications. Mini-grids are defined by ESMAP as power generation and distribution systems of various sizes and energy sources that are providing electricity to multiple customers. This research summary highlights key mini-grid learnings from the ESMAP report.¹

The mini-grid industry presents not only a number of investment worthy market opportunities, but is also key to achieving SDG 7.

- » Globally, there are at least 19,000 mini-grids installed, 61% of which are in Asia, representing a cumulative global investment of US\$28 billion, and providing electricity to 47 million people. In Africa and South Asia, there are 11,000 mini-grids connecting 31 million people, representing an investment of US\$5 billion. (5)
- » A further 7,500+ mini grids are planned to go online over the next couple of years, mostly in Africa, connecting more than 27 million people through an investment cost of US\$12 billion. These planned systems show significant shift from diesel to solar-hybrid using the latest technologies. (5)
- » Even with these positive trends, according to the World Bank achieving universal access to electricity will require the construction of more than 210,000 mini grids, mostly solar-hybrids, by 2030, connecting 490 million people at an investment cost of almost US\$220 billion. (48,49)

Mini-grid cost dropped by more than half between 2010–18 and is the least-cost option for rural electrification for half a billion people. If this trend continues, mini-grids deployed between 2018–30 globally could bring US\$3.3 billion of annual profit for developers by 2030.

- » Mini-grid capital costs dropped from US\$8,000/kW in 2010 to US\$3,900/kW in 2018. Projection shows that by 2030, the upfront investment cost of solar-based mini-grids could drop below US\$3,000/kW. (6)
- » Current connection cost for mini-grids is between US\$1,000 to US\$2,100 per connection, which is already competitive with the average unsubsidized cost of US\$2,000 per connection to expand national grid in rural Africa. (8)
- » Mini-grid levelized cost of electricity (LCOE), which accounts for capital expenses, operating expenses, generation and consumption load profile, useful lifetime and other macroeconomic parameters, can be reduced by as much as 60% by 2030 to US\$0.20/kWh. This is lower than the average cost-reflective tariff of US\$0.27/kWh in sub-Saharan Africa. (13,17)
- » Current tariff of mini-grids is US\$0.45/kWh, with an annual profit of US\$28 million in 2019. By 2030, the tariff will be able to drop to US\$0.26/kWh with an annual profit of US\$608 million. (27)
- » Performance-based grants equivalent to 40% of total estimated connection costs would enable the developers to charge a tariff 11–22% less than their unsubsidized LCOE. The sum of these result-based financing is often still less than the subsidy that national utility receives. (8,45)

Private-sector participation is strong in mini-grid development. National energy planning using geospatial analysis, friendly regulatory environment, and strong human capital are needed for mini-grid take-off.

- » There is a strong private-sector participation in the mini-grid value chain due to high profit potential. The mini-grid industry created US\$512 million of profit along its value chain in 2019, and this will reach US\$4.7 billion by 2030. (26,30)

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By the Numbers:

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- » Geospatial analysis can not only help identify least-cost electrification pathways but also support mini-grid developers to manage their portfolio of systems. (30,31)
- » Cost-based tariff, performance-based grants, simplified permitting processes, and compensation for grid-arrival are key measures to create an enabling regulatory environment for mini-grids. (33,36)
- » ESMAP has identified 50 training programs for mini-grids. Identification of skill gaps in the sector is critical for early-stage program design. (38)

210,000

NUMBER OF MINI-GRIDS BY
2030

Financial commitment from development partners are strong. Innovative financing, grants and subsidies are important means to close the financial viability gap.

- » To date, US\$28 billion has been invested in mini-grids globally, among which US\$5 billion was in Africa and South Asia and US\$259 million was in private-sector mini-grid developers. (2,27,42)
- » Donor support is taking up 10% of total planned investment globally. A group of 15 major international development partners have committed more than US\$1.3 billion of investment; the World Bank alone committed more than US\$660 million over the next 5 years, which is expected to leverage US\$1.1 billion in cofinancing. (8,9)
- » Innovative financing options are emerging, including equity crowdfunding, convertible loans (loans that can be turned into shares), socially oriented equity investment and peer-to-peer lending. (43)
- » Performance-based subsidies for mini-grids help lower the cost of electricity and are often the cheaper option than subsidized cost of grid electricity that varies between 40–80% of the connection cost. (44)

\$220 billion

MINI-GRID INVESTMENT NEEDED
TO ACHIEVE SDG 7

Share the Message

- » 47 million people globally are connected to 19,000 mini-grids to date. Achieving SDG 7 will require construction of more than 210,00 mini-grids at an investment cost of almost US\$220 billion.
- » Mini-grids are shifting from diesel to solar-hybrid. The majority of 19,000 mini-grids built to date are diesel-based, however most planned and projected mini-grids will be solar-hybrids.
- » Mini-grids are the least-cost electrification options for 490 million people by 2030. Performance-based subsidies are needed for mini-grids to deliver electricity service at an affordable tariff.

Sources:

1. "Mini-grids for half a billion people: Market outlook and handbook for decision makers" ESMAP. June 2019.