ENERGY CATALYST

INSIGHT: Trends in technical approaches to universal energy access

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Energy Catalyst accelerates the innovation needed to end energy poverty. Through financial and advisory support, and by building strategic partnerships and uncovering new insights, Energy Catalyst supports the development of technologies and business models that can improve lives in Africa and Asia. Energy Catalyst is an Innovate UK programme with co-funding from the Foreign, Commonwealth and Development Office, Global Challenges Research Fund, the Department of Business, Energy and Industrial Strategy and the Engineering and Physical Sciences Research Council. This material has been funded by UK aid from the UK government; however, the views expressed do not necessarily reflect the UK government's official policies.

This insight piece explores the trends in different countries' technical approaches to universal energy access and their likely impact on the UN's SDG 7 goals. It provides a snapshot of research undertaken with the co-operation and input of Energy Catalyst portfolio companies, as well as a range of interviews with other key market players.

United Nations Sustainable Development Goal 7 (SDG 7) aims to provide access to affordable, reliable, sustainable and modern energy services for all by 2030. National approaches towards achieving SDG 7 differ due to a multiplicity of factors. Energy Catalyst Accelerator Programme (ECAP) research highlights five trends that are shaping the diverse approaches to universal energy access.

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The Five Key Trends

1. Off-Grid Distributed Renewable Energy (DRE): Filling the Gap

- In the past 10 years, off-grid DRE has grown into a viable alternative to grid connection and is now considered a key component of achieving SDG 7 by 2030.
- The overwhelming majority of new electricity connections since 2000 have been through the main grid. However, 6% of total new connections from 2010-17 were from off-grid and mini-grid systems and off-grid technologies are projected to be the least-cost option for 71% of rural connections to meet SDG 7 by 2030 (IEA 2017, Lighting Global 2020).
- Key factors for this market share include recognition of the potential of off-grid DRE, technological developments, cost decreases, and innovative financing models.

2. Data, Data, Data

- Improved data collection methodologies and technologies have increased capacity for energy access planning. Developing and deploying these strategies will be key to achieving SDG 7 by 2030.
- Analytical tools such as the Multi-Tier Framework (https://mtfenergyaccess.esmap.org/) and developments in geospatial technology have enabled better identification of energy access gaps and design of energy access interventions.
- These tools have been utilised by countries to create much more in-depth, targeted energy access plans.

3. Regulations, Policies and Electrification Plans: Towards Integrated Approaches

- The right regulatory and policy frameworks are crucial to plans for reaching universal energy access; without the right regulatory frameworks, for both electricity access and for clean cooking, countries will struggle to meet targets.
- Despite increases in recent years in the number of countries with advanced policy frameworks for energy access, progress is patchy across countries.
- Integrated energy access pathways advocating more comprehensive, data-driven, inclusive approaches have become more common in recent years.

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4. Under-the-Grid

- Under-the-grid customers may appear connected to electricity but in fact either have no power at all or unreliable, inconsistent, and/or low-quality power that means they are not truly benefitting from electricity access.
- The issue of under-the-grid customers is a challenge for efforts to reach SDG 7. Solutions include better data and new business models.

5. Beyond Households: Institutions and Productive Use

- Providing energy access for institutions and productive users (PU) is crucial. The segmented market and wide variety of approaches and technologies for providing energy access presents logistical challenges.
- The importance of energy access to other development goals provides added impetus for governments and institutions.
- The current market for off-grid DRE for institutions and PU is nascent and fragmented but will likely develop in the coming years.

Major Challenges

There have been significant steps forward in technical approaches to energy access in the past ten years, but there are some major challenges that need to be overcome in order to reach SDG 7 by 2030.

- **Finance** - current projections estimate that at least $52 billion USD of investment, from governments, private sector and international donors, will be required per year. Only half has been committed and only 1.3 percent of this investment is in off-grid solutions (Wood Mackenzie et al. 2019). This number will need to increase rapidly if off-grid DRE growth is set to achieve targets.
- **COVID-19** – the impact on government finances, donor funding and consumer finances is likely to have a negative effect on efforts to reach SDG 7 by 2030. The pandemic could even result in a reversal of electricity connections for the first time in a decade (IEA 2020).
- **Clean cooking** – under current projections universal access to clean cooking will fall short of SDG targets by 30% in 2030. Whilst access has increased in Eastern and South-Eastern Asia, in sub-Saharan Africa population growth and stagnant access rates mean that the number of people without access is rising (IEA et al. 2020).
- **Global Regional Variation** – for electricity access 70% of the total global access deficit is in sub-Saharan Africa; for clean cooking South Asia, Eastern and South-Eastern Asia and sub-Saharan Africa contain the majority of the global access deficit (IEA et al. 2020).

- **The Rural-Urban Divide** – for electricity access, global urban connection rates are nearly universal; by contrast, rural areas have 85% of the global electricity access deficit. Similarly, for clean cooking; 83 % of urban households have access to clean cooking compared to 37% in rural areas (IEA et al. 2020). It is crucial that these gaps are bridged to meet universal energy access targets.

Further Reading

Overall Energy Access Trends:

IEA,IRENA, UNSD, World Bank, WHO, 2020, 'Tracking SDG 7: The Energy Progress Report', https://trackingsdg7.esmap.org/

Energy Sector Management Assistance Programme (ESMAP), 2020, 'The State of Access to Modern Energy Cooking Services', http://documents1.worldbank.org/curated/en/937141600195758792/pdf/The-State-of-Access-to-Modern-Energy-Cooking-Services.pdf

Lighting Global, 2020, 'Off-Grid Solar Market Trends', https://www.lightingglobal.org/wp-content/uploads/2020/05/VIVID_OCA_2020_Off_Grid_Solar_Market_Trends_Report_Full_High-compressed.pdf

Off-grid/Data:

60 Decibels, 2020, 'Why off-grid energy matters', https://60decibels.com/energy-report

Davies G, Phillips J and Plutshack V, 2020, 'An off-grid energy future requires learning from the past', https://www.brookings.edu/blog/future-development/2020/05/04/an-off-grid-energy-future-requires-learning-from-the-past/

Regulations:

SEforAll, 2019, 'Integrated Electrification Pathways for Universal Access to Electricity: A Primer', https://www.seforall.org/system/files/2019-06/SEforALL_IEP_2019.pdf

Under the Grid:

International Finance Corporation (IFC), 2019, 'The Dirty Footprint of the Broken Grid', https://www.ifc.org/wps/wcm/connect/2cd3d83d-4f00-4d42-9bdc-4afdc2f5dbc7/20190919-Full-Report-The-Dirty-Footprint-of-the-Broken-Grid.pdf?MOD=AJPERES&CVID=mR9UpXC

Productive Use:

Lighting Global, 2019, 'The Market Opportunity for Productive Use Leveraging Solar Energy (PULSE) in Sub-Saharan Africa', https://www.lightingglobal.org/wp-content/uploads/2019/09/PULSE-Full-Study.pdf

Other interesting reading:

International Energy Agency (IEA), 2020a, 'The Covid-19 crisis is reversing progress on energy access in Africa', https://www.iea.org/articles/the-covid-19-crisis-is-reversing-progress-on-energy-access-in-africa

Clean Cooking Alliance, Clean Cooking Alliance to Develop First Geospatial Data Platform for Clean Cooking in Partnership with World Resources Institute, https://www.cleancookingalliance.org/about/news/03-09-2021-clean-cooking-alliance-to-develop-first-geospatial-data-platform-for-clean-cooking-in-partnership-with-world-resources-institute.html

Energy Access Explorer Tool, https://www.energyaccessexplorer.org/

Global Electrification Platform, https://electrifynow.energydata.info/

RISE Database, https://rise.worldbank.org/scores