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Approach Paper

An Evaluation of the World Bank Group's Support to Electricity Access in Sub-Saharan Africa, 2015–24

February 19, 2025

1. Background and Context

1.1 This evaluation assesses the World Bank Group's contributions to supporting electricity access in Sub-Saharan Africa during 2015–24. Electricity access is an end user's ability to use an energy supply for the desired energy services. As such, electricity access includes both supply and demand factors.[1] This evaluation follows a 2015 Independent Evaluation Group (IEG) evaluation on the same topic (World Bank 2015) but focuses on Sub-Saharan Africa because the main electricity access gaps remain in that Region, and the Bank Group has renewed efforts to close the gap by 2030.

1.2 Increasing reliable, sustainable, and affordable access to electricity is essential to improving human welfare and boosting productivity. Access to electricity enables transformative changes in education, health care, clean water, communication, financial services, and income generation while enhancing security and reducing poverty. Providing access to reliable, sustainable, and affordable energy is a step in creating the conditions for a world free of poverty, increasing productivity, and supporting economic development (Bhatia and Angelou 2015).

1.3 Electricity access is provided by expanding the electricity grid or through off-grid means. The conventional electricity grid consists of networked generation, transmission, and distribution facilities typically managed by public utilities. Off-grid electrification is provided through decentralized network systems (minigrids) and individual systems, typically offered and managed by private sector power system operators (operators). Minigrids can power lights and appliances for several households, small institutional users, or small businesses. They can additionally provide power for activities such as water pumping, milling, grinding, and other forms of processing. Individual systems are usually solar home systems (SHSs), ranging from household-size systems that can power a few light bulbs, a fan, and a radio or a small television to larger-size systems. Although current technology allows for more powerful SHSs, they are still too expensive for households in Sub-Saharan Africa. Different technologies have different impacts on welfare and economic growth.

1.4 More than four out of five people worldwide without electricity access live in Sub-Saharan Africa. Although the share of the world's population without access to electricity fell from 13 percent in 2015 to 9 percent in 2022,[2] there were still 688 million

people without access in 2022. Of these, 588 million (85 percent) live in Sub-Saharan Africa. The share of the population without access is 49 percent compared with about 7 percent in other Regions (table 1.1).

Table 1.1. Population Without Electricity Access, by Region

	Share of Population Without Access (%)		Population Without Access (millions)
Region	**2015**	**2022**	**2022**
Sub-Saharan Africa	61	49	588
East Asia and Pacific	3	2	42
South Asia	13	2	33
Middle East and North Africa	3	3	13
Latin America and the Caribbean	3	1	9
Europe and Central Asia	1	0	0
All	13	9	688

Source: World Development Indicators.

1.5 Sub-Saharan Africa has by far the largest number of countries with low electricity access; several of them are countries affected by fragility, conflict, and violence. In 2022, there were 13 countries in Sub-Saharan Africa with low access (more than 25 percent and less than 50 percent of the population having access) and 8 countries with very low access (less than 25 percent of the population having access), as shown in table 1.2. In contrast, there is at most one low-access country in each of the other Regions. Of the top 20 countries in terms of population without access, 16 are in Sub-Saharan Africa and 11 are countries affected by fragility, conflict, and violence (see table A.1 for more details).

Table 1.2. Countries with Low and Very Low Electricity Access (number)

	Low Access[a]		Very Low Access[b]	
Region	**2015**	**2022**	**2015**	**2022**
Sub-Saharan Africa	15	13	15	8
Other Regions	2	1	3	3

Source: World Development Indicators.
Note: a. A country with low access is one in which more than 25 percent and less than 50 percent of the population has access to electricity.
b. A country with very low access is one in which 25 percent or less of the population has access to electricity.

1.6 In addition, there is a wide urban-rural divide in electricity access in Sub-Saharan Africa. Approximately 60 percent of the population in the Region lives in rural communities. As of 2022, the proportion of residents without electricity access was 69 percent in rural areas compared with 19 percent in urban areas—far higher than in any other Region. As an illustration, less than 5 percent in rural areas in Senegal had

access compared with 55 percent in urban areas (IEA et al. 2023). See table A.2 for more detailed information.

1.7 Sustainable Development Goal (SDG) 7 captures the global agenda for achieving universal electricity access. This goal aims to ensure access to affordable, reliable, sustainable, and modern energy services for all by 2030 (UN 2015). The indicator for electricity access under this SDG is the "proportion of population with access to electricity" (SDG indicator 7.1.1; UN 2017, 11).

1.8 Electricity access and its attributes are defined in terms of the Multi-Tier Framework (MTF). The MTF distinguishes five access levels (tiers) based on end-user electricity supply availability (ESMAP 2024). The expectations for service duration (or adequacy) and reliability increase from 4 hours a day for tiers 1 and 2 (task lighting, cell phone charging, radio and television, and small appliances) to 23 hours a day for tier 5 (all uses, including refrigerators, power tools, and other heavy appliances). See appendix B for more details about the MTF for electricity access.

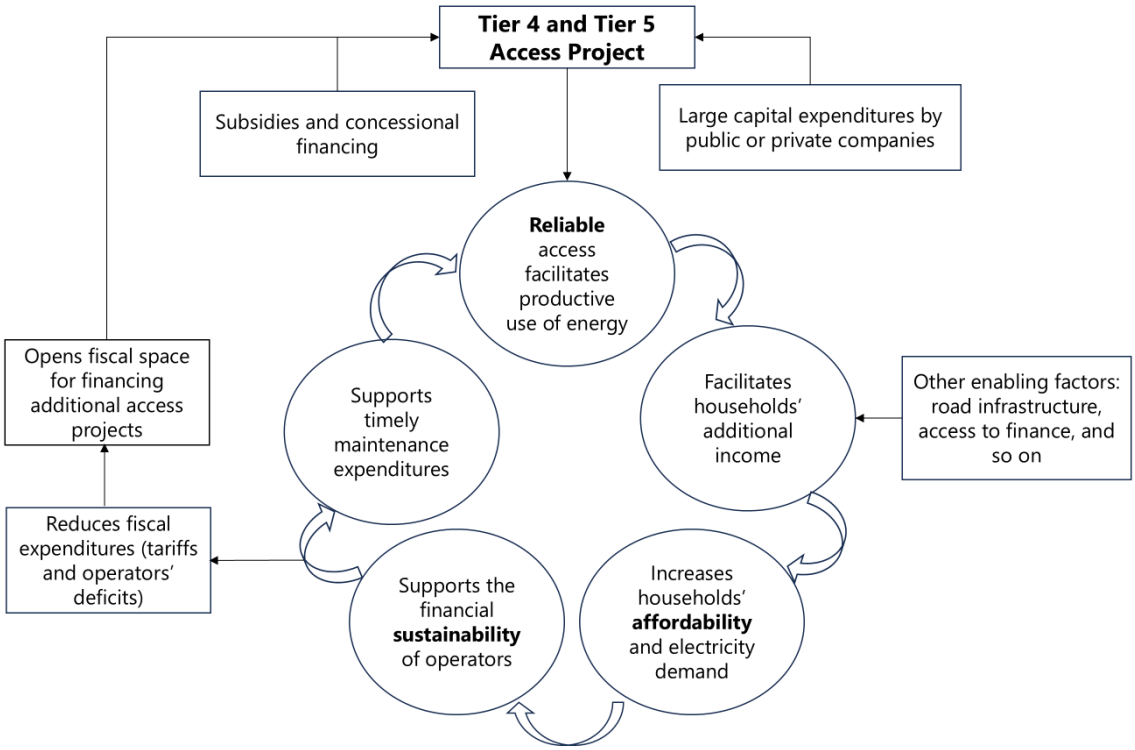
1.9 Increasing electricity access over time requires providing reliable, sustainable, and affordable electricity. Because MTF tier 4 and tier 5 electricity access projects involve significant capital and operational investments to provide electricity to end users whose energy service demand is potentially low, they require long maturities to become financially sustainable (figure 1.1). Low demand is a consequence of households' financial constraints, but providing reliable and affordable electricity—together with other enabling factors, such as road infrastructure and access to finance—helps make it possible for them to use energy to generate additional income (Balboni et al. 2024; Blimpo and Cosgrove-Davies 2019; Selod et al. 2024).[3] Household additional income increases affordability and boosts electricity demand. As operators' business models become financially sustainable and electricity tariffs increasingly reflect the cost of producing electricity, companies have the resources to invest in operations and maintenance, thus ensuring reliable electricity. At the same time, governments have additional fiscal space to support other electricity access projects, offering hope for the future of these initiatives.

1.10 Although earlier literature claimed a clear link between electrification and economic development, recent empirical evidence in rural communities in Sub-Saharan Africa and India suggests that the impact is weaker. Older literature claims a clear link between electrification and economic development (Kline and Moretti 2014; Lipscomb et al. 2013; Rud 2012). Some of the literature is based on the experiences of countries such as the United Kingdom and the United States (Crafts 2004; Jorgenson 1984; Lucas 2002). Using cross-sectional analysis, Barnes et al. (2010) find positive effects of electrification on reducing poverty in rural Bangladesh. More recent experimental and quasi-experimental

studies, however, find less pronounced effects of electrification on welfare and economic impact (Ankel-Peters et al. 2024, 2025; Burlig and Preonas 2022; Moore et al. 2020). In an experimental randomized expansion of grid electricity in rural Kenya, Lee et al. (2020b) find low consumption from newly connected households and no meaningful impacts on health and education outcomes.[4] This issue is also noted by Burgess et al. (forthcoming) in a study in rural India, where households have low valuations on improvements in the quality of electricity supply. Lee et al. (2020a) argue that the greater gains from access in these programs likely concentrate on more affluent households, further increasing economic inequalities. This literature suggests that complementary programs may be instrumental in boosting the economic impacts of electrification. While most rural electrification impact evaluations provide evidence for short horizons, some literature on longer-term impact also finds weak links between rural electrification and consumption and income. For example, Masselus et al. (2024) and Peters et al. (2011) look at the effect of electrification in rural areas in Rwanda and Benin with 7- to 10-year horizons and also find modest effects on consumption and productivity.

1.11

Figure 1.1. Impact Pathways of Multi-Tier Framework Tier 4 and Tier 5 Electrification



Source: Independent Evaluation Group.

1.12 MTF tier 1 and tier 2 electrification projects can support achieving SDG 7. MTF tier 1 and tier 2 electrification offers limited service but nevertheless contributes to SDG 7. Tier 1 and tier 2 electrification, commonly offered with SHS, provides cost-effective solutions that facilitate fast deployment of electricity in rural and remote areas and involve lower capital and operational expenditures compared with the grid and minigrid technologies. The literature also acknowledges that the electricity demand for most newly connected households can be satisfied by MTF tier 1 and tier 2 electrification (Ankel-Peters et al. 2024). It is an empirical matter whether lower tiers of electrification provide an engine for generating additional income for households. How the different MTF tiers of electrification play out during implementation depends on policy options, varies by country, and is dynamic in space and time.[5]

1.13 In many low-access countries, grid and off-grid rollouts have been delayed because of a cycle of weak financial performance of many power utility companies and inadequate regulatory frameworks to attract private sector investors. Electricity access in many countries has stalled or advanced at an unpredictable pace on account of shortcomings in one or more sector readiness conditions, such as national commitment to scale toward universal access, governance, institutional framework, capacity, sustained follow-through, accountability, on-and-off rather than programmatic finance, and insufficient regulatory frameworks to support bankable energy access projects for the private sector to finance.

1.14 Closing the large investment gap for access scale-up will require client country resources and developmental finance to be supplemented by greatly increased private sector participation. The financing gap for Sub-Saharan Africa to reach SDG 7 access goals is estimated to range from US$35 billion to US$50 billion annually.[6] Rozenberg and Fay (2019) estimate the cost of universal electrification between 0.7 percent and 1 percent of the region's GDP per year between 2015 and 2030, with the difference explained by the MTF service tier targeted. Although some share of this gap can be filled by concessional development finance from multilateral and bilateral sources, the largest share will need to come from private sector sources (IEA et al. 2023). Most low-access countries need improvements in policy and regulation, risk management, concessional capital, and local currency markets to incentivize and mobilize private sector investment (IEA et al. 2023).

2. Evolution of the World Bank Group's Electricity Access Agenda

2.1 The Bank Group's support for electricity access in client countries was articulated in the lead-up to the SDGs (2015), which was followed by systematic engagement in several low-access countries. The report "Toward a Sustainable Energy Future for All: Directions for the World Bank Group's Energy Sector" outlined its future sector

directions and initiatives to improve electricity access (World Bank 2013). Since then, the Bank Group has supported elaborating national electrification plans (NEPs) in several countries, with assistance in developing geospatial least cost electrification plans. These plans have been followed by sectorwide access scale-up projects and programs in several client countries in Sub-Saharan Africa, including Burkina Faso, the Republic of Congo, Eritrea, Ethiopia, Kenya, Madagascar, Malawi, Mozambique, Uganda, and Zambia (World Bank 2020a). Several transmission and distribution Bank Group projects have included components for access to new beneficiaries. The Bank Group has also pioneered technical assistance programs for electricity access, including the Lighting Africa program and its successor, the Lighting Global program (Lighting Global 2024).

2.2 The Bank Group monitors progress in electricity access through its new Corporate Scorecard. The Bank Group Corporate Scorecard FY 2024–30 defines electricity access as millions of individuals provided with access to electricity. Bank Group interventions affect access directly or indirectly. Direct interventions are downstream investments that expand power distribution and result in a measurable number of connections. For example, Bank Group interventions that support households' access through minigrids directly affect electricity access. Indirect interventions are upstream investments—including increases in generation capacity, transmission line reinforcements, and intraregional power trade—that allow expanding the distribution network. For example, the energy generated by a new wind farm supported by the Bank Group is expected to create additional power to allow the electrification of new communities.[7] The Corporate Scorecard monitors access with three indicators: (i) people directly provided with access to electricity through new connections, (ii) people provided with inferred electricity access,[8] and (iii) people provided with improved electricity service. The first indicator relies on a project's results framework; the other two are model-based calculations performed by global reporting teams (World Bank 2023a).

2.3 Increasing energy access in Sub-Saharan Africa is an important Bank Group priority. Energy access is a major component of the Bank Group's Global Challenge Program (energy transition efficiency and access)—a new initiative to accelerate and scale private and public sector solutions as One World Bank Group to respond to countries wrestling with global challenges. *Tracking SDG7: The Energy Progress Report 2024* finds that recent progress is not on track to reach the SDG 7 target of universal electricity access by 2030 (IEA et al. 2024). At the April 2024 Bank Group–International Monetary Fund annual meetings, the presidents of the Bank Group and the African Development Bank declared electricity access a priority and set a goal of covering 300 million people in Sub-Saharan Africa by 2030 (World Bank 2024a), which has subsequently been called Mission 300. At the Meeting of African Heads of State and

Government on April 29, 2024, to support the 21st Replenishment of the International Development Association, energy access was declared a top priority (World Bank 2024b). The Bank Group has recently announced two major access scale-up programs for Sub-Saharan Africa.[9]

3. Rationale and Objective of the Evaluation

3.1 This evaluation responds to concerns expressed in many policy and development forums regarding the slow progress toward electricity access scale-up in Sub-Saharan Africa. It is also intended to inform the Bank Group's recently announced programs.

3.2 Most evaluative work on electricity access has focused on connectivity rather than reliability, sustainability, or affordability. Measuring access by counting the number of connections (connectivity) provides a single angle on a complex problem. Less work has attempted to assess the extent to which Bank Group–supported projects aimed at increasing grid access have mitigated the risk of affecting the reliability of the network, supported the financial sustainability of the utility company, and ensured that households can afford the electricity and reap its benefits in terms of welfare and productivity. Studying these outcomes is timely as the Bank Group prepares to scale up its electricity access agenda in Sub-Saharan Africa. Specifically, as the Bank Group continues supporting NEPs, it is important to assess the extent to which they consider reliability, sustainability, and affordability outcomes.

3.3 Although the Bank Group has supported countries' public investments in energy access in Sub-Saharan Africa for decades, it is also timely to assess its contributions aimed at attracting private sector investments in electricity access. Expanding access through private sector off-grid operators has a different set of complexities compared with doing it through grid public utility companies. Some of these business models, especially in the case of minigrids, require significant subsidies with amounts in the range of 50 percent of the total capital expenditures. The Bank Group has an important role in ensuring that these resources improve households' welfare. These resources can be optimized by supporting fair bidding processes for connection sites and sound regulatory and supervisory frameworks that encourage more potential bidders to participate.

3.4 This evaluation also provides an opportunity to learn from the Bank Group's efforts in operationalizing the recommendations from the 2015 IEG evaluation of Bank Group support for electricity access. The 2015 evaluation covered FY00–14 (World Bank 2015). In addition, there are potential lessons from IEG's more recent evaluations on renewable energy (World Bank 2020b) and energy efficiency (World Bank 2023b). Box 3.1 summarizes the main recommendations of IEG's *World Bank Group Support to Electricity Access, FY2000–2014* (World Bank 2015), and appendix C provides a more

detailed explanation. The evaluation will take stock of the progress of the Bank Group in implementing these recommendations.

Box 3.1. Recommendations from the 2015 Independent Evaluation Group Evaluation on Electricity Access

World Bank Group Support to Electricity Access, FY2000–2014 made four recommendations:

- Engage decisively and intensely on countries with low electricity access (most of which are in Sub-Saharan Africa).
- Use a sectorwide organizing framework and process far more extensively to mainstream the sustained engagement needed for implementing rapid access scale-up, as opposed to a predominantly project-by-project approach that lacks the scale and speed to move rapidly toward universal access.
- Design an engagement strategy to enable low-access countries to mobilize sector-level investment financing on the scale required and sustained over the next 15 years (2015–30). Specifically, the government should design an investment financing platform to crowd in necessary financial resources from public and private sources by leveraging the World Bank's contributions.
- Expand the "evidence-base related to electricity access and its alignment with the corporate goals of promoting shared prosperity and ending extreme poverty" (World Bank 2015, 91).

Source: World Bank 2015.

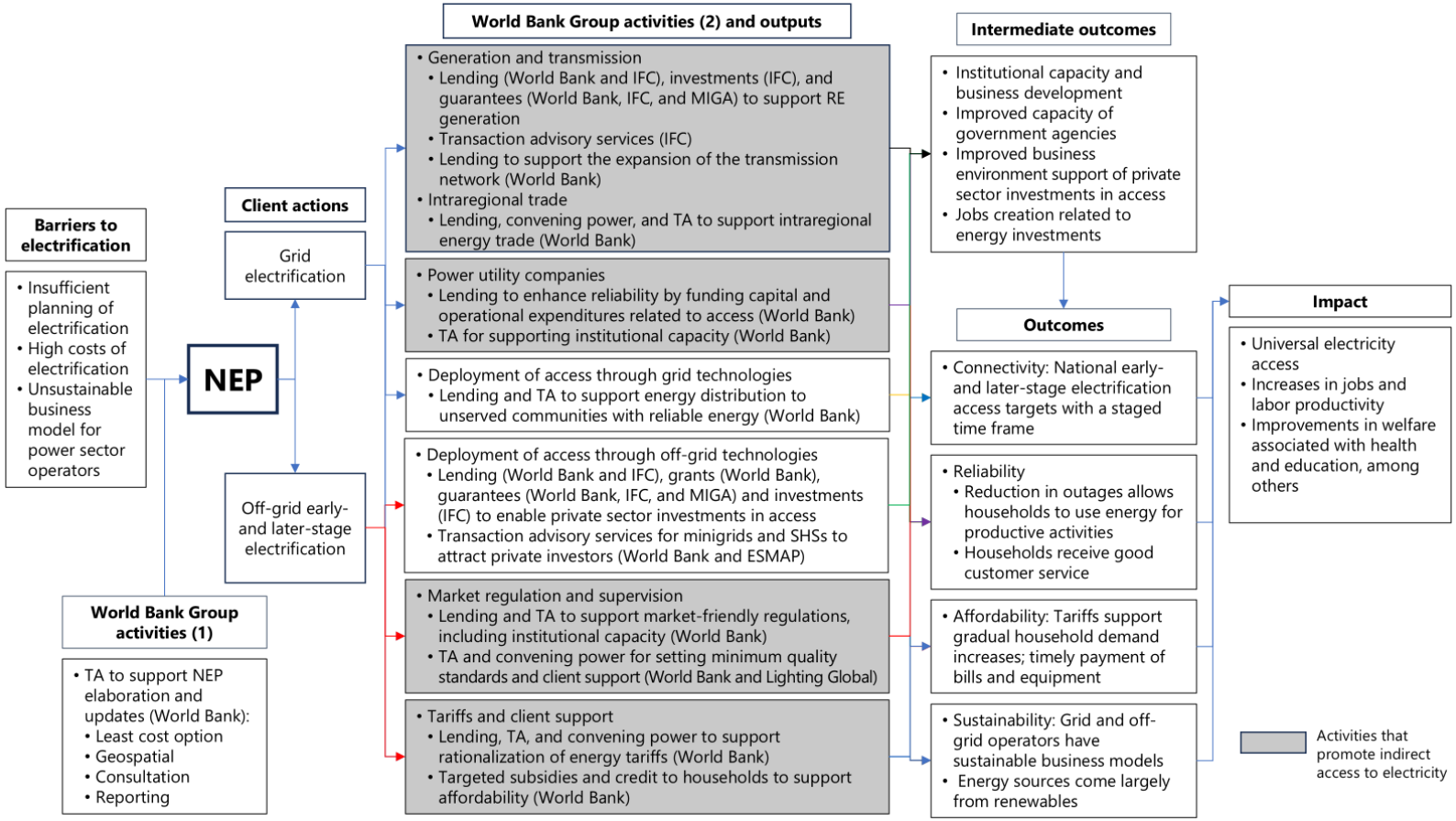
Evaluation Objective

3.5 The evaluation's objective is to assess the Bank Group's relevance, effectiveness, and coherence in supporting client countries in Sub-Saharan Africa in scaling up electricity access. The evaluation will be conducted in the context of the Bank Group's goal to provide 300 million people with electricity connections by 2030.

Theory of Change

3.6 This evaluation proposes a theory of change for scaling up electricity access in Sub-Saharan Africa based on the Bank Group's experience over the past two decades in supporting client countries in their efforts. The theory of change (figure 3.1) is situated in the context of the global agenda to reach universal access to affordable, reliable, and sustainable electricity access by 2030. Because insufficient planning is considered a key barrier to mobilizing resources into energy access, the theory of change builds on NEPs as the backbone of electricity access. Preliminary portfolio identification from the team suggests that of the 32 countries in Sub-Saharan Africa with World Bank direct access interventions in the evaluation period, only Gabon, The Gambia, and South Sudan do not have NEPs.[10] The evaluation will focus on countries with NEPs.

Figure 3.1. Electricity Access: Theory of Change



Source: Independent Evaluation Group.

Note: The theory of change assumes that the NEPs are designed with state-of-the-art analytics that include connectivity, reliability, affordability, and sustainability considerations for setting the electrification goals. In addition, it assumes that those goals are clearly defined (for example, universal access with Multi-Tier Framework 3) using different target dates (for example, 2030 and 2040). It also assumes that the rollout of the electrification plans follows the NEP and that utility companies operate efficiently with financially sustainable objectives. Finally, it assumes that external enabling factors, such as access to finance and physical infrastructure, including roads and water access, are ready to be used. ESMAP = Energy Sector Management Assistance Program; IFC = International Finance Corporation; MIGA = Multilateral Investment Guarantee Agency; NEP = national electrification plan; RE = renewable energy; SHS = solar home system; TA = technical assistance.

Barriers to Electrification

3.7 The literature suggests three main barriers to achieving universal electrification: insufficient planning, high costs of electrification, and unsustainability of power system operators' business models. Because of large-scale capital and operational expenditures associated with expanding electrification to new communities, which are expected to demand modest amounts of energy in the short and medium term, operators find challenges in adopting financially sound business models. Efforts to expand access without long-term funding for power system operators may jeopardize maintenance and operational expenditures that affect energy reliability. Without a sound business model for these operators, system reliability is affected, and communities are potentially subject to frequent power outages.

Government Actions and World Bank Group Activities

3.8 NEPs are one of the main anchors for electricity access in countries. Through a NEP, a country can design a strategy for expanding access to electricity and prioritizing communities over a predefined time frame. Given that NEPs must be both designed and operationalized, the theory of change conceptualizes Bank Group interventions in two stages. First, the Bank Group supports client countries in designing electrification plans by supporting good practices in methodologies and fitness for purpose. Second, it provides operational support for the rollout of these electrification plans.

3.9 In the first stage, the World Bank offers technical assistance for elaborating NEPs. Developing NEPs typically involves state-of-the-art methods, including least cost options for electrification with the support of geospatial analysis. The support also includes a transparent consultative process with stakeholders. Depending on the physical distance from the main grid and the demographics of all communities in the country, among other factors, the least cost analysis provides a strategy for electrification with a combination of grid and off-grid technologies. Whereas utility companies controlled by the state typically operate grid technologies, in most cases, private operators operate off-grid technologies.

3.10 In the second stage, once the NEPs are finalized, the Bank Group provides resources for new connections and other interventions that enhance energy reliability, sustainability, and affordability. Through lending to governments and private partners, the World Bank and the International Finance Corporation (IFC), respectively, support investments in power generation, including those in renewable energy. IFC may also invest directly in power generation companies and, together with the World Bank and the Multilateral Investment Guarantee Agency (MIGA), provides guarantees to foster private sector investments. IFC also provides transaction advisory services for attracting

private sector investments—for example, in power generation through the Scaling Solar program. In addition, the World Bank supports agreements that allow countries to trade power across borders, using its convening power.

3.11 The World Bank supports electricity access more directly through the grid by lending to utility companies to expand the distribution network to new end users. It also provides (i) long-term financing to power utility companies (and in some cases to governments) for the capital and operational expenditures associated with providing access to these communities and (ii) technical assistance to improve utility companies' institutional capacity, including governance. These interventions are instrumental in lifting some of the key barriers that inhibit electricity access, including financing utility companies' investments at low cost, ensuring their technical capacity to manage the extended network, and supporting new investments and maintenance capacity to ensure reliable energy supply to final users. The theory of change suggests that Bank Group support would aim to allow power utility companies to run a financially sustainable business. The Bank Group may also provide financial support to private utility companies that run market segments (generation, transmission, and distribution).[11]

3.12 For off-grid technologies, the Bank Group supports investments in minigrids and SHSs, which in some cases result in MTF tier 1 and tier 2 electrification. This support is provided through lending, guarantees, grants, technical assistance, and convening power. In the case of minigrids, the World Bank supports lending and grants to governments to be used as subsidies for minigrid companies. These grants are aimed to support projects' large capital expenditures and facilitate a sustainable business model. In addition, IFC and MIGA support private sector participation by investing (equity or fixed income) in and guaranteeing minigrid projects, respectively. Through technical assistance, the Bank Group supports the contractual framework for minigrid providers and incentivizes access to underserved communities. In the case of SHSs, the World Bank provides technical assistance and supports the installation of solar roof panels and batteries through lending and grants to governments that are used as supply- and demand-side subsidies to increase affordability for final users. It also includes technical assistance that supports the regulatory framework and support for underserved communities. These solutions are considered temporary because the opportunities for using the MTF tier 1 and tier 2 electricity from SHSs for entrepreneurial activities are limited and because households need to incur subsequent capital expenditures for replacing the equipment.[12] Still, they can play an important role in energy transition and have a function in NEPs. In some cases, through the expansion of the grid, the World Bank supports MTF tier 4 and tier 5 solutions for those communities later in time. These interventions would support the sustainability of the business models of off-grid operators, which is an important barrier that inhibits electricity access.

3.13 The World Bank also supports improvements in the energy sector's regulatory and supervisory framework, which applies to grid and off-grid technologies. Regarding regulation, the World Bank supports capacity building and the enactment of market-friendly regulations that support private sector participation in the areas where the private sector has comparative advantages. Regulation and supervision affect sectors that directly (for example, off-grid technologies) or indirectly (for example, power generation) have an impact on energy access. This support is informed by tools such as the Regulatory Indicators for Sustainable Energy, managed by the Energy Sector Management Assistance Program, which monitors the presence and quality of regulations across countries for grid, minigrid, and off-grid technologies. In the case of minigrids, the World Bank supports regulations that support collaboration with grid technologies or proper compensation to minigrid companies when the grid reaches communities served by minigrids. The evaluation will focus on capacity building and areas of regulation that promote private sector participation in off-grid technologies. In the case of the off-grid market, the World Bank also supports minimum quality standards for the equipment (such as solar panels and batteries) and a contractual framework with final users that ensures customer support. These interventions support the business sustainability of grid and off-grid operators.

3.14 Through technical assistance and lending, the World Bank supports rationalizing frequently distorted energy tariffs and offers targeted subsidies for the cost of the connections of low-income households. Electricity tariffs are a key topic for explaining both the weak financial performance of most power utility companies in Sub-Saharan Africa and the affordability problems that inhibit household demand uptake. Demand-side challenges are also a significant obstacle to greater electrification (Blimpo and Cosgrove-Davies 2019; Lee et al. 2020a). Supporting electricity demand by ensuring affordable tariffs for targeted households and electricity supply (through financial support to companies and operators to generate sufficient revenue to cover their costs) makes the Bank Group interventions essential for supporting investments in electricity access. Bank Group interventions also include lending to governments or public institutions, such as state-owned banks, to on-lend to households through financial intermediaries to purchase appliances and productive tools. The Bank Group also supports on-lending to financial institutions to support energy service companies.

Intermediate Outcomes

3.15 Bank Group interventions may have facilitated enhancements in the institutional capacity of countries, including government, regulatory, and supervisory agencies, private sector companies, and utility companies. Credible planning has allowed the mobilization of domestic and international resources toward electricity access. Once power utility companies can balance their budgets, the theory of change suggests that they run sustainable business models and are no longer a financial burden for governments. At that

point, governments have resources to support lower tariffs in poor communities and accelerate the transition from low to high tiers of electrification. In addition, a better business environment allows the private sector to participate actively in electricity access, creating a competitive market with the participation of multiple providers. Finally, these investments create new job opportunities for the population.

Outcomes

3.16 The theory of change indicates that direct and indirect investments in grid and off-grid technologies result in the electrification of the country. Investments in generation and transmission, together with financial support and technical assistance to utility companies, allow utility companies to have the technology and human and financial resources to invest in network maintenance and offer reliable energy. Electricity access allows some households to generate additional income, which helps boost demand. MTF tier 1 and tier 2 electrified communities receive reliable, sustainable, and affordable electrification solutions, and off-grid operators receive compensation that allows them to run sustainable businesses while offering reliable energy. In addition, prioritizing technologies through least cost options and targeted demand subsidies gives households affordable access to energy. Allocation of subsidies to the minigrid and SHS providers through a competitive process helps households access affordable energy sources, including replacing fossil fuel generators.

Impact

3.17 Ultimately, electricity access allows households to increase their productivity and improve their welfare. Through the outputs and outcomes documented in the theory of change, countries achieve universal access with the cost burden of electrification spread over time and shared between stakeholders (government, users, donors, and private sector participants). Electricity access allows households to access productive activities that support labor productivity and economic growth. For example, in rural areas, it allows communities to use electricity to improve their irrigation systems. These links assume that other basic infrastructure including roads, access to credit, and technical assistance to support businesses become available. Electricity access also allows households to improve their welfare, including education and health. The impact on households' productivity and welfare might be different in the case of MTF tier 1 and tier 2 electrification.

4. Evaluation Scope, Questions, and Design

Evaluation Scope

4.1 The evaluation will cover Sub-Saharan African projects, investments, analytic and advisory activities, and guarantees offered by the World Bank, IFC, and MIGA with

significant objectives or subobjectives for providing electricity access to households that were either approved or closed from FY15 to FY24. The previous evaluation on electricity access covered FY00–14 (World Bank 2015). The scope of this evaluation includes projects with direct and indirect impacts on access in Sub-Saharan Africa. IEG's preliminary lending portfolio for the World Bank (table 4.1) includes projects closed or approved in FY15–24 that provided people with direct, improved, or inferred access but excludes access provided to firms, institutions, and street lighting projects. The rest of the portfolio, including IFC and MIGA activities, consists of projects in FY15–24 that affect access directly or indirectly. Overall, the analysis has identified 249 access activities in the World Bank portfolio, which are included in 224 projects. These encompass lending projects with direct (120), inferred (67), and improved (62) access, respectively (as defined in chapter 2). Because it is common for a single World Bank project to have direct and indirect access activities, table 4.1 presents the number of activities and projects in different columns. In addition, the preliminary portfolio for this evaluation includes 53 IFC investment projects, 51 World Bank advisory services and analytics activities, 27 IFC advisory services activities, and 44 MIGA guarantees. The evaluation will also take stock of activities under the Lighting Global initiative, the Energy Sector Management Assistance Program's knowledge products, the MTF reports, and the contributions of the Global Electrification Platform and will assess analytic and advisory activities on electricity access to countries in the region. See appendix D for more detailed information.

Table 4.1. World Bank Group Support for Electricity Access in Sub-Saharan Africa, FY15–24

	Direct Access	Inferred Access	Improved Access	Total Electricity Access		
Commitment Type	Activities (no.)	Activities (no.)	Activities (no.)	Activities (no.)	Projects (no.)	US$, millions[a]
Projects or investments						
World Bank projects	120	67	62	249	224	38,236
IFC investments	—	—	—	—	53	1,236
Analytic and advisory activities						
World Bank ASA	—	—	—	51	—	—
IFC advisory services	—	—	—	27	—	80
Guarantees						
MIGA	—	—	—	—	44	—

Sources: IFC Business Intelligence; MIGA database; World Bank Business Warehouse; World Bank Standard Reports.
Note: The World Bank lending portfolio includes projects approved or active in FY15–24. IFC investments and MIGA guarantees include projects approved or active in FY15–23. World Bank ASA and IFC advisory services include activities approved or active in FY15–23. Because a World Bank project may have multiple activities, including direct, inferred, and improved access, the total number of activities may be higher than the number of projects. ASA = advisory services and analytics; IFC = International Finance Corporation; MIGA = Multilateral Investment Guarantee Agency; — = not available.
a. For World Bank projects and IFC investments, it reflects the total amount of project commitments; for World Bank analytic and advisory activities, the total project cost; and for IFC advisory activities, the total funds managed by IFC.

Evaluation Questions

4.2 The evaluation will try to answer questions regarding the Bank Group's relevance, effectiveness, and coherence in supporting electricity access in Sub-Saharan African countries:

- **Evaluation question 1.** Relevance: To what extent have Bank Group interventions in Sub-Saharan African countries been aligned with good practices to support electricity access according to country needs?

    a. To what extent has the Bank Group contributed to good practices in methodologies and fitness for purpose for NEPs?

    b. To what extent have the Bank Group interventions aimed to increase electricity access in a reliable, sustainable, and affordable way?

- **Evaluation question 2.** Effectiveness: To what extent have Bank Group interventions in Sub-Saharan African countries achieved their stated outcomes and contributed to the achievement of the countries' electricity access targets?

    a. To what extent have the Bank Group interventions supported Sub-Saharan African countries in advancing electricity access with different technologies (grids, minigrids, and SHSs) in terms of new connections, service reliability, sustainability, and affordability?

    b. Where relevant, to what extent has the Bank Group supported the sound development of the off-grid electricity market through financial resources, institutional development of relevant public sector organizations, and adequate regulatory and supervisory framework in the power sector?

- **Evaluation question 3.** Coherence: How coherent has the Bank Group's support been across its institutions (World Bank, IFC, and MIGA) in supporting electricity access in Sub-Saharan African countries and with other development partners in the elaboration and implementation of electrification plans?

4.3 Evaluation question 1 will assess good practices in methodologies and fitness for purpose for NEPs, with a focus on understanding their relative emphasis on connectivity, reliability, sustainability, and affordability outcomes. The evaluation will assess how the Bank Group aims to balance the trade-offs among the different outcomes in its efforts to support electricity access using different technologies (grids, minigrids, and SHSs). Because the impacts on welfare and productivity of low and high tiers of electrification are different, the evaluation will assess the Bank Group's expected impact from their access interventions. The evaluation will consider regional variations within

Sub-Saharan Africa to reflect the diverse electricity access challenges in different countries. The extent of engagement on NEPs and their implementation allows this evaluation to follow up on recommendations 1 and 2 of the previous evaluation (see box 3.1).

4.4 Evaluation question 2 will assess the effectiveness of the Bank Group interventions—in particular, its capacity to increase access while supporting sustainable business models for power utility companies, minigrid developers, and other off-grid private sector providers. The assessment of the Bank Group's effectiveness in mobilizing private sector investments in electricity access (both grid and off-grid) will provide insights into the Bank Group's preparedness for achieving the corporate goal of connecting 300 million people by 2030 with reliable, sustainable, and affordable electricity. Reliability will be assessed for grid electricity only.[13] In addition, the team will gather evidence about the sustainability of the minigrid business model and the extent to which other enabling factors, including support from local governments, may have facilitated the development of the off-grid market. The issues to be assessed in this question align with the previous evaluation's third recommendation about the need to mobilize financing to energy access at scale (see box 3.1).

4.5 Evaluation question 3 will assess the extent to which synergies among the World Bank, IFC, and MIGA have been exploited through a coherent approach to increasing electricity access among countries. Evidence of success will be measured in terms of realizing synergies from interinstitutional coordination to increase energy access in client countries. The evaluation will also assess potential factors leading to the failure of such coordination to ascertain institutional strengths and weaknesses. While the evaluation acknowledges that multiple development partners (including multilateral development banks, development agencies, and donors) support electricity access in the region, assessing the full extent of coordination will require another evaluation. Consequently, this evaluation will assess coherence with external partners only through the lens of collaboration with key development partners in the elaboration and implementation of NEPs.

Evaluability

4.6 The Bank Group's support for electricity access is highly amenable to evaluation. The evaluation can draw on the Bank Group's portfolio documents, IEG validations of Bank Group self-reporting documents (Implementation Completion and Results Reports and Expanded Project Supervision Reports), knowledge products from the Energy Sector Management Assistance Program, and reports and publications from the African Development Bank, the Asian Development Bank, the International Energy Agency, the International Initiative for Impact Evaluation, the International Renewable Energy

Agency, Sustainable Energy for All, the United Nations Development Programme, industry associations, and academic sources. The proposed evaluation can build on the findings from a previous IEG evaluation of the Bank Group on the topic completed in 2015 (see box 3.1) and IEG learning products focusing on off-grid electrification (World Bank 2016b) and the financial viability of power sectors in client countries (World Bank 2016a) in 2016.

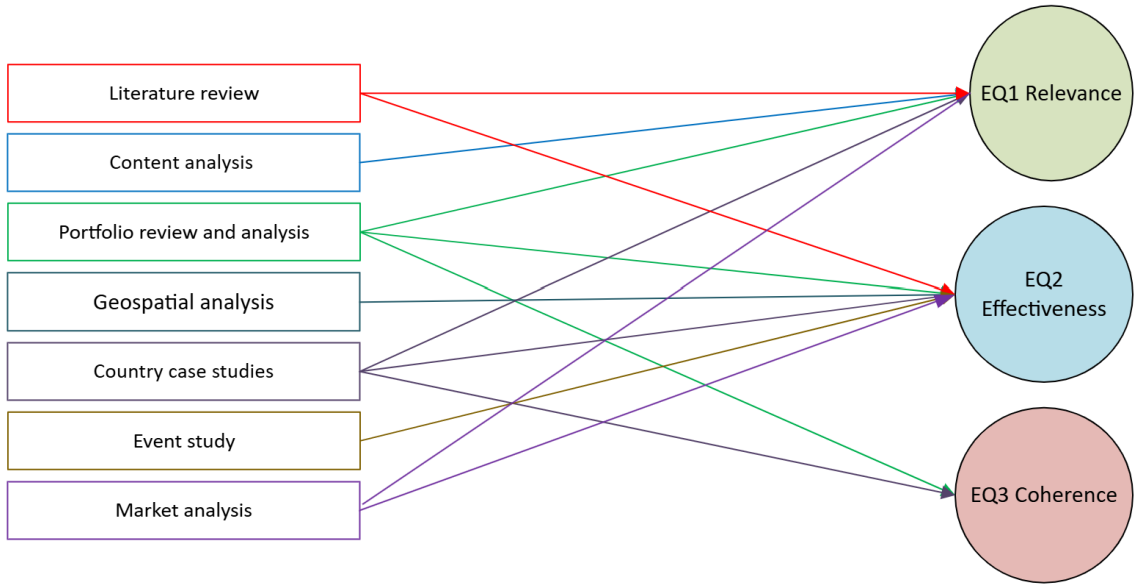
4.7 Some aspects of the recent IEG evaluations of the Bank Group's support for renewable energy (World Bank 2020b) and energy efficiency (World Bank 2023b) can complement the proposed evaluation. A recent Project Performance Assessment Report cluster on electricity transmission and distribution provides some findings on access results linked to grid expansion.[14]

Evaluation Design

4.8 The evaluation will use a mixed methods approach to assess the relevance, effectiveness, and coherence of the Bank Group's engagements on electricity access in Sub-Saharan Africa. It will apply a range of qualitative and quantitative methods to answer the questions, considering the focus of the evaluation on outcomes; the diverse literature; the large and heterogeneous Bank Group portfolio; a definition of electricity access that has evolved over time; difficulties for obtaining some data (for example, affordability); and the participation of multiple stakeholders with different incentive structures. Considering the corporate target of providing connections to 300 million people in Sub-Saharan Africa by 2030, the evaluation aims to provide evidence of the trade-offs between outcomes and impact associated with technology selection decisions and how context may affect those decisions.

4.9 The evaluation includes several modules. Figure 4.1 illustrates the modules and how they map to the evaluation questions. They combine quantitative and qualitative evaluative evidence to address the evaluation questions, underpinned by evidence from the Bank Group portfolio of investment, guarantee, and analytic and advisory activities. The modules are described briefly in this section and in more detail in appendix E.

Figure 4.1. Evaluation Modules and Evaluation Questions



Source: Independent Evaluation Group.
Note: EQ = evaluation question.

4.10 **Literature review.** The literature review will shed light on two issues that underpin the evaluation: (i) the strengths and limitations of least cost analysis and (ii) the impact of rural electrification programs on welfare and economic development. Least cost analysis is a tool frequently used in NEP to achieve electrification targets and adequate energy for supporting productive activities within a predefined time frame. To assess it and inform evaluation question 1, the team will review academic research papers and gray literature publications that directly or indirectly (that is, because of the assumptions) may influence technology selection. To address the impact issue and inform evaluation question 2, the team will build on the findings of the systematic literature review on electricity access conducted by the Asian Development Bank and the International Initiative for Impact Evaluation in 2020 (Moore et al. 2020). The team will follow the IEG guidelines for structured literature reviews (Villar 2022) and will cover both academic research papers and gray literature. This literature review will assess evidence of the extent to which MTF tier 1 and tier 2 electrification programs (with a focus on connectivity) and higher tiers of electrification programs (with an additional focus on reliability, sustainability, and affordability) have improved welfare and productivity.

4.11 **Content analysis.** This method includes the content analysis of NEP and Bank Group analytic and advisory activities. Since NEPs are the backbone of electrification plans, the evaluation will assess the extent to which the Bank Group influenced their elaboration and fitness for purpose. To that end, the analysis will examine whether the

Bank Group–supported methodologies, such as demand assessments and geospatial least cost analysis, have been included in countries' NEPs. It will also assess the consistency of proposed Bank Group interventions with the NEPs and the extent to which there are significant differences between the Bank Group and countries' approaches to electrification that are not reflected in these plans (evaluation question 1). In addition, the analysis will assess the extent to which NEPs include references to reliable, sustainable, and affordable energy. As these electrification plans are regularly updated, the evaluation will examine possible methodological improvements that can explain changes in electrification paths using different technologies. The content analysis of Bank Group analytic and advisory activities related to electricity access aims to take stock of the extent to which they have a consistent focus on connectivity, reliability, sustainability, and affordability (evaluation question 1).

4.12 **Portfolio review and analysis.** The purpose of the portfolio review and analysis is manyfold. First, it will allow mapping Bank Group interventions to the NEPs' connectivity targets to assess (i) the consistency of the Bank Group portfolio with the investments proposed in the NEPs and (ii) the possibility of some prioritization patterns in the Bank Group interventions, for example, through the prioritization of last-mile versus first-mile communities, grid versus off-grid solutions, or communities that have greater economic growth potential (evaluation question 1). Second, it will also allow for the identification of how the Bank Group interventions envisage financing, technical assistance, and changes in institutional development that may facilitate private sector investments in the provision of reliable, sustainable, and affordable electricity (evaluation question 1). Third, it will be used to make (i) comparisons between the proposed and effective number of connections achieved by the type of technologies and (ii) an analysis of the Bank Group projects measured against indicators of reliability (for example, average duration and frequency of unpredictable outages), sustainability (for example, financial sustainability of power utility companies and reliance on grants and concessional lending from off-grid private operators), and affordability (for example, electricity demand from low-income communities). This task will be performed using key performance indicator analysis (evaluation question 2). Fourth, the portfolio review and analysis will facilitate an assessment of the extent of collaboration among the Bank Group institutions (evaluation question 3).

4.13 The portfolio analysis will cover the identified cohort of projects approved or closed during FY15–24 (see appendix D). For the selected cohort of projects, targeted data and information, including target number of connections, target average duration, and frequency of outages, type of electrification technology, and organizational structure of the population, will be extracted from Project Appraisal Documents, Implementation Completion and Results Reports, IFC's Project Completion Reports,

MIGA's Project Evaluation Reports, and IEG's Implementation Completion and Results Report Reviews, Expanded Project Supervision Report reviews, and Project Performance Assessment Reports.

4.14 **Geospatial analysis.** To determine whether Bank Group interventions have been effective in supporting access with different technologies (evaluation question 2a), the evaluation will use geospatial analysis to trace the intensity of nighttime lights across the region derived from the Bank Group interventions and conduct some comparative analysis, as explained in this section. Nighttime light intensity will be used as a proxy for economic development. The analysis will be developed using a two-tiered approach, beginning with a broad overview and advancing to a more detailed and in-depth examination. Module 1 will concentrate on analyzing the entire grid portfolio, whereas module 2 will focus on specific off-grid case studies.

4.15 Module 1 will assess the Bank Group grid access electrification portfolio, focusing on connectivity, reliability, and sustainability of the grid portfolio. Module 1 consists of two submodules. Submodule 1a will analyze the historical nighttime light evolution in communities that benefited from Bank Group interventions that offered (i) direct access and (ii) indirect access through investments in transmission. Using nighttime lights, submodule 1b will trace the communities that benefited from Bank Group electrification interventions and compare them with the plans set in the NEPs. In addition, it will assess potential prioritization patterns in the Bank Group interventions.

4.16 In specific areas of interest, module 2 will conduct a comparative analysis to assess the reliability, sustainability, and economic impact of electrification using different technologies, including MTF tier 1 and tier 2 electrification. These exercises will start with a pilot and expand to broader samples, depending on the results from the pilot. The team will work with the methods team to ensure that the findings are representative of the Bank Group portfolio. Within a selected area of interest in a country, the evaluation will study the following:

- **Electricity uptake.** The impact of nighttime light on communities that received (grid) electrification and nearby communities where SHSs were installed. This exercise will allow the evaluation to see both types of communities' uptake (electricity demand) over time and compare economic activity (proxied by nighttime lights) over time.
- **Land cover and land use.** The evaluation will investigate changes in land cover and land use in (grid) electrified communities. This includes examining shifts in land use for agricultural or industrial purposes, such as the transition from bare soil to agricultural land. In addition, the exercise will assess these patterns in

nearby electrified communities. Nearby communities that received MTF tier 1 and tier 2 electrification will be used as a control group.

- **Maintenance of solar panels.** The evaluation will also explore households' responses to the long-term effects of MTF tier 1 and tier 2 electrification. Given that rooftop solar panels typically have a lifespan of three to five years and a warranty of about one year, the study will assess the extent of maintenance and upkeep of these panels.

4.17 **Country case studies.** The evaluation will conduct 10 case studies, of which 6 are expected to include field visits, to assess (i) the extent to which the Bank Group has contributed to NEP (and its updates) in its main documents, including the Country Partnership Frameworks and IFC country strategies (evaluation question 1); (ii) the consistency of proposed Bank Group interventions with the NEPs (evaluation question 1); (iii) the extent to which there are significant differences between the Bank Group's and countries' approaches to electrification not reflected in these plans (evaluation question 1); (iv) the factors that may have supported, inhibited, or delayed the rollout of the electrification plans, including insufficient funding of public utility companies and off-grid private sector operators and inability to attract private investment (evaluation question 2); (v) how the Bank Group has addressed these barriers (evaluation question 2); and (vi) the extent to which the World Bank, IFC, and MIGA have coordinated and collaborated in their interventions (evaluation question 3).

4.18 Country selection for the case studies will be based on two criteria. The first is to reflect different levels of progress in electricity access since 2015. This variable aims to assess the relative success in increasing access during the evaluation period. The second criterion is to reflect different degrees of off-grid intensity. This variable aims to reflect the technologies that countries may use to address their different geographic landscapes and organizational structures of the population, including the relative size of cities, villages, and isolated rural communities.

4.19 **Event study.** The evaluation will conduct an event study to assess whether public power utility companies in countries in Sub-Saharan Africa supported by the World Bank have better financial and operational performance than those that have not been supported. Financial results and operational performance are used as proxies for sustainability and reliability, respectively. Financial results will be measured by variables such as cost recovery, collection rate, and net profit margin of public utility companies. Operational performance will be measured by reliability indicators such as the System Average Interruption Duration Index and the System Average Interruption Frequency Index. The treatment group will include public utility companies in countries the Bank Group has supported through lending and technical assistance to improve

their financial and operational results. The comparison group will be selected using the nearest-neighbor method (Lin and Ye 2007).

4.20 **Market analysis.** Market analysis will assess the extent to which changes in market conditions may have influenced portfolio decisions (evaluation question 1) and effectiveness in attracting private sector investment into electricity access (evaluation question 2). For example, while the significant price reduction of solar panels between 2015 and 2020 may help explain the higher share of SHSs in the Bank Group portfolio compared with previous years, changes in price trends in 2021 and 2022 may have deterred private sector investments in electricity access. These price trends and the financial success of some pilot projects may have also created the conditions for the incursion of larger private sector companies in the SHS business. They may have also increased the uptake of electricity among low-income families. The market analysis will also assess how the enabling environment and the macrofinancial environment, including inflation, interest rate fluctuations, and periods of shortage of raw materials, may have affected the effectiveness of the Bank Group portfolio and the capacity to attract private sector investments into electricity access in recent years. Finally, the market analysis will shed light on the financial sustainability of the minigrids business model (evaluation question 2). Recent evidence suggests a small participation of private capital in the minigrid business (Sustainable Energy for All 2024). In particular, it will gather information about the structure of funding for minigrid developers and SHS operators in Sub-Saharan Africa, including reliance on grants and concessional lending, and the extent to which results-based grants address the financial sustainability gap of off-grid companies. The evidence suggests that, in many cases, stable demand from anchor institutions or business clients has supported the financial sustainability of minigrids (Beath et al. 2021; Sustainable Energy for All 2024). The evaluation will also assess their financial sustainability in rural setups where those core clients are not available. The evaluation may gather some market information from interviews with private sector stakeholders.

Limitations and Their Mitigation

4.21 The evaluation will be limited by information and data availability:

- **Incomplete evidence on the impact of electricity access programs in Sub-Saharan Africa.** The literature on the development impact of electrification offers rich evidence on countries that have achieved high electrification rates in the past centuries. Conversely, the evidence based on the impact of electrification programs in Sub-Saharan Africa has many gaps and does not point to a unified set of findings. The evaluation will take stock of existing evidence, point to

remaining gaps, and complement the literature review with other sources of information where the evidence is missing.

- **Data availability.** Five issues may limit the availability of outcome data, which can limit the ability of the evaluation to assess the success of electricity access programs: (i) the Bank Group may not systematically collect data related to outcomes (such as affordability) and impact (such as productivity); (ii) the portfolio of projects that seek to enable minigrid adoption is relatively new and might not be sufficiently mature to assess long-term impact; (iii) private sector participants involved in financing off-grid projects might not be willing to share proprietary information; (iv) data might be more abundant in countries with higher capacity or where the Bank Group has a more extensive portfolio; and (v) medium-resolution satellite nighttime data can be noisy and unreliable in rural areas of Sub-Saharan Africa, which may limit the outcome of module 1 of the geospatial analysis. To address these challenges, the team may rely on a more qualitative assessment (for example, in the case of minigrid business models) and look for proxies for the missing data. The geospatial analysis may prove to be useful for completing some data gaps, especially in the analysis that relies on higher-resolution nighttime data. Regarding potential biases on data availability, the team will be mindful of generalizing the findings where relevant.

Quality Assurance Process

4.22 The quality and usefulness of the evaluation's findings will be assessed through IEG's quality assurance processes and peer review. The evaluation will be peer-reviewed by three independent external experts: Vivien Foster (former World Bank chief economist, Infrastructure; principal research fellow, Faculty of Natural Sciences, Centre for Environmental Policy, Imperial College London); Rebekah Shirley (former chief of research at Power for All; deputy director, World Resources Institute, Africa); and Jörg Ankel-Peters (cohead of the Climate Change and Development research department, Leibniz Institute for Economic Research; professor of economics, University of Passau). Together, they bring worldwide experience with electricity access issues and trends in new strategies and technologies, in-depth exposure to Sub-Saharan Africa, links with broader development issues and other sectors, private sector perspective, and academic and research depth.

5. Expected Outputs, Timeline, and Outreach

5.1 The evaluation draft and IEG management review are planned for the first quarter of FY26. Bank Group management review and Committee on Development Effectiveness discussions are expected to occur in the second quarter of FY26. The main output will be a report.

5.2 With IEG's Knowledge and Communications unit, the team will develop a dissemination plan in consultation with Bank Group staff. This plan may include dissemination through two or three regional workshops in collaboration with partner organizations, including the African Development Bank, the Asian Development Bank, and the Sustainable Energy for All Global Forum.

6. Resources

6.1 The evaluation will be task managed by Heinz P. Rudolph (senior evaluation officer), under the guidance of Avjeet Singh (acting manager, Sustainable Development), and Carmen Nonay (director, Finance, Private Sector, Infrastructure, and Sustainable Development). The evaluation team will benefit from the guidance of Estelle Raimondo (head of the Methods Advisory Function) to ensure that the implementation of the design is fit for purpose and Rasmus Heltberg (lead evaluation officer) as a technical adviser. The evaluation will be prepared by a team comprising Ridwan Bello, Sanittawaan Nikki Tan, Priyanka Sood Jetwani, Santiago Tellez Canas, and Virginia Ziulu (all IEG) and Moussa Blimpo, Ihsan Kaler Hurcan, Pablo Correa, Tano Michel Aka, Namory Doumbia, Burcin Pamuksuz, and Johan Lopez (consultants). Romayne Pereira will provide administrative support. Other senior consultants and subject matter experts will be added for case studies and the event study. The team will make efforts to identify consultants in the region that may support this evaluation.

6.2 This evaluation will be sent to the Bank Group management for review and submitted to the Committee on Development Effectiveness in the second quarter of FY26.

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[1] See Glossary for terminology.

[2] The year 2022 is the latest year for which comprehensive global electricity access statistics are available (IEA et al. 2024).

[3] Most studies in the literature have found a unidirectional relationship between electricity consumption and economic growth, but some studies have found bidirectional causality (World Bank 2015). Although the debate is still open, more recent empirical analysis reinforces the first approach (Mutumba et al. 2024). In practical terms, electricity access is a potential enabler of economic growth.

[4] The findings of the study are based on data reported 18 months after the intervention.

[5] Recent International Energy Agency models suggest that approximately half of household electrification in Sub-Saharan Africa should be provided using off-grid technologies, which imposes challenges for engaging private sector investments.

[6] Assuming Sub-Saharan African governments provide an average of 10 percent of the finance needed for energy development and access, there is an estimated annual energy finance gap of between US$31.5 billion and US$45 billion (AfDB 2018).

[7] Although algorithmic calculations make it possible to infer the number of beneficiaries of interventions with indirect impact on access in a country or region, it remains difficult to identify them.

[8] Inferred access measures the number of people in households previously lacking electricity service that are likely to have benefited from new services made possible as an indirect result of investments that increased the availability of electricity in the grid in the given country (World Bank 2023a).

[9] The Distributed Access Through Renewable Energy Scale-Up platform announced during the 27th Conference of the Parties to the United Nations Framework Convention on Climate Change (2022) focuses on Nigeria, and the Accelerating Sustainable and Clean Energy Access Transformation Using the Multiphase Programmatic Approach announced during the 28th Conference of the Parties to the United Nations Framework Convention on Climate Change (2023) seeks to provide access to 100 million people in Eastern and Southern Africa by 2030. Both programs seek to leverage private sector participation alongside contributions from the African Development Bank, Japan International Cooperation Agency, and Sustainable Energy for All. The Energy Sector Management Assistance Program, through its Electrifying Africa programmatic advisory services and analytics, supports coordination between the Accelerating Sustainable and Clean Energy Access Transformation Using the Multiphase Programmatic Approach and the Distributed Access Through Renewable Energy Scale-Up platform.

[10] Gabon, The Gambia, and South Sudan are countries in Sub-Saharan Africa with World Bank direct electricity access lending operations but no NEP. Each of these countries has a single World Bank operation during the evaluation period.

[11] Out of a sample of 72 power utility companies in Sub-Saharan Africa, half were vertically integrated companies (World Bank and ESMAP 2023).

[12] The duration of solar panels is expected to be in the range of five years. Some may last longer, depending on quality (Ankel-Peters et al. 2024) and climate conditions. Battery duration can be longer.

[13] The reliability assessment will focus on grid electricity. The team is not confident of finding good-quality data on reliability for minigrids. MTF definitions suggest that reliability is considered only starting at tier 3.

[14] Project Performance Assessment Reports: Tanzania and Burkina Faso–Ghana.

Glossary[1]

Access to energy services. The ability of an end user to use energy services (such as lighting, phone charging, cooking, air circulation, refrigeration, air conditioning, heating, communication, entertainment, computation, motive power, and so on) that require an energy appliance and suitable energy supply.

Access to energy supply. The ability of an end user to use an energy supply that can be used for desired energy services.

Affordability of energy supply. An attribute of energy supply that implies the ability of the end user to pay for energy needed for a defined package of energy consumption. Affordability encompasses one-time connection charges, energy charges, capacity charges, maintenance charges, and replacement charges. The affordability of energy access is a function of the defined package, the price of energy (including all the abovementioned charges), and the user's income level. Energy supply is considered to be affordable when the cost of energy for a defined package of energy consumption does not exceed a normative percentage of the household income.

Appliances (end-use devices). Equipment powered by electricity or other energy sources that accomplish some function or task to deliver an energy service (for example, light bulb, electric fan, cookstove, refrigerator, radio, washing machine, X-ray machine, drilling machine, and so on).

Attributes of energy supply. Characteristics of energy supply that influence its usability for various energy services. Eight key attributes have been selected for the purpose of defining and measuring energy access: capacity, affordability, availability, reliability, quality, health and safety, legality, and convenience.

Availability of energy supply. An attribute of energy supply that implies the ability to draw energy when needed for the use of energy services. Availability is measured as the time and duration of supply. The availability of electricity can be measured as the time during the day (and night) when electricity is available or the total number of hours when electricity is available each day. Fuel availability can be measured as the number of days per year during which the fuel is available or whether a secondary fuel is used to address the lack of availability of a preferred fuel. The availability of electricity is often more important during the evening hours, especially for lighting needs. Therefore, the evening supply may sometimes be treated as a separate indicator of the availability of electricity supply.

[1] Most definitions were taken from Bhatia and Angelou (2015).

Capacity of energy supply. An attribute of energy supply that relates to the quantity of energy made available to the user. It can be measured as a combination of total energy available over a period of time and the maximum power (rate of energy delivery) that can be used. For example, for electricity, capacity can be measured as the maximum power available (in watts) or the total energy available each day (in watt-hours). Similarly, capacity of fuel-based energy supply can be measured as the quantity of fuel available each day.

Convenience of energy supply. An attribute of energy supply that relates to the time and effort involved in securing, processing, and using the energy source (such as fuels).

End user. The ultimate consumer who requires energy for desired energy services at any locale—a household, productive enterprise, or community institution.

Energy access. The ability of the end user to use energy supply that is usable for the desired energy services. Improvement in energy access is achieved through enhancement of the usability of the energy supply with improvement in attributes. Energy access can be defined as either inclusive or exclusive of the use of appliances. When defined as inclusive of appliances, it is called access to energy services, and when defined as exclusive of appliances, it is called access to energy supply.

Energy applications. The set of five categories—lighting, information and communication technology and entertainment, motive power, product and water heating, and space heating—into which energy services have been codified to allow energy access to be measured in terms of its ability to support these applications.

Energy carrier or energy source. A substance or means that can be used to produce mechanical work or heat or to operate chemical or physical processes. Energy sources (or energy carriers) include fuels and renewable energy sources that are harnessed directly, as well as grids and minigrids powered by fossil fuels and renewable energy sources. They provide energy supplies that are used by end users to use energy services.

Energy poverty. The state of being deprived of certain energy services or not being able to use them in a healthy, convenient, and efficient manner, resulting in a level of energy consumption that is insufficient to support social and economic development. Although energy poverty can be measured using binary indicators (by specifying a minimum package of energy services or minimum amount of energy use), it is, in reality, a continuous variable encompassing deprivation of a range of energy services.

Energy results chain. The series of causal links between energy investments and their socioeconomic development impacts. It entails a seven-step causality chain (inputs,

intermediate outputs, outputs, intermediate outcomes, outcomes, intermediate impacts, and impacts) with reducing attribution of results to the energy intervention as a result of external factors increasingly coming into play at each step.

Energy services. Amenities that are delivered through the use of energy when converted into light, sound, heat (or cold), motion, signal, and so on. Energy services encompass lighting, cooking, air circulation, refrigeration, air conditioning, heating, communication, entertainment, computation, motive power, and so on.

Energy supply. The provision of energy regardless of the availability of end-use equipment.

Fuels. Any material that stores energy that can be extracted through a combustion process to perform mechanical or heating work. Fuels are often classified in three types: solid (wood, coal, dung, and so on), liquid (diesel, kerosene, liquefied petroleum gas, and so on), and gaseous (natural gas, biogas, and so on).

Health attribute. An attribute of energy supply that relates to the risk of adverse health consequences from the use of energy. This attribute is particularly important for fuel-based energy for cooking and heating.

Legality of energy supply. An attribute of energy supply implying that in using the energy supply, the end user is not indulging in any activity proscribed by law.

Locales of energy use. The broad locations of end use of energy for availing energy services. Locales of energy use include households, community institutions, and productive enterprises.

Motive power. An application of energy that pertains to delivery of linear or rotatory motion as the output. Motive power typically requires electrical motors or engines as the appliances for converting electricity or fuels, respectively, into motion.

Quality of energy supply. An attribute of energy supply that implies correct level and stability of voltage (and frequency) in case of electricity, and absence of adulteration (including excessive moisture) in case of fuels so that desired combustion characteristics can be achieved.

Reliability of energy supply. An attribute of energy supply that entails an absence of unpredictable outages of energy supply. It is measured by the frequency and length of unpredictable outages.

Safety. An attribute of energy supply that relates to the risk of injury from the energy supply.

Stacking. The use of multiple energy solutions (such as different fuels) to meet a single energy need.

Usability of energy supply. The potential to use energy supply when required for desired energy services. Usability can be enhanced by improving the attributes of energy supply, such as capacity, availability, reliability, affordability, safety, convenience, and so on.

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Appendix A. Electricity Access: Selected Data

Table A.1. Population Without Electricity Access, 2022: Top 20 Countries

No.	Country	Country Affected by Fragility, Conflict, and Violence (Yes or No)	Region	Population Without Electricity Access, 2022 (millions)
1.	Nigeria	Yes	Sub-Saharan Africa	86.3
2.	Congo, Dem. Rep.	Yes	Sub-Saharan Africa	77.7
3.	Ethiopia	Yes	Sub-Saharan Africa	55.5
4.	Tanzania	No	Sub-Saharan Africa	35.5
5.	Uganda	No	Sub-Saharan Africa	25.0
6.	Mozambique	Yes	Sub-Saharan Africa	22.0
7.	Niger	Yes	Sub-Saharan Africa	21.1
8.	Madagascar	No	Sub-Saharan Africa	18.9
9.	Angola	No	Sub-Saharan Africa	18.3
10.	Burkina Faso	Yes	Sub-Saharan Africa	18.3
11.	Malawi	No	Sub-Saharan Africa	17.5
12.	Sudan	Yes	Sub-Saharan Africa	17.2
13.	Chad	Yes	Sub-Saharan Africa	15.6
14.	Myanmar	Yes	East Asia and Pacific	14.2
15.	Kenya	No	Sub-Saharan Africa	13.0
16.	Korea, Dem. People's Rep.	No	East Asia and Pacific	11.8
17.	Pakistan	No	South Asia	11.8
18.	Burundi	Yes	Sub-Saharan Africa	11.6
19.	India	No	South Asia	11.3
20.	Mali	Yes	Sub-Saharan Africa	10.6

Sources: IEA et al. 2024; World Bank.

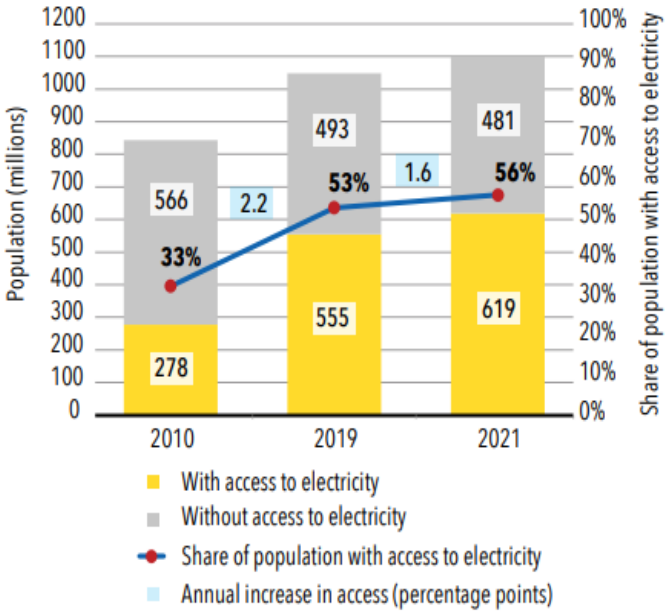
Table A.2. Population Without Electricity Access, by Region (percent)

	Urban		Rural	
Region	2015	2022	2015	2022
Sub-Saharan Africa	28	19	81	69
South Asia	3	0	18	2
Latin America and the Caribbean	1	0	11	3
Middle East and North Africa	0	0	8	6
East Asia and Pacific	0	0	5	3
Europe and Central Asia	1	0	1	0

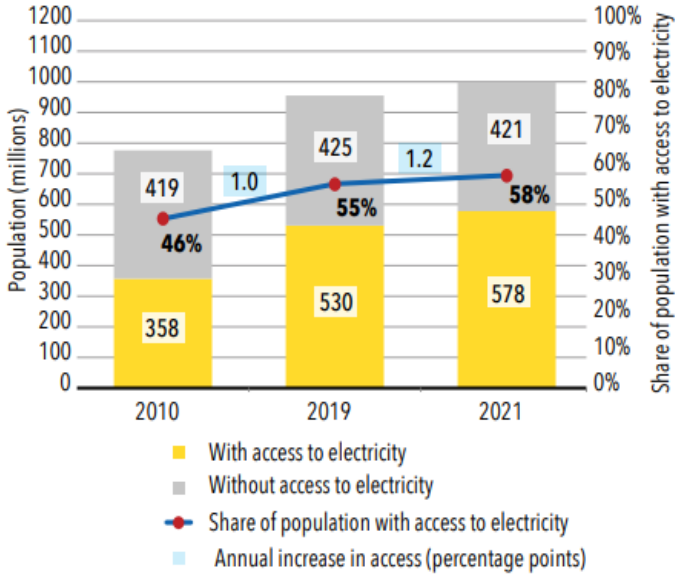
Source: World Development Indicators.

Figure A.1. Increases in Global Access to Electricity in Least Developed and Conflict-Affected Countries, 2010, 2019, and 2021

a. Least developed countries



b. Countries classified as fragile and conflict-affected situations



Source: World Bank 2023.

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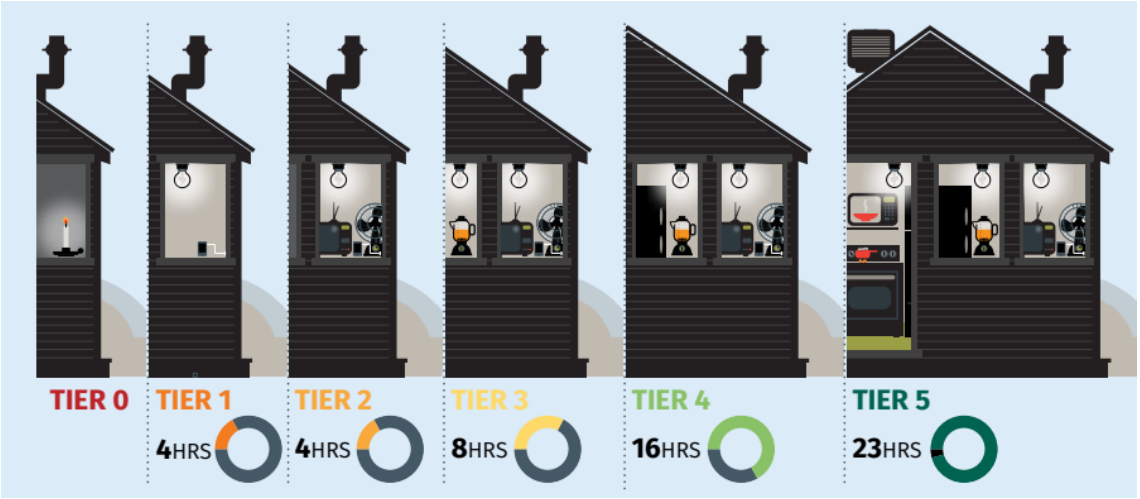
Appendix B. Multi-Tier Framework for Electricity Access

The Multi-Tier Framework (MTF) was developed within the Sustainable Energy for All initiative because of the shortcomings of a binary energy access assessment, in which a household was defined as either having access to electricity or not. The aim of the framework is "to monitor and evaluate energy access by following a multidimensional approach" (UNDP 2021, 22). This is done by measuring energy access using a multitiered spectrum, which ranges from tier 0 (no access) to tier 5 (the highest level of access; figures B.1 and B.2). The data are gathered through the Global Tracking Framework, which is used to measure global progress toward the United Nations Sustainable Development Goal 7 that aims to achieve universal access to affordable, reliable, and modern energy services by 2030.

Figure B.1. Minimum Requirements by Tier of Electricity Access



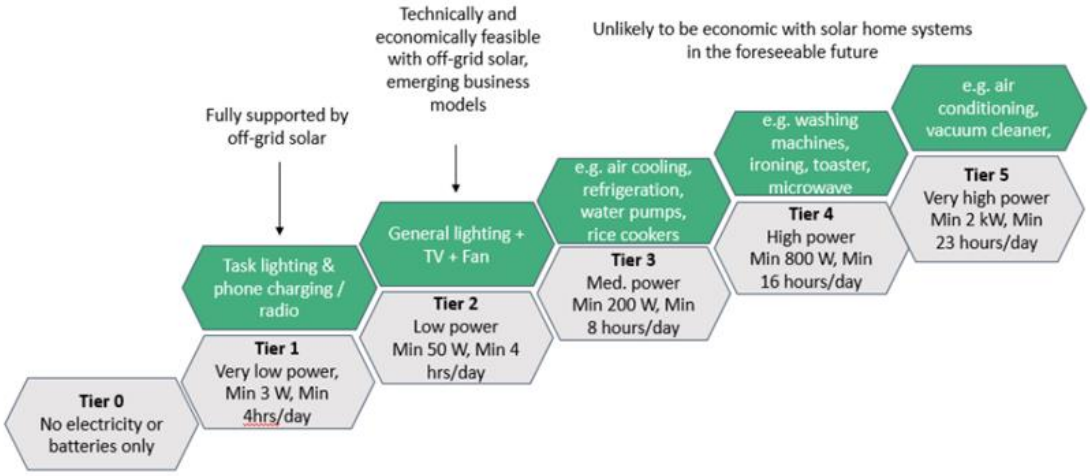
Source: ESMAP 2024.
Note: hr = hour.

The four main objectives of the MTF are as follows:

- To establish a global baseline of energy access, starting in 10–15 high-access deficit countries based on the multifaceted definition according to MTF;
- To transfer capacity to national statistical offices to keep tracking progress toward Sustainable Energy for All goals and the Sustainable Development Goal in the future;
- To continue improving tools and capacities for tracking progress toward reaching the Sustainable Energy for All objective of universal access to modern energy services by 2030 based on MTF; and

- To provide reliable data on energy sector that can meet needs of multiple stakeholders, including government, regulators, utilities, project developers, civil society organizations, development agencies, financial institutions, appliance manufacturers, international programs, and the academia.

Figure B.2. Levels of Electricity Access Under the Multi-Tier Framework



Source: Bloomberg New Energy Finance and Lighting Global 2016.
Note: hr = hour; kW = kilowatt; Min = minimum; W = watt.

Multi-Tier Framework:

- **Tier 0.** Electricity is not available or is available less than 4 hours per day (or less than 1 hour per evening) or has a capacity off less than 3 watts (or less than 12 watt-hours). Households cope by using candles, kerosene lamps, or battery-powered devices, such as flashlights and radios.

- **Tier 1.** Electricity is available at least 4 hours per day, including at least 1 hour per evening, and the capacity is sufficient to power task lighting and phone charging or a radio. All electricity sources may meet these requirements—from certain solar photovoltaic systems to the national grid.

- **Tier 2.** Electricity is available at least 4 hours per day, including at least 2 hours per evening, and capacity is sufficient to power low-load appliances, such as multiple lights, a television, or a fan, as needed during that time. Sources that may meet these requirements include a rechargeable battery, solar home systems, generator, minigrid, and the national grid.

- **Tier 3.** Electricity is available at least 8 hours per day, including at least 3 hours per evening, and capacity is sufficient to power medium-load appliances, such as

a refrigerator, freezer, food processor, water pump, rice cooker, or air cooler, as needed during that time. In addition, the household can afford a basic consumption package of 365 kilowatt-hours per year (cost of the package is less than 5 percent of household income). Sources that may meet these requirements include a solar home system, generator, minigrid, and the national grid.

- **Tier 4.** Electricity is available at least 16 hours per day, including at least 4 hours per evening, and capacity is sufficient to power high-load appliances, such as a washing machine, iron, hair dryer, toaster, and microwave, as needed during that time. There are no frequent unscheduled interruptions (less than 14 interruptions per week) and no voltage issues that lead to appliance damage, and the electricity source is formal and safe. Sources that may meet these requirements include a generator, minigrid, and the national grid.

- **Tier 5.** Electricity is available at least 23 hours per day, including 4 hours per evening, and capacity is sufficient to power very-high-load appliances, such as air conditioners, space heaters, vacuum cleaners, and electric stoves, as needed during that time. Electricity service meets all the above criteria of being affordable, formal, and safe. In addition, there are no voltage issues, and there are at most three unscheduled interruptions per week with a total duration of less than 2 hours. The most likely source for meeting these requirements is the national grid, although a generator or minigrid might also suffice.

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Appendix C. Recommendations from *World Bank Group Support to Electricity Access, FY2000–2014* and Summary of Management Action Record

The Independent Evaluation Group's evaluation *World Bank Group Support to Electricity Access, FY2000–2014* made four recommendations (World Bank 2015):

Recommendation 1. Engage decisively and intensely on countries with low electricity access (most of which are in Sub-Saharan Africa).

This evaluation highlights large gaps in country coverage and weak engagement in low-access countries. In line with the Country Partnership Frameworks, the World Bank Group should broaden and deepen its engagement in low-access countries to help them address the huge shortfalls in investment, capacity building, and knowledge resources needed to move toward universal access in 15 years.

Management Action Record summary:

- Engaged in 44 low-access countries of which only 3 lacked power sector programs: Cambodia, Chad, and Timor-Leste.
- Energy Access Business Plan was endorsed. The Global Practice is to deploy its efforts for rapid scale-up in several low-access countries (Burkina Faso, the Central African Republic, the Democratic Republic of Congo, Liberia, Mauritania, Mozambique, Niger, Papua New Guinea, Rwanda, Tanzania, Uganda, and Zambia) and deepening engagement in Angola, Benin, Ethiopia, Guinea, Haiti, Kenya, Mali, and Tuvalu.
- Proposed an "accelerated path to energy access" in using new approaches and partnerships in 3 or more countries. Collaboration is to be launched with nontraditional electricity access partners.
- Elements of a talent management plan were proposed.

Recommendation 2. Move from a predominantly project-by-project approach—which lacks the scale and speed to achieve universal access by 2030 in low-access countries—to a far greater use of a sectorwide organizing framework and process for mainstreaming the sustained engagement needed for implementing rapid access scale-up.

The scope and timing of the sectorwide frameworks and engagement plans should be led and coordinated by the government and take into account the starting sector context and readiness. The core principles and strategic drivers underlying the best practice programs should inform the new strategic framework and country plans, and the Bank

Group's operational engagement going forward. These are systematic implementation of national electricity access, enabling sector policies and regulation, commercial viability of service providers, affordability of connections costs for the poor, and overarching government commitment and leadership.

Management Action Record summary:

- Prospectuses (for a sectorwide framework and implementation plan for scale-up) were being supported in Burundi, Guinea, Liberia, Mozambique, Myanmar, Nigeria, and Senegal, and, as of FY 2017, were completed in Guinea, Myanmar, and Nigeria.

Recommendation 3. Design an engagement strategy to enable low-access countries to mobilize sector-level investment financing on the scale required, and sustained over the next 15 years, 2015–30.

Specifically, design an investment financing platform led by the government to crowd in necessary financial resources from both public and private sources well beyond what would be possible with the Bank Group's own contributions under conventional project and transaction modes of operation. In this effort, the International Bank for Reconstruction and Development, the International Development Association, the International Finance Corporation, and the Multilateral Investment Guarantee Agency should draw on their strengths and expertise in generation and transmission and distribution and tailor syndication mechanisms, differentiated as appropriate for generation investments financing, and otherwise for transmission and distribution investments.

Management Action Record summary:

- In Nigeria, the World Bank is following up with preparation of the Nigeria Electrification Project (P161885), which would finance off-grid electrification activities by the private sector. The World Bank is also preparing the Electricity Transmission Project (P146330), which would increase the power transfer capacity of Nigeria's transmission network.

- Among the completed prospectuses (Guinea, Myanmar, and Rwanda), the International Development Association Myanmar National Electrification Project is supporting investments identified in the prospectus, including grid extension and off-grid systems.

- The International Finance Corporation is also active in Myanmar, including advisory services and Lighting Global support.

Recommendation 4. Improve the evidence base related to electricity access and its alignment with the corporate goals of promoting shared prosperity and ending extreme poverty. (A) At the project level, (i) design results frameworks for electricity sector projects that go beyond simple headcount measures of access—grid, off-grid, [solar home system], end-uses served—to include attributes such as quality, reliability, affordability of service; and (ii) where joint Bank Group projects are undertaken, assess value added of such joint projects to the private sector and country clients. (B) At the sector and country levels, help country clients to appropriately enhance their monitoring and evaluation systems, household surveys, census and similar undertakings to measure and monitor the economic, welfare, and gender-related outcomes from increased electricity access. (C) Across country clients, promote uniformity and comparability in indicators, and help improve country capacity for designing, implementing, and utilizing the monitoring and evaluation frameworks.

Management Action Record summary:

International Finance Corporation:

- Completed an impact evaluation study framework for Türkiye for the power generation sector to better assess impact of increased electricity access to employment and economic growth with relevance for low-access countries.
- Conducted a technical briefing to the Bank Group Board on the International Finance Corporation's evolving strategy to fill the investment gap in the power sector.
- Projections of beneficiaries made in projects in Myanmar, Pakistan, and Sierra Leone were noted.

World Bank:

- Conducted the Multi-Tier Framework surveys in 15 countries (including Ethiopia, Haiti, Kenya, and Rwanda). Outside the World Bank, the German Agency for International Cooperation, GOGLA (the global association for the off-grid solar energy industry), and KfW adopted the Multi-Tier Framework approach for their monitoring and evaluation across the board.

Reference

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Appendix D. World Bank Group Support for Electricity Access, 2015–24: Highlights from Preliminary Portfolio Review

Tables D.1 through D.4 show an analysis of the World Bank commitments related to electricity access by subregion,[1] ranking of the top 10 low-access countries by commitment and lending instrument, and type of access (as described in chapter 2). Table D.5 shows International Finance Corporation (IFC) commitments and Multilateral Investment Guarantee Agency (MIGA) guarantees for electricity access. Table D.6 shows World Bank advisory services and analytics and IFC advisory services.

The World Bank lending portfolio was identified in three sequential steps. In the first step, the team selected projects that met the following criteria:

- The Energy Global Practice was the lead Global Practice or a contributing Global Practice in the project.[2]
- Project country is in Sub-Saharan Africa.
- Approval date or closing date falls between FY 2015 and FY24.
- Project status is either active or closed.

In the second step, from the previous pool, the team screened projects based on key access text attributes (such as project name, project development objective, and component titles). Selecting projects with text attributes that contained the keywords—*electricity generation*, *electricity transmission*, *electricity distribution*, and *access to electricity*—this screening excluded projects unrelated to electricity access (such as mining and water and sanitation projects) and additional financing projects.

In the third step, from the previous pool, the team manually reviewed the Project Appraisal Documents to confirm relevance to energy access and to categorize projects into energy access types. In addition, after consulting with World Bank technical counterparts, the team included some projects that were not captured by the analysis.

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[1] An electricity access project means any power project that has a direct or indirect effect on increasing or improving access to electricity through direct, inferred, or improved access as defined in chapter 2.

[2] In this preliminary process, the team identified seven electricity access projects that do not fulfill these criteria. These projects were included. The team will revise the methodology in subsequent stages.

The IFC investment services portfolio consists of projects in Sub-Saharan African countries that were committed or approved between FY15 and FY24 and mapped to one of the following tertiary sectors: Distribution Business, Electric Power Other (Including Holding Companies), Electric Power Transmission, Gas—Thermal Power Generation, Heavy Fuel Oil—Thermal Power Generation, Large Hydro—Renewable Energy Generation, Power Projects Through Financial Intermediaries (Non RE [Renewable Energy]), Renewable Energy Holding Companies, Rural Electrification, Small Hydro (<10 megawatts)—Renewable Energy Generation, Solar—Renewable Energy Generation, and Wind Power—Renewable Energy Generation. This process was followed by a manual review of the disclosure pages, where available, of the selected projects. The team started consultations on the selected portfolio with IFC technical counterparts.

The IFC advisory services portfolio consists of projects in Sub-Saharan African countries whose implementation plan was approved between FY15 and FY24 and mapped to the following tertiary sectors: Biomass—Renewable Energy Generation, Distribution Business, Electric Power Other (Including Holding Companies), Electric Power Transmission, Gas—Thermal Power Generation, Geothermal—Renewable Energy Generation, Large Hydro—Renewable Energy Generation, Renewable Energy Holding Companies, Renewable Funds—Renewable Energy Generation, Renewable Through Financial Intermediaries—Renewable Energy Generation, Rural Electrification, Small Hydro (<10 megawatts)—Renewable Energy Generation, Solar—Renewable Energy Generation, Waste to Energy—Power, and Wind Power—Renewable Energy Generation.[3] The team started consultations on the selected portfolio with IFC technical counterparts.

The World Bank advisory services and analytics portfolio consists of activities approved between FY15 and FY23 that use *electricity access* and *electricity sector reform* as keywords.[4] These concepts are more related to direct access. From this portfolio, the team manually refined the search through a preliminary assessment of advisory services and analytics summaries. The team started consultations on the selected portfolio with World Bank technical counterparts.

The MIGA portfolio is made up of power sector projects supported by MIGA guarantees issued in Sub-Saharan Africa between FY15 and FY24.[5] The team received the portfolio

[3] The portfolio excludes projects approved before FY15 and active during the evaluation period.

[4] Activities with Activity Initiation Summary approved between FY15 and FY23.

[5] This preliminary portfolio may include projects that provide access not only to households but also to businesses and institutions. In subsequent stages, the team will refine the search. It excludes projects approved before FY15, while active during the evaluation period.

from MIGA technical counterparts and adjusted it to address the scope of the evaluation.

Table D.1. World Bank Electricity Access Portfolio in Sub-Saharan Africa, FY15–24, Project Count and Total Commitments by Subregion

	Projects (no.)				Total Commitments (US$, millions)			
	Active	Closed	Total	(%)	Active	Closed	Total	(%)
Eastern and Southern Africa	51	51	102	46	10,513	11,154	21,667	57
Western and Central Africa	43	79	122	54	9,148	7,421	16,569	43
Total	94	130	224	100	19,661	18,575	38,236	100

Source: World Bank Business Warehouse.

Table D.2. World Bank Electricity Access Portfolio in Sub-Saharan African Countries with Low Access, FY15–24: Ten Largest Commitments

		Projects (no.)				Total Commitments (US$, millions)			
Country	Income Group	Active	Closed	Total	(%)	Active	Closed	Total	(%)
Kenya	LMIC	4	7	11	15	709	2,626	3,335	25
Ethiopia	LIC	5	2	7	10	1,608	309	1,916	14
Niger	LIC	3	4	7	10	425	760	1,185	9
Uganda	LIC	2	5	7	10	668	490	1,158	9
Rwanda	LIC	3	7	10	14	499	645	1,143	9
Tanzania	LMIC	3	4	7	10	617	362	979	7
Benin	LMIC	1	8	9	13	200	775	975	7
Angola	LMIC	2	1	3	4	380	500	880	7
Mozambique	LIC	3	4	7	10	550	305	855	6
Congo, Dem. Rep.	LIC	1	2	3	4	600	218	818	6
Top 10 low-EA countries, total		27	44	71	100	6,255	6,989	13,244	100
Top 10 low-EA countries, SSA portfolio (%)		29	34	32		32	38	35	

Sources: World Bank Business Warehouse; World Bank Open Data.
Note: Low electricity access means electrification rates in 2015 is 50 percent or less, according to World Bank Development Indicators. Top 10 countries ranking is based on World Bank lending commitments. EA = electricity access; LIC = low-income country; LMIC = low-middle-income country; SSA = Sub-Saharan Africa.

Table D.3. World Bank Electricity Access Portfolio in Sub-Saharan Africa, FY15–24: Project Count and Total Commitments by Lending Instrument

Lending Instrument	Projects (no.)	Total Commitments (US$, millions)
IPF	169	27,251
PforR	10	3,475
DPF	45	7,510
Total	224	38,236

Sources: IFC Business Intelligence; MIGA database; World Bank Business Warehouse.
Note: DPF = development policy financing; IFC = International Finance Corporation; IPF = investment project financing, including adaptable program loan, specific investment loan, and emergency recovery loan; MIGA = Multilateral Investment Guarantee Agency; PforR = Program-for-Results.

Table D.4. World Bank Electricity Access Portfolio in Sub-Saharan Africa, FY15–24: Activity Count by Type of Access

Electricity Access	Active	Closed	Total
Direct access	68	52	120
Inferred access	21	46	67
Improved access	13	49	62
Total	102	147	249

Source: World Bank Business Warehouse.
Note: A project can have multiple energy access activities.

Table D.5. International Finance Corporation and Multilateral Investment Guarantee Agency Electricity Access Portfolios, Approved in FY15–24

	Projects (no.)			Commitments (IFC) or Guarantees Issued (MIGA) (US$, millions)		
Type	Active	Closed	Total	Active	Closed	Total
IFC IS	47	6	53	1,193	43	1,236
MIGA guarantees	34	10	44	2,981	101	3,082

Sources: IFC Business Intelligence; MIGA database.
Note: IFC = International Finance Corporation; IS = investment services; MIGA = Multilateral Investment Guarantee Agency.

Table D.6. Electricity Access World Bank Advisory Services and Analytics and International Finance Corporation Advisory Services in Sub-Saharan Africa, Approved in FY15–24

	Analytic and Advisory Activities (no.)			Cost (US$, millions)
Type	Active	Closed	Total	Total
World Bank ASA	14	37	51	—
IFC AS	10	17	27	80

Sources: IFC Business Intelligence; MIGA database.
Note: World Bank ASA includes activities with Activity Initiation Summary approved between FY15 and FY23. AS = advisory services; ASA = advisory services and analytics; IFC = International Finance Corporation; — = not available.

Appendix E. Evaluation Methodology and Design

Table E.1. Evaluation Design Matrix

Subordinate Evaluation Question	Information Required	Proposed Analytic Approach	Comments About the Method
1. Relevance: To what extent have World Bank Group interventions in Sub-Saharan African countries been aligned with good practices to support electricity access according to country needs?			
1a. To what extent has the Bank Group contributed to good practices in methodologies and fitness for purpose for NEPs?	• Gray and academic literature.	• Literature review: The least cost analysis offers a key variable for deciding on whether to electrify using grid or off-grid technologies. The team will assess the strengths and limitations of the least cost analysis used in NEP to achieve electrification targets and adequate energy for supporting productive activities within a predefined time frame. It will assess to what extent issues such as the intertemporal cost of money is included or the bankability of some proposals for private sector participation.	• The literature review will give insights related to the robustness of the literature overall. However, from that review, it will not be possible to assess the specific ways that the methodology is applied in each NEP. The emphasis will be on areas that are excluded in the least cost analysis and the potential biases associated with such omissions.
	• NEPs and their updates for all Sub-Saharan African countries that have them. The team will use partial electrification plans, including regional or rural electrification plans, in countries without NEPs. We will use local sources and RISE.	• Content analysis of NEPs for all Sub-Saharan African countries with NEP to identify (i) World Bank contributions and (ii) adoption of good practices in its elaboration, including least cost analysis and geospatial mapping.	• Preliminary evidence from the team suggests that out of the 32 countries in Sub-Saharan Africa with World Bank operations related to direct access, 29 have NEPs. The quality of the information in the NEP is heterogeneous and not easily comparable. The team expects to work with World Bank counterparts to try to access all NEP and their updates, in case they are not publicly available. • Some NEPs might have incomplete information to assess the questions. They may also make references to documents that are inaccessible to the team. • The information provided in the NEP could be uneven and

Subordinate Evaluation Question	Information Required	Proposed Analytic Approach	Comments About the Method
			in cases insufficient for making meaningful comparisons. • Government counterparts that worked during the preparation of NEP might be difficult to reach. The team will work with available government counterparts and try to reach out to them with the support of the World Bank counterparts.
	• Project documentation for relevant Bank Group portfolio (for example, CPFs, PADs, PPs, ICRs, ICRRs, PPARs, ASAs, InfraSAPs, and IFC and MIGA project documents).	• PRA: Mapping of the Bank Group interventions with the targets identified in the NEP. This analysis will assess (i) the consistency of the Bank Group portfolio with the NEP and (ii) the possibility of some biases or patterns in the Bank Group interventions, for example, through the prioritization of last-mile versus first-mile communities or communities with greater economic growth potential.	• The evidence from PRA will be triangulated with the one from case studies. • Connecting NEP targets with World Bank projects might prove challenging considering the granularity of the information. The team will do its best to develop a consistent methodology, considering data availability in the documents.
	• Relevant Bank Group staff and government and private sector counterparts. • NEPs, project documentation for relevant Bank Group portfolio (for example, CPFs, PADs, PPs, ICRs, ICRRs, PPARs, ASAs, InfraSAPs, and IFC and MIGA project documents).	• Case studies: To assess (i) the extent to which the Bank Group has contributed to NEP (and its updates) in its main documents, including CPFs and IFC country strategies; (ii) the consistency of proposed Bank Group interventions with the NEPs; and (iii) the extent to which there are significant differences between the Bank Group and country approaches to electrification that are not reflected in these plans. Case studies include the use of semistructured interviews with relevant stakeholders.	• Six out of the 10 case studies will include field visits. While they will include semistructured interviews with Bank Group counterparts, desk reviews will be more limited in accessing information from external stakeholders.
1b. To what extent have the Bank Group	• NEPs and their updates for all Sub-	• Content analysis of NEPs to assess the extent to which	• Considering that the NEPs' format is not necessarily

Subordinate Evaluation Question	Information Required	Proposed Analytic Approach	Comments About the Method
interventions aimed to advance electricity access in a reliable, sustainable, and affordable way?	Saharan African countries that have them. We will extract information from local sources and RISE.	NEPs include references to reliable, sustainable, and affordable energy.	standardized, some of the information needed for this method might be omitted.
	• Project documentation for relevant Bank Group portfolio (for example, CPFs, PADs, PPs, ICRs, ICRRs, PPARs, ASAs, InfraSAPs, and IFC and MIGA project documents).	• PRA to identify how the Bank Group interventions envisage financing, technical assistance, and changes in institutional development that ensure access to reliable, sustainable, and affordable electricity (KPI analysis).	• Bank Group project might provide incomplete information about their impact on institutional development and access to reliable, sustainable, and affordable electricity.
	• Relevant World Bank staff and government and private sector counterparts. • Project documentation for relevant Bank Group portfolio (for example, CPFs, PADs, PPs, ICRs, ICRRs, PPARs, ASAs, InfraSAPs, and IFC and MIGA project documents).	• Case studies to assess whether the Bank Group has clear diagnostics on the constraints that inhibit electrification through different technologies.	• Six out of the 10 case studies will include field visits. Desk reviews will be more limited in accessing information from external counterparts. • Some of the barriers might be beyond the scope of the project (for example, access to finance). In such cases, the team expects to find these constraints as risk factors for potential demand uptake.
	• ESMAP reports. • Lighting global products. • Global electrification platform.	• Content analysis of Bank Group analytics and activities on electricity access. The evaluation will take stock of the advisory and analytics under the Lighting Global initiative, ESMAP's knowledge products, including the Multi-Tier Framework reports, and the contributions of the Global Electrification Platform.	• Some of these analytics represent the views of the authors and not necessarily the views of the Bank Group. • The team may complement the findings with interviews with Bank Group staff and management.
	• Public information on the prices of key inputs, including solar panels and batteries;	• Market analysis to assess the factors that (i) may have contributed to the shift in the Bank Group portfolio allocation	• The information from this method can help give some context to the Bank Group portfolio and complement the information gathered through

Subordinate Evaluation Question	Information Required	Proposed Analytic Approach	Comments About the Method
	macroeconomic information, such as interest rates and inflation; and equity prices of companies investing in access, including solar and wind.	between grid and off-grid technologies with relative changes in prices of renewable energy inputs and (ii) potential slowdown in off-grid investments in 2020–22 because of changes in macroeconomic conditions that may have affected the financial results of private sector companies operating in the off-grid market.	other methods. For example, preliminary evidence suggests that some Bank Group operations may not have moved forward because of market conditions during 2020–23.
2. Effectiveness: To what extent have Bank Group interventions in Sub-Saharan African countries achieved their stated outcomes, and how have they contributed to achieving their electricity access targets?			
2a. To what extent have the Bank Group interventions supported Sub-Saharan African countries in advancing electricity access with different technologies (grid, minigrid, and solar home systems) in terms of new connections, service reliability, sustainability, and affordability?	• Literature review on impact evaluation of electrification using gray and academic literature.	• Literature review: To assess the evidence of the impact of rural electrification programs in terms of welfare, including jobs, education, and health. The literature will also search for enabling factors for economic development of communities that receive electricity access, including villages' access to roads, households' availability of credit, and technical assistance to communities for supporting business development.	• The findings from the review might be overreliant in a small number of countries and might not be generalizable or replicable in all countries in Sub-Saharan Africa.
	• Project documentation for relevant Bank Group portfolio (for example, CPFs, PADs, PPs, ICRs, ICRRs, PPARs, ASAs, InfraSAPs, and IFC and MIGA project documents).	• PRA (KPI analysis): (i) comparisons between the proposed and effective number of connections achieved by the type of technologies and (ii) analysis of the Bank Group projects measured against their reliability, sustainability, and affordability targets.	• The analysis will rely mostly on closed projects with data on actual connections. It will provide partial insights into open projects, which are a considerable portion of the portfolio. These projects might have only partial data on achieved outcomes at the time of the evaluation. This limitation will be mitigated with the triangulation of this evidence with the one obtained from the case studies.
	• The module will use medium-resolution Visible Infrared	• Geospatial analysis: The analysis will be developed using a two-tiered	• The quality of the information provided in the NEPs can be mixed. They may require to

Subordinate Evaluation Question	Information Required	Proposed Analytic Approach	Comments About the Method
	Imaging Radiometer Suite Nighttime Lights data as the main data source for the analysis. • A data set on electricity access by tiers for Sub-Saharan Africa may serve as a complement. • Hyperspectral satellite imagery or high-resolution multispectral satellite imagery, land use and land cover data, and vegetation indexes. These types of imagery may need to be purchased from commercial vendors. • NEPs.	approach, beginning with a broad overview and advancing to a more detailed and in-depth examination. Module 1 will (i) analyze the historical nighttime light evolution in communities that benefited from the Bank Group interventions and (ii) will trace the communities that benefited from Bank Group electrification interventions and compare them with the plans set in the NEPs. Module 2 will focus on specific off-grid case studies: electricity uptake, land cover and land use, and maintenance of solar panels.	work with a selection of countries. • Module 2 case studies present significant challenges in terms of data accessibility, cost, and sample. The team will start with pilot and expand into bigger samples, depending on the results from the pilot.
	• Project documentation for relevant Bank Group portfolio (for example, CPFs, PADs, PPs, ICRs, ICRRs, PPARs, ASAs, and IFC and MIGA project documents); relevant World Bank staff; and government and private sector counterparts.	• Case studies: (i) analysis of the factors that have supported, inhibited, or delayed the rollout of the electrification plans and (ii) assessment of how the Bank Group has addressed these barriers. Case studies will be carried in 10 countries and include the use of semistructured interviews with relevant stakeholders.	• For case studies to be implemented as desk reviews (6 out of 10), information may be limited. • Information might be more limited for recent projects. • The challenge will be to conceptualize the "stories" that may come out from the interviews on factors that supported, inhibited, or delayed the rollout of the electrification plans and turn them into meaningful findings. For example, suitability of the business model considering private sector expected rates of return or insufficient legal certainty for making long-term investments.
	• Country sources and World Bank UPBEAT database.	• Event study: An econometric study of the impact of the World Bank interventions on utility	• The sample of companies in the treatment group might end up being relatively small. The World Bank database has

Subordinate Evaluation Question	Information Required	Proposed Analytic Approach	Comments About the Method
		companies on improving (i) their financial performance and (ii) reliability indicators (for example, SAIDI and SAIFI).	information on 72 companies in Sub-Saharan Africa, but the portfolio analysis will help identify the companies that will be part of the treatment group. • The event study will not be able to capture all the complexities associated with power utility companies in the region, including governance, operational inefficiencies, and limited human capital. Previous IEG evaluations have addressed these issues. This method will try to shed light on whether the Bank Group has made a difference in terms of improving the financial sustainability of utility companies and improving the reliability of the electricity to facilitate uptake and promote the productive use of electricity.
2b. Where relevant, to what extent has the Bank Group supported the sound development of the off-grid electricity market through competition, institutional development of relevant public sector organizations, and adequate regulatory and supervisory framework?	• Project documentation for relevant Bank Group portfolio (for example, CPFs, PADs, PPs, ICRs, ICRRs, PPARs, ASAs, InfraSAPs, and IFC and MIGA project documents); relevant World Bank staff; and government and private sector counterparts.	• PRA (KPI analysis): The evaluation will assess the extent to which off-grid interventions have provided financial resources (for grants and concessional lending), support for institutional development of relevant public sector organizations, and technical assistance for adequate regulatory and supervisory framework.	• Documents might not be able to capture the extent of the demand from private sector participants for investing in the off-grid sector.
	• Project documentation for relevant Bank Group portfolio (for example, CPFs, PADs, PPs, ICRs, ICRRs, PPARs, ASAs, InfraSAPs, and IFC and MIGA project documents); relevant World Bank staff;	• Case studies will address specific questions regarding the success or failure of Bank Group interventions in attracting the private sector to invest in the off-grid market. In the case of success, the team will analyze the derisking conditions that may have facilitated the	• This method requires evaluators to have a level of expertise that goes beyond energy access. It may also require more than a round of interviews with some counterparts and more time. To address this challenge, the team will conduct a pilot with a team member with more expertise in the topic and work

Subordinate Evaluation Question	Information Required	Proposed Analytic Approach	Comments About the Method
	and government and private sector counterparts. • Contracts with off-grid market developers; changes in laws and regulations.	participation and assess this information considering the scalability of these operations.	on a template of questions to be used for the team members who will lead the rest of the case studies.
	• Public information about prices of raw materials, inflation, interest rates, and FX fluctuation of Sub-Saharan Africa currencies. • Public information about the financial strength of leading off-grid operators in Sub-Saharan Africa, including other multilateral organizations, DFIs, and institutions involved in the off-grid market (that is, Sustainable Energy for All). • Interviews with market participants, including DFIs, NGOs, and private sector investors.	• Market analysis: This method will analyze the trends in the development of the off-grid market in Sub-Saharan Africa. For example, recent evidence suggests persistent difficulties for attracting private capital into the minigrid sector. In the case of the solar home systems market, recent trends suggest significant consolidation of the market players, including the participation of large international operators in Sub-Saharan Africa.	• This method aims to assess whether the problems faced by the World Bank in attracting private capital to energy access are common across the Sub-Saharan Africa. The challenge will be to find reliable sources that can provide a comprehensive view of the off-grid market in Sub-Saharan Africa. • While this method also aims to shed light on the sustainability of the business model for some off-grid activities, private sector participants might be reluctant to share some key information, including the capital structure of their projects.
3. Coherence: How coherent has the Bank Group's support been across its institutions (World Bank, IFC, and MIGA) in supporting electricity access in Sub-Saharan African countries and with other development partners in the elaboration and implementation of electrification plans?	• Project documentation for relevant Bank Group portfolio (for example, CPFs, PADs, PPs, ICRs, ICRRs, PPARs, ASAs, InfraSAPs, and IFC and MIGA project documents); relevant World Bank staff; and government and private sector counterparts.	• PRA: To assess the extent of internal collaboration and sequencing of interventions among the Bank Group institutions. • Case studies: To assess the extent of internal and external collaboration: (i) internal collaboration will be measured in terms of the objective of providing access, and (ii) external collaboration will be measured in terms of coordination with key development partners in	• During the evaluation period, the Bank Group has enacted guidelines that promote collaboration, including cascade and Mobilizing Finance for Development. Preliminary evidence suggests that these initiatives have not been fully implemented. While the evaluation may find some cases of collaboration, it might be the case that it simply reflects good personal relationships among Bank Group staff, rather than an institutional framework

Subordinate Evaluation Question	Information Required	Proposed Analytic Approach	Comments About the Method
		the preparation and implementation of the NEPs.	designed to foster collaboration. • The assessment on external collaboration will provide a single perspective of a broader topic of collaboration with external partners.

Source: Independent Evaluation Group.
Note: ASA = advisory services and analytics; CPF = Country Partnership Framework; DFI = development finance institution; ESMAP = Energy Sector Management Assistance Program; FX = foreign exchange; ICR = Implementation Completion and Results Report; ICRR = Implementation Completion and Results Report Review; ICT = information and communication technology; IEG = Independent Evaluation Group; IFC = International Finance Corporation; InfraSAP = Infrastructure Sector Assessment Program; KPI = key performance indicator; MIGA = Multilateral Investment Guarantee Agency; NEP = national electrification plan; NGO = nongovernmental organization; PAD = Project Appraisal Document; PP = Project Paper; PPAR = Project Performance Assessment Report; PRA = portfolio review and analysis; RISE = Regulatory Indicators for Sustainable Energy; SAIDI = System Average Interruption Duration Index; SAIFI = System Average Interruption Frequency Index; UPBEAT = Utility Performance and Behavior in Africa Today.

Content Analysis

A template will be developed to analyze the content of the national electrification plans (NEPs) to determine the extent of the World Bank Group's influence on their elaboration and the relative weight given to relevance, sustainability, and affordability (evaluation questions 1a and 1b). Content analysis will also be used to take stock of the analytic and advisory activities developed by the Bank Group during the evaluation period (evaluation question 1b).

Since NEPs are the backbone of electrification plans, the evaluation will assess the extent to which the Bank Group influenced their elaboration and fitness for purpose. To that end, the analysis will examine whether the Bank Group–supported methodologies, such as demand assessments and geospatial least cost analysis, have been included in countries' NEPs. It will also assess the consistency of proposed Bank Group interventions with the NEPs and the extent to which there are significant differences between the Bank Group's and countries' approaches to electrification that are not reflected in these plans (evaluation question 1). In addition, the analysis will assess the extent to which NEPs include references to reliable, sustainable, and affordable energy. As these electrification plans are regularly updated, the evaluation will examine possible methodological improvements that can explain changes in electrification paths using different technologies.

The team tentatively plans to use NVivo for the analysis. The categories to be assessed in the template include the following:

- Basic information: country, coverage (urban, peri-urban, rural, or national), and period
- Models and tools used for the elaboration of the NEP
- Bank Group–identified contributions
- Outcome targets in the NEP
- Whether the NEP includes targets for reliability, sustainability, and affordability; how those targets are calculated; and the reliability of the data sources
- Mix of electrification technologies proposed in the NEP (grid, minigrid, and solar home systems)
- Sources of financing for projects identified in the NEP, including public and private sources, multilateral organizations, development finance institutions, and donors

The content analysis of Bank Group analytic and advisory activities related to electricity access aims to take stock of the extent to which they have a consistent focus on connectivity, reliability, sustainability, and affordability (evaluation question 1).

Geospatial Analysis

To determine whether Bank Group interventions have been effective in supporting access with different technologies (evaluation question 2a), we will use geospatial analysis to trace the intensity of nighttime lights across the region derived from the Bank Group interventions and conduct some comparative analysis, as explained in this section. Nighttime light intensity will be used as a proxy for economic development. Geospatial analysis is a unique method for linking Bank Group interventions with economic activity goals. It also allows tracing Bank Group activities in relation to the NEP, understanding the extent of possible prioritization patterns that benefit some communities over others, and assessing the impact of some of these interventions over short and medium time frames.

The analysis will be developed using a two-tiered approach, beginning with a broad overview and advancing to a more detailed and in-depth examination. Module 1 will concentrate on analyzing the entire on-grid portfolio, whereas module 2 will focus on specific off-grid case studies.

Module 1 will assess the Bank Group grid access electrification portfolio, focusing on connectivity, reliability, and sustainability of the on-grid portfolio. Module 1 comprises two submodules. Submodule 1a will analyze the historical nighttime light evolution in

communities that benefited from Bank Group interventions that offered (i) direct access and (ii) indirect access through investments in transmission. Using nighttime lights, submodule 1b will trace the geographic areas that benefited from Bank Group electrification interventions and compare them with the plans set in the NEPs. In addition, it will assess potential prioritization patterns in the Bank Group interventions.

Submodule 1a. This submodule will provide a comprehensive overview of electrification progress in Sub-Saharan Africa during the evaluation period, highlighting areas where the Bank Group has a direct impact. The analysis will be able to observe not only connectivity but also the prevalence of blackouts and interruptions in the system (that is, reliability). In addition, the analysis will be able to capture whether some grid electrification programs have had transitory or permanent effects on communities. For example, an initial boost in economic activity motivated by improvement in reliability from a new transmission line might diminish after a few years because of lack of maintenance or increases in demand, leading to reduced network reliability (power blackouts and brownouts). The submodule will use medium-resolution Visible Infrared Imaging Radiometer Suite Nighttime Lights data as the main data source for the analysis.[1] This data source is publicly available for the evaluation period. The data set will be complemented with ancillary socioeconomic data sets, portfolio data, and project site geolocation information. The Nighttime Lights' inability to capture power systems of Multi-Tier Framework (MTF) tier 1 and tier 2 electrification technologies explains the absence of analysis of solar home systems in this submodule.

Submodule 1b. This submodule will compare Bank Group interventions with NEPs. Specifically, this submodule will trace the geographic coordinates of planned interventions outlined in the NEPs and compare them with Bank Group–supported projects. The goal is to determine how well Bank Group interventions align with the priorities set forth in the NEPs and to identify any patterns in prioritization. For example, the Bank Group might target first- or last-mile communities or focus on communities with greater expectations of economic development, measured by existing or anticipated road access. Existing literature, as will be documented in the literature review of this evaluation, indicates that road access significantly enhances economic activity in electrified communities.

Submodule 1b will use data sources similar to those in submodule 1a, with the addition of road network data. Because of the lack of standardization and inconsistent quality of NEPs, submodule 1b will concentrate on a sample of countries. Preliminary assessments

[1] Visible Infrared Imaging Radiometer Suite captures a stable measure of radiance as observed at night from space.

reveal that NEP information varies widely in format and detail. To address this, the team will develop criteria to ensure a representative sample from Sub-Saharan Africa and establish minimum quality thresholds for NEP data. A standardized template will also be created to extract and record information consistently from selected NEPs.

Module 2. In specific areas of interest, module 2 will conduct a comparative analysis to assess the reliability, sustainability, and economic impact of electrification using different technologies, including MTF tier 1 and tier 2 electrification. These exercises will start with a pilot and expand to broader samples, depending on the results from the pilot. The pilot will provide critical insights into data and computation requirements, as well as the potential usefulness of the findings. On the basis of these outcomes, the team will select the most appropriate methodology—such as difference-in-differences, propensity score matching, or other suitable approaches—to ensure the robustness of the analysis. The team will work with the Methods team to ensure that the findings are representative of the Bank Group portfolio. Within a selected area of interest in a country, the evaluation will study the following:

- **Electricity uptake.** The intensity of nighttime light on communities that received (grid) electrification and nearby communities where solar home systems were installed. This exercise will allow the evaluation to see both types of communities' uptake (electricity demand) over time and compare economic activity (proxied by nighttime lights) over time.

- **Land cover and land use.** The evaluation will investigate changes in land cover and land use in electrified communities. This includes examining shifts in land use for agricultural or industrial purposes, such as the transition from bare soil to agricultural land. In addition, the exercise will assess these patterns in nearby pre-electrified communities. Because MTF tier 1 and tier 2 electrification projects are not expected to have productive use of energy as an objective, these communities will be used as a control group.

- **Maintenance of solar panels.** The evaluation will also explore households' responses to the long-term effects of MTF tier 1 and tier 2 electrification. Given that rooftop solar panels typically have a lifespan of three to five years and a warranty of about one year, the study will assess the extent of maintenance and upkeep of these panels.[2]

[2] Under some contractual frameworks, households pay for electricity according to pay-as-you-go schemes, which may incentivize the replacement of solar panels once they become obsolete.

This module will use high-resolution satellite imagery, hyperspectral satellite imagery, and very-high-resolution satellite imagery. While most of these data sources are publicly accessible, very-high-resolution imagery will likely need to be purchased from commercial vendors. Because of the significant computational resources required for processing these images and the potential cost associated with very-high-resolution data, module 2 will concentrate on specific case studies. The sample for these exercises will include rural communities that received grid-type electricity access and compare with neighboring pre-electrified communities during similar time period.

Case Studies

The evaluation will carry out case studies to assess (i) the extent to which the Bank Group has contributed to NEP (and its updates) in its main documents, including the Country Partnership Frameworks and International Finance Corporation country strategies (evaluation question 1); (ii) the consistency of proposed Bank Group interventions with the NEPs (evaluation question 1); (iii) the extent to which there are significant differences between the Bank Group's and countries' approaches to electrification not reflected in these plans (evaluation question 1); (iv) the factors that may have supported, inhibited, or delayed the rollout of the electrification plans, including insufficient funding of public utility companies and off-grid private sector operators (evaluation question 2); (v) how the Bank Group has addressed these barriers (evaluation question 2); and (vi) the extent to which the World Bank, the International Finance Corporation, and the Multilateral Investment Guarantee Agency have coordinated and collaborated in their interventions (evaluation question 3).

The case studies will be carried out for 10 selected countries where the Bank Group has long engagements in electricity access. The country case study design will closely follow the theory of change and use a template to enable cross-country comparison and proxies for counterfactual scenarios, geared to identifying broadly applicable findings and lessons. If necessary, the team may consider remote missions to desk review countries. The case studies will predominantly include countries in Sub-Saharan Africa, but the team may select 1 or 2 countries outside the region to fulfill the criteria discussed in the next paragraphs.

Country selection for the case studies will be based on two criteria—progress in electricity access and off-grid intensity:

1. **Progress in electricity access.** It aims to assess the relative success in increasing access during the evaluation period. It measures the extent of progress in connecting households to electricity, either grid or off-grid. Access to electricity

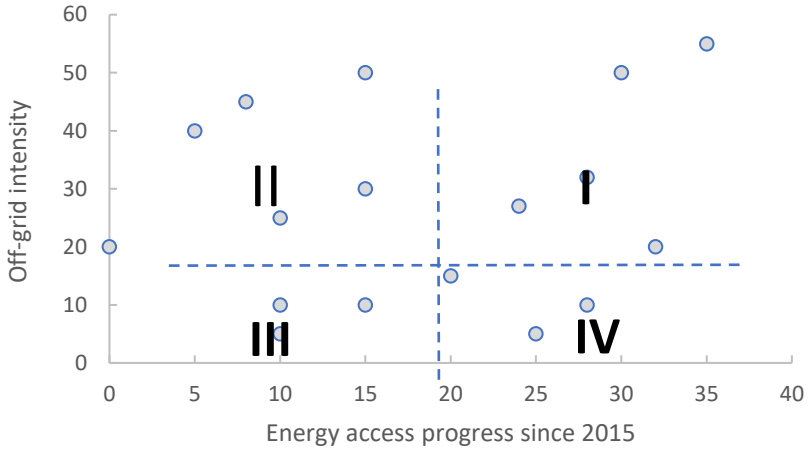
will be measured as reported by the World Bank: access to electricity (percentage of the population). Preliminary evidence suggests that the range of progress in Sub-Saharan Africa is between 0 percent and 35 percent, including countries moving from very low to low electricity access rates (from less than 25 percent of the population to between 25 percent and 50 percent of the population).

2. **Off-grid intensity.** Off-grid intensity aims to reflect the technologies that countries may use to address their different geographic landscapes and population distributions, including the relative sizes of cities, villages, and isolated rural communities. Different approaches toward increasing electricity access involve selecting different technologies (grid, minigrid, and solar home system). These approaches aim to reflect different geographical landscapes and organization of communities in a country. For example, although electrification in smaller countries with bigger urban and peri-urban areas might be more efficient through grid solutions, larger countries with scattered rural communities dispersed across the territory might find it more efficient to provide access to rural communities using a greater proportion of off-grid technologies. Off-grid intensity will be measured by the target of off-grid electricity access included in the NEP.[3] Preliminary analysis of NEP suggests a range between 2 percent and 50 percent of the cases.

These two criteria will be used to populate the quadrants in figure E.1. Quadrant I reflects countries that have been relatively more successful in increasing access while using off-grid technologies more intensively. Quadrant II reflects countries that have had less success in increasing access while using off-grid technologies. Quadrant III reflects countries that have been less successful in increasing access while using off-grid technologies less intensively. Finally, quadrant IV reflects countries that have been relatively more successful in increasing access but using more intensive grid technologies. The evaluation may select one or two countries outside the region to reflect countries that have been successful in increasing access to high levels while relying more intensively on off-grid technologies. Preliminary evidence suggests that it might be difficult to find evidence for the far-right side of quadrant I in Sub-Saharan Africa.

[3] Percentage of households with access to electricity receiving electricity from off-grid sources.

Figure E.1. Illustration of Country Selection Criteria



Source: Independent Evaluation Group.

Complementary criteria for country selection include regional diversity (Eastern, Central, and Western Africa), income (blend or International Development Association), and the financial situation of the relevant power utility company at the time of the first NEP within the evaluation period. This last criterion aims to reflect the extent to which the Bank Group may find challenges in making electricity access progress through companies that are in financial distress.

The case studies will use the NEPs as a benchmark to measure progress in terms of new connections, reliability, sustainability, and affordability. A geospatial analysis will be attempted to characterize the effectiveness of the Bank Group's interventions according to the plan and the economic and welfare benefits for communities that receive access. The case studies will examine the issues relating to factors affecting access expansion through grid and off-grid and will assess the effectiveness in delivering services. The team will follow a template to collect and analyze information from the case studies, which, at a minimum, will include information about the issues and criteria mentioned in this section.

The case studies will have the NEP as a benchmark to be complemented by the following methods:

- Country Partnership Strategies, Country Partnership Frameworks, Systematic Country Diagnostics, and related Independent Evaluation Group reviews that will be assessed for all low and medium access at present and that will be analyzed based on the elements in the theory of change, in terms of relevant

electricity access issues raised, strategies proposed, specific proposals for a work program, and follow-through

- Semistructured interviews with Bank Group staff, government officials, private sector representatives, and other development partners, as relevant
- In-depth analysis of project-level documents and Independent Evaluation Group validations
- Review of relevant laws and regulations at the country level
- Analysis of country-level statistics and market trends in the energy sector