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World Bank Group Support to Electricity Access, FY2000-2014

AN INDEPENDENT EVALUATION

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WHAT WORKS

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Abbreviations

AAA	analytic and advisory activities
APL	Adaptable Program Loan
ASTAE	Asia Sustainable and Alternative Energy
CAS	Country Assistance Strategy
CPS	Country Partnership Strategy
DPC	Development Policy Credit
DPL	Development Policy Loan
DPO	development policy operation
E&S	environmental and social
EDL	Electricité du Laos
ESMAP	Energy Sector Management Assistance Program
ESW	economic and sector work
GDP	gross domestic product
GEF	Global Environment Facility
GIS	geographic information system
GPOBA	Global Partnership on Output-based Aid
IBRD	International Bank for Reconstruction and Development
ICR	Implementation Completion Report
ICRR	Implementation Completion Report Review
IDA	International Development Association
IDCOL	Infrastructure Development Company Limited
IEA	International Energy Agency
IEG	Independent Evaluation Group
IFC	International Finance Corporation
IPP	independent power provider
KPI	key performance indicator
LED	light-emitting diode
M&E	monitoring and evaluation
MIGA	Multilateral Investment Guarantee Agency
NGO	nongovernmental organization
OBA	output-based aid
OPCS	Operations Policy and Country Services
PAD	Project Appraisal Document
PCG	Partial Credit Guarantee
PPAR	Project Performance Assessment Report
PPIAF	Public-Private Infrastructure Advisory Facility
PPP	public-private partnership
PPP	purchasing power parity
PRG	Partial Risk Guarantee
PRSC	Poverty Reduction Support Credit
RERED	Rural Electrification and Renewable Energy Development
SE4All	Sustainable Energy for All
SHS	solar home system
SIL	Specific Investment Loan
T&D	transmission and distribution
WDI	World Development Indicators

All dollar amounts are U.S. dollars unless otherwise indicated.

Acknowledgments

This evaluation is a product of the Independent Evaluation Group (IEG). The evaluation team was led and coordinated by Varadarajan Atur and Ramachandra Jammi (IEGPS) under the supervision of Marie Gaarder (Manager, IEGPS) and the general direction of Emmanuel Jimenez (former Director, IEGPS), Marvin Taylor-Dormond (acting Director, IEGPS), and Caroline Heider (Director-General, IEG).

Fernando Manibog provided support on the evaluation design and approach at the Approach Paper stage. Elena Bardasi provided inputs and guidance on the gender aspects of the evaluation. Aurora Medina Siy (IEGPE) led the review of the IFC and MIGA portfolio and coordinated the inputs related to private sector aspects of the evaluation. Mari Noelle Roquiz provided research and portfolio review support to Aurora throughout, and Alexandra Liapliana helped with such review in the early part of evaluation. Istvan Dobozi prepared background papers on off-grid electrification and power sector financial viability aspects with support from Sofia Chiarucci and Chiara Rogate, respectively, and provided inputs to the overall messages. Arun Sanghvi provided inputs to the evaluation throughout, especially on the sectorwide frameworks, and served as advisor to the team on sector-related aspects. Romayne Pereira was responsible for the administrative aspects. William Hurlbut, Barbara Rice, and Cheryl Toksoz provided editorial support.

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Overview

World Bank Group Support to Electricity Access, FY2000–FY2014

Highlights

The World Bank Group has committed to achieving universal access to electricity by 2030 under the Sustainable Energy for All (SE4All) initiative. This is a daunting challenge: more than 1 billion people do not have access, and another 1 billion have chronically inadequate or unreliable service. Most of those without access are poor, and the largest share is in Sub-Saharan Africa. Achieving universal access within 15 years for the low-access countries (those with under 50 percent coverage) requires a quantum leap from their present pace of 1.6 million connections per year to 14.6 million per year until 2030. The investment needed would be about $37 billion per year, including erasing generation deficits and meeting demand from economic growth. By comparison, in recent years, low-access countries received an average of $3.6 billion per year for their electricity sectors from public and private sources, including $1.5 billion per year from the World Bank Group.

Development outcomes of the Bank Group's assistance were generally favorable compared with other infrastructure sectors. However, performance in improving financial viability of country electricity sectors was below expectations. There were significant gaps in the Bank Group's coverage of low-access countries, mostly in Sub-Saharan Africa. Median implementation time of World Bank investment projects was nine years, with time overruns attributable to inadequate project design and borrower capacity. Support for off-grid electrification was low and sporadic, with a few notable exceptions. The Bank Group's growing non-conventional renewable energy portfolio is dealing with technology and regulatory challenges. Tracking welfare and gender impacts in World Bank projects has improved, and International Finance Corporation (IFC) has made a beginning in addressing these issues. The Bank made some significant pilot contributions to addressing the affordability of electricity connections. Collaboration grew among World Bank, IFC, and MIGA through joint projects, which helps break ground for the private sector in some high-risk and fragile countries, and supports a few large and complex projects.

There are several good practice national access scale-up experiences worldwide, some with significant Bank Group involvement—Vietnam, the Lao People's Democratic Republic, Indonesia, and Bangladesh—and more recently, Rwanda and Kenya's national electrification programs combining grid and off-grid means. These experiences illustrate common underlying principles adapted by each country to its own institutional framework, broadly stated: adherence to a nationwide least-cost national access rollout plan using coordinated grid and off-grid delivery as appropriate to achieve universal access nationwide; maintaining the financial sustainability of the sector and the commercial viability of its agent(s) to draw investment financing requirements on a sustained basis; addressing equity by targeting the poor nationwide to ensure affordability; and not the least, guided by a unifying government vision and committed leadership that stays the course over the duration of the implementation program.

The scale of the SE4All challenge requires the Bank Group to reposition itself as a global solutions provider in the sector, going well beyond the confines of its own direct support for access. This evaluation points to the urgency for the Bank Group's energy practice to adopt a new and transformative strategy to help country clients orchestrate a national, sustained sector-level engagement for universal access. A major challenge in this effort is to deploy the Bank Group units' individual and collective strengths beyond Bank Group–led projects and transactions to stimulate private sector investments for closing the financing gap—especially in generation—for low-access countries.

Lack of access to electricity is a major constraint to economic growth and increased welfare in developing countries. This has been reemphasized by the United Nations and the World Bank Group as co-chairs of the global Sustainable Energy for All (SE4All) initiative, which was launched in 2011, with the goal of achieving universal access to energy within the next 15 years, along with improving energy efficiency and increasing the use of renewable energy. Providing access to electricity is also integral to the Bank Group's corporate goals of increasing shared prosperity and ending extreme poverty by 2030.

More than 1 billion people—one-seventh of the world's population and mostly poor—do not have access to electricity. About the same number do have access but receive electricity services that do not meet standards for the quantity and reliability of service that an efficiently performing sector should provide. These shortcomings in performance have a variety of effects:

- Lack of electricity access impairs progress in human welfare and quality of life. Directly or indirectly, electricity access enables transformative progress in education, health care, access to water, essential communications, and information, and access to financial services and opportunities for income generation.
- Power supply inadequacy (shortages in generation and supply) undercuts the productivity of manufacturing and commerce and reduces overall economic growth. An inadequate supply of electricity increases the costs of doing business by, among other things, resulting in costs to self-provide electricity generation, which is far more expensive than efficient grid supply would be.
- Poor electricity service reliability—high frequency and long-duration outages—adversely affects business performance and productivity, with cascading adverse implications for enterprises upstream and downstream in supply chains. Further, unplanned interruptions often impose more costs stemming from damage, spoilage, cleanup, and startup after the outage, and lost or deferred sales and transactions.

The Scale and Geographic Dimensions of Electricity Access

The access challenge in the next 15 years (2015–2030) is concentrated in Sub-Saharan Africa. Of the 1.1 billion people without electricity access, 99 million are in East Asia and Pacific region, 378 million in South Asia, and 591 million in Sub-Saharan Africa. East Asia is broadly on track to nearly close its access gap by 2030, and South Asia can also largely eliminate its access deficit if it maintains the pace of new connections it implemented in recent years. Therefore, the challenge is most acute in Sub-Saharan Africa, which accounts for 40 of the world's 51 low-access countries—defined in this study as countries where less than 50 percent of the population has electricity access. The challenge is daunting: 22 countries in the Region have less than 25 percent access, and of those, 7 have less than 10 percent access.

Unless there is a big break from recent trends, the population without electricity access in Sub-Saharan Africa is projected to increase by 58 percent, from 591 million in 2010 to 935 million in 2030. Furthermore, 20 countries are projected to have access levels below 25 percent by 2030, 5 of which would continue to have access levels below 10 percent. Thirty-nine countries in the Region would still be in the low-access category. Note that more than 40 percent of Sub-Saharan Africa's population is under 14 years old—if the current level of investment in access continues, yet another generation of children will be denied the

benefits of modern service delivery facilitated by the provision of electricity.

Achieving universal access in low-access countries within the next 15 years requires a quantum leap in the pace of new connections and in levels of investment. The implementation rate for new connections will need to increase from the average annual rate of 2.0 million during 2000–2010 to about 14.6 million per year for the next 15 years. The requirements for additional generation capacity and for transmission and distribution (T&D) to meet the demand from new connections will be an estimated $17.1 billion per year—$11.9 billion for T&D and $5.2 billion for new generation capacity. These figures are in addition to the annual expenditures needed for refurbishing and expanding existing electricity infrastructure, meeting suppressed demand, and improving service reliability for those who already have access, for which about $20 billion per year would be needed for low-access countries in Sub-Saharan Africa alone. Thus, the total requirements amount to $37.1 billion per year—$ 25.2 billion per year for generation investment, and $ 11.9 billion per year for grid T&D investment. This is more than 10 times the current average annual investment financing (which averaged $3.6 billion during 2000–2014 from all sources, including multilateral banks and donors, together with government counterpart funding and the private sector), including $1.5 billion per year from the Bank Group.

In contrast to low-access countries, medium-access countries are likely to come close to universal access by 2030. The average annual rate of 6.2 million connections made during 2000-2010 would need to be raised to 6.7 million; the Bank Group can continue to have a significant supporting role, apart from addressing adequacy and reliability issues, which will also continue to be relevant in high- and universal-access countries.

Evaluation Approach

To support the World Bank Group effort to achieve the SE4All goals, this evaluation assessed the contributions of the International Bank for Reconstruction and Development (IBRD), International Development Association (IDA), International Finance Corporation (IFC), and Multilateral Investment Guarantee Agency (MIGA) to increasing electricity access during fiscal year (FY)2000–2014. The evaluation assessed both quantitative and qualitative results data at the individual projects level (IBRD and IDA), investments (IFC), and guarantees (World Bank, IFC, and MIGA). It sought to answer the question: To what extent has the World Bank Group been effective in the past and, going forward, how well is it equipped to put its country clients on track to achieve universal access to electricity that is adequate, affordable, and of the required quality and reliability?

The evaluation takes an integrated view of the challenge of providing electricity access. Electricity access is more than a connection to electricity service. The timely and sustainable provision of adequate, reliable, and affordable electricity requires balanced attention (design, planning, implementation, operation, and maintenance) to the synchronized development of all components of the electricity supply chain—from generation to T&D to customer connections.

Bank Group Engagement for Access in the Past 15 Years

The Bank Group provided $63.5 billion to the electricity sector during FY2000–2014, about 9 percent of its commitments for all sectors during the period. The World Bank accounted for $45 billion (71 percent); IFC, $13.6 billion (21 percent); and MIGA, $4.9 billion (8 percent). The electricity sector was 10 percent of World Bank commitments, 8 percent of

IFC commitments, and 18 percent of MIGA exposures.

Despite the size of the Bank Group's overall engagement in and financial assistance to the electricity sector, low-access countries received the lowest share of Bank Group assistance, especially those in Sub-Saharan Africa. The following patterns underscore this situation:

- Low-access countries received only 22 percent of World Bank lending commitments and 6 percent of IFC investment commitments for the electricity sector in the past 15 years.
- The Bank Group's engagement was shallow and sporadic in the electricity sectors of most low-access countries. During FY2000–2014, in the 51 low-access countries—including 22 fragile and conflict-affected states (FCS)—the Bank Group did not approve any projects in 14 countries, and approved only one project each in 10 countries and two projects each in 7 countries. IFC was absent in 29 of the 51 low-access countries and had only one or two operations each in 15 countries. MIGA operated in only 8 of the 51 low-access countries.
- Low-access countries accounted for a small share of all physical infrastructure supported by the Bank Group in the electricity sector during FY2000–2014. Low-access countries received 8 percent of the generation capacity (in gigawatts), 7 percent of the electricity connections, and 3 percent of the kilometers of T&D network.

The *median* duration of a World Bank electricity sector investment project is 9 years, including project preparation, planned implementation, and time overrun. If project durations and scale and depth of engagement do not improve, most low-access countries are likely to benefit from just two to four World Bank projects in the next 15 years, which seems well below its potential for helping countries to improve their electricity access.

The evaluation recognizes that the approximately 78 percent of the WBG portfolio invested outside of low access countries—that have reached medium to near-universal access— focused to a greater extent on other dimensions of electricity access including quality and reliability, and energy efficiency and renewable energy, which are key goals of the SE4ALL Initiative. Notwithstanding this, overall, the Bank Group's commitment to the SE4All goal to achieve universal electricity access in 15 years clearly requires the institution to commit or organize resources and activities that are several orders of magnitude greater than it has so far in low-access countries.

Portfolio Performance for Electricity Access

The Bank Group's electricity sector portfolio during the past 15 years showed strong performance in the provision of physical infrastructure compared with other infrastructure sectors. Nearly 90 percent of IFC's conventional generation projects—the vast majority of its investments—were rated successful or better, compared with 71 percent for the World Bank and 33 percent for MIGA, each based on their own rating criteria. The vast majority of T&D projects were executed by the World Bank, 73 percent of which had outcomes rated moderately satisfactory or better. The physical achievements supported by the Bank Group (based on the results reported at completion in project documents) for projects that closed during FY2000–2014 are:

- An estimated 60.2 gigawatts of generation capacity
- 122,135 kilometers of T&D network

- 10.9 million grid connections
- 2.3 million off-grid connections, mainly solar home systems (SHS) that provided households with basic electricity services—lighting, small appliances, television, and cellphone charging—and improved community services such as schools, clinics, community centers, and administration centers.

For perspective, the grid-based connections supported by the Bank Group are estimated to be about 4.4 percent of all connections added during FY2000–2014 by all country clients, and 4.8 percent of all connections added by low-access country clients for the same period.

The Bank Group's support for off-grid electrification was a small part of its overall portfolio. Results were modest overall for individual home systems (mainly SHS), with notable exceptions of good practice, mainly in Bangladesh and Mongolia. Significant contributions were made for promoting solar lighting products through the joint IFC-World Bank Lighting Africa program. Attempts to promote isolated mini- and micro-grids did not yield significant results. The good practice experiences for SHS are relevant for several Sub-Saharan Africa countries that are in fragile situations, have dispersed populations, or whose sector conditions are not minimally in place for systematic and rapid scale-up.

Collaboration among World Bank, IFC, and MIGA through joint projects grew with time, though initially in an ad hoc manner, and is relatively higher in lending assistance in low- and medium-access countries compared with high- and universal-access countries. These operations helped break ground for the private sector in some high-risk countries, and supported a few large and complex projects. Still, the scale of these joint efforts is a relatively small portion of Bank Group commitments to the sector. The challenge is to deploy the Bank Group units' individual and collective strengths to stimulate private sector investments beyond Bank Group–led projects and transactions to facilitate the syndication of the financing gap, especially in generation for low-access countries.

Attention to welfare and gender-related outcomes of electricity access interventions appears to be increasing in World Bank projects, and with satisfactory impacts. However, there is a long way to go for welfare and gender impacts to be mainstreamed in IDA and IBRD electricity projects. IFC has made a beginning in addressing these issues.

Supporting Sector Financial Viability and Affordable Access

The Bank Group did not make much headway in improving the financial viability of the electricity sectors as a whole of country clients, despite its strong analytical work and lending efforts. The vast majority of development policy operations targeting the financial viability of electricity sectors were directed to high- and universal-access countries. Half of the development policy operations had favorable outcomes. There was not much traction from the relatively fewer investment operations that relied on covenants to stimulate financial discipline in the electricity sectors of country clients.

The Bank produced sound analytical work on affordability as a barrier to new electricity connections, especially for the poor. But this is not adequately reflected in country partnership strategies. The Bank supported the implementation of some well-designed pilot interventions for ensuring affordability of connections in a targeted manner in Lao PDR, Vietnam, and Zambia. However, there is no way to track the performance of these schemes after the projects end. Pilot projects implemented by the Global Partnership on Output-based Aid showed some positive

results, but these are yet to be demonstrated on a significant scale.

Lessons from World Bank Group Experience on Expanding Access

Best practice country experiences show that the transition from low to high or universal access can be made within two decades. Indonesia, Lao PDR, and Vietnam recently accomplished this feat. The Bank Group had a key role in this process for Lao PDR and Vietnam, and in the early stages of establishing momentum and accelerating new connections in Indonesia's program. With the Bank Group's ongoing support, Bangladesh achieved a remarkable expansion of off-grid SHS that quickly brought basic electricity services to nearly 10 million people and is filling a void left by a greatly slowed or even stalled grid expansion.

The first sectorwide programs in the electricity sector, in Rwanda and Kenya, are showing better results than what can be achieved using a project-by-project approach. The Bank supported Rwanda and Kenya in developing national electricity access rollout plans based on geospatial mapping and using least-cost combinations of grid and off-grid electrification. These plans form the basis for structured engagement of government with multilateral banks, donors, and private sector partners. This arrangement, coupled with proven government commitment, led to significant financing commitments from development partners. In particular, the private sector made commitments it may not have made without the sectorwide programs adopted by the two countries. After a long period of stagnation, access levels increased from 6 percent to 15 percent in Rwanda, and 23 percent to 30 percent in Kenya in the past four years.

Lessons from these successful examples point to some principles of success. Analysis of countries' electrification experiences shows that they succeeded through their own homegrown styles, and that neither the public sector nor the private sector alone can marshal the capacity, financing, quality, and policy for achieving universal access. They used innovative and cost-effective techniques, and made good use of their national energy endowments and institutional strengths. The common principles, regardless of specific institutional structures, are:

- Planning the rollout of national electricity access needs to be comprehensive and synchronized, integrating grid and off-grid means and bringing development partners together in a framework of "many partners, one team, one plan."
- Financial viability of the electricity sector and its agents depends on clear institutional roles and accountability, and may require appropriately targeted subsidies.
- Affordability, equity, and inclusion need to be addressed by targeting the poor and those in remote and inaccessible areas.
- Government vision and its engagement in all the above issues is the crucial binding factor.

Opportunities for Change in the World Bank Group's Electricity Access Efforts

This evaluation holds a mirror to the Bank Group's performance record with improving electricity access during FY2000–2014 to inform its approach to achieving universal electricity access by 2030. In the large array of relevant Bank Group efforts, several aspects are not well aligned with the scale and urgency of the universal access goal.

Specifically, the project- and transaction-based approach alone does not lead to meeting SE4All universal access targets. The Bank Group's own experience with scaling up

shows that timely and efficient achievement of universal access requires a sectorwide, least-cost nationwide access rollout plan, and a programmatic framework for mobilizing investment financing that could be sustained for at least two decades.

Several strengths and promising trends can be built upon, such as IFC's potential for promoting public-private partnerships, and its experience and strength in building electricity generation capacity. The World Bank contributed extensively in T&D in the past 15 years. MIGA built valuable experience in providing critical risk mitigation comfort through its guarantees, particularly in low-access and low-income countries.

The off-grid experience in Bangladesh showed how to maintain the momentum of electrification where grid expansion is stalled or is yet to gain momentum; though ideally, grid and off-grid rollout should be undertaken simultaneously in a coordinated manner nationwide, based on relative cost-effectiveness *ceteris paribus*. This experience holds promise for undertaking rapid initial scale up ("pre-electrification") in the context low access countries where the main grid sector expansion is temporarily stalled until such time the necessary drivers of good practice performance—outlined above—are more or less in place.

The positive experience with sectorwide program prospectus financings in Rwanda and Kenya—especially for T&D investment for grid rollout as well as for coordinated off-grid investments—highlight the potential and scope for syndicating financial resources on a programmatic and aligned basis. This goes well beyond the scope of a conventional project-by-project and transaction-by-transaction approach; crowding-in investment financing from a wider range of stakeholders and in aggregate orders of magnitude higher than possible solely by World Bank resources alone, or other donors going it alone.

Finally, Bank Group cooperation needs to expand well beyond the present joint transaction-by-transaction approach across Bank-IFC-MIGA. It should involve upstream collaboration appropriate to the individual and collective strengths of the World Bank, IFC, and MIGA. This is particularly important for supporting low-access country governments to mobilize on a timely and ongoing basis, the required investment financing for generation expansion undertaken by third parties, which may not necessarily involve direct participation by the Bank Group. Furthermore, this needs to be balanced with ongoing T&D expansion to effectively power economic growth as well as enable the client countries to advance towards the SE4ALL goal of adequate, affordable and reliable universal access within 15 years.

Recommendations

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 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 towards universal access in 15 years.

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 sector-wide organizing framework and process for mainstreaming the sustained engagement needed for implementing rapid access scale-up. The scope and timing of the sector-wide

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.

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, 2015–2030. 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, IBRD, IDA, IFC, and MIGA should draw upon their strengths and expertise in generation and in T&D, respectively, and tailor syndication mechanisms, differentiated as appropriate for generation investments financing, and otherwise for transmission and distribution investments.

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, SHS, 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 sector and country level, help country clients to appropriately enhance their M&E 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 M&E frameworks

Management Response

World Bank Group management thanks the Independent Evaluation Group (IEG) for undertaking an evaluation of *World Bank Group Support to Electricity Access*. The Report highlights the challenges for the World Bank Group in the electricity sector in pursuit of the goal of achieving universal access to electricity by 2030 under the Sustainable Energy for All initiative (SE4ALL). World Bank Group management acknowledges and is broadly in agreement with IEG's recommendations. The report accurately identifies success in different countries and areas for improvement. The report also provides a positive assessment of the Bank Group's past efforts to contribute to the expansion of energy access, including acknowledging the Bank Group's support for an addition of one-sixth of the total generation capacity during the review period and 7 percent of new electricity connections.

General Comments

Management appreciates the report's **definition of electricity access** which includes elements that emphasize adequacy, affordability, quality, and reliability. This is largely in line with the Multi-Tier Framework for measuring energy access for SE4ALL, which will be introduced globally. The Multi-Tier Framework recognizes that electricity access is more than just the connection. It offers a framework for grading the quality and other attributes of available power. Accordingly, the Bank is working on improving measurement under the SE4ALL Global Tracking Framework.

Acknowledging the definition of electricity access introduced in the report, it nevertheless tracks progress on energy access in a traditional "binary" way; for instance counting the number of connections, regardless of the type and quality of service achieved. This is understandable, given the available data, but these limitations may have also skewed the conclusions. Management sees this as a missed opportunity. To measure impact, it is critical to evaluate energy access with all its attributes, including availability, quality, reliability, safety and affordability. Recognizing that virtually all Bank Group power sector engagements aim to improve some element of service to the customer, such a multi-dimensional definition of "access" could substantially change the assessment on the real access achieved during the period covered in this report.

As the report notes, **strong government ownership and commitment** has been one of the most important factors in successful electrification programs. Increased Bank Group engagement is not enough to guarantee results. While the World Bank Group strives to expand support to low-access countries (51 countries, of which 22 are fragile and conflict-affected states or FCS), it has finite resources and must align

those resources to support client priorities. Many low-access countries require support in almost all of the Bank Group's key sectors. Therefore, even though energy access may be a priority, it must also compete with other priorities for limited Bank Group program resources.

The **World Bank Group also plays an important role in countries not considered as low-access countries.** The Bank Group helps these clients to strengthen reliable and affordable electricity provision—part of the multi-dimensional definition of access—to support economic growth. In many of these countries, institutional and financial indicators for utilities are not improving, indicating a continued need for the Bank Group to focus support in these areas.

The report provides a good assessment of the nature of **World Bank Group collaboration in the electricity sector**, mainly through joint projects featuring at least two of the three institutions. The Bank brings value-added through its upstream support and advice to country clients on policy and institutional frameworks, and partial risk and partial credit guarantees to backstop government payment obligations to private investors. The International Finance Corporation (IFC) offers various types of term financing, plus mobilization of other investors, which is rarely available in countries with underdeveloped financial markets and high investor risk. The report also highlights the Multilateral Investment Guarantee Agency's (MIGA) value added in terms of: (i) providing long-term political risk insurance for high-risk countries not available from international commercial insurers; (ii) enhancing credit worthiness of projects; and (iii) mobilizing additional capital. While the report states that collaboration among the Bank, IFC, and MIGA through joint projects has grown in an ad hoc manner, management would like to note that there are some good examples of strategic Bank Group collaboration. For example, in four years of operations, the IFC-MIGA partnership has mobilized a total of US$2.1 billion with a focus on investments in International Development Association (IDA) countries and FCS. The Bank Group has also been engaged in more intensive collaboration, including through Joint Implementation Plans (JIPs). The report provides useful evidence regarding the positive correlation between the value of Bank Group collaboration and the difficulties of the operating environment, i.e., the greater the challenges, the higher the value of Bank Group collaboration.

The report provides good examples of **Bank Group-supported projects that stimulated private sector investments** in the electricity sector and highlights the "ground breaking" nature of these projects. It correctly points out the challenge in stimulating private sector investments for electricity over and above Bank Group led operations, especially in low-income, low-access countries. The sector-wide operations offer good illustrations of their critical "de-risking" role in testing approaches and resolving uncertainty about legal and regulatory frameworks essential for leveraging private sector investments. The report also notes, in the

success stories of Rwanda and Kenya where access levels have dramatically increased, the commitment of the private sector on a level that may not have been possible in the absence of the sector-wide programs. Management agrees with this assessment and notes that such operations are often characterized by demonstration and replication effects fundamental to the private sector development process.

Comments on Specific IEG Recommendations

Engaging Countries with Low Electricity Access

With respect to the recommendation on engaging in countries with low electricity access, management concurs with the need for expanded support to low-access countries as well as broader and deeper Group-wide engagements identified in Country Partnership Frameworks (CPFs). Management acknowledges that the Bank Group's role is very important to help client countries achieve universal access to electricity that is adequate, affordable, and of the required quality and reliability. At the same time, management wishes to emphasize the crucial role of country governments, power utilities, and other development partners in achieving significant gains on electricity access. As noted above, decisions on where to engage and allocate resources are made based on multiple factors, taking into account competing priorities for limited development resources, opportunities for impact, and selectivity. Energy access is one of the priority areas acknowledged by the World Bank Group. To operationalize the global practice's (GP) commitment to energy access, an Energy Access Global Solutions Group and an Energy Access Global Lead are now in place in the Energy and Extractive Global Practice (E&E GP). This group will, in particular, provide expertise, advice, and additional technical inputs to low-access countries that have identified energy access as a priority.

IFC management has already placed a priority on electricity access as a central part of IFC's overall business strategy. This strategy involves efforts in FCS countries as well as many countries that are part of the "low access country" list introduced in the evaluation. If population is factored into the calculation, IFC has portfolio or new business engagements that will potentially serve more than 50 percent of the people in the low access country list within Sub-Saharan Africa. Lastly, while IFC management thanks IEG for the low access country list and will continue to ensure that focus is placed on countries that have low access as part of its efforts, it is important to note that a focusing of our priorities on such a list could lead to sub-optimal outcomes, such as a lack of prioritization on key countries like Nepal and Bangladesh that are classified as high and medium access, respectively, based on the methodology used to prepare the list.

Sector-wide Framework and Engagement

Management also agrees with the recommendation on the greater use of a sector-wide organizing framework and process for rapidly increasing access, where

appropriate, to achieve universal access by 2030 in low-access countries. The principle of sector-wide planning is anchored in the 2013 World Bank Group Energy Sector Directions Paper. The paper notes, "The World Bank Group will support a long-term approach with sector-wide planning—nationally and, where appropriate, regionally—to achieve optimal and cost-effective results. This involves looking beyond individual projects to consider the full range of energy supply options in any particular country. While the World Bank Group will support consideration of all options at the planning stage, given limited availability of its resources, the eventual World Bank Group financing will be applied selectively to areas where it has comparative advantage." The same principle will be applied specifically to energy access. However, the scope and timing of the sector-wide frameworks and engagement plans should be set by governments, taking into account readiness factors and the local context. Management will remain flexible in applying different approaches (e.g., a sector-wide framework and engagement, a specific targeted project, a Bank Group joint project, etc.) to suit the given context.

Designing an Engagement Strategy

On the recommendation to design an engagement strategy, again it would be important to consider country conditions appropriate for the formulation of a sector-wide approach and a government-led investment financing platform. Management appreciates the report's acknowledgement that engagement approaches must reflect the country's conditions. Whenever applicable, management is committed to drawing upon respective institutional strengths and expertise and tailoring mobilization mechanisms. Depending on the country priorities, starting conditions, and capacities, the focus may be on the overall sector or on specific sub-sectors.

Results and Impacts of Electricity Access

Management is committed to advance the evidence on results and impacts of electricity access, including its contributions to the Bank Group goals of ending extreme poverty and promoting shared prosperity. However, some of the specific recommendations are too broad and go beyond the energy sector, and some are difficult to translate into measurable actions and indicators. As part of an effort to advance the evidence on results and impact, more impact evaluations are being done as part of ongoing energy access projects. The Bank will roll-out the SE4ALL Multi-Tier Framework to measure progress towards universal access, and track project contributions, starting with a pilot group of energy operations to be implemented in FY16, and expanded afterwards. IFC will continue to implement across sectors its eight-point action plan that resulted from IEG's evaluation on IFC's Poverty Focus, over a three-year timeframe. Management is also pleased that IFC is among the 25 international finance institutions that have agreed upon a list of 27 harmonized reporting indicators across 13 different sectors and industries. However, as energy access is often one of many influences over broader

development impacts, a cautious approach is needed about including explicit links in the project's results framework. The causality and attribution of an access program to broader welfare gains are difficult to rigorously confirm. In addition, there is frequently a time lag between the project period and the emergence of welfare impacts that further clouds any direct links. The specific recommendation to assess "value-added" of Bank Group joint projects to private sector clients and the country would not be feasible in the absence of counterfactuals and the absence of a Bank Group-wide methodology for such an assessment.

Other Specific Comments

Interpretation of the sample. While the report presents useful findings, the limitations of the sample should be recognized in interpreting the findings. For instance, the report uses the whole of the Bank's electricity lending as a proxy for support to electricity access, and compares that input with the results achieved in terms of increased connections. In fact, the Bank estimates that the projects directly supporting electricity connections (distribution or off-grid) account for only about 4 percent of the Bank's electricity lending. As reported in the evaluation, Bank Group engagement in off-grid electricity is 1.5 percent of the total portfolio, which seems "marginal." Yet, it is important to recognize that the off-grid share among the projects directly supporting new connections (about 4 percent of the Bank's energy lending) is slightly over one-third. For MIGA projects, the evaluation findings are based on 15 Project Evaluation Reports (PERs), from a population of 72 MIGA guarantee projects, which do not provide a robust sample for firm conclusions.

Lighting Africa. Management stresses the unique role and groundbreaking performance of the Lighting Africa program. As documented in its final evaluation, this initiative's achievements range from development of global product quality standards to number of beneficiaries reached, and from greenhouse gas emissions reduced to creating a model for a joint World Bank-IFC partnership and from investment and donor funds mobilized to financial sustainability. Above all, the program has been influential in creating the conditions for the sector and the market to attract new entrants and rapid expansion to achieve scale. In terms of findings on Lighting Africa, management regrets missed opportunities to identify critical lessons, such as Bank-IFC collaboration leveraging on inherent strength, innovations, and impact to the beneficiary as a result of using a single evaluative lens across the four programs. Lighting Africa is a market-based approach and fundamentally different in nature from the other three umbrella multi-donor trust fund facilities. The report, in particular, mischaracterizes the program's donor reporting function, which was discontinued and replaced with overarching and periodic half-year program reporting. Impact results are publicly reported semi-

annually through the Lighting Africa website, as well as on the Lighting Global and Lighting Asia websites.

IFC's support in FCS. Recognizing its critical importance for development, support for electricity access has long been at the center of IFC's strategy, with an increasing focus on low-income countries and FCS. As announced recently, management is strengthening IFC's commitment to FCS where supporting infrastructure, including electricity, is key. As FCS have among the lowest rates of electricity access worldwide, management believes that this strengthened commitment, backed by, *inter alia*, an enhanced risk envelope, new pools of risk capital and blended finance instruments, and boosted resources and talents in these markets, would help accelerate their improved electricity access. To improve electricity access, including reliability and quality, the Bank Group is engaged in more intensive collaboration on project-related as well as broader sector and institutional challenges, including through JIPs. These efforts are showing initial signs of pay-offs in the form of growing pipelines in some of the most difficult business environments from the private sector perspective.

MIGA's role in World Bank Group support for electricity access. The report notes that MIGA accounted for only 8 percent of the $63.5 billion provided by the Bank Group to the electricity sector over the period FY2000-2014 (World Bank-71 percent, IFC-21 percent). However, across the Bank Group, the sector's share in total MIGA commitments as well as the share of low-access countries within the electricity access portfolio was the highest in MIGA (18 percent and 35 percent, respectively), which denotes its relative importance. It would have been useful for the report to draw lessons from the experience, and provide a coherent explanation and guidance as to MIGA's roles and contributions in low-access, low-income countries.

Impacts of MIGA guarantee projects. The report finds it challenging to get evaluative evidence of the impacts of MIGA guarantee projects on end-users, especially the poor, and on its fiscal sustainability. The report also states that MIGA and IFC do not have any significant provision for tracking the welfare and gender outcomes related to their operations. The challenges faced with regard to MIGA's Development Data Gathering has been well recognized by IEG's 2013 assessment of self-evaluation systems in MIGA and IFC. Essentially, this challenge is inherent to MIGA's business model as a political risk insurance provider, including the arms-length nature of its relationship with the project company.

Management Action Record

IEG Findings and Conclusions	IEG Recommendations	Acceptance by Management	Management Response
The Bank Group's engagement has been shallow and sporadic in the electricity sectors of the majority of low-access countries. During FY2000–2014, in the 51 low-access countries (including 22 fragile and conflict-affected states, or FCS), the Bank Group approved no projects in 14 countries, one project each in 10 countries, and two projects each in 7 countries. The International Finance Corporation (IFC) was absent in 29 of the 51 low-access countries, and	**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 Bank Group should broaden and deepen its engagement in low-access countries to help them address the huge shortfalls in investment, capacity building and	Agree	Management wishes to emphasize the critical role of government's ownership and commitment for successful programs. World Bank Group engagements in electricity access are determined based on multiple factors, taking account of competing priorities for limited development resources, opportunity for impact, and selectivity. The Bank Group will duly consider and support energy access needs of low-access countries, as identified in the country engagement process. Energy access is one of the priority areas acknowledged by the World Bank Group To operationalize its commitment, the

IEG Findings and Conclusions	IEG Recommendations	Acceptance by Management	Management Response
had only one or two operations each in 15 countries. The Multilateral Guarantee Agency (MIGA) operated in only 8 of the 51 low-access countries. Low-access countries received only 22 percent of World Bank lending commitments and 6 percent of IFC investment commitments for the electricity sector over the past 15 years.	knowledge resources needed to move towards universal access in 15 years.		Bank has recently created an Energy Access Global Solutions Group and an Energy Access Global Lead role. This Group will provide expertise, advice and additional technical inputs to low-access countries that have identified energy access as a priority. IFC management has already placed a priority on electricity access as a central part of IFC's overall business strategy. This strategy involves efforts in FCS countries as well as many countries that are part of the "low access country" list introduced in the evaluation. If population is factored into the calculation, IFC has portfolio or new business engagements that will potentially serve more than fifty percent of the people in the low access country list within Sub-Saharan Africa. Lastly, while IFC management thanks IEG for the low access country list and will continue to ensure that focus is placed on countries that have low access as part of its efforts, it is important to note that a focusing of our priorities on such a list

IEG Findings and Conclusions	IEG Recommendations	Acceptance by Management	Management Response
			could lead to sub-optimal outcomes, such as a lack of prioritization on key countries like Nepal and Bangladesh that are classified as high and medium access respectively, based on the methodology used to prepare the list.
Achieving universal access in low-access countries over the next 15 years will require the implementation rate for new connections to increase from the average annual rate of 2.0 million during 2000–2010 to about 14.6 million per year for the next 15 years. The investment needs for this effort together with refurbishing existing assets are estimated at $37.1 billion per year, which is more than ten times the current average annual investment financing which averaged $3.6 billion over the period 2000–2014 from all sources (multilateral banks and donors together with government counterpart funding and the	**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 sector-wide organizing framework and process for mainstreaming the sustained engagement needed for implementing rapid access scale-up.** The scope and timing of the sector-wide 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	Agree	The principle of sector-wide planning is anchored in the 2013 World Bank Group Energy Sector Directions Paper, which articulates the Bank Group's commitment to support a long-term approach with sector-wide planning, where appropriate. In countries where the CPFs identify energy access as a priority, the Bank will engage in a dialogue to start moving from the project-by-project approach to programmatic and sector-wide planning, taking into account country priorities, starting conditions and capacities. Management will however remain flexible in applying different approaches (e.g., sector-wide framework and engagement, a specific targeted project, a World Bank Group joint project, etc.) to suit the given context.

IEG Findings and Conclusions	IEG Recommendations	Acceptance by Management	Management Response
private sector), including $1.5 billion per year from the Bank Group. The Bank Group's present project- and transaction based approach alone does not add up to meeting SE4All universal access targets. The Bank Group's own experience with scaling up shows that timely and efficient achievement of universal access requires a sector-wide least-cost nationwide access rollout plan, as well as a programmatic framework for mobilizing investment financing that has the potential to be sustained for at least two decades.	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**.**		
The Bank's sector-wide programs in Rwanda and Kenya show the scope for syndicating financial resources far beyond a project-by-project approach. In both these countries, development partners	**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**	Partially Agree	Following the dialogue on programmatic and sector-wide engagements, the Bank will support implementation of the resulting energy access programs, including through mobilization of additional (public and private) resources, where feasible. The

IEG Findings and Conclusions	IEG Recommendations	Acceptance by Management	Management Response
(multilateral banks, donors, and private sector) have made significant financing commitments that go far beyond what might have been achieved by a project by-project approach. In this context, Bank Group cooperation needs to go beyond joint projects, and involves equal engagement by the World Bank, IFC and MIGA from the beginning, particularly in supporting low-access countries in raising more resources to move towards universal access within 15 years. Several strengths and promising trends can be built upon. Among them are IFC's experience and strength in building electricity generation capacity and its potential for promoting public-private partnerships. The World Bank, meanwhile, has been contributed extensively in T&D over the past 15 years.	**years, 2015–2030.** 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, International Development Association, IFC, and MIGA should draw upon their strengths and expertise in generation and in T&D, respectively, and tailor syndication mechanisms, differentiated as appropriate for generation investments financing, and otherwise for transmission and distribution investments.		Bank will closely collaborate with IFC and MIGA, where applicable, to draw on the Bank Group's respective strengths and comparative advantages. However, depending on the country priorities, starting conditions, and capacities, the focus may be on the overall sector or on specific sub-sectors.

IEG Findings and Conclusions	IEG Recommendations	Acceptance by Management	Management Response
MIGA has built valuable experience in providing critical risk mitigation comfort through its guarantees, particularly in low-access and low-income countries.			
Monitoring and evaluation show weaknesses in all elements of design and implementation. This weakness is more marked in low- and medium-access countries, largely due lack of indicators, weak baseline data, and inadequate capacity for monitoring. The shortcomings are highest regarding the tracking of economic and welfare outcomes, including gender considerations, but there has been greater recognition of this matter in the World Bank and recent improvements in M&E frameworks in this regard. However, IFC and MIGA do not have any significant provision for tracking the	**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, SHS, 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 sector and country level, help country	Partially Agree	Management is committed to advance the evidence on results and impacts of electricity access, including its contributions to the Bank Group's goals of ending extreme poverty and promoting shared prosperity. To this end: (i) The Bank will apply the SE4ALL Multi-Tier Framework for measuring electricity access. The framework will be used to: (a) measure country progress towards universal access under SE4ALL; and (b) track project contributions, starting with a pilot group of energy operations to be implemented in FY16, and expanded afterwards. In addition, efforts will be made to facilitate the adoption of the framework by other parties to ensure consistency of reporting under SE4ALL and to assist clients to adopt a simplified version for their own tracking.

IEG Findings and Conclusions	IEG Recommendations	Acceptance by Management	Management Response
welfare and gender outcomes related to their operations. Collaboration among World Bank, IFC, and MIGA through joint projects has grown over the years, albeit in an ad hoc manner. Feedback from both internal and external stakeholders point to a number of areas for improvement. In order to take effective action in this area, more and solid evidence is needed on the value added as well as on costs and benefits to private sector clients from such joint projects.	clients to appropriately enhance their M&E 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 M&E frameworks.		(ii) The Bank will continue mainstreaming impact evaluations in the selected energy access operations. The specific recommendation to assess "value-added" of Bank Group joint projects to the private sector clients and the countries would not be feasible in the absence of counterfactuals and the absence of a Bank Group-wide methodology for such an assessment. IFC will continue to implement across sectors its eight-point action plan that resulted from IEG's evaluation on IFC's Poverty Focus, over a three-year timeframe. IFC will carefully take stock on its evidence-base in relation to the corporate goals across sectors and examine and discuss the next steps for improvement.

Report to the Board from the Committee on Development Effectiveness Sub-Committee

The Sub-Committee (SC) of the Committee on Development Effectiveness (CODE) considered the Independent Evaluation Group's (IEG) report, *World Bank Group Support to Electricity Access, FY2000-FY2014—An Independent Evaluation, Draft Management Response,* and *World Bank Group Support toElectricity Access, FY2000-FY2014: An Independent Evaluation—Annex*.

The Committee welcomed IEG's evaluation and assessment of the technical and financial constraints to reaching universal electricity access. They recognized that the World Bank Group has made progress in expanding access to electricity, but noted that to achieve universal access by 2030, a major shift had to be made. Members endorsed the recommendations and called for the World Bank Group to increase its support to countries with low-access to electricity, asking the World Bank and the International Finance Corporation (IFC) to engage decisively and step up their engagements. They were pleased to learn that by having targets on fragile and conflict-affected states, IFC was not ex-ante foreclosing its engagements across low-access countries; they were hopeful that the new Energy Access Global Solutions Group and the Energy Access Global Lead would provide a clearer vision on how the World Bank Group could maximize its efforts. Members noted the importance of securing government ownership and commitment to achieve universal electricity access. Management reiterated its strong concurrence with the report's recommendations and noted its commitment to developing a comprehensive action plan.

Members queried whether the World Bank Group possessed the skills in-house to reach the targets and the ambitious goals. Noting that the World Bank Group will not be able to deploy the needed $33 billion to meet the 2030 goal, the Committee encouraged the World Bank Group to use its convening power to mobilize resources from other donors and the private sector. Members highlighted that there was space to scale up renewable energy and put an emphasis on non-conventional renewable energy in poor rural areas. Members agreed that the World Bank Group should move from a predominantly project-by-project approach to a sector-wide approach to include generation, transmission, and distribution investment and asked that the institution work closely with governments to set appropriate timing and sequencing. Management cautioned about the need to maintain a flexible approach at the country and sectoral context level. The Committee was pleased to learn that the tracking framework that integrates documentation from both governments and development partners is fully rolled out and will be updated approximately every two years. Management explained that the multi-tier framework had recently been presented to the Sustainable Energy for All (SE4ALL) initiative and that it was now being socialized with governments and donors who will ultimately be responsible for implementing the agreed monitoring and evaluation framework. The Committee welcomed the Bank's commitment to apply and promote the SE4ALL multi-tier framework and encouraged IFC to also apply it.

Members commented on the scope of the evaluation, noting that it would have benefited from addressing underlying problems (e.g. price distortions from fuel subsidies; poorly functioning power sectors, level of
government commitment); assessing how World Bank Group interventions have impacted electricity tariffs; including investment advisory services and public finance management; and discussing private, public, and joint ownership of assets. Members expressed their interest for management to continue its full Board engagements on sustainable energy

1. Evaluation Context, Scope, and Approach

Access to electricity can enable economic growth, reduce poverty levels, and enhance human welfare. The World Bank Group has long acknowledged this and highlighted it with its decision to support the global Sustainable Energy for All (SE4All) initiative, launched in 2011.[1] Supporting this initiative is integral to achieving the Bank Group's twin goals of increasing shared prosperity and ending extreme poverty by 2030. The goal of SE4All is to achieve universal access to energy, including electricity, within the next 15 years. It also aims to improve energy efficiency and increase the use of renewable energy by 2030. The initiative is co-chaired by the UN secretary-general and the president of the World Bank.

This evaluation examines the Bank Group's support to its country clients for scaling up access to electricity during the 15-year period from fiscal year (FY)2000 through FY2014, aiming to inform its strategy to support access-deficit countries in a move toward universal access in the next 15 years. This assessment covers IBRD and IDA lending and nonlending assistance, IFC investments and advisory services, and MIGA guarantees.

Dimensions of the Access Challenge

About 1.1 billion people—one-sixth of the world's population and mostly poor—do not have access to electricity. Among those who have access, a comparable number receive electricity services that are below the standards of quantity and reliability expected of an efficiently performing sector. These shortcomings in electricity sector performance can seriously undermine a country's economic growth and prevent the realization of improvements in human welfare (figure 1.1; appendix B).

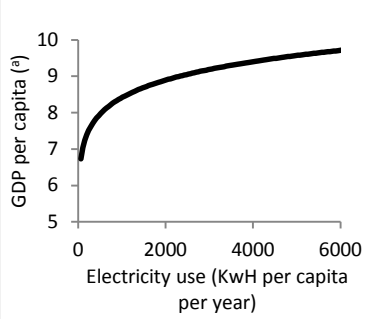
Inadequate electricity access can severely limit human development and quality of life. Directly or through its economic multiplier effects, electricity access can enable transformative progress in all dimensions of human development (education, health care, access to water, essential communications and information), and in access to financial services and opportunities for income generation. For example, education may improve since lighting improves school environments and enables studying at home. Positive health effects may result from better food storage and less indoor air pollution. Outside the home, electricity can facilitate sterilization, water purification and supply, sanitation, and refrigeration of essential medicines. Access to electricity

may also increase the willingness of the educated workforce (teachers and doctors, for example) to live in rural areas. Better access to information and less time spent on nonpaid work can bring positive gender impacts. More access to entertainment and information via television, radio, and mobile phones can also improve opportunities and quality of life (box 1.1).

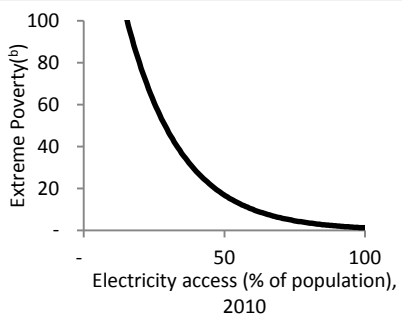
Inadequate electricity access can also have adverse effects on the productivity of manufacturing and commerce (IEG 2014e). Business costs increase because of the need to take preventive measures against power outages, such as self-provision of electricity. Costs are also incurred from outage-related damage, spoilage, and cleanup, startup after an outage, and lost or deferred sales and transactions (Foster and Steinbuks 2009).

Figure 1.1. Socioeconomic Indicators and Electricity

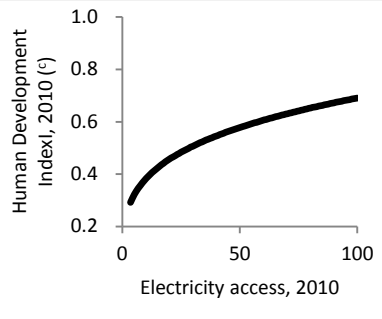
A. Income and Electricity Consumption



B. Poverty and Electricity Access



C. Human Development and Electricity Access



(a) GDP per capita, purchasing power parity (PPP; constant 2011 international).
(b) Poverty headcount ratio at $1.25 a day (PPP) (percent of population).
(c) Human Development Index, 2010.
Source: World Development Indicators; data related to 2010; United Nations 2012.

The three charts in figure 1.1 show correlations rather than causal relations among income, human development, and electricity access (positive correlations) and between poverty and electricity access (negative correlations). But substantial research has examined the causal links between electricity access and economic growth. Literature reviews (Bayar and Özel 2014; Ozturk 2010) reported that a majority of the studies found unidirectional causality between electricity consumption and economic growth, but some studies found bidirectional causality (Calderon and Servén 2014). Where causality was unidirectional, studies in some countries found it unidirectional from electricity consumption to economic growth, but the reverse in others (Gurgul and Lach 2011; Bildirici and Kayikçi 2012; Hu and Lin 2013; Ogundipe and Apata 2013; Nazlioglu, Kayhan, and Adiguzel 2014). The

Independent Evaluation Group (IEG) has conducted a systematic review of the evidence on the welfare impacts of electricity access on beneficiaries. The findings, summarized in box 1.1 and detailed in appendix J, provide some evidence on welfare impacts.

Box 1.1. Systematic Review of Welfare Impacts from Electricity Access—Findings

Systematic reviews are used to answer a specific research question by identifying and screening relevant impact evaluations and synthesizing the quantitative and qualitative evidence from them to inform policy and practice.

IEG, in collaboration with the EPPI-Center, is conducting a systematic review on the welfare impacts of electricity access on beneficiaries. Using a screening process, the review has narrowed the analysis to 32 impact evaluations, including five associated with World Bank projects in Bangladesh, Nepal, India, and Vietnam. Most of the studies (63 percent) were in middle-income countries (12 in lower-middle income and 7 in upper-middle income). The regions with the largest gaps in electricity access—Sub-Saharan Africa and South Asia—are represented well with 14 and 9 studies, respectively. 24 studies covered grid-based electricity connections and the remaining 8 covered off-grid provision of electricity comprising six cases of solar home systems (SHSs) and two with mini-hydro schemes. Majority (85 percent) of impact evaluations covered rural electrification.

The findings of the systematic review show that electricity access improves children's study time at home, school enrollment and has a positive impact on years of schooling. The review finds mixed evidence on fertility and women empowerment. Two studies show significant effect of electricity access on fertility reduction, while one study found no effect. Very few studies measured the impact of electricity access on health. However, one study found evidence that electricity access significantly reduces indoor pollution. Another study found the incidence of cough, respiratory problems, eye irritation, and headache lower in electrified households than in un-electrified households. The evidence base for the impact of electricity access on microenterprise profits is also thin. Regarding household income, electricity access is found to have a positive impact on total income as well as non-farm income. No overall impact on the number of hours worked was observed.

While these emerging findings add to the knowledge of links between electricity access and welfare outcomes, they also underline the need to increase the evidence base to better understand the extent and magnitude of these links.

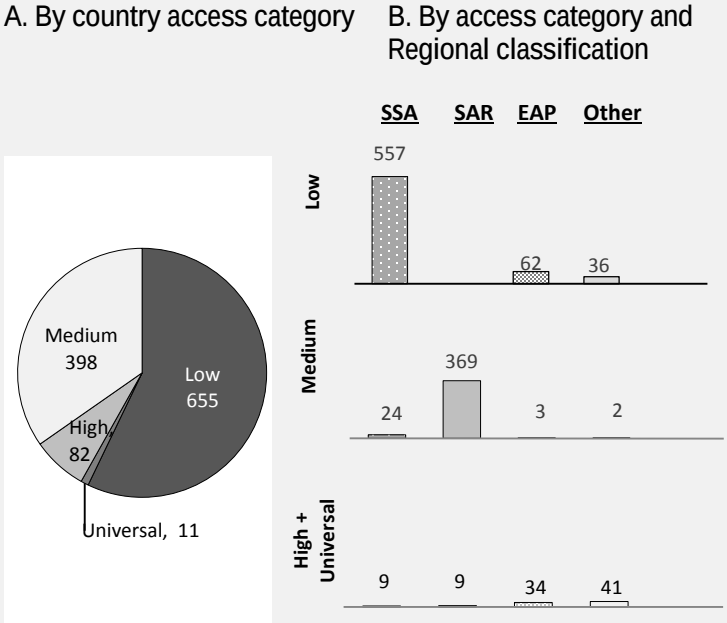
Although electricity access to households tends to be highlighted in developmental efforts, it should be noted that the household sector accounts for a relatively small portion (about 20 percent) of global and national electric power demand. Industry, business and commerce, government, health and education services, agriculture, and other economic activities account for the remaining 80 percent. [2] The technical

performance, financial viability, and reliability of the entire electricity delivery system (generation, transmission, and distribution) is anchored by the industrial sector, which continuously uses electricity and is capable of paying for it.

Electricity access is more than just a connection to a distribution network; it requires that electricity is provided adequately as demanded and in a reliable, affordable manner. The SE4All framework includes the attributes of adequacy, reliability, and affordability in its definition of electricity access (World Bank and IEA 2013). The provision of adequate and reliable electricity service on demand requires a balanced, planned expansion of generation capacity and transmission and distribution (T&D) for delivering electricity securely and efficiently, based on the location of generation plants and load centers, and coordinating with off-grid options where feasible. Policies and regulation are needed to achieve this, both to facilitate the large capital investments needed to bridge the access gap and to ensure that electricity services are financially viable and affordable for all, especially the poor. Therefore, this study assesses the range of support the World Bank Group (including IBRD, IDA, IFC, and MIGA) provides for the electricity sector that relates to electricity access, including physical infrastructure for generation and T&D, the enabling sector policy framework and policy dialogue, and technical assistance and advisory services.

Sub-Saharan Africa and South Asia have the largest populations without electricity access. Of the nearly 1.1 billion people without electricity access, 591 million are in Sub-Saharan Africa, 378 million are in South Asia, and 99 million are in East Asia, (figure 1.2).[3] If all Bank Group country clients are categorized by their level of access (low, medium, high, and universal), the majority of low-access countries—40 out of 51—are in Sub-Saharan Africa (table 1.1).[4] A complete list of the Bank Group's country clients

Figure 1.2. Sub-Saharan Africa and South Asia Have the Largest Populations without Electricity Access (millions), 2010



Source: UN 2012.
Note: EAP = East Asia and the Pacific; SA = South Asia; SSA = Sub-Saharan Africa.

with access level, category, and selected demographic and economic data is in appendix C.

Table 1.1. Bank Group Country Clients by Electricity Access Category (number of country clients)

Country access category (percent of population with electricity access)	Sub-Saharan Africa	East Asia and Pacific	Eastern Europe and Central Asia	Latin America and the Caribbean	Middle East and Northern Africa	South Asia	All
Low (≤ 50%)	40	8	n.a.	1	2	n.a.	51
Medium (50–75%)	6	7	n.a.	2	n.a.	3	18
High (75–95%)	2	4	n.a.	19	3	2	30
Universal (>95%)	1	5	32	12	9	1	60
Total	49	24	32	34	14	6	159

Source: UN 2012.
Note: Electricity access data are for 2010 (the latest year for which the most consistent data are available).

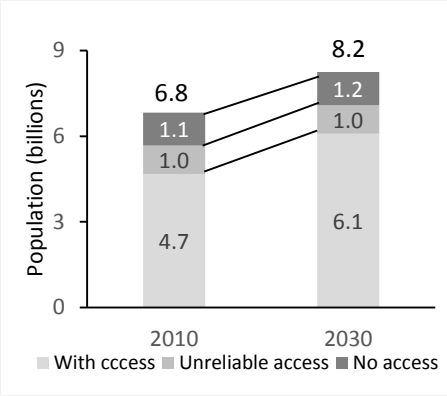
If the pace of new connections made during 2000–2010 continues for the next 15 years and population growth is taken into account, the number of people without access in low-access countries would rise by 40 percent by 2030 (box 1.2). There would still be 1.2 billion people without electricity by 2030, and another 1 billion are likely to be constrained by unreliable electricity supplies.

The access challenge set by SE4All is almost exclusively concentrated in Sub-Saharan Africa. East Asia is on track to nearly close its access gap by 2030. South Asia can largely eliminate its access deficit by then if it maintains the pace of new connections it implemented in recent years. By contrast, the challenge in Sub-Saharan Africa is daunting: Of the 40 low-access countries in the Region, seven have access less than 10 percent, and another 15 countries have access less than 25 percent. Unless there is a big break from recent trends, the population without electricity access in Sub-Saharan Africa is projected to increase by 58 percent (from 591 million to 935 million) during 2015–2030. Furthermore, five countries would still have access levels below 10 percent by 2030; and another 15 countries would have access levels under 25 percent. Overall, in Sub-Saharan Africa, 39 countries would still be in the low-access category. A serious implication of continuing the current pace of access is that yet another generation of children will be denied the benefits of modern service delivery facilitated by provision of electricity, including education, health, and connectivity. And more than 40 percent of Sub-Saharan Africa's population is under 14 years old.[5]

Box 1.2. Electricity Access Projections for 2030 at Current Pace

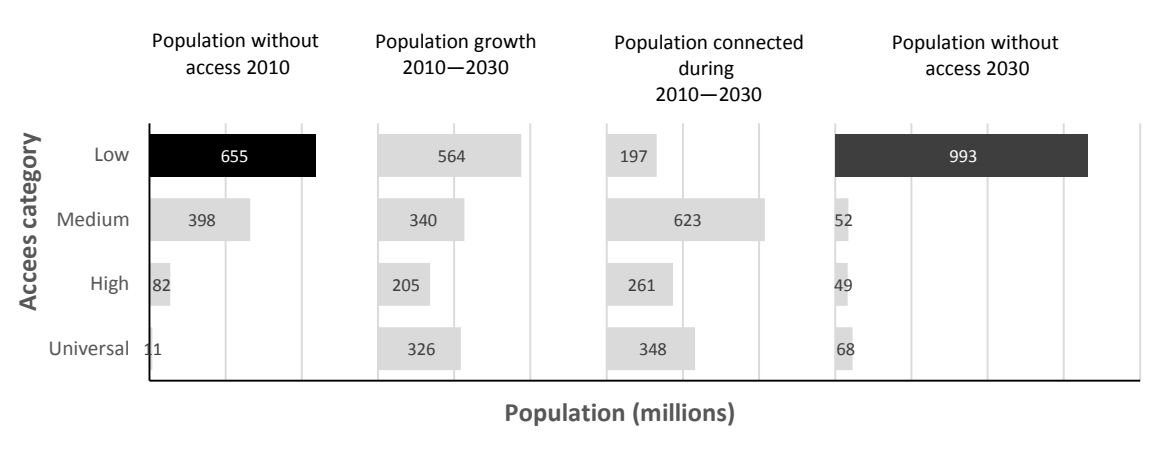
If new connections continue to be added at the average rate realized during 2000–2010, about 1.8 billion people worldwide will gain electricity connections by 2030. However, the increase in population during the period would still leave 1.2 billion people without electricity. Another 1 billion are likely to remain constrained by unreliable supply of electricity. Thus, by 2030, 2.2 billion people with no access at all or with unreliable access will be unable to share in the economic productivity and welfare improvements that can accrue from access to electricity (figure B1.2.1). Countries in the medium-, high-, and universal-access categories would likely have largely eliminated their access deficits by 2030. However, the number without access in low- access countries would *rise* by 50 percent, reflecting the present inability of the electrification rates in these countries—the large majority of which are in Sub-Saharan Africa—to keep pace with population growth (figure B1.2.2).

Figure B1.2.1. Electricity Access in Bank Group Country Clients at Current Pace



Sources: Electricity access: UN 2012; population: World Development Indicators and United Nations Development Programme (UNDP); IEG estimates.
Note: Assumes the average annual growth rate of connections during 2000–2010 continues to 2030.

Figure B1.2.2. Projected Electricity Access by Country Access Category at Current Pace



Source: Electricity access: UN 2012; population: World Development Indicators and UNDP; IEG estimates.
Note: Projections assume new connections are added at the average annual rate achieved during 2000–2010. Assumes five persons per connection/household.

The World Bank Group's Evolving Strategy for Electricity Access

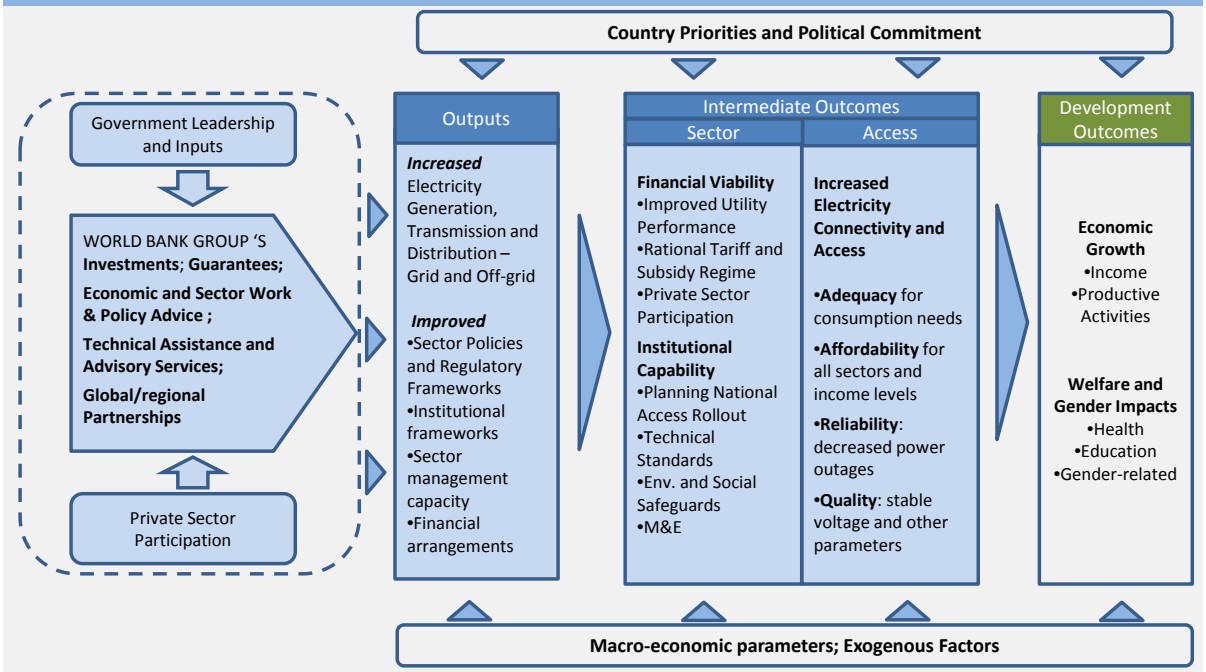
The Bank Group gradually sharpened its focus on electricity access, as seen in its approach to the electricity sector during the past few decades. In the 1970s and 1980s the Bank Group concentrated on investments in generation, transmission, and distribution in vertically integrated national electricity companies. Some of the key policy and guidance documents governing this period were the Operational Manual Statement OMS3.72 (World Bank 1978), power sector support strategy (World Bank 1983), and the corresponding operations directive (1987). In the 1990s the Bank Group financed a wave of rural electrification projects that carried into the 2000s, informed by lessons learned from the initial cohort of operations. The policy paper on power sector governed Bank Group support during the 1990s (World Bank 1993). Starting in the 2000s, the strategy focused on unbundling and privatization. In the latter part of the decade, those strategies emphasized electrification and increased support to national utilities for renewable energy and off-grid options as technologies improved and became less expensive. The Bank Group aimed to improve focus on the environmental concerns and impacts of the power sector covered in the report *Fuel for Thought: An Environmental Strategy for the Energy Sector* (World Bank 2000), which led to the policy guidelines in *Development and Climate Change: A Strategic Framework for the World Bank Group* (World Bank 2008). More recently, the Bank Group shifted again toward scaling up access nationwide by supporting the full range of electricity infrastructure. It began with sectorwide approaches using a comprehensive planning approach backed by geospatial planning and pooled resources for balanced access growth. In 2012 the Bank Group partnered with the SE4All global initiative. And in July 2013 the Bank Group outlined its future sector directions for energy access, energy efficiency, and renewable energy in the Board Report *Toward a Sustainable Energy Future for All: Directions for the World Bank Group's Energy Sector*, which contains actions and initiatives to improve electricity access (World Bank 2013f).

Evaluation Questions and Methodology

This evaluation considered the question: To what extent has the World Bank Group been effective in the past and, going forward, how well is it equipped to put its country clients on track to achieve universal access to electricity that is adequate, affordable, and of the required quality and reliability? The focus is on drawing upon the Bank Group's experience in the last 15 years to inform strategy as it prepares to face the access challenge.

The evaluation was guided by a results framework consisting of the logically linked inputs, outputs, intermediate outcomes, and development outcomes for electricity access, shown in figure 1.3. The results framework reflects the development objectives, components, and key performance indicators of lending, technical assistance, and advisory services implemented by the World Bank Group for the electricity sector, and the core development indicators adopted by the energy practice in the Bank Group.[6]

Figure 1.3. Electricity Access Evaluation: Results Framework



Source: IEG.
Note: Env. = environmental; M&E = monitoring and evaluation.

The results framework implicitly assumes that with the requisite government leadership and private sector participation, the Bank Group's support and interventions would lead to increased electricity generation, transmission, and distribution, and to improved sector frameworks (policies, regulations, and institutions), sector management capacity, and financial arrangements. These outputs are assumed to lead to intermediate outcomes through improved financial viability and institutional capacity in the sector, and increased connectivity and access for the population and businesses. Finally, the increased access that is financially and technically sustainable is expected to lead to development outcomes through improved economic growth, human development aspects, and welfare. To investigate the linkages in the theory of change implied by the results framework, this evaluation drew upon project data and knowledge products from the Bank

Group, and macroeconomic, human development, and electricity sector data from World Development Indicators, the IEA, and other sources.

The evaluation assessed both quantitative and qualitative results for individual projects during FY2000–2014. The portfolio review covered all projects for the World Bank, IFC, and MIGA that were approved or closed/matured during FY2000–2014 as shown in table 1.2. Field-based Project Performance Assessment Reports (PPARs) were prepared for 10 projects in four countries. Detailed Country Electricity Sector Profiles were prepared for a sample of 35 countries covering nearly 60 percent of the Bank Group's lending for the electricity sector, and more than 75 percent of the world's population without electricity access. Key performance indicators for projects completed and reported in the 35 sample countries from FY2000–2014 were rated. More than 25 interviews were conducted with staff, task team leaders, and management of the Bank Group's Global Practice for Energy and Extractives. The list of sample countries with selected data, list of PPARs, a detailed note on methodology, and the task team leaders templates are in appendixes C, D, E, and F, respectively.

Table 1.2. Bank Group Electricity Sector Projects Covered by the Evaluation, FY2000–2014

World Bank		IFC		MIGA	
Approved	Closed	Active	Closed	Active	Non-Active
278	255	275	148	36	36

Source: WB Business Intelligence; IFC and MIGA databases.
Note: IFC = International Finance Corporation; MIGA = Multilateral Investment Guarantee Agency.

The evaluation complements and builds on the findings from parallel, recent, and older IEG evaluations. It complements the earlier IEG reports *Power for Development: A Review of the World Bank Group's Experience with Private Participation in the Electricity Sector* (IEG 2003) and *New Renewable Energy: A Review of the World Bank's Assistance* (IEG 2006), and it adds to the relevant findings of *The Welfare Impact of Rural Electrification: A Reassessment of the Costs and Benefits, An IEG Impact Evaluation* (IEG 2008b) through an analysis of economic and welfare outcomes from World Bank projects. The evaluation also complements the findings of *Safeguards and Sustainability Policies in a Changing World: An Independent Evaluation of World Bank Group Experience* (IEG 2010), which covered electricity sector projects, and two evaluations on climate change (IEG 2008a; Chomitz 2010), which covered energy policies and energy efficiency issues. Relevant findings of *The Big Business of Small Enterprises: Evaluation of the World Bank Group Experience with Targeted Support to SMEs, 2006–12*, which identified electricity access as a major constraint in this sector, were taken into account (IEG 2014e). The findings of *World Bank Group Support to Public-Private Partnerships – Lessons from Experience in Client Countries, FY02–12* (IEG

2014c) and the *World Bank Group Assistance to Low-Income Fragile and Conflict-Affected States* (IEG 2014g), where relevant to the electricity sector, were also considered by this study.

IEG conducted a cluster review of four partnership programs: the Energy Sector Management Assistance Program (ESMAP), Asia Sustainable and Alternative Energy Program (ASTAE), Global Partnership on Output-based Aid (GPOBA), and Lighting Africa (IEG 2005). These four programs were selected because they are the largest partnership programs contributing to the Bank Group's work in energy access. The findings from this cluster review are reflected in the analysis of portfolio focus and performance (ESMAP, ASTAE, and Lighting Africa) and of affordability of access to the poor (GPOBA).

IEG's 2008 study of Bank Group activities related to climate change covered the World Bank's win-win energy policy reforms: energy price reform and policies for energy efficiency—both of which offer potentially large gains at the country level, together with significant reductions in greenhouse gas emissions. One of the report's conclusions is that "there is no significant trade-off between climate change mitigation and energy access for the poorest. Basic electricity services for the world's unconnected households, under the most unfavorable assumptions, would add only one-third of a percent to global greenhouse gas emissions, and much less if renewable energy and efficient light bulbs could be deployed. The welfare benefits of electricity access are of the order of $0.50 to $1 per kilowatt-hour, while a stringent valuation of the corresponding carbon damages, in a worst case scenario, is a few cents per kilowatt-hour." Others note that universal energy access can be achieved with essentially no increase in the global emissions of CO_2 only if the billions of people without access to energy services (or with poor quality service) demand only a minimal amount of energy services (Bazilian and Pielke 2013).

The report is organized as follows:

Chapter 2 analyzes the Bank Group's interventions and support for electricity access (lending, policy advice, and knowledge development) in country clients through the lens of electricity access categories and assesses the portfolio's electricity access relevance, outcomes and impacts, and efficiency.

Chapter 3 evaluates the Bank Group's role and effectiveness in improving institutional frameworks for electricity access, focusing on the financial viability of electricity sectors, and addressing the affordability of electricity access for the poor.

Chapter 4 evaluates Bank Group support for national access expansion programs through grid and off-grid means. It also examines recent efforts for systematic

national access rollout and syndicating financial resources using sectorwide frameworks and processes.

Chapter 5 presents the main findings of the evaluation and makes recommendations for World Bank Group management.

Notes

[1] See appendix A: Sustainable Energy for All (SE4All).

[2] http://www.eia.gov/tools/faqs/faq.cfm?id=447&t=3

[3] Electricity Access Data relates to 2010, the latest year for which consistent and comprehensive data was compiled by SE4All resources.

[4] This evaluation classifies Bank Group country clients according to four electricity access categories based on the percentage of population with electricity access: low (up to 50 percent), medium (>50–75 percent), high (>75–95 percent), and universal (>95 percent).

[5] World Development Indicators.

[6] Operations Policy and Country Services, World Bank Group.

2. Assistance, Focus, and Performance, FY2000–2014

Highlights

- The World Bank Group's support to the electricity sector is a significant share of its overall engagement with country clients.
- Within the electricity sector, countries with low- and medium- electricity access received a smaller share of assistance relative to high- and universal-access countries.
- There were significant gaps in coverage of low-access countries, with low engagement and continuity mostly in Sub-Saharan Africa, the Region with the largest population without access.
- Support for off-grid electrification was low and sporadic, with a few significant exceptions.
- The World Bank consistently raised issues and strategies to country clients for adequacy, reliability of electricity services, and financial viability, but less so for affordability and welfare.
- The Bank Group—on its own and through global partnerships—contributed substantially to knowledge development in electricity access for country clients.
- Development outcomes were favorable overall compared with other infrastructure sectors, but outcomes for low-access countries were somewhat lower relative to other categories.
- Infrastructure projects performed better than policy loans. The growing renewable energy portfolio is scaling the learning curve for dealing with technology and regulatory challenges.
- Median implementation time of World Bank electricity sector investment projects was nine years, with time overruns attributed partly to quality of project design and borrower capacity.
- Monitoring and evaluation performance of World Bank projects was poorer in low- and medium-access countries compared with high- and universal-access countries.
- Tracking welfare and gender impacts in World Bank projects improved; a beginning has been made in this respect by IFC.

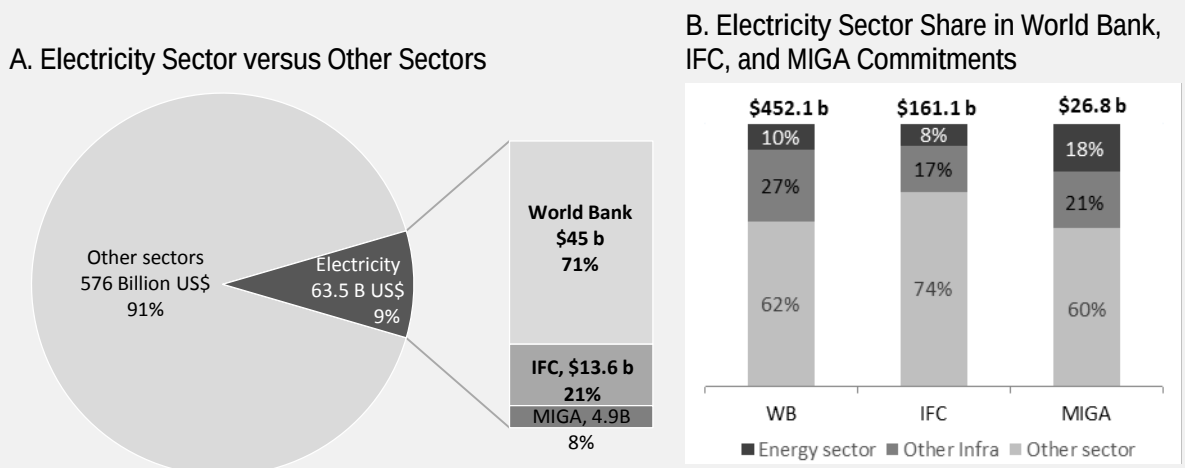
Lending and Focus on Electricity Access

The World Bank Group provided $63.5 billion to the electricity sector during FY2000–2014, about 9 percent of its support for all sectors during the period. WB support is regarded as commitments and includes grants, credits or loans and guarantees; IFC investment support is regarded as financing and include loans and equity; MIGA support is regarded as insurance and includes guarantees. This portfolio concentration tracked the directional flow of global private investments, mostly involving high and universal access countries, and included sixty-one (61) of 88 countries that received repeated IFC and MIGA support during the past 15 years and

were also noted to be in different stages of the reform trajectory. The latter group of countries are mostly IDA-eligible countries, primarily with low electrification rates. Using country risk as a filter, with regard to country risk and access levels, fifteen universal and high access countries with projects that received WB Partial Risk Guarantees (PRG), IFC financing and advisory work and/or MIGA political risk insurance (PRI) were rated high risk by Institutional Investor and the Economic Intelligence Unit. (figure 2.4).

The World Bank (IBRD and IDA) accounted for $45 billion (71 percent); IFC), $13.6 billion (21 percent); and MIGA, $4.9 billion (8 percent). The electricity sector was 10 percent of World Bank commitments, and all other infrastructure sectors (transport, water, and telecommunications) accounted for 27 percent of overall lending. IFC's commitments for the electricity sector accounted for 8 percent of all IFC commitments, compared with 17 percent for all other infrastructure sectors. MIGA devoted 18 percent of its overall gross exposure to the electricity sector, compared with 21 percent for all other infrastructure sectors. Overall, this is a significant emphasis on the electricity sector (figure 2.1).

Figure 2.1. Bank Group Commitments for the Electricity Sector, FY2000–2014 ($, billions)



Source: World Bank Business Intelligence; IFC and MIGA databases.
Note: b = billion; IFC = International Finance Corporation; MIGA = Multilateral Investment Guarantee Agency; WB = World Bank.

When viewed by access levels, however, the share of Bank Group electricity sector commitments for low-access countries during the period was not commensurate with the scale of the challenge for this group of countries. Only 22 percent of Bank Group commitments went to low-access countries, compared with 42 percent for universal-access countries; 6 percent of IFC commitments went to low-access countries,

compared with 58 percent to universal-access countries. MIGA has a more balanced portfolio compared with the Bank and IFC: the share of low-access countries was higher at 35 percent while the share of universal access countries at 39 percent is the lowest among the Bank Group (figure 2.2). The World Bank's relatively low share for low-access countries can be partly attributed to limited IDA resources, which have multiple claims from a variety of sectors. Also, the large incidence of fragile and conflict-affected states (FCS) among low-access countries (22 of 51) limits Bank operations to small grants under the multi-donor trust fund. However, IDA support to the electricity sector increased in line with the expanding overall IDA commitments during FY2000–2014 (figure 2.3). The evaluation recognizes that the approximately 78 percent of the WBG portfolio invested outside of low access countries—that have reached medium to near-universal access— focused to a greater extent on other dimensions of electricity access including quality and reliability, and energy efficiency and renewable energy, which are key goals of the SE4ALL Initiative.

Bank Group funding for private sector investments was also heavily skewed toward high and universal access countries. This portfolio concentration tracked the directional flow of global private investments, mostly involving high and universal access countries, and included sixty-one (61) of 88 countries that received repeated IFC and MIGA support during the past 15 years and were also noted to be in different stages of the reform trajectory. The latter group of countries are mostly IDA-eligible countries, primarily with low electrification rate. Using country risk as a filter, fifteen universal and high access countries with projects that received WB Partial Risk Guarantees (PRG), IFC financing and advisory work and/or MIGA political risk insurance (PRI) were rated high risk by Institutional Investor and the Economic Intelligence Unit[1] (figure 2.4).

Figure 2.2.Commitments by Country Electricity Access Category, FY2000–2014 (%)

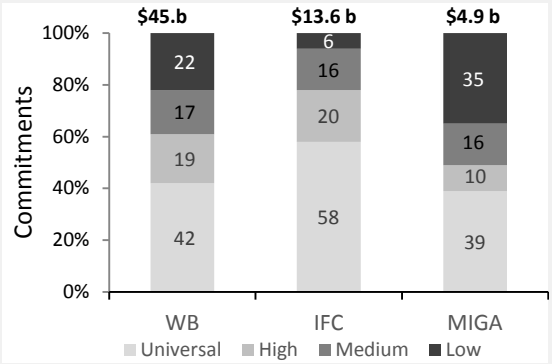
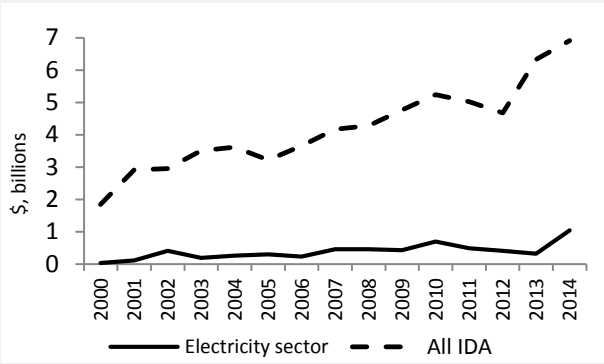
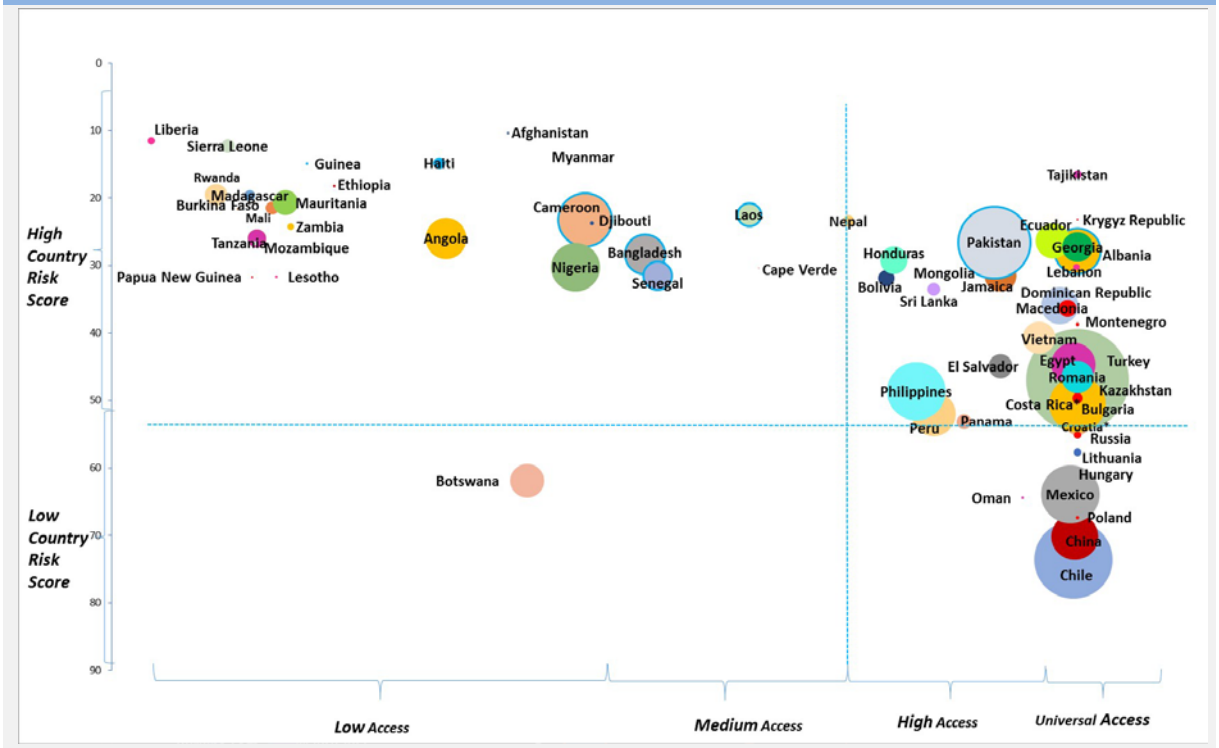


Figure 2.3. IDA commitments: Electricity Sector vs. Total. FY2000-2014



Sources: World Bank Business Intelligence; IFC and MIGA databases.
Note: b = billion; IDA = International Development Association; IFC = International Finance Corporation; MIGA = Multilateral Investment Guarantee Agency; WB = World Bank.

Figure 2.4. WBG Support to Private Sector Investments in Electricity Sector, by Electricity Access Category and Country Risk Scores (FY2000–2014)



Sources: World Bank Business Intelligence; IFC and MIGA databases; Institutional Investor Country Risk rating data, Economic Intelligence Unit (http://www.eiu.com).
Notes: Circle size denotes quantum of lending. Botswana, Mali, Mauritania, and Sierra Leone have projects supported only by World Bank Partial Risk Guarantees or Partial Credit Guarantees

The depth and continuity of the Bank Group's engagement in low- and medium-access countries is poor compared with their access needs and the urgency of the Sustainable Energy for All (SE4All) goals. Of 51 low-access country clients, the Bank Group supported two projects at most in 31 countries during the past 15 years and did not engage at all in 14 countries. Similarly, of 18 medium-access countries, 11 had two projects or fewer, and five countries had no engagement at all. IFC's engagement was sparser, with no engagement at all in 29 of the 51 low-access countries, and nine of the 18 medium-access countries (table 2.1).

Table 2.1. Depth and Continuity of Engagement in the Electricity Sector, FY2000–2014

Country access category	Number of Bank Group country clients	Number of FCS	Number of World Bank, IFC, and MIGA projects			
			0	1	2	>=3
Low	51	22	14	10	7	20
Medium	18	5	7	2	2	7
High	30	1	12	6	–	12
Universal	60	4	15	8	3	34
Total	159	32	48	26	12	73

Sources: World Bank Business Intelligence; IFC and MIGA databases.
Note: FCS = fragile and conflict-affected states; IFC = International Finance Corporation; MIGA = Multilateral Investment Guarantee Agency.

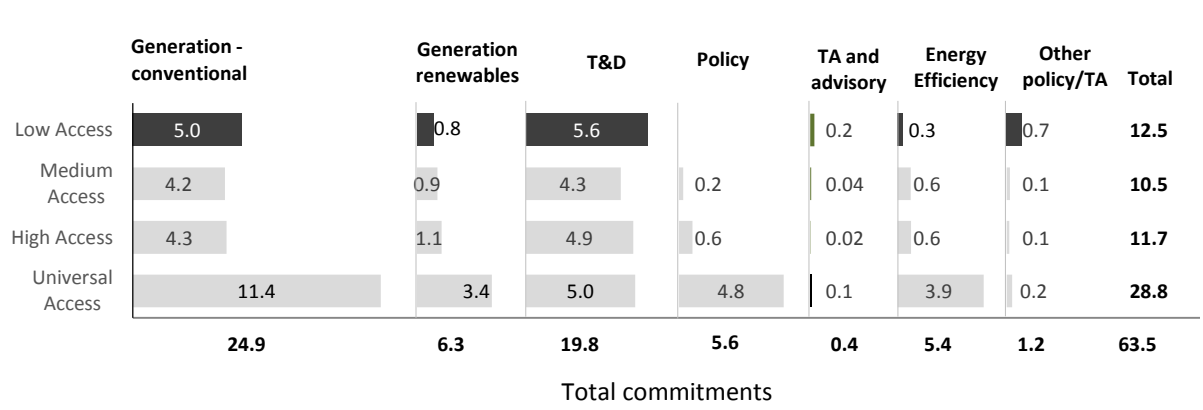
World Bank lending for the electricity sector was concentrated in infrastructure, with generation and transmission and distribution (T&D) each accounting for about one-third of the FY2000–2014 portfolio; this is in line with demand and the capital-intensive nature of the sector. Two themes—improving energy efficiency and enabling policy framework—had shares of 12 percent each, and dedicated technical assistance projects had less than 0.5 percent. IFC's investments were predominantly in generation, which made up 85 percent of its portfolio, with much of the remaining amount going to T&D. Advisory services and other categories accounted for less than 0.5 percent each. MIGA guarantees was also largely in generation, which absorbed three-fourths of its overall gross exposure, and the rest going to T&D (figure 2.5).

Figure 2.5. Commitments and Exposure by Project Type, FY2000–2014 ($, billions)

Note: IFC = International Finance Corporation; MIGA = Multilateral Investment Guarantee Agency; T&D = transmission and distribution; TA = technical assistance; WB = World Bank. WB and IFC commitments and MIGA gross expsoure in large hydropower projects (defined as ≥ 10 MW) were classified under "Generation." IFC Advisory Services amounts were classified under Technical Assistance and Advisory.

Regarding access categories, the Bank Group's lending and guarantees in low-, medium-, and high-access countries was mostly concentrated in electricity infrastructure. Bank lending for sector policy was significantly higher in high- and universal-access countries ($5.4 billion of $5.6 billion) and was delivered through dedicated projects reflecting the demand from these countries and availability of financing under IBRD terms. This pattern also reflects various elements of the Bank Group's energy sector strategy as it evolved during the past few decades (as detailed in the section on Strategy for Electricity Access in chapter 1), and as it applied to countries at different levels of access and sector development. In low- and medium-access countries, policy-related support, technical assistance, and advisory assistance were typically channeled through relatively small components of infrastructure investment projects, which totaled $674 million in low-access countries and $135 million in medium-access countries. The outcomes from these approaches to policy and technical assistance support are discussed in various sections of this chapter and in chapter 3 (figure 2.6).

Figure 2.6. Electricity Sector Commitments by Country Access Category and Major Purpose, FY2000–2014 ($, billions)



Sources: World Bank Business Intelligence, IFC and MIGA databases.
Note: T&D = transmission and distribution; TA = technical assistance. WB and IFC commitments and MIGA gross expsoure in large hydropower projects (defined as ≥ 10 MW) were classified under "Generation". IFC Advisory Services amounts were classified under Technical Assistance and Advisory.

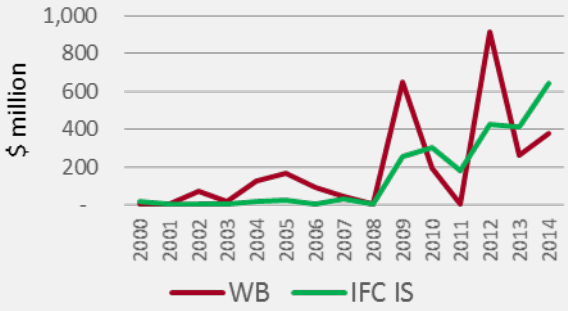
Non-conventional renewable energy accounted for nearly 25 percent of the Bank Group's support for generation during FY2000–2014 (figure 2.5). Individually, the World Bank, IFC, and MIGA devoted significant shares of their resources to build generation capacity using non-conventional renewable sources, which absorbed 25 percent, 19 percent, and 27 percent of their portfolio amounts, respectively. The patterns observed in the growth of the Bank Group's renewable energy portfolio are described in box 2.1.

Box 2.1. Bank Group Support for non-conventional Renewable Energy

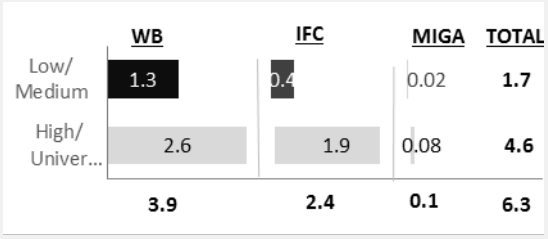
Support for non-conventional renewable energy (solar, wind, biomass, mini-hydro, geothermal) trended upward during the past 15 years. IFC's commitments, in particular, accelerated since 2008 after several years of slow growth, and exceeded World Bank commitments for this purpose in 2013 and 2014 (figure B2.1.1). Bank Group staff indicate that IFC's investments in non-conventional renewable energy have built on previous and ongoing Bank support for policy and regulatory frameworks in countries where IFC operates. The proportion of lending for non-conventional renewable energy generation in low- and medium-access countries is still on the low side for IFC (17 percent) relative to the World Bank (33 percent). Overall, more non-conventional renewable energy projects by the World Bank had favorable development outcomes ratings (69 percent) compared with 50 percent of the small cohort of evaluated IFC investment projects in this sub-sector (discussed in the section on Bank Group performance). IFC investment projects in conventional generation (including large hydro) had better development outcomes compared with its projects in non-conventional renewable energy. Technology risks and regulatory uncertainty affected outcomes of non-conventional renewable energy projects. In particular, withdrawal of government subsidies and tax incentives plus policy reversals in some countries placed financial viability of non-conventional renewable energy projects' at risk. Work quality shortcomings at appraisal also contributed to lower development and investment outcomes, particularly for IFC equity investments. Another IEG review of IFC's renewable energy projects, which included large hydro projects, identified constraints in land acquisition issues and regulatory uncertainty as factors affecting outcomes. The review also highlighted recent and evolving experience by the private sector and governments in this sub-sector.

Figure B2.1.1. Bank Group Support for New Renewable Energy, FY2000–2014

A. By years



B. By access category and institution

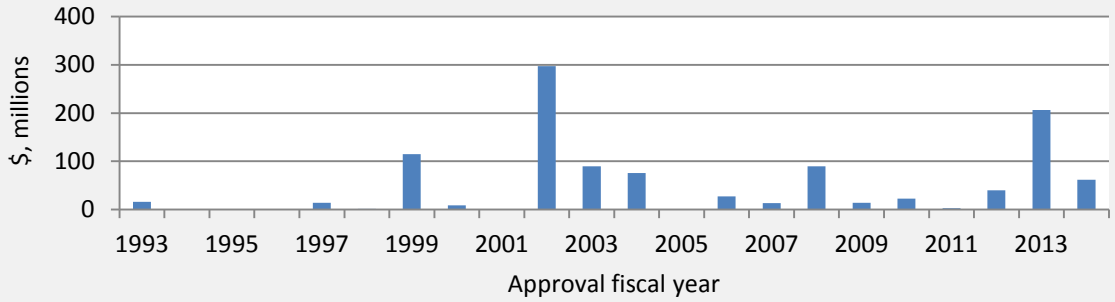


Sources: IEG 2015a; IFC and MIGA databases.
Note: IFC = International Finance Corporation; IS = Investment Services; MIGA = Multilateral Investment Guarantee Agency; WB = World Bank.

The World Bank promoted off-grid solutions—individual units, mainly solar home systems (SHS) and isolated mini- and micro-grids—as a fast way to provide energy services to rural and remote areas (World Bank 2014a). However, its assistance for

off-grid electrification in the past 15 years is only a small part of its electricity sector portfolio. During FY2000–2014 the Bank Group committed $1.1 billion[2] to off-grid electrification projects, which is 1.5 percent of its total commitments to the electricity sector during the period. There is no discernible trend in the World Bank's support for off-grid electrification in the past 15 years, during which small spurts of lending were punctuated by large commitments to a few projects (figure 2.7; table 2.2).

Figure 2.7. World Bank Commitments for Off-Grid Electrification ($, millions), Projects Closed or Approved during FY2000–2014



Source: World Bank Project Appraisal Documents, and Implementation Completion and Results Reports.
Note: FY = fiscal year.

Off-grid projects were heavily concentrated in a few countries that received 70 percent of the total support for this purpose (Argentina, Bangladesh, Ethiopia, Mali, Mongolia, and Sri Lanka). Two operations in Bangladesh (Rural Electrification and Renewable Energy Development Projects I and II) accounted for 41 percent of the Bank Group's total off-grid support during FY2000–2014.[3] Only two fully dedicated off-grid operations were financed during this period, in Mongolia and Nicaragua.[4]Other off-grid interventions were components of larger projects (appendix G).

Table 2.2. Share of Off-Grid Electrification in World Bank Commitments for the Electricity Sector: Projects Closed or Approved during FY2000–2014

Project status	Electricity sector projects [a]	Projects with off-grid component	Lending commitment for electricity sector ($, billions)	Off-grid commitments ($, billions)	Off-grid share of total commitments (%)
Closed	538	27	43.5	0.64[b]	1.48
Active	213	20	31.0	0.45[c]	1.46
Total	751	47	74.6	1.10	1.47

Source: Project documents.
a. Only parent projects. The financing takes into account linked additional financing and/or project-related Global Environment Facility funding.
b. Per Implementation Completion and Results Reports.
c. Per estimate in project documents.

Only 30 percent of the World Bank's off-grid support in the past 15 years was directed toward low-access countries. This contrasts with the potential of off-grid electrification to rapidly bring basic electricity services on a large scale to people who are not likely to be reached by the grid in the near future, or to remote or sparsely populated areas that are not likely to ever be cost-effective for grid expansion. The size and significance of off-grid electrification grew in many countries and thus could be important in scaling up electricity access, both on its own and as a pre-electrification complement to grid expansion. The Bank Group's support for various business models for off-grid electricity and to create markets for basic lighting and charging products are discussed in chapter 4.

Coverage of Electricity Access Issues and Strategies in CAS/CPS

During FY2000–2014, the World Bank Group was generally diligent in diagnosing country needs, raising relevant issues, and proposing strategies for most components of the results framework for improving electricity access. This is evident from an analysis of Country Assistance Strategies (CASs) and Country Partnership Strategies (CPSs) for the 35 case study countries. The strategies consistently and comprehensively covered issues relating to the adequacy and reliability of electricity services. Similarly, the financial viability of sector utilities and other service providers was covered in depth in almost all the sampled countries. Off-grid electrification issues were taken up in the vast majority of both low/medium- and high/universal-access countries, but there was little continuity from one CAS/CPS to the next, and there was less attention to specific strategies. The CAS/CPS fell short on coverage of electricity affordability for the poor and on links between electricity access and welfare impacts. Just 10 of the 19 sampled low-

and medium-access countries received an analysis of issues and strategic directions with respect to electricity affordability for the poor. Similarly, welfare outcomes were covered in only 14 of the 19 low- and medium-access countries (table 2.3; appendix H).

Table 2.3. Coverage of Policy and Strategy on Electricity Access Issues

Country access category	Number of sampled countries	Number of countries where CAS/CPS raised issues/strategy					
		Adequacy and reliability	Enabling framework	Financial viability	Affordability	Welfare impacts	Off-grid
Low/medium	19	19	18	18	10	14	16
High/universal	16	10	16	14	9	8	11
Total	35	29	34	32	19	22	27

Source: World Bank Business Intelligence; IEG ratings.
Note: CAS = Country Assistance Strategy; CPS = Country Partnership Strategy.

Knowledge Development for Electricity Access

The Bank Group made strong contributions to knowledge about electricity access development. This body of knowledge was generated by the Global Practice for Energy and Extractives (formerly the Energy Sector of the Sustainable Development Department), the Development Economics Group, various Bank Regions, and the Energy Sector Management Assistance Program (ESMAP) and Asia Sustainable and Alternative Energy (ASTAE), two global programs administered by the Bank Group that have devoted significant resources to energy access. This section also draws upon the findings of a parallel IEG learning product on global programs for electricity access covering ESMAP and ASTAE, and the activities of the Global Partnership on Output-based Aid (GPOBA) and the Lighting Africa program. A summary of the learning product is in appendix I.

This evaluation identified 321 knowledge products for FY 2000–2014, including 147 sectorwide economic, policy, and technical studies, 162 policy research working papers, and 12 policy notes covering one or more aspects of electricity access. Of the 321 studies, 187 (59 percent) related to various aspects of sector management (including generation and T&D), 66 (21 percent) focused on renewable energy, and 50 (16 percent) covered access-welfare linkages. For geographic coverage, about one-third dealt with multiple Regions, and 38 products (22 percent) looked primarily at Sub-Saharan African countries, followed by South Asia and East Asia and the Pacific with 46 products each (14 percent each). Thus the knowledge products had an even coverage in subject matter and set priorities for Regions with the most prominent access issues.

The global programs ESMAP and ASTAE contributed prominently to the mix of knowledge products. ESMAP is a global program for knowledge assistance that covers advice on legal, regulatory, and policy frameworks; training to strengthen the capacity of energy institutions; dissemination of best practices; and support to pave the way for World Bank investments. Energy access accounted for 38 (21 percent) of ESMAP's completed activities and $12.3 million (26 percent) of total budget allocations during FY2009–2012 (World Bank 2013d).

The ESMAP has an important role in supporting knowledge products that are directly linked to access-related project preparation and implementation. ESMAP piloted the preparation of geospatial access rollout plans based on geographic information system techniques in Senegal and Kenya, where there was no systematic planning of this kind before. This process was also used in Rwanda and Kenya, which prepared credible and bankable prospectuses detailing the sector parameters, government policy commitments, and sectorwide programs to scale up electricity access in a staged manner (discussed in more detail in chapter 4). This process is yielding tangible results in both countries. Similar efforts are at an advanced stage in Indonesia (in three Eastern Indonesian provinces), Myanmar, Nigeria, and Papua New Guinea. An external evaluation of ESMAP for 2007–2011 found that it was successful in influencing World Bank lending operations and, in some situations, was successful in catalyzing private sector investment and moderately successful in influencing the donor community (Lafontaine and others 2012).

The ASTAE, a regional program for East Asia and the Pacific and South Asia, supported upstream project preparation, some implementation support work, and a few freestanding technical assistance projects, mostly consisting of knowledge products. IEG identified 34 completed and ongoing ASTAE-funded activities, totaling $6.5 million, in FY2007–2013 that supported rural grid and off-grid electrification and renewable energy. This evaluation finds that ASTAE's inputs for project preparation were valuable—it provided quickly accessible funding for small-scale activities such as the preparation of an operations manual and implementation plan in Vietnam, capacity building in Bangladesh, geospatial mapping in Indonesia, and a beneficiary survey in Mongolia.

A sample of 16 analytical products covering electricity access issues was assessed as part of the learning product on global programs for electricity access, which covered ESMAP, ASTAE, GPOBA, and the Lighting Africa program. The learning product found that more than half of the sampled analytical products analyzed issues with objectivity and rigor, and generated new knowledge on energy access. The best publications contributed substantively to the global body of knowledge; their

conclusions, lessons, and recommendations were useful for the intended purpose; and they were written for the target audience. However, less than half of the papers were suited to their intended purpose based on the overall relevance of the original objective, and on the facts and analysis underpinning their conclusions, lessons, or recommendations. Only four of the sample reports satisfied all the criteria of objectivity, rigor, fitness to purpose, and ease of understanding for the intended audience. A list of sample products and specific examples underpinning the above conclusions are part of a summary of the report on global programs in appendix I.

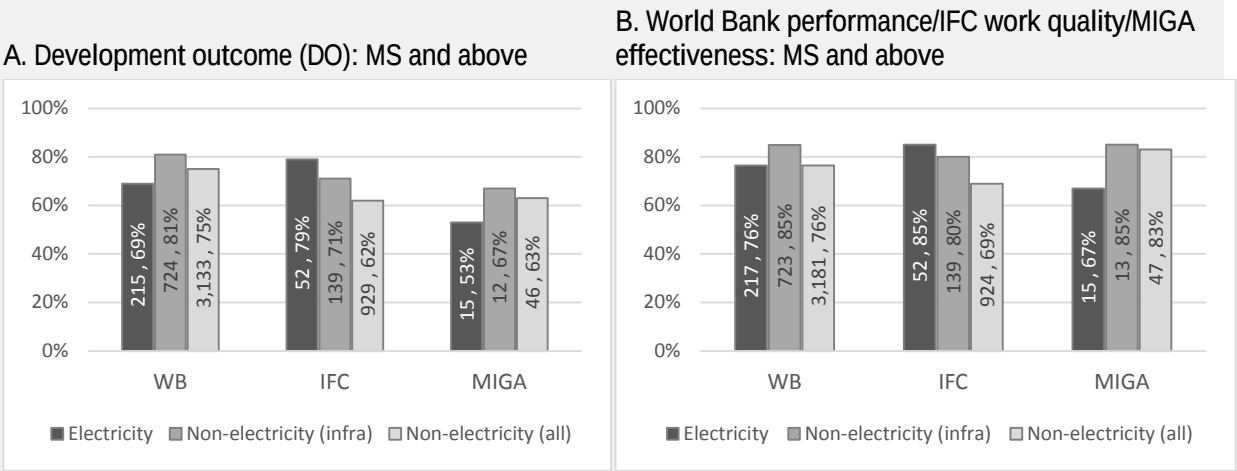
Development Outcomes: Adequacy, Reliability and Quality, Affordability, and Welfare

This evaluation analyzed the development outcomes for electricity sector projects that closed (IBRD and IDA) or have reached early operating maturity (IFC and MIGA) with evaluations completed during FY2000–2014.[5] For the World Bank, 69 percent of the projects had outcomes rated moderately satisfactory or better, and 79 percent of IFC investment projects had outcomes rated successful or better. Of MIGA's 15 evaluated guarantee projects, seven projects (53 percent) had development outcomes that were rated satisfactory and better. These performance measures are based on the respective evaluation methodologies of the World Bank, IFC, and MIGA, which are described in Appendix E (Table E.2). The World Bank portfolio performance reflects the portfolio's diversity of investments in generation, T&D, and development policy operations with a greater spread of performance. Based on the XPSRs completed in FY2000-2014, IFC supported relatively more generation projects and those in middle-income and higher access countries. Aggregate outcome ratings of IFC investment projects were influenced by the higher proportion of conventional generation (85 percent) and T&D (85 percent) projects with successful development outcomes. Development outcome ratings of IFC power sector projects were buoyed by the projects' "satisfactory and better" economic contribution[6] and environmental and social (E&S) effects. Lower development outcome ratings of MIGA conventional generation projects (38 percent), although located in higher access countries, has affected the aggregate outcome ratings of its projects in the sector. MIGA's renewable energy generation and T&D projects had slightly better outcomes.[7]

The World Bank's performance in the electricity sector is somewhat lower than its performance in other infrastructure sectors combined (transport, water, and information and communication technologies), though in a similar comparison, IFC's performance was better (figure 2.8). The complexity and diversity of energy sector activities and operations compared with those of other infrastructure sectors

may partly explain this difference. The relatively better outcomes of IFC's electricity projects, especially in conventional generation, benefit from the layers of contractual obligations defined under power purchase agreements covering technical, safeguards, and operational requirements. Multilayered contractual obligations are not found in other sectors, except for the extractive industries. IFC's performance also benefits from the sound technical capacity of its clients, and from its greater presence in countries with more favorable country and investment risk profiles. The aggregate outcome ratings of MIGA power sector projects relative to other sectors were affected by the older cohort of evaluated projects which lagged in environmental and social (E&S) sustainability effects. The lack of post-contract of guarantee follow-up and monitoring in this older set of evaluated projects was also a factor. A few projects experienced financial problems, which were further linked to weaknesses in project appraisal.

Figure 2.8. Development Outcomes and Institutional Performance

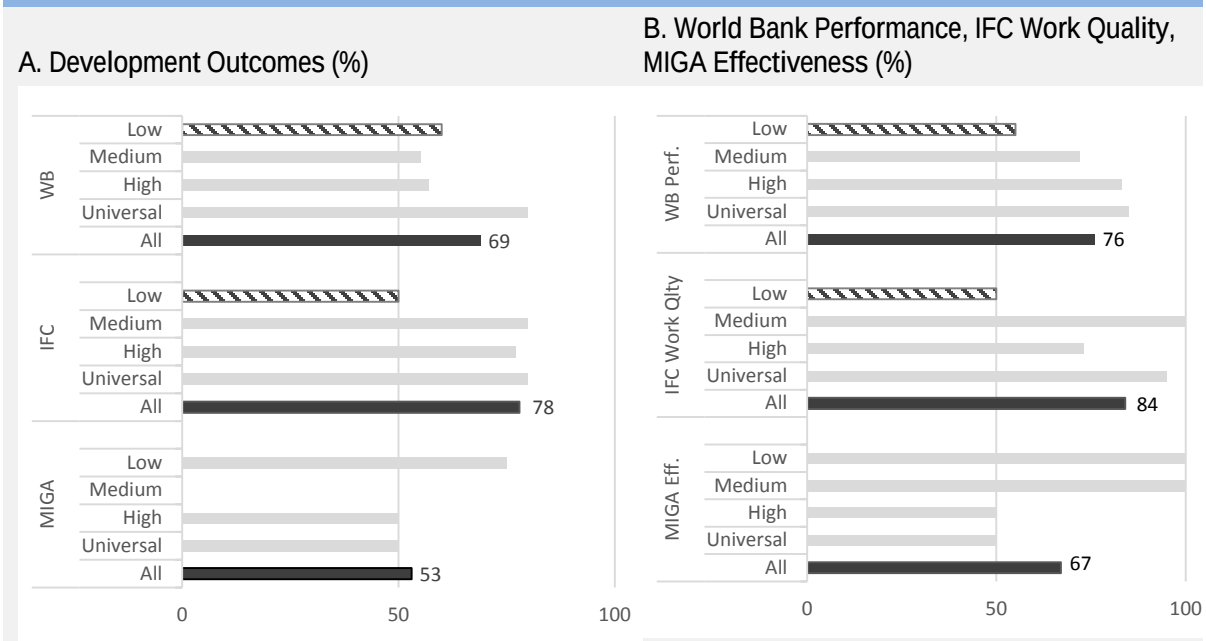


Source: IEG Implementation Completion Report Reviews; Expanded Project Supervision Report Reviews.
Note: IFC = International Finance Corporation; infra = infrastructure; MIGA = Multilateral Investment Guarantee Agency; MS = moderately satisfactory; WB = World Bank. IFC outcomes pertain to evaluated investment projects only.

When classified by country access categories, development outcomes for World Bank projects in all low-, medium-, and high-access countries were significantly lower than for universal-access countries (figure 2.9). This result is broadly correlated with the less favorable World Bank performance (combining project design, quality at entry[8], and project supervision) in low-access countries. Only 55 percent had results rated moderately satisfactory or better compared with 76 percent for the whole cohort. IFC ratings for development outcome reflects its portfolio concentration in higher access countries. IFC work quality was in the acceptable range for only one out of two evaluated projects in the low-access countries,

compared with 85 percent of all evaluated projects in the sector. Despite the small number of MIGA evaluations, three of the four evaluated projects in low access countries had satisfactory and better outcomes. Reasons for better performance vary by project and has. World Bank performance and IFC work quality are also affected by the weaker institutional and sector management capacities in low-access countries. The factors driving the lower World Bank performance in low-access countries are discussed with illustrative examples in the section on implementation efficiency later in this chapter.

Figure 2.9. Electricity Sector Portfolio Performance Ratings, FY2000–2014 (% projects rated moderately satisfactory/successful or better)



Source: World Bank Business Intelligence; IFC and MIGA databases.
Note: Eff. = efficiency; IFC = International Finance Corporation; MIGA = Multilateral Investment Guarantee Agency; Perf. = performance; Qlty. = quality; WB = World Bank.

When development outcomes for the electricity sector are analyzed based on the major project purpose, World Bank projects focused on policy lending—mainly financial viability issues—fare distinctly worse than projects focused on electricity infrastructure (table 2.3). The poorer performance of policy-oriented projects is of particular importance for the sustainability of electricity access. This issue, along with links to affordability of access to the poor, is covered in more detail in chapter 3.

For IFC, conventional generation and T&D projects had the most successful or better ratings. This was due to IFC's corporate expertise, experience, and comparative

advantage in conventional generation and to the contractual features of power sector operations as discussed above. The lower ratings for IFC's new renewable generation projects is partially due to IFC's more recent engagement in this area, and hence the learning curve it faced in dealing with the technology and regulatory risks in this field (box 2.1). MIGA's performance was relatively better for T&D and renewable energy projects compared with conventional generation projects, but because of the small number of evaluated projects, further analysis is challenging. (table 2.4).

Table 2.4. Development Outcome Ratings for Projects Classified by Major Purpose: Moderately Satisfactory/Successful or Better (percent)

Category	World Bank	IFC	MIGA
Generation—conventional	71	85	38
Generation—renewable	69	50	67
T&D	73	85	75
Energy efficiency	63	–	–
Technical assistance	68	–	–
Policy	50	–	–
Others		75	–

Source: IEG ratings.
Note: IFC = International Finance Corporation; MIGA = Multilateral Guarantee Agency; T&D = transmission and distribution; – = data not available; 'Generation-conventional' includes large hydro (>10 MW)

IFC advisory services. IEG also reviewed 20 evaluated IFC advisory services activities relating to the electricity sector, which is about 16 percent of those evaluated for all sectors during FY2000–2014. The evaluated activities included assistance to clients to structure public-private partnership transactions, and structuring tenders and bids document that sought to improve the enabling environment for electricity sector investments. All 20 evaluated activities were rated satisfactory and above for IFC's role and contribution in helping improve the enabling environment for power sector investments, and generally displayed higher development effectiveness than the rest of the advisory services portfolio. In several projects, the advisory activities followed World Bank sector work but in few cases, IFC advisory work preceded the Bank's sector work. The actual impact of the advisory projects is difficult to assess because the evaluated projects' impacts were too early to judge, but there appears to be value in continuing the upstream-downstream linkage. Unbundling IFC's advisory operations would have to ensure that the focus on low-income countries' needs continue.

Key Performance Indicators for access attributes, financial viability, and welfare

This evaluation also assessed the performance of World Bank projects that closed during FY2000–2014 and which focused on the attributes of electricity access—adequacy, reliability and quality, and affordability. The assessment used detailed analysis of key performance indicators for a sample of 35 countries. Key performance indicators for financial viability and welfare outcomes were assessed using the same approach, and were consolidated at the country level for the entire period FY2000–2014. The sample of countries studied (listed in appendix C) accounts for nearly 60 percent of the Bank Group's lending for the electricity sector and more than 80 percent of the population without access in Bank Group country clients.

Adequacy and reliability outcomes correspond broadly to generation and T&D infrastructure outputs, respectively, and were each addressed in 27 of the 35 sample countries. Between 55 and 60 percent of these countries had moderately satisfactory or better indicators and did not differ much between low/medium- and high/universal-access countries. Financial viability was addressed in the next largest set of 24 countries. Here the outcomes were distinctly better for high- and universal-access countries compared with low- and medium-access countries.9 Welfare indicators were present in projects for 20 countries, with positive results in 60 percent of them. Affordability received the least attention; projects in only 10 of the 35 countries took up this issue. Of these, outcomes were moderately satisfactory or better in six cases. The World Bank's experience with supporting its country clients in improving electricity affordability for the poor is covered in detail in chapter 4 (table 2.5).

Table 2.5. Key Performance Ratings of Attributes by Country Access Category

Country access category	Number of countries in sample/ratings	Adequacy	Reliability / quality	Affordability	Financial viability	Welfare
Low	Number of countries	10	12	4	8	9
	Moderately satisfactory or better (%)	70	42	25	38	33
Medium	Number of countries	4	5	1	5	4
	Moderately satisfactory or better (%)	50	60	100	0	50
High/ universal	Number of countries	13	10	5	11	7
	Moderately satisfactory or better (%)	62	70	80	82	100
All	Number of countries where addressed	27	27	10	24	20
All	Moderately satisfactory or better (%)	17	15	6	12	12
		63	56	60	50	60

Source: Project documents; IEG assessment.

The evaluation also considered the differences in outcomes in the above attributes between low-access countries subdivided into two groups: 0–25 percent access and 25–50 percent access. The differences in ratings are not statistically significant except for sector finances, in which the 25–50 percent access group is performing worse. Overall, this data does not lend itself to much interpretation given the limited number of interventions in both country groups in this regard, and the generally poor performance of utilities in both these groups, as discussed in chapter 3.

The evaluation assessed the extent to which Bank Group projects, in their results frameworks, have linked electricity access with improved outcomes for productive activities, income, and welfare benefits (health, education, communication, and safety) together with gender-related tracking. IEG found that only a few of the World Bank's dedicated rural electrification projects (a subset of all projects related to electricity access) incorporated welfare-related issues into project design, even though most of the projects considered improvements in welfare to be part of their objectives (IEG 2008b). The report recommended that tailor-made surveys be built into a greater number of Bank projects and designed to allow rigorous testing of the impacts of electrification. IFC projects covered by this evaluation do not yet include indicators on poverty and distributional effects. An IEG on evaluation of IFC's poverty focus recommended that IFC should define, monitor, and report poverty outcomes for projects with poverty reduction objectives (IEG 2011). [10] While IFC has made progress in addressing the recommendations, poverty measurement has not been fully integrated in its project approval documents and in its monitoring system.[11] Recently (last two years), IFC project approval documents had included an estimate of the number of women beneficiaries.[12] However, data collection and verifiability remains a challenge.

During FY2000–2014 16 World Bank electricity sector projects—a fraction of the 278 projects approved during this period—included indicators in their results frameworks for tracking productive uses and increased income from activities associated with electricity access. These projects were mostly in a mix of low-, medium-, and high-access countries—Bangladesh, Ethiopia, Indonesia, Mexico, Peru, Philippines, Senegal, Sri Lanka, and Uganda. The indicators related to adoption of electricity-using equipment for small and micro business or stores and farming activities.

Relative to productive uses of electricity, World Bank projects paid more attention to human welfare and gender-related outcomes (box 2.2). During FY2000–2014, 48 World Bank projects included performance indicators for welfare or gender-related aspects, and 36 of these were in low- and medium-access countries. Twenty-eight of the 48 projects were approved in FY2009 or later, pointing to continued and

potentially increased attention to these issues in recent years. Seventy-five percent of projects approved (36 out of 48) were in low- and medium-access countries, suggesting a greater focus on the poor. Most of these indicators from closed projects showed satisfactory or better results. However, the quality of indicators for welfare outcomes was uneven, with most indicators focused only on the number of beneficiaries that obtained welfare benefits without quantifying the improvements, and most tracked outputs instead of outcomes. Significant exceptions were found in Bangladesh, Peru, and Sri Lanka, as explained in the following paragraphs.

Box 2.2. WBG Progress in Integrating Gender Issues

Since the adoption of its first gender strategy, *Integrating Gender into the World Bank's Work: Strategy for Action* in 2001, gender issues have become more integrated in the World Bank's energy operations. ESMAP supported a gender and energy program through the Africa Renewable Energy and Access program (AFREA, 2010) and published a guidance note on *Integrating Gender Considerations into Energy Operations* (2013). It is supporting World Bank teams on integrating gender considerations into projects by providing direct financial and technical support, such as in the case of the Bolivia's Rural Electrification Program; a regional gender assessment of India, Nepal and Pakistan; the second phase of the AFREA gender and energy program; a gender and energy subsidies research program in the Eastern Europe and Central Asia region; a technical assistance program on social accountability in the energy sector in Egypt; and the development of a new East Asia and Pacific Gender and Energy Program. IFC has also undertaken several steps to address gender in its investments and advisory services and promoted business opportunities for women in the private sector. In 2002, IFC set up a Gender Entrepreneurship Markets program, and has since advocated increasing the number of women board members in the companies in which it invests; in 2012 it addressed gender in its Sustainability Framework. These initiatives were also guided by the 2009 IEG evaluation of the Bank's Strategy between 2001 and 2005, which concluded that gender integration at the strategic level did not always translate into project-level design features, attributing this to the absence of results frameworks and weak monitoring and accountability mechanisms.

The portfolio review carried out under this evaluation revealed that the following need improvement in key performance indicators for gender: (i) a clear definition of beneficiaries vs. users, since they may be different groups; (ii) tracking of outputs and outcomes, not only headcount figures; (iii) measures of outcomes. Most projects limited themselves to tracking the "number of female beneficiaries (%)". In some instances, indicators were better designed, and tracked, for example: "Number of hours school aged girls in the household study at night; percentage of women getting access to news and information; and number of women knowledgeable about reproductive health, HIV/AIDS and other women issues"[13]; "Contribute to the increase of income of participating communities, with percentage distribution between women, men and youth ($/year)"[14]; "Percentage of active loans to women-owned businesses (%)"[15]. However, these good practice examples did not track gender outcomes.

There is need for better monitoring of gender outcomes and impacts in WBG operations in order to support the corporate goals of promoting shared prosperity and ending extreme poverty and by 2030.

Source: World Bank 2014d; World Bank 2014e, World Bank, 2015.

In Bangladesh and Sri Lanka, a set of impact evaluation studies (Khandker, Barnes, and Samad 2009) and a monitoring and evaluation (M&E) study (RDC 2008) covered the productive uses, economic, welfare, and gender-related impacts of electricity access. The Bangladesh studies found positive impacts of grid electrification on household incomes, use of technology in the home, women's empowerment, and study time for boys and girls. The impact evaluation of the SHS program found a positive and significant impact of electricity access on study time; and a correlation between those households with a television, and health outcomes and impact on women's mobility, among others. Sri Lanka's M&E study found that even in small quantities, electricity consumption brings significant lifestyle changes in families, mainly by making home life more convenient and housework easier. Small and micro business activities, such as grocery shops, bakeries, battery-charging stations, communication centers, computer training centers, grinding/rice milling and cinnamon processing, benefitted from mini-hydro schemes. Villagers reported increased safety from lighting after dark, and an increase in sociocultural activities because of the presence of electricity at religious places in the villages.

In the remote areas and poorer regions of Peru, a high-access country, the link between electricity access and productive activities was established by the World Bank's Peru Rural Electrification Project.[16] The project's productive uses component helped more than 21,000 rural producers—one-third of which were women—to adopt electricity-using equipment for processing cereals, coffee, cocoa, baked goods, meat products, milk, wood and metal products, and handicrafts; and to pump water for expanded agricultural production and processing. More examples are discussed in the context of off-grid electrification in chapter 4.

Reliability and Quality

The World Bank recognized the reliability and quality of service issues and provided country clients with support to address them. In 29 of the 35 case study countries, CASs/CPSs covering the period 2000-2014 analyzed quality and reliability issues, and proposed strategies to address them. Typical strategies and measures adopted in the projects were "improving availability, reliability and

affordability of electricity supply for households and businesses" (World Bank 2010b); "improving reliability and financial sustainability of electricity distribution companies" (World Bank 2009a); "reliability in rural distribution" (World Bank 2012a); "urgent upgrading of antiquated electricity distribution infrastructure" (World Bank 2012a); and "increase the reliability of electricity supply to improve the financial viability of the state-owned energy utility" (World Bank 2014b).

The project-level outputs and outcomes for reliability and quality as measured through key performance indicators satisfactory or better results in 35 of 37 evaluable projects. IEG reviews of project implementation completion and results reports show that strong government commitment and a realistic project design were the main contributing factors to satisfactory performance. These conditions were in place, for instance, in Uganda, where the Bank project reduced service interruptions by 48 percent (the original target was 30 percent).[17] In Nigeria, the cluster-level losses were reduced from 37 percent to less than 12 percent (with a target of 12 percent); tail-end voltage improved from an average of 29 kilovolts to 33 kilovolts in the 32 clusters; and end-user voltage was increased from 200 volts to 220 volts (achieving the targets). Furthermore, the number of clusters developed with demonstrable improvements in service levels was increased from zero to six (overachieving the initial target of five clusters).[18] In Kenya, the number of combined monthly distribution line interruptions per 100 kilometers for 66 kilovolt and 33 kilovolt lines was reduced from 4.7 to 2.0, and annual T&D losses were reduced from 18.7 percent to 16.2 percent.[19]

By contrast, reliability and quality outcomes were less than satisfactory in the reviewed Bank projects in Senegal and Pakistan. These results are attributed to the project design being too complex (both in areas addressed and number of implementing agencies involved), or not taking sufficient account of the local institutional capacity and context; and weak borrower commitment. In the Senegal project, the technical and nontechnical T&D losses (as a share of net generation) increased to 21.4 percent by project close instead of decreasing from 17.5 percent to 15.5 percent, as planned. Moreover, a targeted reduction in power interruptions from 14 gigawatt hours to 8 gigawatt hours was not achieved.[20] In Pakistan, there were shortcomings in achieving planned outcomes all around. The substation automation and protective relaying was achieved for only 20 of the 67 targeted stations; the Hyderabad Electric Supply Company annual T&D loss reduction was short of target; but Lahore Electric Supply Company annual T&D losses and system load at two grid stations increased.[21]

The analysis of IFC and MIGA projects' key performance indicators in country reviews mirrors the World Bank's focus and performance. Although projects with

quality and reliability objectives and indicators covered a diverse range of interventions for the World Bank, in the case of IFC and MIGA most projects with quality and reliability objectives (60 percent) were linked with increasing (greenfield projects) or enhancing (modernization and/or privatization projects) the countries' generation capacity (adequacy) and thereby contributed to better quality of service and reliability. IFC and MIGA projects' that had reliability and service quality objectives had mostly satisfactory results, with only two out of seven evaluated projects underperforming on the relevant indicators.

Institutional Framework and Capacity Building

The World Bank has long provided clients with support for developing and reforming their policy and institutional frameworks to respond to the emerging and long-term developmental needs of the sector. The assistance typically supported government and sector ministries to improve policy development and implementation. Among other things, the Bank supported sector planning and management; enactment and reform of sector laws; regulatory institution set up and capacity building; enabling private sector investment; sector restructuring, unbundling, and corporatization; and improving the financial viability of the sector and access to services by the poor. In a limited way, the Bank also supported utilities to improve operations. Following the World Bank's lead, many bilateral and multilateral donors and multilateral development banks began to support institutional development and capacity building in a significant way (ADB 2014).

The CASs/CPSs of 34 of the 35 countries reviewed discussed sector policy, institutional and capacity issues, and proposed measures to address them. Of the 186 projects reviewed, 177 included key performance indicators focused on institutional framework and capacity, 174 focused on sector planning and management, 56 focused on sector regulation and agency, and 10 focused on utility operations. Overall, 164 projects (88 percent) reported performance on key performance indicators as moderately satisfactory or better, and there was no significant difference in rating covering one or more of the issues between country access levels. Among the other 22 projects with poor performance, 13 were in low- and medium-access countries, and the remaining were in high- and universal-access countries. IEG's review of Implementation Completion and Results Reports showed that government commitment was a strong factor behind the performance.

Several successes are particularly notable. In Brazil, three projects achieved the intended sector and market reforms.[22] Tariffs regulations were issued and enforced, a new wholesale market structure was established, transmission and distribution (T&D) were unbundled, and energy efficiency laboratories were established around

the country. In India, six projects helped four states and the national power grid to establish new legal, regulatory, tariff, and institutional frameworks, including unbundling of generation, transmission, and distribution.[23] The Bank built on the Renewable Resources Development Project for mobilizing $113 million in private capital for renewables.[24] In Ethiopia, several projects helped establish a regulatory agency, transform the main utility into a for-profit corporation, put rules in place facilitating private participation, and trained staff.[25] Also, a regulatory and institutional structure for rural electrification was established, including training for designing and constructing rural networks. In Cambodia, two projects helped phase out wholesalers, establish the main utility as a separate entity, and establish a Rural Electrification Fund.[26] Furthermore, the World Bank provided advisory services for establishing a regulatory agency and developing a sector master plan. In Bangladesh, although sector studies and private sector investments in two generation projects were achieved, corporatization of a distribution company and capacity building for the Energy Regulatory Commission (ERC) were not fully achieved (IEG 2014a).

At the utility level, the World Bank supported operational improvement through a supervisory control and data acquisition system (SCADA) in Nigeria,[27] and technical studies in Tanzania.[28] It also supported establishing environmental units in Cambodia,[29] Nigeria, and Indonesia,[30] and unbundling and corporatization in Bangladesh,[31] Indonesia, and Tajikistan.[32]

By contrast, in Pakistan, the operation did not succeed in sector restructuring, including private sector development, market unbundling (including the underpinning legislation), and improving sector finances by phasing out government subsidies.[33] In Senegal, there were no satisfactory results for ensuring cost-recovery tariffs for the main utility (Senelec), market reform and restructuring through privatization and unbundling, establishing a regulatory authority for the hydrocarbon subsector, and strengthening Senelec's internal audit department.[34] In Vietnam, the integration of small power producers into the market was not fully achieved.[35] In Cameroon, the World Bank's efforts to support enactment of the Electricity Act[36] was not successful. In Ethiopia, training of Ethiopian Electric Power Corporation staff was not completed because of implementation delays due to an over-optimistic project design.[37] In Senegal, the projects did not succeed in reinforcing the Senelec internal Audit Departments, or the unbundling of Senelec and the achievement of adequate private participation during the lifetime of the project.[38] In Vietnam, the planned installations for operational management systems was not completed.[39]

IFC's InfraVentures facility aims to support early-stage infrastructure project development, thus facilitating private sector investments for infrastructures projects, including in the electricity sector. InfraVentures was created in 2007 to address private sponsors' funding and capacity constraints as well as risk averseness during the early phases of project development. It has $150 million funding, and commitments since 2007 reached $70.7 million for 30 projects, including $62 million for 25 power sector projects (of which 19 active and six closed) as of the end of FY2014. Ten power projects are located in the Sub-Saharan Africa Region, representing fifty percent of the power sector commitment amounts. Except for three projects in Indonesia and Serbia, the projects are located in IDA countries. So far, two InfraVentures-supported projects reached the financing stage with IFC investment support (a 181 megawatt hydro project in Georgia and the 96 megawatt thermal project in Senegal, Tobene IPP). IEG's review of InfraVentures supervision reports found challenges to scaling up InfraVentures activities from heightened political and macroeconomic risks in several countries; technical feasibility problems, especially in wind farm projects; project bankability issues; and delays in signing power purchase agreements.

Implementation Efficiency of World Bank Electricity Sector Investment Projects

SE4All set a short period for reaching universal electricity access globally. Therefore, one dimension of efficiency—implementation efficiency of World Bank electricity sector projects—including the time required to implement them, is particularly important. This section examines the record of planned implementation times and time overruns for investment projects executed by the public sectors of country clients, and identifies and analyzes the principal factors that drive their efficiency.

Implementation times were evaluated for all 215 World Bank electricity sector investment projects that closed during FY2000–2014. Of these projects, 81 were in low- or medium-access countries, and 134 were in high- or universal-access countries. About 78 percent of all projects were delayed relative to the original planned implementation period. Delays ranged from five months to eight years, with an average delay of 2.5 years and a median delay of two years. The share of delayed projects in low- and medium-access countries (84 percent) was somewhat higher than that for high- and universal-access countries (72 percent). Among the sample of closed investment projects reviewed for the efficiency analysis, 20% of projects had additional financing (AF) to scale up project activities and extend the project closing date. An analysis of the median delay for the projects with and without AF showed an insignificant difference of about one month and a half.

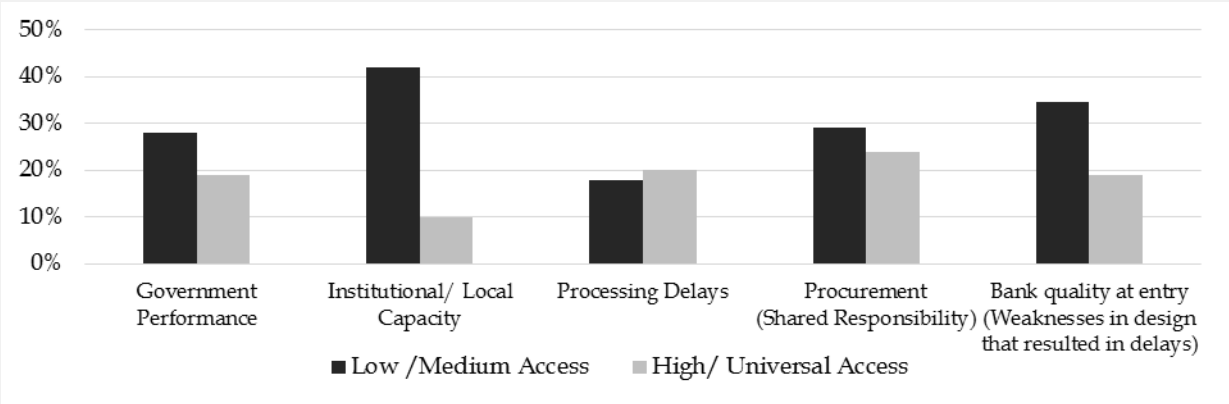
Analysis of preparation times (the time elapsed between the review of the project concept note and project approval by the Board) yields a median preparation time of two years. The median length of a World Bank investment project, including time overruns, is nine years (figure 2.10).

Figure 2.10. Median Duration of Electricity Sector Investment Projects

Source: World Bank Business Intelligence.
Note: Based on data for closed World Bank electricity sector investment projects, FY2000–2014.

The major reasons for implementation delays in these projects are the responsibility of both the Bank and the borrower. Borrower institutional capacity and the Bank's quality at entry are the most important factors, followed by the government's commitment to the project, and areas of shared responsibility, principally procurement matters. Low- and medium-access countries were more affected by shortcomings in institutional capacity than high- and universal-access countries (42 percent versus 10 percent). Similarly, as seen in figure 2.11, quality at entry contributed more often to implementation delays in low- and medium-access countries than in high- and universal-access countries (35 percent versus 19 percent). By contrast, for projects that closed on time, no significant shortcomings were observed in institutional capacity, and the Bank's quality at entry was inadequate in only one of thirty projects.

Figure 2.11.
Major Factors Associated with Delays in Electricity Sector Projects (Closed during FY2000–2014)



Source: World Bank Business Intelligence.

The two key factors—inadequate institutional capacity and poor quality at entry—appeared to reinforce each other in many projects that experienced time overruns. Inadequate institutional capacity was a factor in Uganda's Energy for Rural Transformation project,[40] Zambia's Power Rehabilitation Project,[41] and Cabo Verde's Energy and Water Project.[42]

In Uganda, an overrun of 50 percent on a planned implementation period of 4.7 years was due to an overestimation of government and sector institution capacity to implement an ambitious program of rural transformation. Although training and technical assistance were included in the project, they took time to favorably affect the severe absorptive capacity constraints. Capacity limitations were aggravated by weak implementation arrangements. In Zambia, a 75 percent time overrun on a planned four-year implementation period resulted. The project design was complex and tried to combine investment requirements with a range of policy issues accumulated during more than 20 years of Bank absence from the sector. In the Cabo Verde project, a 95 percent overrun on a five-year implementation period followed when little account was taken of the difficulties of implementing a complex and sensitive program involving the power and other infrastructure sectors in a geographically dispersed country with limited institutional, technical, and managerial capacity. Two key privatization-related risks—faltering political commitment and an unsatisfactory concession agreement—were initially rated as negligible to modest, but they materialized in a big way. The major part of the renewable energy and development component, consisting of the extension of 7.8 megawatts of wind farms, was rolled back because of mismanagement of the procurement process, mainly on the Bank's part.

Capacity constraints also affected projects in countries with more mature electricity sectors and high or universal levels of access. Albania's Power Sector Generation and Restructuring Project had a nearly 100 percent time overrun on a planned four-year implementation period, and ended with an unsatisfactory development outcome. The project's progress was mainly affected by shortcomings in quality at entry, capacity, and procurement. The Bank's analysis of the capacity of the Albanian Power Corporation did not adequately consider its limited experience with thermal power plants and their construction problems. Vietnam's System Efficiency Improvement, Equitization, and Renewables Project took 10.5 years to complete compared with the planned 5.5 years.[43] This project illustrates how an otherwise successful national electrification program had to contend with gaps in technical and management capacity of some of the implementing agencies, which caused delays or cancellation of several subprojects, especially during the early

years of implementation. The T&D improvement subprojects were affected by inexperience in substation control systems, poor coordination between equipment suppliers and civil contractors, delays in compensation of affected persons, and prolonged contracting processes.

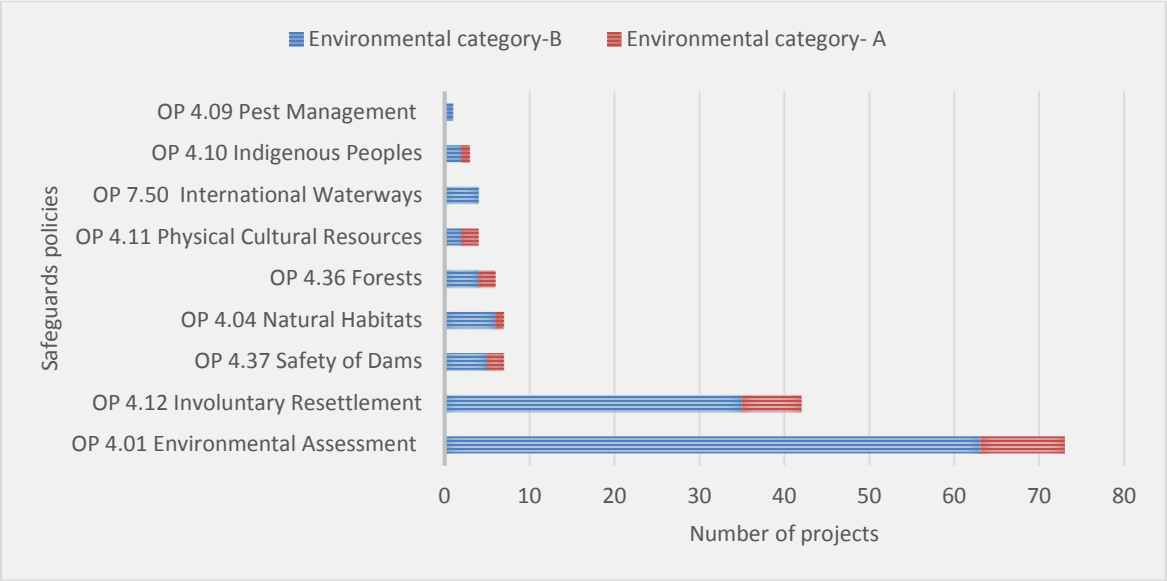
Rwanda's project was a fast-track operation to alleviate the country's power supply shortfall[44]. The project gave primacy to power system reinforcement while beginning to build capacity that would support present and future activities in the sector. However, the project was affected by high staff turnover due to increased competition for key project staff in donor and government-funded projects.

The importance of implementation time efficiency also came up during interviews with the staff and management of the Bank Group's Global Practice on Energy and Extractive Industries. Task team leaders with experience in low-access countries, particularly in Sub-Saharan Africa, pointed to weaknesses in the institutional capacity of both the government and the implementing agency as constraints on speedy and effective implementation of projects. At the government or ministry level, the weaknesses generally relate to sector planning and financial and regulatory issues; designing and managing public-private partnerships; and strengthening institutions for these functions. Gaps in technical and planning capacity exist at the implementing agency level. Staff turnover due to lack of career incentives or substantially better prospects in other work situations is a continual problem, though this may be a positive feature if that talent is being mainstreamed in the country's electricity sector. Although these observations relate to low-access countries, even countries with higher access levels and a longer history of electrification are subject to capacity constraints, but in narrower areas.

Safeguards Performance

The World Bank started to more systematically track environmental and social safeguard issues in its project Implementation Completion and Results Reports after 2007; and this review covers the 83 electricity sector projects that closed from that year onwards. Most of the projects are assigned category B under the World Bank's environmental and social safeguards policies[45], when potential environmental impacts are expected to be moderate (76 percent of the sample of 83 projects). Only about 10 percent are assigned category A. The most frequent safeguard policies triggered are Environmental Assessment OP 4.01 and Involuntary Resettlement OP 4.12, followed by Safety of Dams OP 4.37 and Natural Habitats OP 4.04 (figure 2.12).

Figure 2.12. Frequency of Safeguard Policy Actions in World Bank Electricity Projects, (FY2007–2014)



Source: IEG Project Implementation Completion Report Reviews.
Note: OP = Operational Policy.

All the project Implementation Completion and Results Reports reported that their projects were generally in compliance with the World Bank's environmental and social safeguards policies. There were some outstanding issues at closure in 6 percent of the projects—mainly generation and T&D projects. For the Afghanistan Emergency Power Rehabilitation Project (P083908), assigned category B, deficiencies in dam safety arrangements were identified. These were not addressed during implementation, and the Bank had to prepare a separate project to address these deficiencies at the Naghlu plant. Nine projects were reviewed by the Inspection Panel, three of which were subsequently investigated (Albania Power Sector Generation and Restructuring Project, India Vishnugad Project, and Nepal Power Development Project).[46]

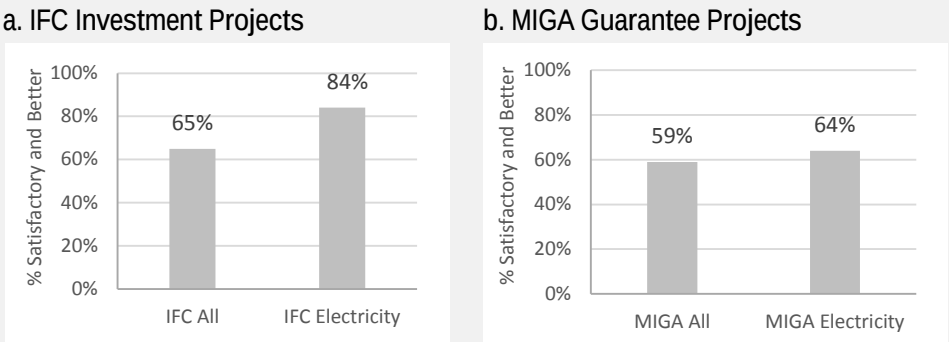
In four World Bank projects, safeguards issues were reported to have caused implementation delays, in most cases related to land acquisition. In Indonesia (P004021, 1996–2003), right-of-way negotiations and land acquisition problems were time-consuming. In Argentina (P006036, 1993–2000), the agency was slow in performing land acquisitions and housing construction, adding to pressures that slowed down project implementation. In Pakistan (P039281, 1996–2003), there was a significant increase in the cost of compensation for land, which caused long delays in land acquisition ($36.95 million appraisal estimate versus $116.5 million actual); this situation warranted an investigation by the National Accountability Bureau of

Pakistan and led to the arrest and prosecution of a number of officials and other people. In Sri Lanka (P076702, 2002–2011), delays were related land acquisition and to obtaining required approvals from the Central Environmental Authority and other agencies.

IEG reviewed 51 IFC investment projects evaluated during FY2000–FY2014 for their E&S effects on two environmental dimensions.[47] The first dimension relates to the environmental and social performance of the client, such as the preparation and implementation of environmental and social action plans; compliance with contractual environmental and social requirements; performance against national and IFC performance standards, and IFC's Environment, Health, and Safety Guidelines. The second dimension assessed and rated the extent of environmental change or impact brought about by the project as positive or negative.

Of 51 projects, 84 percent achieved satisfactory rating for addressing projects' environmental and social effects (E&S); these outperformed evaluated projects in other sectors (52 percent). When weighted by type of power projects, the E&S effects ratings remains about the same at 88 percent for renewable energy projects, 85 percent for T&D projects, and 81 percent for conventional generation projects.(figure 2.13, panel a).

Figure 2.13. Environmental and Social Effects Ratings, FY2000–2014



Source: IEG Evaluation Notes and Project Evaluation Reports (PER) Ratings Databases.
Note: IFC = International Finance Corporation; MIGA = Multilateral Investment Guarantee Agency. IFC All and MIGA All refers to evaluated projects in other sectors.

Among the fourteen evaluated MIGA projects rated for their E&S effects, nine projects (64 percent) had positive ratings. (figure 2.13, panel b) This share was relatively higher than the evaluated projects in other sectors with satisfactory and better ratings (59 percent) for this same indicator. By sub-sectors, all three evaluated T&D projects were rated positively and two of three renewable energy generation projects (67 percent) were also rated satisfactory and better for their E&S outcomes.[48]

The main drivers of positive E&S effects were the commitment of the sponsor and the competence of the project management. Projects rated excellent had also gone beyond typical corporate social responsibility. Several satisfactory-rated projects established systems to receive the ISO 14001 certification on environmental compliance.

Only in a few evaluated IFC and MIGA projects has compliance to its respective E&S standards caused project completion delays. Such delays were experienced in large generation Category A projects in India, Chile, and the Bujagali project in Uganda. Of the 495 IFC and MIGA power sector projects that were covered in this evaluation, four received complaints from local communities and were investigated by the Compliance Advisor/Ombudsman relating to[49]: the Albania Advisory project (IFC Advisory Services); Allain Duhangan, India (IFC Investment Services); Himal Power, Nepal (IFC Investment Services and MIGA); and Magat Power, Philippines. All cases are closed.

Monitoring and Evaluation

The World Bank began rating M&E design, implementation, and utilization in project ICRs in 2007, and IEG validated these ratings through its ICR reviews. Analysis of these ratings for 79 closed projects for which M&E ratings are available found that about half have M&E ratings that are substantial or better (on a four-point scale of high, substantial, modest, and negligible). M&E performance in low- and medium-access countries is poorer than in high- and universal-access countries (table 2.6).

The main reason for inadequate M&E performance in low- and medium-access countries was lack of appropriate or measureable key performance indicators, including for economic and welfare outcomes—the last link in the results framework. The M&E rating for one-third of the projects in low- and medium-access countries was affected by absence of baseline data or targets and weak implementation capacity.

Table 2.6. World Bank Electricity Access Projects: Quality of M&E Ratings (Projects Closed during FY2007–2014)

Countries by access to electricity	Number of projects	M&E rating (number of projects)				Modest or negligible (%)
		High	Substantial	Modest	Negligible	
Low and medium access	30	1	7	14	8	73
High and universal access	49	5	25	15	4	39

Source: IEG ICR Reviews.
Note: ICR = Implementation Completion and Results Report; M&E = monitoring and evaluation.

Among projects with inadequate M&E systems, Mali's Household Energy project provided limited evidence that the project's inputs and outputs led to increased productivity of small and medium enterprises, enhanced quality and efficiency of health and education centers, and improved living standards.[50] In the Ethiopia/Nile Basin Initiative: Ethiopia-Sudan Interconnector project, the outcome indicators were narrowly defined as export volumes and revenues, and the development objective broadly aimed to create the conditions and capacity for Ethiopia to generate export revenues.[51] Although the indicators for infrastructure allowed easy tracking of the project results, indicators on institutional issues were broader and could have been better articulated to include both qualitative and quantitative indicators. In another example, the performance indicators for India's Rajasthan Power I project were poorly designed and confusing. Goals such as "loss reduction" or "improved revenue generation" were included in the design without quantitative or measurable indicators. The design had few measurable, time-bound targets. In Rwanda's Urgent Electricity Rehabilitation project, the data identified in the M&E plan were being collected regularly, but use of those data was limited.[52] The Bank's recommendation to revise the intermediate outcome indicators for technical performance—reliability and quality of electricity supply—to reflect international standards could not be followed through because of The Rwanda Electricity Corporation's inadequate capacity to implement them.

Among projects with favorable M&E ratings, performance indicators for Uganda's Power Specific Investment Loan 4 covered institutional measures relating to sector reform and management, and projected outputs and outcomes such as load shedding, loss reductions, and the number of new connections.[53] The indicators were mainstreamed and continued to be tracked beyond the end of the project. In Bangladesh's Rural Electrification and Renewable Energy Development Project, an ongoing monitoring system was established by the implementing agency, the Infrastructure Development Company (IDCOL), and partnership organizations' representatives.[54] The data collected through project M&E had a strong impact on

improving project implementation. In particular, feedback from the field helped the project team and IDCOL incorporate new technical specifications and technologies (such as LEDs) in SHSs to better serve lower-income households.

It is challenging to get evaluative evidence of the impacts of IFC investment and advisory and MIGA guarantee projects on financial sustainability and on end-users, especially the poor. Project effects on affordability and fiscal sustainability are often not considered in the project documents—an issue that was identified in earlier IEG evaluations. In most project documents, there continues to be little discussion, if any, on affordability relative to inclusion and the impact of the take-or-pay contracts on government finances. In nearly all of the evaluated projects, assessment of fiscal effects did not go beyond taxes paid to the government. With MIGA, regular tracking of project performance and project data collection has been challenging because of its business model, in which the contractual obligation to provide project-level information rests on the guarantee holder (typically a foreign investor) and not on the project company.

As the preceding examples show, indicators for economic and welfare outcomes, including gender-related outcomes, were more likely to be missing or poorly defined and inadequately followed up during project implementation. This is of particular significance because of the Bank Group's goals for reducing extreme poverty and promoting shared prosperity. In recent years, there was some progress in including welfare-related indicators in electricity sector projects.

Conclusions

Insufficient focus on low-access countries. When set against priorities for electricity access, Bank Group lending volumes for the electricity sector were skewed toward high- and universal-access countries, which absorbed 46 percent of the resources, and low-access countries accounted for 22 percent. IFC, in particular, channeled only 6 percent of its lending to low-access countries. Overall, electricity sector lending to the private sector (IFC, MIGA, and World Bank guarantees) heavily favored high- and universal-access countries and was not sensitive to investor's perception of country risks.

The depth and continuity of Bank Group engagement in investment projects in low-access countries was low. During the past 15 years, there were two or fewer World Bank investment projects approved in 31 out of 51 low-access country clients. IFC's engagement was sparser in low-access countries, with no engagement at all in 29 out of the 51 countries. For the World Bank, the median length of an investment

project is nine years. When taken together with its thinly spread engagement, the weak momentum generated by the World Bank in many low-access countries contrasts sharply with the scale and urgency of the SE4All universal access goal.

The focus on access for the poor is weak. The Bank Group sharpened its approach to electricity access during the past 15 years. However, its strategic coverage of affordability issues for electricity access for the poor, especially in low- and medium-access countries is inadequate.

Bank Group performance in supporting electricity infrastructure is strong overall. Development outcomes for electricity sector projects that closed or matured during FY2000–2014 show a favorable record for the World Bank and IFC, and somewhat lower performance for MIGA. When analyzed further, the Bank Group's performance is strong in providing electricity infrastructure (generation and T&D). In particular, IFC, whose investments is predominantly in generation, shows strong outcomes in this area, reflecting its depth of involvement and expertise.

The Bank Group's involvement in non-conventional renewable energy projects has been growing in recent years. But the performance of such projects trails that of conventional generation, mainly due to still-evolving regulatory regimes. Bank Group support for renewable off-grid electrification in the past 15 years was an uneven and minor portion of electricity sector lending, though there are a few outstanding projects in this area.

Knowledge products increased the information and analytical base for policymaking, and some provided valuable linkages to project preparation. The Bank Group made a major contribution to expanding knowledge about all aspects of electricity access through its economic and sector work and with balanced coverage of all Regions. It emphasized learning lessons, informing policymakers, and applying knowledge to innovate and improve lending operations. Chapter 4 provides more detailed analysis of how specific knowledge products supported project preparation and lending under sectorwide frameworks and processes.

World Bank performance in supporting sector institutional frameworks and capacity building is notable, but policy reforms aimed at financial viability is weak. The analysis of key performance indicators of policy reforms involving sector planning and restructuring, regulations, and utility operations show notable successes across the low- to universal-access countries. However, outcomes show lower performance for financial viability compared with electricity infrastructure. Low- and medium-access countries show distinctly poorer performance for financial viability compared with high- and universal-access countries. Given the crucial role

of financial viability in scaling up electricity access, the Bank's performance in these areas is discussed in more detail in chapter 3.

Monitoring and evaluation show weaknesses in all elements of design and implementation. This weakness is more marked in low- and medium-access countries, largely because of a lack of indicators, weak baseline data, and inadequate capacity for monitoring. The shortcomings are highest regarding the tracking of economic and welfare outcomes, including gender considerations, but there has been greater recognition of this matter in the World Bank and recent improvements in M&E frameworks in this regard. IFC has made a beginning in addressing these issues.

Notes

[1] IEG used country risk rating scores from Institutional Investor Country Risk Rating database. Ratings were also checked against country risk assessments and scores from the Economic Intelligence Unit

[2] Includes funding from the Global Environment Facility.

[3] Bangladesh, Rural Electrification and Renewable Energy Development I (2002–2013), P 071794 and II (2013), P131263.

[4] Nicaragua, Off-Grid Rural Electrification Project (2003–2011), P075194 and the Mongolia Renewable Energy and Rural Electricity Project (2006–2012), P099321.

[5] IBRD and IDA validate the performance ratings of all project implementation completion reports; IFC's Expanded Project Supervision Report system is based on a sampling rate of about 45 percent of IFC investment operations' net approval population (NAP) that reached early operating maturity in a given period; IEG evaluates a number of closed projects included in the NAP. MIGA evaluates all active guarantee projects that reached early operating maturity in a given period; IEG evaluates cancelled projects in the cohort.

[6] One example is an IFC investment in the privatization of an electricity distribution in MENA region. The project helped the company transition towards commercially-oriented principles and eased the government's budget constraints. Pre-privatization operational risks relating to high technical losses, low capital expenditures and growing budget support have been stemmed after privatization. The project also exceeded targets in terms of delivery of electricity output, downstream access, employment, gender, technical loss reduction and capital investments.

[7] A renewable energy project with MIGA coverage contributed to the diversification of the country's power generation mix, making the country less vulnerable to droughts. The project helped ease power shortages and rationing during a period of severe drought. MIGA value-added was high particularly when it came to resolving disputes between the government and the sponsor. With MIGA coverage and dispute resolution, the project demonstrated that a geothermal independent power producer (IPP) can successfully operate in a high risk political environment.

[8] Quality at entry refers to the extent to which the Bank identified, facilitated preparation of, and appraised the operation such that it was more likely to achieve planned development outcomes, and was consistent with the Bank's fiduciary role.

[9] The result is significant at the 95 percent level.

[10] Recommendations from IEG. 2011. Assessing IFC's Poverty Focus and Results. Washington: DCIFC is expected to define, monitor, and report poverty outcomes for projects with poverty reduction objectives; periodically test assumptions on how IFC interventions contribute to growth and poverty reduction through select in-depth evaluations; and support willing clients to assess and report the impacts of their interventions on identified beneficiary groups.

[11] IEG 2013 Review of Management Action Record on IEG's recommendations in the Evaluation of IFC's Poverty Focus.

[12] IFC's Development Outcome System (DOTs) tracks the number of female staff employed by the Project Company and most IFC Expanded Supervision Reports (XPSRs) and Project Completion Reports (PCRs) report on the number of female employees at the project company.

[13] Bangladesh, Rural Electrification and Renewable Energy Development (2002-2012), P071794.

[14] Senegal, Second Sustainable and Participatory Energy Management, PROGEDE II (2010-2016), P120629.

[15] Turkey, SME Energy Efficiency (2013-2018), P122178.

[16] Peru, Rural Electrification Project (2006-2013), P090116.

[17] Uganda, Power Project (04) (2001–2008), P002984; Implementation Completion Report (ICR) 760; Implementation Completion Report Review (ICRR) 13115.

[18] Nigeria, Nigeria National Energy Development Project (2005–2013), P090104; ICR2462; ICRR14149.

[19] Kenya, Energy Sector Recovery Project (2004–2013), P083131; ICR2915.

[20] Senegal, Electricity Sector Efficiency Enhancement—Phase 1 (2005–2010), P073477; ICR1832; ICRR13780.

[21] Pakistan, Electricity Distribution and Transmission Improvement Project (2008–2014), P095982; ICR3137.

[22] Brazil, Energy Efficiency Project (1999–2006), P047309; Energy Sector Reform Loan (2002), P076905; Energy Sector Technical Assistance Project (2001–2002), P076977.

[23] India, Haryana Power Sector Restructuring Project (FY1998–2000), P035160; Second Powergrid System Development Project (2001–2006), P035173; Rajasthan Power Sector Restructuring Project (2001–2006), P038334; Uttar Pradesh Power Sector Restructuring Project (FY2000–2004), P036172; Second Renewable Energy (FY2000–2008), P049770; Andhra Pradesh Power Sector Restructuring Project (1999–2003), P049537.

[24] India, Renewable Resources Development Project (1992–2001), P010410.

[25] Ethiopia, Energy Project (02) (1997–2005), P000736; Energy Access Project (2002–2013), P049395; Ethiopia/Nile Basin Initiative: Ethiopia-Sudan Interconnector (2007–2013), P074011; Accelerated Electricity Access (Rural) Expansion (2006–2012), P097271; Ethiopia Electricity Access Rural Expansion Project, Phase II—GPOBA (2008–2013), P105651.

[26] Cambodia, Phnom Penh Power Rehabilitation Project (1995–2000), P004032; Rural Electrification and Transmission Project (2003–2012), P064844.

[27] Nigeria, Transmission Development Project (2001–2008), P072018.

[28] Tanzania, Songo Songo Gas Development and Power Generation Project (2001–2010), P002797.

[29] Cambodia, Phnom Penh Power Rehabilitation Project (1005–2000), P004032.

[30] Indonesia, Sumatera, and Kalimantan Power Project (1994–2001), P003910.

[31] Bangladesh, Power Sector Development Technical Assistance Project (2004–2012), P078707.

[32] Tajikistan, Programmatic Development Policy Grant (2006–2007), P074889; Pamir Private Power Project (2002–2010), P075256.

[33] Pakistan, Structural Adjustment Credit Project (2001), P071463; Structural Adjustment Loan (1999), P059323; Pakistan Poverty Reduction and Economic Support Operation (2009–2010), P113372.

[34] Senegal, Energy Sector Recovery Development Policy Financing (2008–2010), P105279.

[35] Vietnam, System Efficiency Improvement, Equitization and Renewables Project (2002–2012), P066396.

[36] Cambodia, Phnom Penh Power Rehabilitation Project (1995–2000), P004032.

[37] Ethiopia, Ethiopia/Nile Basin Initiative: Ethiopia-Sudan Interconnector (2007–2013), P074011.

[38] Senegal, Senegal Energy Sector Recovery Development Policy Financing (2008–2010), P105279.

[39] Vietnam, System Efficiency Improvement, Equitization and Renewables Project (2002–2012), P066396.

[40] Uganda, Energy for Rural Transformation Project (2001-2009), P069996.

[41] Zambia, Power Rehabilitation Project (1998-2005), P035076.

[42] Cape Verde, Energy and Water Project (1999-2007), P040990.

[43] Vietnam, System Efficiency Improvement, Equitization & Renewables Project (2002-2012), P066396.

[44] Rwanda, Urgent Electricity Rehabilitation Project (2005-2010), P090194.

[45] For more information about the Environmental and Social Safeguard Policies, see the World Bank external internet website at http://go.worldbank.org/WTA1ODE7T0.

[46] For more information, see the World Bank external website/Inspection Panel home page at http://ewebapps.worldbank.org/apps/ip/Pages/Home.aspx.

[47] IFC's methodology for rating environmental and social effects of projects is briefly described in appendix E.

[48] Four of eight (50%) evaluated conventional generation projects were rated satisfactory and better for their environmental and social effects. Conversely, the other four evaluated projects were rated partly unsatisfactory and below for its E&S effects.

[49] For more information about the case, see the CAO/Ombudsman web-site at http://www.cao-ombudsman.org/cases/.

[50] Mali, Household Energy and Universal Access (GEF) Project (2003-2009), P076440.

[51] Ethiopia, Ethiopia/Nile Basin Initiative: Ethiopia-Sudan Interconnector (2007-2013), P074011.

[52] Rwanda, Rwanda - Urgent Electricity Rehabilitation Project (2005-2010), P090194.

[53] Uganda, Fourth Power Project (2001-2008), P002984

[54] Bangladesh, Rural Electrification and Renewable Energy Development (2002-2012).

3. Supporting Sector Financial Viability and Affordable Access for the Poor

Highlights

- The financial performance of the electricity sector in many country clients is weak, adversely affecting their ability to provide adequate and reliable electricity services, and to organize investments to expand access.
- The Bank Group, through its strategy documents and analytical work, has consistently and comprehensively raised issues and proposed strategies to improve the financial viability of countries' electricity sectors.
- Overall, efforts to improve financial viability through development policy operations and components of investment projects have not yielded positive results. This points to the need for new approaches to address this issue, which is a major constraint for expanding electricity access.
- The Bank Group produced sound analytical work on affordability of electricity access for the poor, but this is not adequately reflected in its country strategy documents and project monitoring and evaluation frameworks.
- The Bank Group made some significant pilot contributions to addressing the affordability of electricity connections through project components and output-based assistance.

As discussed in chapter 2, the World Bank provided a range of support to country clients in developing and reforming their electricity sector policy and institutional frameworks, and improving capacity for sector planning and management. This chapter examines the overall impact of the World Bank's upstream work related to policy and institutional frameworks and capacity and on the financial viability of electricity sectors, which have impacts on the adequacy, reliability, and affordability of electricity services.

Commercial Viability of Institutions and Financial Viability of the Electricity Sector

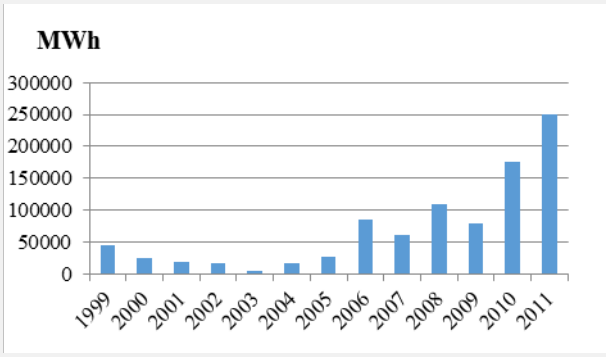
Maintaining the commercial viability of electricity utilities is essential for the provision of adequate and reliable electricity services, regardless of whether the service delivery agents are under public or private ownership. Commercial viability entails the ability to generate sufficient income to meet operating payments and debt commitments, and to allow for growth while also maintaining service standards. Several Bank Group government clients regulate electricity services and set retail tariffs below full cost recovery (operating costs and capital costs), citing concern

about the affordability of service for the poor. Inadequate revenues limit the ability to make needed investments on a timely basis for access expansion (generation, transmission, and distribution) and to support required operations maintenance. In time, these factors lead to the progressive deterioration of service reliability and performance efficiency, including technical and nontechnical losses, extended service restoration times after outages, chronic power supply inadequacy from insufficient generation capacity, and downgraded performance of existing generation plants (box 3.1).

Box 3.1. Financial Performance and Adequate and Reliable Services

Poor financial performance of the electricity sector sets up a vicious cycle by causing deterioration in the reliability and quality of electricity services, which in turn negatively affects the sector's finances. Undercapitalization and structural operating deficits caused by insufficient tariffs, lagging budget transfers, network losses, power theft, and poor bill collection perpetuate inefficiencies by preventing the sector from investing in required maintenance of aging assets and new capacity. The resulting impacts on the adequacy (persistent and widespread power shortages) and the quality and reliability of electricity supply (frequent and long-duration service interruptions) prevent consumers of all categories from realizing the potential welfare and economic gains from electricity use. Considerable country-based evidence points to the adverse impact of poor financial performance on broader access outcomes. For instance, the link between lack of financial viability and available electricity supply from existing infrastructure is evident in Senegal's recent experience. Financial losses for Senelec, the country's national utility, increased by a factor of 14 between 2004 and 2010 because of delays in needed generation investments, poor operational efficiency, and fuel supply difficulties, and undelivered energy jumped by a factor of 12.5 during the same period.

Figure B3.1.1. Senegal: Unserved Electricity Demand, 1999–2011



Source: World Bank, Project Appraisal Document for the Senegal Electricity Sector Support Project.
Note: MWh = megawatt hours.

In many countries where the Bank Group operates, the financial condition of the electricity sector remained weak for years. In a sample of 40 countries covering all

regions and levels of income and electricity access, three-fourths of the national or leading power utilities reported net financial losses (net income after taxes) in 2013. For low- and medium-access countries (16 of the 22 in the sample were in Sub-Saharan Africa), 82 percent of utilities reported net losses; in high- and universal-access countries, 67 percent of utilities had losses. Thus, financial distress is spread across all categories of countries (table 3.1; appendix L). Sector finances in some countries (Bangladesh, India, Senegal, and Vietnam) deteriorated in recent years—in some cases rather sharply. The Bank Group provided substantial policy and institutional support to these countries through investment projects and development policy lending.

Table 3.1. Profitability Status (Net Income after Tax) of Leading Electricity Sector Utilities in Selected Countries

	Number of Countries					
Net income after tax	2000	2010	2013			
			Total	Sub-Saharan Africa	Low- and medium-access countries	High- and universal-access countries
Profit	4	14	10	3	4	6
Loss	36	26	30	13	18	12
TOTAL	40	40	40	16	22	18
Unprofitable (%)	90	65	75	81	82	67

Source: Utility annual reports; Bank Group documents.
Note: Where multiple utilities exist, data for the most prominent utility is used (details in appendix L).

Support for Improving Sector Financial Viability

The World Bank's support for improving the overall financial viability of client electricity sectors comes through two channels: development policy operations (DPOs) and financial management components in investment loans, sometimes accompanied by financial covenants. The Bank deployed DPOs mainly in medium-, high-, and universal-access countries, and to a far less extent in low-access countries.

The use of financial covenants in investment lending is generally restricted to utility performance, such as payment collection, reduction of commercial losses (metering, for example), and cost rationalization. Covenants such as tariff-setting for addressing policy issues, though once prevalent, are less frequently used now.

Development policy operations provide quick-disbursing budget support to governments for achieving specific policy and institutional reforms—typically drawn from the government's reform program—that are considered critical to achieving sustainable improvements in the sector's financial performance. All DPOs require prior actions, which are reform measures to be fulfilled by the government before the operation is cleared and the funds disbursed. Prior actions in support of electricity access tend to focus on the adoption of cost-recovery tariffs, payment collection, and reduction of commercial losses (such as metering), cost rationalization, and government subsidy transfers. DPOs are either freestanding operations, a series of freestanding but independent operations, or programmatic series. In contrast to a freestanding series, DPOs in a programmatic series are linked by flexible indicative actions or triggers to respond to the country's circumstances. In most DPOs, financial viability or sustainability of the electricity sector (or national utility) was explicitly included as a development objective, but almost all DPOs contained key performance indicators related to sector financial performance.[1]

World Bank Effectiveness in Improving the Commercial Performance of Service Providers and Overall Financial Viability of Electricity Sectors

The World Bank's efforts at improving the commercial performance of service providers and the overall financial viability of the client electricity sectors during the past 15 years did not measured up to expectations. Among the sample of case study countries, the experience of financial components and covenants in investment operations was positive in Kazakhstan, but was not encouraging in Senegal and Vietnam.

The Kazakhstan Electricity Transmission Project and a series of follow-on projects helped the national utility reverse a pattern of losses in the late 1990s and display financial viability from 2002 to 2012.[2] Policy and technical assistance components in these projects promoted cost recovery for its services, including setting a cost-reflective transmission tariff, eliminating administratively imposed tariff discounts, improving payment collections, reducing accounts receivable, and divesting non-core businesses. Meanwhile, Senegal's Electricity Sector Efficiency Enhancement Project, with provisions for a new electricity tariff mechanism and a series of financial covenants (including debt service coverage, return on assets, and accounts receivable) could not prevent a serious deterioration of Senelec's finances (IEG, 2013). In retrospect, the covenants were not sufficiently elaborated during project preparation, and the government lacked an overall strategy to address the sector's deep-seated structural problems related to tariffs and budget transfers and long-term investment decisions, particularly for generation. Similarly, a long series of

Bank-supported investment projects in Vietnam that included time-bound measures related to tariffs and financial performance did not make headway in these matters because of excessive political implementation risks (IEG, 2014c).

Interviews and discussions with the Energy and Extractives Global Practice staff suggest that financial covenants and policy activities operate on different time lines and with different stakeholders, making it difficult to seamlessly combine the actions required under investment projects and DPOs. With investment loans, the point of maximum leverage on reform-related issues occurs before Board presentation and quickly dissipates as attention is focused on the physical investment portion of the project.

The Bank Group funded 25 DPOs in 13 countries during FY2000–2014 that addressed the electricity sector alone or in combination with other sectors.[3] These DPOs represented total commitments of $6.6 billion, of which $5 billion was for actions related to the electricity sector. A list of DPOs and their ratings is in appendix M. Most of the DPOs were in high- and universal-access countries. Only three DPOs were in low-access countries, accounting for $87 million in commitments for the electricity sector. Seventeen of the DPOs belonged to programmatic series of two or more operations, and the rest were one-off interventions. Reforms related to transparency, governance, and accountability also became more common than in the past. For example, the Bangladesh Power Sector Development Credit supported enhanced governance and accountability in addition to more typical measures such as tariff adjustment, payment collection, and budgetary transfers to the national utility (table 3.2).

Table 3.2. Development Policy Operations with Financial Objectives in the Electricity Sector, FY2000–2014

	All countries		By country income group				By electricity access					
			Low income		Middle income		Low access		Medium access		High/ universal access	
DPOs	No.	$, billions	No.	$, billions	No.	$ billions	No.	$, billions	No.	$, billions	No.	$, billions
Freestanding	15	2.9	4	0.5	21	4.4	3	0.1	8	1.0	14	3.8
Programmatic series	10	2.1										
TOTAL	25	4.9										

Source: World Bank Business Intelligence.
Note: Commitment amount is specific to the electricity sector.

Seventeen of the 25 DPOs were rated. Of the 17 DPOs in 10 countries, nine had overall outcome ratings of moderately satisfactory or better, and the remaining seven were rated moderately unsatisfactory or worse. No DPOs were in a low-access country. Only four of the 17 projects had a low or moderate rating for risk to development outcome. Overall, medium-access countries had a better proportion of favorable outcome and risk ratings (table 3.3).

Table 3.3. Ratings for Development Policy Operations with Financial Viability Objectives, FY2000–2014

Electricity access level	Number of DPOs rated by IEG	Overall development outcome: moderately satisfactory or better	Risk to development outcome: low or moderate
		Number of DPOs	Number of DPOs
Medium	7	5	3
High/universal	10	4	1
ALL	17	9	4

Source: IEG Implementation Completion Report Reviews.

The focus of DPOs on improving the financial performance of electricity sectors was appropriate and in line with the Country Assistance Strategies (CASs) and Country Partnership Strategies (CPSs), but despite these efforts, few country clients showed improvements in sector finances. The relatively poor performance of electricity sector DPOs (only 50 percent were rated moderately satisfactory or above) contrasts with the generally good performance of all DPOs (81 percent were rated moderately satisfactory or above, with large variations across the regions) based on Operations Policy and Country Services findings (World Bank 2004) and IEG's review of DPOs as part of this study. The World Bank's own findings and guidance note on DPOs note the critical importance and fragility of country ownership of reforms; they also note the role of the Bank in building and sustaining such ownership through continuous policy dialogue, policy notes, and analytic and advisory activities (among others), and through ensuring that program design is simple, can be monitored, and directly complements governments' own reforms (World Bank 2004). DPOs pose higher risks of achieving development results in the electricity sector than in other sectors—only four of 17 DPOs had low or moderate risk to development outcome, and hence warrant particular care in design and implementation.

Most of the DPOs reviewed by this evaluation experienced delays or only partially fulfilled reform commitments. The DPOs that yielded the most notable results in the past 15 years were in Turkey and Brazil, both middle-income countries with universal access. On average, the performance of DPOs in low- and medium-access

and low-income and lower-middle-income countries is unimpressive, especially regarding key performance indicators that directly relate to electricity sector financial issues.

Shifting political commitment to reforms involving financial stabilization and recovery objectives was evident in Bangladesh, the Dominican Republic, and Senegal. This commitment is often fragile and can be eroded by new elections, changes in government, macroeconomic crises and external shocks, or an abating sense of urgency after a severe crisis was weathered, and after having acquired sizable financial support from the Bank. The value of political commitment was clearly shown in Turkey and Brazil, but note that the strength and diversity of their economies helped to maintain that commitment.

As illustrated by the experiences of Bangladesh and Senegal, the longstanding nature of electricity sector financial viability issues in many countries and their lack of financial and technical resources point to the need for continuous Bank Group engagement to help countries put their sector finances in order and put them on the road to adequate, reliable, and affordable electricity access. In the best of cases, where government commitment and follow-through is demonstrated, it takes five to 10 years for sector reforms to take hold.

Experience suggests that reform covered by one-off DPOs should be designed to be complementary with other Bank operations, whether through investment lending or technical assistance. For instance, in the Dominican Republic, the freestanding sector DPO should have been accompanied or preceded by parallel investment operations by the Bank (or other development agencies) to address the high risks stemming from the poor technical condition of the power infrastructure and overdependence on high-priced imported oil for electricity generation.

Programmatic DPOs, by contrast, displayed flexibility. A programmatic approach is especially useful when the government's medium- and long-term reform direction is clear, but the timing and details of implementation need to be flexible. Programmatic DPOs generally fared better than multi-tranche operations (all the programmatic DPOs received moderately satisfactory IEG-validated outcome ratings as in Bangladesh, Ghana, Tonga, and Turkey). Multi-tranche operations are prone to noncompliance with agreed actions and loan cancellations, as in Senegal. They are considered more rigid since the tranche release conditions are predetermined and require waivers from the Bank if the conditions are not fully met.

The Bank's large lending volumes in Turkey and Brazil (in support of complex reforms involving large retail tariff adjustments) provided a strong incentive for the government to comply with all major policy conditions. However, in the Dominican Republic, the sector DPO provided support that was too inadequate to motivate the government or defray the costs of reform. In Senegal, the heavy front-loading of fund disbursement while back-loading the restructuring conditions greatly reduced the government's incentives to meet the tough second-tranche release conditions.

Affordable Access for Inclusive Development and Shared Prosperity

The need to recover operating costs and financing costs for capital expenditures to ensure financial viability of the electricity sector competes with the need to keep electricity access and consumption affordable for the poor. High costs for connection and service can discourage low-income households from gaining access to electricity even if they are within reach of the distribution network. Common practices for subsidizing connection costs include partial or complete subsidy, delayed monthly payment for a long period, treating connection costs as capital costs, or a combination of these approaches (World Bank 2010a). The World Bank usually supported such subsidy schemes where governments administer them with their own funds; direct use of Bank funds has been limited and generally involves arrangements where governments use IDA funds for grants to utilities to cover capital costs associated with distribution, metering, and connection to poor households. Recently, output-based aid (OBA) approaches aim to combine these schemes with pre-agreed targets for performance-based subsidy (World Bank 2010a), and the Bank embraced such pilot projects in several poor countries. Regarding monthly payments for consumption, these are found to be less of an obstacle because the costs of alternatives, such as kerosene or batteries, are comparable to most grid-supplied electricity tariffs for small consumers (Golumbeanu and Barnes 2013).

Among the 35 case study countries examined by this evaluation (appendix C), the World Bank discussed affordability of electricity in 19 CASs/CPSs during FY2000–2014, which include 10 of the 18 low- and medium-access countries and nine of the 16 medium- and universal-access countries in the sample. Of the countries that raised affordability matters, seven low- and medium-access and all of the high- and universal-access countries also proposed specific strategies or actions for addressing them. However, the discussions of affordability focused more on consumption aspects instead of connection cost issues, with only five strategies referring to them (including the Democratic Republic of Congo, Ethiopia, and Lao PDR). Also, the World Bank actively partnered with the Global Partnership on Output-based Aid

(GPOBA) to support and undertake pilot projects in eight countries (seven of which are low- and medium-access countries).

Although the Bank Group devoted considerable effort to identifying, analyzing, and following up on issues of affordability and inclusion in the countries where it operates, more effort is needed to cover all countries, since many still require support for paying the connection costs, even in some universal-access countries. Illustrative experiences and findings from the World Bank's interventions to address connection cost affordability are discussed in the next sections.

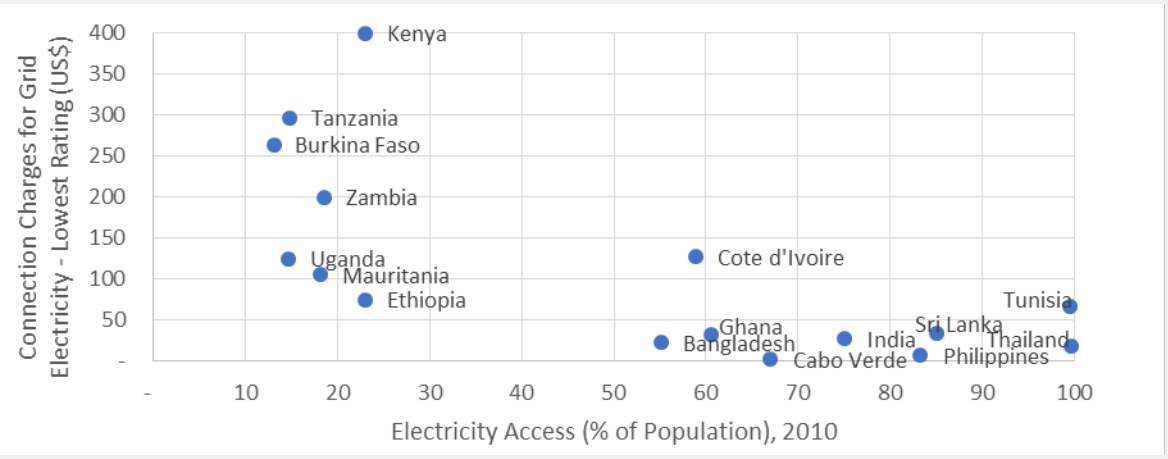
In Vietnam, the costs of providing electricity to communities (extending power networks at medium and low voltages) was shared by local, regional, and national governments. An effective partnership between the national state utility (Electricity of Vietnam) and local operators and communities, as along with multiple funding sources (customers' contributions; community funding; district, province, and central government budgets; international donors; and others) helped increase rural households' access to electricity from about 60 percent in 1995 to 94.5 percent in 2008 (IEG 2014f). This is a different institutional arrangement than is found in most Sub-Saharan African countries, where funding for electricity expansion is mainly provided through government-sponsored projects to national power companies. The Bank Group contributed to this effort with its continuous engagement in Vietnam's electricity sector during the period.

Box 3.2. Connection Costs and Electricity Access: An Issue of Shared Prosperity

High connection costs and electricity tariffs can discourage low-income households from gaining access to electricity. In practice, monthly payments for consumption are less of an obstacle because the costs of alternatives, such as kerosene oil, candles, and batteries, are comparable to most grid-supplied electricity tariffs for small consumers. However, connection charges—depending on the extent and period in which they are recovered—can deter poor households from obtaining available service, and can have a dramatic dampening effect on electrification rates. This is a key issue for the Bank Group's goal of shared prosperity, given the linkages between electricity access and poverty and welfare.

For a grid connection, the costs include the house wiring and utility charges. The grid connection charges for small residential consumers vary considerably across countries—from modest (often subsidized) sums of $10–20 to $200 or more in some countries, as shown in the figure B3.2.1. To obtain service in many cases, the consumer is expected to reimburse the utility for the entire 20- or 30-year capital cost of an electricity service that often was designed not for subsistence consumers, but for users of larger amounts of electricity.

Figure B3.2.1. Electricity Connection Charges: Selected Countries, 2010



Source: Golumbeanu and Barnes 2013.

In Lao PDR, the Bank Group supported the Power to the People program, which successfully targeted poor rural households (box 3.3) through a combination of appropriate connection subsidy and extended repayment.

Box 3.3. Lao PDR's Power to the People Program for Poor Rural Households

The Power to the Poor (P2P) program, implemented by the Lao PDR national utility Electricité du Laos together with the Ministry of Energy and Mines, subsidizes connections and finances indoor wiring for poor rural households. The program, supported by the World Bank's Rural Electrification Adjustable Program Loan (P075531), uses participatory methods and targets poor, female-headed households. Eligible households receive a basic low-voltage connection that is sufficient for two light bulbs and a small electrical appliance, such as a radio. Households make an average upfront payment of about $24 and can obtain an interest-free credit of up to $87 to cover the costs of installation and indoor wiring. The credit is paid back over three years in installments of about $2.50 as part of the household's monthly electricity bill. Both the repayment of the interest-free credit and electricity consumption are at the same level as their expenditures for vastly inferior traditional energy substitutes (such as batteries, diesel lamps, and candles). In the villages where P2P was implemented, it helped more than 90 percent of the vulnerable and disadvantaged families connect to the grid, which is 20 to 40 percent of the total number of families in the villages. Strong government commitment to the welfare of its people and the high motivation of the national utility's staff for implementation were crucial to the success of the program and the fast expansion of access to grid-supplied electricity in the country.

Source: World Bank 2012b.

In Rwanda, capital subsidy policy combined with low-cost electrification technologies and improved procurement practices contributed to significant access results. Lower costs combined with a capital subsidy allowed the number of connected households to double in the targeted urban and peri-urban areas during the period 2010–2011 (World Bank 2013e).

In Zambia, the power utility benefits from a World Bank project to reduce connection charges.[4] Under the project, a government subsidy of about $120 covers 75 percent of the cost of a basic household connection. The utility receives the subsidy in the form of materials and equipment to be used to connect a certain number of low-income households. In the initiative's pilot areas, the number of households requesting a connection doubled from the previous volume of requests.

Output-based Aid Approach with GPOBA

This evaluation reviewed the experience of GPOBA, whose objective is to promote access to basic services, including energy, for the poor through the application of a specific OBA model for provision of targeted subsidies. IEG identified nine electricity projects piloted by GPOBA, which mostly built on existing IDA operations. These were mostly in low- and high-access countries—Bangladesh, Bolivia, Ethiopia, Ghana, India, Kenya, Liberia, and Uganda—and targeted the poor with connection subsidies that supported initial access instead of consumption. They also provided financial incentives for utility companies to extend their services to the poor. As pilots, the projects were relatively small, with four pilots under $5 million, three between $5 million and $10 million, and the remaining two between $10 million and $15 million.

Projects in Bolivia and Bangladesh showed successful results, though there were some issues with targeting the poor. In Bolivia, a project to increase electricity access in remote rural areas through the partial subsidization of off-grid SHSs and solar lanterns was well integrated with the government's priorities and, despite a slow start, exceeded its planned targets. A follow-up IDA project is expected to expand the program and ensure continued support for the servicing and maintenance of these systems (World Bank 2013c). A similar project in Bangladesh was also successful. By taking advantage of the falling cost of solar panels and strong consumer demand, the subsidy could be reduced over time and the program far exceeded its original targets; it is now being sustained and expanded with a follow-on IDA project (World Bank 2013b). Targeting was an issue, however; a GPOBA-funded report found that about one-third of the households that purchased the system tended to be the higher-income households in the villages where the solar

systems were offered, which tended to be the more prosperous of the off-grid villages in the country (Asaduzzaman and others 2013).

The project in Ghana aimed to enable the supply of solar panels to remote rural areas by providing microcredit to households. The GPOBA pilot project design provided insufficient incentives to motivate utilities and suppliers to prioritize poor households; thus, the lack of access to working capital stalled the project. Since GPOBA's approach requires that suppliers be paid after work is completed and certified, contractors lacking access to working capital found it hard to finance up-front connection costs. The project began to progress only after a special effort by the project team to engage local banks to provide credit to interested private companies. Although the project eventually succeeded, the business model was sustainable given the continuing lack of access to working capital and trade finance. In Ethiopia, only about one-fifth of the targeted number of households were connected. Major impediments included a two-year moratorium on new connections (in response to electricity supply constraints) and a new government policy to limit its procurement to local suppliers, which restricted the supply of electricity meters. Also, serious local capacity limitations delayed compliance with GPOBA's technical, safety, and administrative requirements. Although the Bank Group provided assistance to help the utility address these issues, no significant improvements could be observed before the closing of the project (World Bank 2014c). The India-Mumbai Slum Electrification project also had an unsatisfactory outcome. The project, which aimed to replace illegal and unsafe connections with legal and safe ones, failed because consumers were unwilling to pay for anything beyond basic electricity access, including safety. In this case, the expectations of beneficiaries and project sponsors were not aligned.

The Energy Sector Management Assistance Program and GPOBA also funded a comprehensive overview and analysis of the financial and technical issues associated with electricity connection charges, solidly grounded on data collected from every utility in Africa. The analysis concluded with practical, actionable strategies for lowering these costs and enhancing their affordability for the poor (Golumbeanu and Barnes 2013).

Conclusions

The Bank's efforts to address financial viability issues in country clients are notable, but their effectiveness is poor. Countries did not sustain the initial reform actions, and some even partly or fully reversed (as in Bangladesh and Senegal). Financial viability issues are deeply rooted and structural, but the Bank's efforts and

instruments were inadequate in addressing the political economy aspects surrounding the issues. At best, multi-tranche DPOs only helped delay the reversal of the initial reforms.

Country ownership and commitment are key. This commitment is often fragile and can be eroded by changes in government, macroeconomic crises and external shocks, or an abating sense of urgency after a severe crisis was weathered, and after the government availed itself of sizable financial support from the Bank. The value of political commitment was clearly shown in Turkey and Brazil, but note that the strength and diversity of their economies were clearly helpful to stay the course.

Continued Bank engagement tends to improve stakeholder awareness of financial viability for expanding electricity access. The longstanding nature of financial viability issues of the electricity sector in many countries and their lack of financial and technical resources point to the importance of continuous Bank engagement to help countries put their sector finances in order and put them on the road to adequate, reliable, and affordable electricity access. In the best of cases, where government commitment and follow-through is demonstrated, it takes five to 10 years for sector reforms to take hold.

The Bank produced sound analytical work and pilot interventions on affordability as a barrier to new electricity connections. Affordability issues in the electricity sector are covered in about two-thirds of the sample CAS/CPS documents but, with a few exceptions, there is little focus specifically on connection costs. The Bank Group supported the implementation of some well-designed pilot interventions for ensuring affordability of connections in a targeted manner (Lao PDR, Vietnam, and Zambia). However, there is no ready means of tracking the performance of these schemes beyond the end of the projects. The pilot projects implemented by GPOBA showed some positive results, but these instruments are yet to be mainstreamed into Bank Group projects.

Notes

[1] IEG considers key performance indicators evaluable when baseline value, original (or revised) target value, and actual value achieved at completion are present.

[2] Kazakhstan, Electricity Transmission Rehabilitation Project, P065414; Project Appraisal Document (PAD) 19620 and Implementation Completion Report (ICR) 1120.

[3] See the list of development policy operations (DPOs) in appendix R.

[4] Zambia, Power Rehabilitation Project (1998-2005), P035076.

4. Enhancing Country Approaches and Scaling Up Access

Highlights

- In low-access countries, a quantum leap in the pace of new connections and in levels of investments will be necessary to reach the goal of universal access within the next 15 years.
- Successful country experiences in rapidly scaling up access suggest important driving factors: comprehensive planning of the national electricity access rollout; ensuring financial viability of the electricity sector; and addressing affordability, equity, and inclusion through targeting the poor.
- The Bank Group's first sectorwide programs in the electricity sector, in Rwanda and Kenya, led to significant financing commitments from development partners, including the private sector, and show promising results.
- The Bank Group collaboration, including joint projects, in low- and medium-access countries is notable. But there is no evidence to verify the value added and cost and benefits to private sector clients.

This chapter begins by reviewing the rate at which country clients increased electricity access in recent years. It then presents indicative estimates of the pace of connections and resources needed by the countries for transmission and distribution (T&D) and associated generation to achieve universal electricity access by 2030. This is followed by an assessment of the Bank Group's support for nationwide efforts to expand access through coordinated grid and off-grid rollouts. It also assesses the Bank Group's knowledge and operational support for sector-level institutional frameworks and processes for organizing, planning, financing, and implementing a programmatic effort for achieving universal access targets. Finally, the chapter reviews the internal synergy between the units of the Bank Group as a crucial element in any future strategy in support of universal access. Taken together with the findings of chapters 2 and 3, the evidence and analysis points to the need for a paradigm shift in the Bank Group's approach to scaling up connections in low-access countries to make credible progress toward achieving the Sustainable Energy for All (SE4All) goal, especially in Sub-Saharan Africa.

The Challenge of Achieving Universal Access

The implementation rate of new electricity connections in country clients during 2000–2010 falls well short of what will be required to achieve universal access by 2030 (table 4.1). In particular, low-access countries added 2 million connections per

year during the period, and will need to raise this rate at least sevenfold and maintain it for the next 15 years to achieve the SE4All goal by 2030.

Table 4.1. Required Pace of Electricity Connections to Achieve Universal Access by 2030

Country electricity access category	Average connections added per year, 2000–2010 (millions)	Average Bank Group–supported connections per year,[a] 2000–2014 (millions)	Average connections required per year for universal access,[b] 2015–2030 (millions)
Low	2.0	0.1	14.6
Medium	6.2	0.2	6.7
High	3.1	0.1	3.2
Universal	5.2	0.3	5.2
TOTAL	16.5	0.7	29.7

Source: UN 2012; World Development Indicators; IEG estimates.
a. Connections compiled from project performance indicators; does not include imputed connections from additional generation capacity supported by the Bank Group.
b. Assumes average annual growth of connections during 2000–2010 continues until 2015; factors in population growth.

Medium- and high- access countries are likely to come close to universal access by 2030. For medium-access countries, the annual rate of new connections will need to rise from 6.2 million to 6.7 million, and high-access countries will need 3.1 million to 3.2 million; these rates would need to be maintained for the next 15 years. The Bank Group will continue to have a significant supporting role in this effort, particularly in addressing growing adequacy and reliability issues in medium-, high-, and universal-access countries.

Table 4.2 underscores the daunting investment financing gap for achieving adequate, reliable, and affordable universal electricity access in low-access countries by 2030. The incremental investment required in low-access countries for access scale-up—T&D extensions and generation capacity required to serve the demand from the new connections—is estimated to be about $17.1 billion per year, which includes $11.9 billion for T&D and $5.2 billion for generation (table 4.2).[1] By comparison, during 2000–2014, the average annual investment financing was about $3.6 billion from principal sources (multilateral banks and donors, together with government counterpart funding and private sector investments), including $1.5 billion per year from the Bank Group (table 4.2). Note that these estimated requirements are in addition to the investments required for refurbishing existing electricity infrastructure, which is generally in poor condition in low-access countries. Adding generation capacity to meet current suppressed demand and keeping up with demand from projected economic growth will cost an estimated $20 billion per year for several years in low-income (and largely low-access) countries in Sub-Saharan Africa alone (Foster and Briceño-Garmendia 2011). Specifically, the estimated investment requirements for 2015–2030 for low-access

countries in Sub-Saharan Africa to achieve universal access by 2030 is about $17 billion, and to satisfactorily address power supply inadequacy and shortfalls experienced in many countries and to meet projected demand from economic growth would be about $37 billion per year, of which $12 billion is for T&D and $25 billion is for generation.

Table 4.2. Projected Investment Needs for Achieving Universal Access by 2030 versus Historical Investments in the Electricity Sector (annual average, $ billions)

Country electricity access category	Bank Group[a] 2000–2014	Other multilateral banks and donors, 2000–2010	Private sector, 2000–2013	Total investment 2000–2014	Projected investment needs for universal access, 2015–2030[b]		
					T&D	Generation	Total
Low	1.5	1.3	0.8	3.6[c]	11.9	5.2[d]	17.1
Medium	1.9	1.2	10.3	13.3	5.5	2.3	7.8
High	2.0	2.3	4.7	8.9	2.6	1.1	3.7
Universal	3.7	5.2	23.2	32.0	4.3	1.8	6.1

Sources: World Bank Business Intelligence; IFC and MIGA databases; AidData database; Public-Private Infrastructure Advisory Facility (PPIAF).
Notes: Data excludes technical assistance, economic and sector work, and advisory services. PPIAF data covers 2000–2013 only; AidData covers 2000–2010 only. This table excludes data on the government's own financing of power sector projects, FDI, EXIM Bank financing, and some concessional government-to-government loans. T&D = transmission and distribution.
a. Includes counterpart funding.
b. IEG estimates of incremental investment for access scale-up only; assumes average $800 per connection; adds 46 percent for generation and transmission (World Bank 2010a).
c. Of which about 50 percent is estimated to be for generation capacity.
d. Does not include annual investment needs in the early years for refurbishing existing infrastructure; adding generation to meet suppressed demand; and demand from economic growth estimated at $20 billion per year for several years starting in 2015.

The preceding analysis of resource needs for universal access for low-access countries uses indicative estimates that are not intended to be precise, but instead indicate the order of magnitude of the additional resources that will be needed for this effort. A main implication from this analysis is that the immense gaps in investment financing under the SE4All targets cannot be met without large-scale private sector involvement, especially in investments for generation capacity to meet new and suppressed demand, ensuring power supply adequacy and reliability to acceptable standards of practice and powering electricity demands from economic growth. Simply continuing the Bank Group's practice of mobilizing resources on a project-by-project or transaction-by-transaction basis cannot be expected to be transformative by itself. On average, for every $1.00 of the Bank Group's own

commitments to the electricity sector in the past 15 years, Bank Group projects mobilized an estimated $1.30 from government counterpart funds, co-financers, and co-investors (table 4.3). This ratio is even lower for low-access countries, at $0.80 for every $1.00 of Bank Group commitments. Given competing demands from other sectors, it is unlikely that the Bank can increase its contribution or counterpart funding to the electricity sector by an order of magnitude that can make a significant dent in the resource gap facing low-access countries that want to achieve universal access.

Table 4.3. Bank Group Efficiency in Leveraging Electricity Sector Resources, FY2000–2014

Country access category	Amount leveraged[a] per dollar of Bank Group commitments ($)
Low	0.80
Medium	1.70
High	1.60
Universal	1.20
ALL	1.30

Sources: World Bank Business Intelligence; IFC and MIGA databases; AidData database; Public-Private Infrastructure Advisory Facility.

a. The above numbers are illustrative of aggregate WBG's leveraging efficiency and were estimated by deducting the amount of WBG support from total project costs. The leveraged amount includes government counterpart funds, co-financing, and co-investments.

The preceding analysis points to the need for mainstreaming radically new and different approaches to complement existing practice that would help syndicate investments on a larger scale than is possible through the current project-by-project approach. The syndication efforts would need to be differentiated for T&D, which remains largely in the domain of the public sector, and for generation, where the private sector has and must have a far larger role. Recent and ongoing World Bank experience with sectorwide frameworks and processes that aim to do this are assessed later in this chapter.

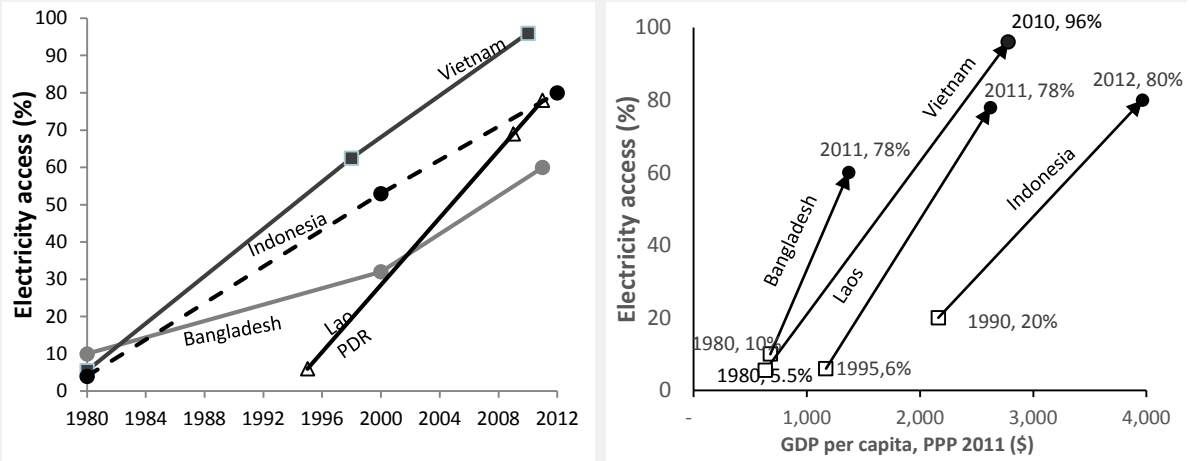
Bank Group–Supported Good Practices for Scaling up Access

Against the background of the preceding discussion, this section highlights the Bank's experience in advancing good practice in selected national country programs toward universal access—grid and off-grid—and their implications for low-access countries, especially in Sub-Saharan Africa.

Figure 4.1 shows the steep gradients of access implementation for four countries over time. Indonesia (Gencer and others 2011), Lao PDR (World Bank 2012b), and

Vietnam (Gencer and others 2011) scaled up from low access levels to connecting the vast majority of their populations to electricity within two decades. Today, electricity access levels are at 80 percent in Indonesia, 83 percent in Lao PDR, and 96 percent in Vietnam, compared to 53 percent in 2000, 6 percent in 1995, and 5.5 percent in 1980, respectively. All these countries achieved this access level despite starting with low gross domestic product per capita, comparable to or even lower than that of several low- and medium-access countries in Sub-Saharan Africa today (figure 4.1). With the Bank Group's ongoing support, Bangladesh achieved a remarkable expansion of off-grid SHS, which quickly brought basic electricity services to nearly 10 million people over the last decade, and is filling the void left by the stalled grid expansion and generation shortages in the country.

Figure 4.1. Rapid Transitions from Low to High or Universal Access, Beginning from Low-Income Levels (GDP per capita)



Sources: Electricity access: UN 2012; GDP per capita: World Bank World Development Indicators.
Note: GDP = gross domestic product; PPP = purchasng power parity.

In all cases, the governments owned the access effort and incorporated it in their growth strategies. Indonesia's national utility, PLN (Perusahaan Listrik Negara), historically achieved about 2 million grid connections per year; in recent years it ramped up connections with government support and financing to well over 3 million per year, most of which are in rural areas scattered across the country's 3,000-mile-long archipelago of several thousand islands. Lao PDR integrated its national electrification in a broader strategy of national development. The government set specific targets for electricity access—70 percent by 2010 (which was exceeded) and 90 percent by 2020—to be achieved through aggressive grid extension complemented by off-grid electrification where cost-effective. In Vietnam in the 1990s, about half of the rural communes and less than 15 percent of rural households had access to electricity. In response, the government made rural electrification a component of its

development strategy to provide households with lighting and improved health care, education, and economic opportunities.

Vietnam and Lao PDR both had to overcome weak institutional arrangements. In Vietnam, almost 90 percent of rural electricity distribution was carried out by commune-level electricity groups—supported by the national utility, Electricity of Vietnam (EVN) —that had no legal status, minimal technical competence, and little financing. Regulation of the power sector was grossly inadequate, lacking an effective legal and regulatory framework and technical standards for rural electrification. The government formulated a phased long-term electrification plan that during the initial years focused on physically connecting rural communes rapidly, and it attracted broad local participation. Starting in the mid-2000s, a second and ongoing phase of the plan focused on improving efficiency and reliability of electricity supply through more efficient technical operation. In Lao PDR, the national electricity utility EDL (Electricité du Laos) was held accountable for annual targets for grid-based access expansion. The government, meanwhile, followed up with the policy and financial commitments necessary to manage the balance between ensuring affordability of electricity connections to the vast majority of the population while remaining sensitive to the need to strengthen EDL's financial health and sustainability to deliver the grid extension program on time.

For Lao PDR, hydropower export revenues helped finance the startup and the early stage growth of the national electrification program. Visionary and opportunistic developments of hydro projects were pursued during the late 1970s and early 1980s. These projects were driven by export sales to nearby Thailand markets, coupled with negotiated arrangements for power buyback or exchange arrangements, where feasible, for electrification of border areas. The revenues from these projects enabled financing of the early hydro projects, and financing the national power expansion and connections program. Starting in the late 1980s, government reforms encouraged the participation of independent private power providers (export hydro IPPs) and led to the significant private investment underlying installed power capacity today, with several more projects in the pipeline.

Vietnam and Lao PDR created a common sector-level platform by planning and phasing access expansion while providing stable sector policies and regulation. The platform was led by their governments and anchored by a national electrification rollout plan aligned to national priorities and targets. It was designed to orchestrate systematic expansion of access through a sustained program supported by donors who financed large-scale access improvement instead of using a door-to-door, project-by-project mode of sector investments. The Bank Group's support for Vietnam's electrification spanned nearly two decades from 1995, providing about $3.3 billion in

investment lending to support $4.1 billion in projects that built and rehabilitated T&D networks together with other lenders, including the Asian Development Bank and the Japan International Cooperation Agency. The Bank has also provided $700 million through a series of three development policy operations (DPOs). In Lao PDR, the government's approach led to strong, longstanding donor engagement and support—finance for the national electrification program investment and knowledge to help the government implement sector reforms, strengthen institutions, and improve sector performance and efficiency. The major grid extension projects sponsored by multilateral institutions during 1987–2009 provided an estimated $450 million, of which about $400 million was for grid investment, $5 million for off-grid investment, and about $25 million for institution building. Given the limited IDA allocations, the World Bank's role was important for mobilizing resources from the Global Environment Facility, Norway, and Australia for rural electrification, and from various trust funds for project preparation.

Bank Group Experience with Off-Grid Expansion

The Bank Group portfolio during the past 15 years displays a range of off-grid electrification experience—in technical delivery modalities and standards, and context-specific institutional frameworks. Notable among these are instances where off-grid provision, particularly deploying solar home systems (SHSs), proved to be commercially viable on a freestanding basis and rapidly scalable in a sustainable manner. These experiences span pre-electrification in grid-proximate areas, regions that are permanently off-grid because of remoteness or difficult accessibility, and in portable cash-and-carry retail solar products for lighting and charging cell phones (box 4.1). The following assessment of various Bank experiences in off-grid electrification shows scope for replication as appropriate in different country or sub-regional contexts. The experience with geospatial planning models that enable the coordinated growth (with the grid expansion) of off-grid electrification is covered in the discussion on sectorwide frameworks and approaches to electrification.

Box 4.1. Off-Grid Electrification in a Nationwide Least-Cost Electrification Strategy

Off-grid electrification that is well coordinated with grid-based electrification is an essential part of a nationwide least-cost electrification strategy (World Bank 2011a). Experience backed by technical and economic analysis shows that in most country contexts, conventional grid extension is generally the most cost-effective means of electrification for most populations in light of the geospatial settlement patterns and density.

However, the unit marginal costs of grid extensions inevitably increase as the grid spreads further out and extends its reach into less populous and more distant areas with lower settlement density and typically lower demand. These costs eventually surpass the unit costs of decentralized delivery modalities such as a mini- or micro-grid (an isolated small generation unit feeding a local network in a compact footprint) and individual units such as solar home systems (SHSs). Increasingly, with the continuing and significant declines in unit costs of some new technologies (especially solar panels) coupled with increasing penetration of mobile banking services, off-grid options such as SHSs offer a fast and cost-effective alternative for meeting high-valued electricity needs.

Outside of grid extensions and coordinated off-grid access scale-up efforts, the fast-growing markets are in filling the gaps in demand for modern energy services, which includes retail, off-the-shelf portable solar charging and lighting products that replace candles, kerosene, or flashlights. These are a major improvement in both the quality of services and costs until the user can get access to an SHS, a mini- or micro-grid, or the main grid. Off-grid solutions provide a critical and transformative first step with basic energy services such as lighting, mobile phone charging, fans, and television. Instead of waiting for all energy needs and the full range of electricity services to be met at once through grid extension, off-grid interventions help get populations on the energy ladder on a time scale that accelerates impact: days and months, not the years and decades they often must wait for centralized power plants and grid extension.

IEG identified and reviewed 47 World Bank projects (20 of which are active) approved since FY2000 that focused on or included off-grid components. These were implemented in 33 countries (15 low access, 5 medium, 9 high, and 4 universal). The list of these projects and financing amounts is in appendix G. Across this set of projects, the World Bank supported several business models and institutional frameworks for off-grid electrification, principally the vendor model and the concession model for SHS. The vendor model, initially tried in Sri Lanka with SHSs, was adopted on a far larger scale in Bangladesh and was tailored to the sector context there. The concession model was used with good results in the electrification of remote and hilly regions of Argentina and Peru. Although the focus in this section is on learning from successful off-grid experiences supported by the Bank Group, as discussed in chapter 2, the Bank Group's less successful experiences in other countries are also reviewed.

WORLD BANK EXPERIENCE WITH SUPPORT FOR PRE-ELECTRIFICATION

Sri Lanka's Bank Group–supported Renewable Energy for Rural Economic Development program was a proving ground for the vendor model of private sector–led off-grid renewable energy development (IEG 2014d). The program was initially hosted in the public sector Development Finance Corporation of Ceylon with a number of credit institutions and private solar vendors participating in the market, selling about 13,000 SHSs per year at the peak of the program. However, with the

faster-than-expected expansion of the electricity grid in Sri Lanka, demand for SHSs declined, though there is still scope and interest in SHS expansion in some regions of the country.

The vendor model got much more traction in Bangladesh in the past decade through the Bank's Rural Electrification and Renewable Energy Development Project (RERED), even though the impetus for this was largely from the stalled main grid extensions and connections rollout program exacerbated by a severe shortfall in electricity generation in the country in the past decade. The Bangladesh off-grid experience is exemplary in many respects, including the attention paid to institutional arrangements, private participation, quality control, maintenance arrangements, and financial provisions to make the SHSs affordable to the beneficiaries. Bangladesh's rapidly scalable off-grid access expansion can be viewed as pre-electrification, a second-best solution for areas that otherwise could be covered cost-effectively by centralized grids. The Bangladesh experience, described in box 4.2, holds promise for low-access countries, especially those in Sub-Saharan Africa where the main grid sector institutional frameworks and other conditions have not advanced sufficiently to undertake a systematic grid extension rollout with matching generation capabilities.

Bangladesh's vendor-based program built upon a first generation effort by the Bangladesh Rural Electrification Board using a fee-for-service approach to deploy SHSs. The scheme did not fare well since it was not cost-effective for the board (and the associated rural electric cooperatives) to undertake bill collection or perform maintenance in dispersed locations. A lack of user ownership of the SHS asset resulted in neglect and even abuse of the installed systems. Additionally, out of seven mini-grids originally planned in the project (accounting for less than 1 percent of the RERED project cost), only three were attempted, of which only one remains in operation. In this case, the lack of a clear regulatory framework for remunerative tariffs and compensation for stranded assets appears to have deterred investors (IEG 2014d). These experiences, when contrasted with the vendor model employed by Infrastructure Development Company Limited, highlight the importance of appropriate institutional and financial arrangements, program design, and incentives for all stakeholders to make off-grid electrification a viable proposition.

Box 4.2. Bangladesh's Experience in Off-Grid Pre-Electrification

Bangladesh's 2002–2013 Rural Electrification and Renewable Energy Development (RERED) Project, supported by the World Bank, notably contributed to social and economic outcomes in rural areas by extending access to electricity through off-grid SHSs, supplementing the extension of the electricity grid. The project and its ongoing successor, RERED II, helped install SHSs on a scale that far exceeded original targets, topping about

2 million by end of 2014, when grid expansion was slowing. The country installed about 100,000 SHSs a month in 2014.

This off-grid experience demonstrated the potential scale and speed at which off-grid facilities can bring connectivity to households. In a relatively short time, an SHS can bring electricity to a household in a rural or remote area that would otherwise have to wait years for the grid to reach it with the promise of more comprehensive services.

The program was managed by Infrastructure Development Company Limited (IDCOL), a semi-governmental infrastructure finance organization, which worked through nongovernmental organizations (NGOs) and demonstrated the feasibility of having beneficiaries pay for a substantial portion of the SHS asset in affordable installments. The program started with five NGO partners with an initial target of installing 50,000 SHSs. By the end of 2014, 49 partner organizations were installing SHSs under a competitive business model. IDCOL also helped mentor and develop the partner organizations.

IDCOL's solar program effectively managed its after-sales network through its partner organizations. To ensure quality standards, the commercial participating organizations—NGOs, microfinance institutions, and private sector institutions—purchase solar panels, batteries, and other components approved by a technical standards committee. Vendors submit required documents, warranties, and product-testing certificates to the committee for examination and approval. Once the products are approved, the participating organizations can buy them directly from the vendor and set up their own terms of purchase and payment. The participating organizations arrange for user training in operations and maintenance, regular after-sale services, and timely handling of customer complaints. IDCOL routinely inspects the installed systems and shares its findings with the participating organizations.

Source: IEG 2014a.

SUPPORT FOR REMOTE-AREA ELECTRIFICATION

Bank Group projects also provided some countries with support to bring off-grid electricity to sparsely populated, remote, or mountainous areas that are unlikely to be covered by the conventional grid. Of particular interest is the concession model employed in the outlying areas of Peru and Argentina—countries with high electricity access.[2]

Argentina's Renewable Energy in Rural Markets Project (1999–2012) supported an early fee-for-service concession model to supply electricity to remote areas.[3] The model worked well given Argentina's long experience with concessions in traditional electricity markets. The project developed eight concessionaires that installed off-grid facilities in nearly 30,000 households—mainly with SHS but also with wind turbines and mini-grids—in addition to installing more than 2,000 SHSs in schools, medical centers, and other public buildings (World Bank 2013a). The relatively large unit size of the institutional installation and mandated installation

(as opposed to individual households that may not opt to sign up) greatly increased the attractiveness of the package to private sector bidders. Similarly, under Peru's Rural Electrification Project (2006–2013), electricity distribution companies installed more than 100,000 SHSs in remote and isolated areas.[4] Though considerably lower than the project's goal of 160,000 connections, the target of increasing electricity consumption for productive uses by 18,000 megawatt hours in the first five years was exceeded by 1,107 megawatt hours. The Bank Group's role was important in supplementing the financing plan, particularly in supporting capital investments and helping ensure transparency in awarding concessions.

In another example of providing off-grid solutions to thinly spread out (and in this case distributed) herder populations, Mongolia's Renewable Energy for Rural Access Project enabled distribution and sales of nearly 70,000 SHSs, covering more than 60 percent of the country's herder population.[5]

In Nicaragua, insufficient attention to commercial arrangements for selling surplus power to the wholesale market during preparation and design of the Off-Grid Rural Electrification project resulted in underperformance of small hydro facilities.[6] After Lao PDR's Southern Provinces Rural Electrification project, a survey revealed that more than 80 percent of the 6,000 SHS were not working properly because of low levels of maintenance.[7] In Mali's Household Energy and Universal Access project, there was weak community demand for stand-alone SHS because the products sold were of low quality and capacity, and maintenance services were substandard.[8] This contributed to the underachievement of project targets for SHS installations by a substantial margin. There was little activity with isolated mini-grids in World Bank projects. As previously noted, the planned mini-grids in the Bangladesh RERED project did not get off the ground. In Vietnam's System Efficiency Improvement, Equitization, and Renewables Project, serious quality problems surfaced during construction and rehabilitation of the mini-hydropower plants planned under a small component, and their relevance was eventually overtaken by a faster-than-expected advance of the grid.[9] The search is still on for commercially viable and scalable mini-grid network models, but there have been no significant results so far.

PRODUCTIVE USES OF OFF-GRID ELECTRICITY

The use of off-grid electrification is mostly dedicated to lighting, comfort, entertainment, and communication. Combining off-grid projects with interventions to promote local productive uses of electricity, as in the Peru case cited previously, is expected to catalyze economic activity and improve incomes. The Mexico Renewable Energy for Agriculture project demonstrated the considerable developmental benefits of promoting productive uses of off-grid electricity by addressing the lack of awareness and risk aversion of potential beneficiaries, and the

lack of trained technicians and standardized specifications.[10] Survey results showed that more than 2,300 farmers who did not have electricity connections previously were provided with a reliable supply (through photovoltaic pumping systems) and thus had refrigeration for milk and fish, which contributed to substantial increases in the beneficiaries' incomes. Under the Lao PDR Southern Provinces Electrification Project, 81 households in Nonsal village reported a 50 percent increase in income from the additional time spent on making handcrafts since SHS were installed.[11]

SOLAR OFF-GRID LIGHTING PRODUCTS

The Lighting Africa program, a joint initiative of IFC and the World Bank, was launched in September 2007 with the goal of catalyzing retail markets in Sub-Saharan Africa for clean, modern, off-grid lighting and charging products (mainly portable solar lamps, some with attachments for charging cellphones and radios). In IEG's assessment, the program is a relevant and innovative approach to meeting the needs of targeted countries, and it made important contributions to the growth of the Region's market for private sector-supplied portable off-grid lighting products. The main drivers of the program's performance were its provision of quality certification and testing infrastructure, and market intelligence. Its focus on unsubsidized market-based approaches has considerable replication potential (box 4.3).

Lessons from the good practice country examples highlighted in the preceding sections (Bangladesh, Indonesia, Lao PDR, and Vietnam), along with those from other earlier, successful country programs and from cases when the World Bank Group was not a major player (notably Brazil, Mexico, Thailand, and Tunisia) point to certain primary drivers of success. These drivers are common across the countries' national electrification program records of achievement toward universal electricity access, but not across the specific institutional models for their achievements.

Box 4.3. The Lighting Africa Program

The Lighting Africa program supports the rapid scale-up and delivery of affordable, quality lighting products, mostly basic solar lanterns (Pico PV or a small PV-system with a power output of 1 to 10W) predominantly for household lighting. Against the backdrop of generally serious product quality difficulties in the region, Lighting Africa addresses quality assurance, market intelligence, business support, access to finance, consumer education, policy, and regulation to help participating governments create an enabling environment for off-grid lighting and integrating it into their national electrification plans.

Lighting Africa implemented four IFC projects and five World Bank projects, with three IFC projects in the pipeline. Lighting Africa reports that it helped lighting products reach nearly 7 million people—an achievement far surpassing the program's initial goal of 2.5 million beneficiaries by 2012. To date, 49 products met or surpassed the program's quality

and performance standards, with more than 1.3 million sold in 20 African countries. The Sub-Saharan African countries where quality-certified solar lanterns are sold increased from 5 to 10 in 2010, and to 20 in 2012, and the number of certified manufacturers grew from 6 to 25 in the same period. To put these achievements in perspective, the program has reached about 2.5 percent of its potential market in Africa.

Although the full extent of the program's contribution to the spread of solar lighting products cannot be established, a stakeholder survey attributed 30–60 percent of all quality solar lighting products to the program (in Kenya and Ghana, where the program was piloted). This suggests that the program's impact is substantial.

The experience of the Lighting Africa program led to programs in Bangladesh, India, and Papua New Guinea, with more programs being developed in Pakistan and Indonesia. The program is now part of the expanded Lighting Global program, which supports Lighting Africa, Lighting Asia, and Lighting Pacific, and which works along the supply chain of off-grid lighting products and systems to reduce market entry barriers and first-mover risks.

Sources: IEG assessment; Castalia 2014.

Countries' electrification succeeded through a homegrown institutional structure and framework of implementation and accountability considered appropriate for their country contexts and circumstances, as revealed by country-specific reviews undertaken by the Energy Sector Management Assistance Program (ESMAP) and other reports (World Bank 2011a). Most high-access achievers in Asia used their national utilities and other public institutions as the main agents for scaling up electricity access; by contrast, several Latin American nations relied on their privatized utilities as primary agents (for example, Argentina, Brazil, and Peru). In some instances, publicly owned distribution cooperatives had a major role in scaling up access, notably in Bangladesh, Costa Rica, the Philippines, and Vietnam (commune electrification councils). Furthermore, the lessons indicate that neither the publicly owned entities nor private sector alone can marshal the capacity, financing, quality, and policy needed to scale up access efficiently, effectively, and sustainably. Another common feature across the good practice country programs is their use of some form of targeted public subsidies—especially for the T&D investments—for ensuring affordability of retail electricity tariffs and customer connection charges to the poor.

The core organizing principles and strategic drivers of successful performance common across the large and diverse spectrum of country contexts and experiences described above—including differences in sector structures, regulatory frameworks, and enabling policies—can be broadly stated as follows:

- Develop a least-cost, comprehensive national electrification rollout plan that is consistent with the national development vision and has government

ownership; uses an appropriate combination of grid and off-grid solutions that will enable economic growth and modernization; and that sets access targets that include household connections and connections for service delivery institutions (health and education), business and commerce, and other enterprises.

- Establish clearly delineated roles and accountability for sector performance and results to ensure efficient and effective management and operation of the sector.
- Ensure the ongoing commercial viability of the delivery agents during the program implementation period, while also ensuring customer affordability, especially for the poor.
- Promote equity, inclusion, and shared prosperity through a well-targeted rollout to ensure affordability of the service for the poor and disadvantaged across geography and time.
- Establish a consultative framework and process that is government-led and facilitates sustained engagement in the sector—recognizing the long-term programmatic nature of the implementation and financing challenge.
- Use a sectorwide organizing architecture guided by the principle of "many partners, one team, one plan," and aim to rally the participation of designated sector agents and key stakeholders. This approach can also help to increase the degree of harmonization in donor participation.

Sectorwide Engagement for Nationwide Access Rollout

This section highlights notable experiences from Rwanda and Kenya, both low-income countries that are implementing sectorwide programs to scale up national access. A key driver of the positive and encouraging experience and results from these programs was the government's ownership, early commitment, and persistent follow-through on the enabling actions established in Investment Financing Prospectuses. Each program is anchored by a least-cost geospatial national electrification rollout plan for grid and coordinated off-grid development for universal access by 2030. Hence, the programs exemplify many of the principles described in the preceding section. In both instances, the Bank is continuing to assist the government.

The Bank supported the governments' efforts to mainstream a framework for sectorwide investment financing to syndicate sufficient financing to support ongoing implementation of the program. An important point in this framework is recognition that the overwhelming share of the investment financing—for sub-transmission and distribution and for off-grid rollout—must come from other sector agents and participants, not from the Bank's sectorwide approach instrument of

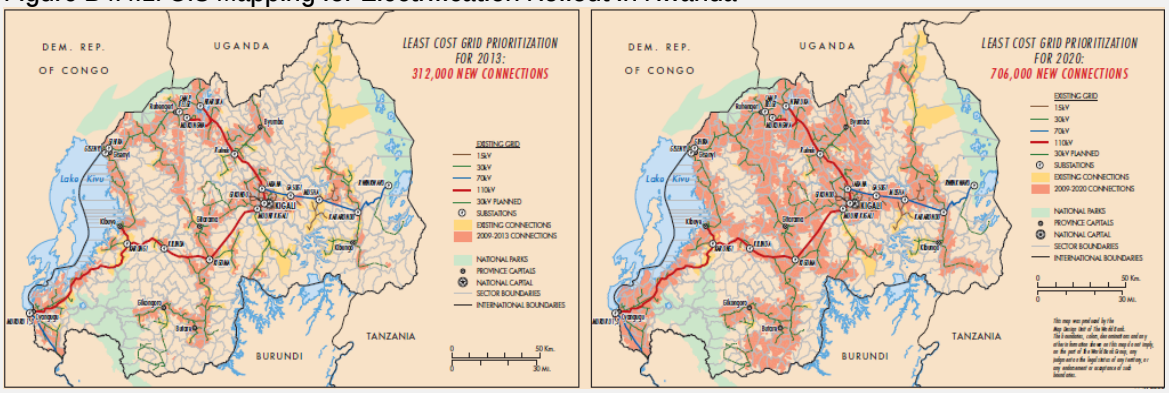
budget support. The Bank deployed a sector investment loan and a supplemental operation to intermediate its own commitments, and most other donors use their own instruments to provide their share of financing support of the access rollout program.

The Bank's engagements began in 2007 for Kenya and 2008 for Rwanda. The first major step for each was preparation of a national geospatial access rollout plan that combined geographic, demographic, and technical parameters to scale up access in a least-cost and time-bound manner. The plan addressed equity and shared prosperity considerations through policies for keeping connections charges affordable for the poor; a substantial off-grid program gave priority to connecting public facilities (schools, clinics, primary health centers, and administrative centers) so that developmental impacts could be spread out even ahead of the progress on household connections (box 4.4). The plans were funded by ESMAP as knowledge products that would be translated into operations.

Box 4.4. Rwanda Geospatial National Electrification Rollout Plan and Investment Financing

Rwanda is among the first countries to prepare and implement a nationwide electrification program combining grid and off-grid means, based on a systematic and least-cost plan aided by geographic information system (GIS) mapping techniques that combine technical, economic, demographic, and demand and supply data. The rollout plan can be updated with new information and offers several advantages over traditional Electrification Master Plans, as follows:

Figure B4.4.1. GIS Mapping for Electrification Rollout in Rwanda



Source: World Bank maps unit.
Note: GIS = geographic information system.

- Geospatial planning is easier to visualize for all stakeholders and can rally financial participation. As experienced in Rwanda and Kenya, the geospatial plan effectively anchored a "prospectus" for large and diverse groups of national and international stakeholders to coordinate and commit to an adequate and sustainable financing package.
- It speeds up wider developmental impact. The geospatial plan captures a national development perspective across all sectors (health, education, administrative

centers) and all households (urban, peri-urban, rural, and deep rural) and is not restricted to a "rural electrification project here and there" planning framework. Geospatial planning helps identify the off-grid interventions that are best in each area.

- Modest cost and ability to make frequent updates make it a dynamic planning platform. The geospatial plans for Rwanda and Kenya each cost about $1 million and took one year to prepare. They better capture the ever-changing situation (growing grid extensions, changing demand and affordability, equipment costs) to inform the implementation process. By contrast, classic Electrification Master Plan studies take two to three years and more than $2 million to prepare, and are based on a static framework.

Source: World Bank 2011a.

As part of the process, each country prepared a prospectus detailing the national electrification rollout plan. The prospectus stated the governments' commitments to sector policies and regulations for ensuring the financial viability of the sector and service providers. It also specified the financing requirements for each element of the program—generation, T&D, off-grid facilities, and others—in a phased manner for the next 15 years. These prospectuses were presented to donor groups in 2009 for Rwanda and 2010 for Kenya.[12]

The Rwanda and Kenya programs are similar in spirit to a compact and code-of-engagement understanding entered into by donors at the outset. They do not incorporate traditional tariffs or other such covenants, nor do they use explicit trigger and tranche mechanisms like a DPO instrument. Instead, the Investment Financing Prospectuses the government presented to donors to syndicate the projected financing gap were prepared with the upfront understanding that the bankability of the Prospectus would hinge, among other expectations, on retail tariffs that would, at minimum, cover all open and all capital expenditures upstream of sub-transmission required for grid supply.

Government commitment and ongoing involvement at the highest levels and from the earliest stages was crucial for the preparation of a sectorwide framework and process. The Rwanda and Kenya governments were involved throughout the design and preparation of the national program and geospatial plan. The governments drew up clear results frameworks and established monitoring and evaluation accountability under the overall institutional setup. To maintain the financial viability of the sector and ensure the commercial viability of the national utility, public subsidy funds were targeted to financing the gap between revenues recovered from retail tariffs set by the regulator, and revenues from affordable connection charges to new customers; the sub-transmission and distribution investment costs of grid rollout and all recurrent costs of the distribution operations were also offset; in other words, all capital and operating expenses upstream of

primary distribution are recovered in the cost of bulk power supply coming into the distribution network and all operational expenditures within the distribution system up to the customer meter. The shortfall in the utility's revenues from regulated tariffs under this scheme were reimbursed to the utility as a grant or as a soft loan.

Based on its prospectus, Rwanda syndicated financing of $340 million for the first five years with contributions from the Bank Group ($78 million), other multilaterals and donors ($185 million), and the government and national electricity utility ($77 million). A review of Public-Private Infrastructure Advisory Facility data (a database that records private sector investments) shows that $158 million was committed by the private sector for electricity projects in Rwanda during 2010–2011; the amount for the previous 10-year period was a mere $1.6 million (tables 4.4 and 4.5).[13] Kenya's prospectus helped raise $1.5 billion for 2009–2013 through a donor financing roundtable. Also, private sector flows of $1.38 billion came into Kenya's electricity sector since 2009 (table 4.4). Project staff, task team leaders, and stakeholders IEG interviewed in Kenya suggested that the private sector flows can be at least partly attributed to the donor response to the country prospectuses.

From tables 4.4 and 4.5, it is clear that the total amount syndicated for electricity access though the sectorwide programs is several times what might have been possible using a project-by-project approach. Specifically, in Rwanda, $78 million in Bank financing leveraged 4.5 times that amount from other public sector donors and stimulated twice the Bank's contribution from the private sector. The Bank Group's contribution directly or indirectly brought in $350 million from public sector or public sector funding sources, and an additional $158 million from the private sector, for an overall leverage of $6 for every dollar contributed by the Bank Group. The rations are similar for Kenya. This contrasts sharply with the leverage performance of the Bank Group (table 4.3) on a project-by-project basis.

Table 4.4. Rwanda Development Partner Pledges: Prospectus Donor Financing Round, 2009–2014

Development partner	Programmed donor contributions[a] ($, millions)
World Bank and GEF	78
Dutch government	45
Japan International Cooperation Agency (transmission and high-voltage stations)	25
African Development Bank	50
European Commission	35
Arab Bank for Economic Development in Africa (BADEA)	10
OPEC Fund for International Development (OFID)	10
Saudi Fund	10
Government contribution	50
Rwanda electricity utility (ELGZ)	27
TOTAL	340

Source: World Bank project documents.
a. Excludes committed generation investments in private sector or purchasing power parity.

Table 4.5. Private Sector Commitments to the Electricity Sector, FY2000–2013 ($, millions)

	Total 2000–2009	2009	2010	2011	2012	2013	Total 2009–2013
Kenya	338	127	–	170	887	200	1,384
Rwanda	1.6		16	142	–	–	158

Source: Public-Private Infrastructure Advisory Facility database.

The evidence available from the ongoing sectorwide programs shows impressive growth in access during 2009–2014 from 6 percent to 15 percent in Rwanda, and from 23 percent to 30 percent in Kenya (tables 4.6 and 4.7). Rwanda exceeded its original electricity access targets for 2014 and revised its target from 12 percent to 25 percent for 2016. By 2016 Rwanda also aims for 80 percent coverage of schools and universal coverage of administration centers, health centers, and hospitals (table 4.6). In 2003 the national utility, Kenya Power and Lighting Company, made 40,000 new grid connections per year, corresponding to less than 0.5 percent of the population. Performance indicator data from the ongoing Kenya Electricity Expansion Project and country sector statistics show that the rate of new connections added annually increased from 135,000 in FY2007–2008 to 443,000 in FY2013–2014 (table 4.7).

Table 4.6. Rwanda—Progress in Electricity Access and Connecting Service Delivery Institutions (percent)

Beneficiary category	2009	2012	2013	2014	Target: 2016
Overall access	6	–	–	15	25
Schools	21	–	–	37	80
Administration centers	39	–	–	59	100
Health centers, hospitals	38	–	–	57	100
Total connections (million)[a]	0.11	0.33	0.39	0.43	Original : 0.37 Revised: 0.77

Sources: ESMAP 2012c; Implementation Status and Results Reports, December 2013 and June 2014; Rwanda Electricity Access Scale-up and Sectorwide Approach (SWAp) Development Project (P111567).
a. Assumes five persons per household.

Table 4.7. Kenya—Progress in Electricity Access and Connecting Service Delivery Institutions

Year	FY2005–2006	FY2006–2007	FY2007–2008	FY2008–2009	FY2009–2010	FY2012–2013	FY2013–2014
Overall access	–	–	–	–	23%	–	30%
Connections added	~40,000	120,000	135,000	200,000	220,000	307,000	443,000*
Total connections (million)	~0.80	~0.90	1.10	1.26	1.46	–	2.80

* By June 2013, 23,000 of 25,873 trading centers, secondary schools, and health centers, were also connected to grid. Of this 6,065 were schools.
Sources: Bank Implementation Status Reports: October 2011, January 2013, and August 2014; Project Appraisal Document "Electricity Expansion Project" May 2010; Various statements by Kenya Power and Lighting Company and other officials and Briefing to Parliamentary Committee on Energy; Eddy Njoroge, former CEO Kenya Power and Lighting Company, presentation on Kenya Vision for developing Electrification Rollout Plan: Kenyan Experience, December 3–5, 2014, Port Moresby.

Collaboration among World Bank, IFC, and MIGA in the Electricity Sector

Collaboration across the Bank Group in the electricity sector is mainly through joint projects in which at least two of the World Bank, IFC, and MIGA are involved. The World Bank brings to this collaboration the value of its upstream work for country clients on policy and institutional frameworks, and the Partial Risk and Partial Credit Guarantee instruments to support government payment obligations to private investors. IFC brings long-term financing that is rarely available in countries with underdeveloped financial markets and high investor risk. MIGA's main value added in the joint transactions is from long-term political risk insurance for high-risk countries, which is not available from international commercial insurers.[14]

Bank Group–wide collaboration in the electricity sector has occurred for several years. IEG identified 25 projects with the involvement of at least two of the three institutions (listed in appendix M). Of these, nine are in low-access countries (Cameroon, Kenya, and Uganda); seven are in medium-access countries (Bangladesh, Côte D'Ivoire, India, Lao PDR, and Senegal); five are in high-access countries (Guatemala, Jamaica, Nepal, Pakistan, and Sri Lanka); and two are in universal-access countries (Tajikistan and Moldova). Bank Group engagement was higher in low- and medium-access countries ($3.4 billion) compared with high- and universal-access countries ($600 million). Also, IFC and MIGA financed projects in high- and universal-access countries without the need for World Bank involvement (table 4.8).

Table 4.8. Joint Projects in the Electricity Sector, FY2000–2014

	Purpose				Involvement			
Country access category	Number of projects	Generation: conventional	Generation: renewable, including hydro	Transmission and others	World Bank	IFC	MIGA	Total commitment ($, millions)
Low[a]	9	6	1	4	9	9	9	1,697
Medium	7	5	–	2	5	6	3	1,721
High	5	4	1	–	–	5	5	468
Universal	2	–	–	2	1	2	1	169
ALL	25	15	2	8	17	24	18	4,055

Sources: World Bank Business Intelligence; IFC and MIGA databases.
a. All in Sub-Saharan Africa.

Fifteen of the 25 projects addressed conventional generation (of which four covered large hydro projects); two addressed small new renewable energy projects, and two others involved privatization of distribution companies (Moldova and Uganda). Ten of the operations had less than $100 million each of Bank Group commitment; 14 had $100–500 million, and the remaining projects (Maharashtra State Electricity Transmission Company Limited and Nam Theun 2) had commitments of $1,050 million. Of the 25 projects, only 10 had been evaluated, of which nine projects have outcome ratings. Seven of these projects had development outcomes rated moderately satisfactory/successful or better. Two projects had less successful results because of the complexity of project design relative to the country's institutional capacity and experience in a joint IDA-IFC rural electrification project. The other joint IDA-IFC project fell short of meeting its objectives because of a change in government and limited IDA support compared with the ambitious objectives. (Bibiyana IPP; Bangladesh Power Sector Development Policy Credit).

The joint projects added value for country clients by breaking ground for the private sector in high-risk countries, and by pulling together financiers in large and complex projects, as is seen in the following examples.

Breaking ground for the private sector. At least six of the joint Bank Group projects were considered pioneering transactions in their respective countries including the first independent power provider in the country (Bangladesh, Cameroon, Jamaica), the first private or privatization of a power company or utility (Moldova and Uganda), or the first such transaction in the country (Guatemala). In the gas-to-power project in Cameroon, IDA designed a hybrid Partial Risk Guarantee (PRG) with a feature like an IBRD) Partial Credit Guarantee because the utility opted for a different procurement model. Without IDA financing and guarantee support, it would have been difficult to mobilize local banks to provide local currency financing and for the other international financiers to provide long-term debt. In the Umeme Limited project in Uganda, the relatively small IDA PRG covering a letter of credit supported by MIGA's political risk insurance helped large capital mobilization, including from IFC (box 4.5).

Box 4.5. Bank Group Collaboration in Transforming Uganda's Electricity Distribution: Lessons from IEG's Evaluation of Umeme Limited

Bank Group support for Umeme Limited, Uganda's privatized utility, is an example of how a "one Bank Group" approach can mobilize private investment, introduce efficiencies, and improve viability of a once underperforming utility in a post-conflict country. Through the provision of an IDA contingent credit and MIGA political risk insurance to support government guarantees, the Bank Group attracted first-rate private investors in the first fully privatized utility in Sub-Saharan Africa. IFC loans and equity investment provided additional lower-cost and long-term financing and helped catalyze financing for Umeme Limited's past and current $439 million 2013–2018 capital investment programs. Previous IDA credits also helped with other aspects of Uganda's power sector reform that had spillover effects on the project. Despite numerous challenges since its concession started in 2005, the Umeme experience showed that privatization of electricity distribution can introduce efficiencies, improve sector viability, strengthen the regulatory framework and capacity, and expand access.

Umeme exceeded the capital expenditures and collection rate improvements required under its 20-year concession agreement with the Uganda Electricity Transmission Company Limited. Electricity consumption in billed sales among the different customer types also increased. Household connections increased in its concession areas. Household electricity consumption increased from 334 gigawatt hours in 2004 to 455 gigawatt hours in 2012. Umeme had its initial public offering in 2012 and is cross-listed in the Kampala and Nairobi Stock Exchanges.

Source: Project documents.

Large and complex projects. Uganda's Bujagali hydropower project is one of the largest private sector operations in the Sub-Saharan Africa power sector, with a total cost of $800 million. In this project, IFC's substantial loan of $130 million and MIGA participation ($115 million) proved critical to financing $152 million of private equity,

and IDA's $115 million PRG supported the entire commercial financing package. For the Cameroon Kribi Gas-to-Power project, the Bank Group covered almost half of the $350 million project cost. The PRG enabled local banks to extend the maturity of their loans from the normal loan length of 7 years to the borrower's need for 14 years, improving the risk profile of the project to financiers. In Thailand, Nam Theun 2 Power Company is a cross-border project and was the World Bank's first major investment in hydropower after the World Commission on Dams report and the Bank's new water strategy of 2003. MIGA provided $200 million in coverage for the foreign equity holders. IDA's financial support was limited to a $20 million grant for social and environmental activities and a $50 million PRG to cover a small portion of the commercial borrowing. Although the IDA funding for this project was small compared with the total project cost, the Bank's appraisal was critical for bringing in other international financial institutions. Private participants, including Thai commercial banks, considered IDA and MIGA involvement essential because they provided critical risk mitigation comfort through their guarantees. Perhaps more important, their participation would ensure that the potential adverse social and environmental impacts of this category A (signifying substantial risks under the Bank's environmental and safeguards policies) would be fully addressed.

Intra-Bank Group parallel financing was hindered in the past by several issues, including the pledge of shares issue between IFC and MIGA, and the lack of familiarity among other Bank Group staff with MIGA's product and value added. Attempts to formalize intra-Bank Group collaboration, especially between IFC and MIGA, started in 2009 with the creation of a joint MIGA-IFC unit within IFC[15] to formalize cross-marketing and business referrals arrangements and a decision to re-establish MIGA field presence within select IFC/WB regional offices. This was followed by the resolution of conflict of interest issues and the joint business development agreement between IFC and MIGA[16]. The signing of a Claims Cooperation Agreement between MIGA and IFC in the event of claims for joint projects where IFC is a senior lender eased the longstanding hindrance to parallel financing. The appointment of MIGA champions in IFC industry units and the financial incentives provided by MIGA to IFC investment teams at financial closure also gave impetus for increased cooperation. Discussions between MIGA, WB's Financial Solutions Unit, and the WB's Sub-Saharan Africa region began in 2010. The revival of World Bank guarantee products also set the stage for the rise in the number of joint Bank Group projects in the last three years.

At the staff and management levels, regular consultations between Bank and IFC country teams are helping better collaboration (Bangladesh, China, Kenya, Indonesia, India), and close communication among World Bank and IFC directors and regional vice presidents helped joint Country Assistance Strategies (India) and spurred joint projects (Kenya). More recently, formalized collaborative arrangements and senior management involvement helped foster greater internal

Bank Group synergy, as with the Bank Group's Joint Energy Business Plan for Nigeria. In April 2014 Bank Group management launched Joint Implementation Plans (JIPs)[17] as a mechanism within the Systematic Country Diagnostic/Country Partnership Framework for fostering better collaboration among Bank Group institutions and placing greater emphasis on leveraging the private sector to provide solutions to development problems (World Bank 2014a).

Feedback from private sector clients points to the need for simplifying requirements and lowering costs (both transactional and business costs) associated with complex structuring. In some cases, the recipients indicated that the process involved in IBRD partial risk guarantees was complex or not easy to understand. Staff from IFC and MIGA conveyed that whenever WB was involved, managing timelines for different processing, especially involving governments and public sector entities, as well as differing E&S guidelines posed challenges. From the perspective of Bank Group staff, however, implementation delays could be partly minimized with a reduction in the multiplicity of policy mandates that must be taken into account in project design and implementation. These policy mandates, usually from shareholders, should be prioritized according to their strong relevance to the project's ultimate purpose. Clear guidance by Bank Group management, including a formalized mechanism delineating interagency responsibilities for appraisal, supervision, monitoring, and managing potential internal conflict of interest issues are required to improve the efficiency of staff-level collaboration. Finally, more focused feedback from private sector clients is necessary to verify the efficiency and value added by joint projects.

In summary, Bank Group–wide collaboration through joint projects added value by jump-starting private sector investments in some countries and providing comfort for investors in large projects, chiefly in generation. In Sub-Saharan Africa, where the access challenge is largest, three low-access countries benefitted (Cameron, Kenya, and Uganda). Total Bank Group commitments during FY2000–2014 for joint projects in low-access countries totaled a little more than $1.7 billion, which is about 13 percent of lending from the Bank Group and 3 percent of the lending from all sources. As previously noted, the projected investment requirements in Sub-Saharan African countries in generation alone is about $25 billion per year, of which $5 billion per year is required through 2030 to meet incremental demand from universal access, and the remaining $20 billion for several years to deal with suppressed demand and increased demand from economic growth.

The relatively small scale of investments made possible by Bank-wide collaboration calls for fresh thinking about how to deploy the Bank Group units' individual and collective strengths to stimulate private sector investments beyond Bank Group–led projects and transactions to facilitate the syndication of the financing gap, especially in generation for low-access countries.

Conclusions

A quantum leap is needed in the access scale-up effort. In low-access countries, a quantum leap in the pace of new connections and levels of investments will be necessary to reach the goal of universal access in the next 15 years.

Best practices point to opportunities. Best practice country experiences, some with Bank Group support, showed that the transition from low access to high or universal access can be made within two decades. Indonesia, Lao PDR, and Vietnam moved to high or universal electricity access through strong and sustained grid-based expansion within two decades. With the Bank Group's ongoing support, Bangladesh achieved a remarkable expansion of off-grid SHS, which quickly brought basic electricity services to nearly 10 million people and is filling the void left by the stalled grid expansion and generation shortages in the country.

A synchronized and comprehensive approach is essential. The country experiences point to the importance of comprehensive and synchronized planning of the national electricity access rollout; integrating grid and off-grid means; ensuring financial viability of the electricity sector and its agents; and addressing affordability, equity, and inclusion through targeting the poor and those in remote and inaccessible areas. All these aspects need to be tied together with a clear government vision and comment to the access goals.

The experience of sectorwide approaches. The first sectorwide approaches in the electricity sector in Rwanda and Kenya are showing better results than a transaction-by-transaction approach and, along with demonstrated government commitment, have so far led to significant financing commitments from various development partners. In particular, the private sector made commitments it may not have made without the sectorwide approach adopted by the two countries. After a long period of stagnation, the access levels increased from 6 percent to 15 percent in Rwanda, and from 23 percent to 30 percent in Kenya during the past four years.

World Bank Group collaboration. Collaboration among World Bank, IFC, and MIGA through joint projects grew with time, though initially in an ad hoc manner. Still, the scale of these joint efforts is a relatively small proportion of Bank Group commitments to the sector. Feedback from both internal and external stakeholders point to a number of areas for improvement. To take effective action in this area, more solid evidence is needed on the value added and on costs and benefits to private sector clients from such joint projects. The challenge is to deploy the Bank Group units' individual and collective strengths to stimulate private sector investments beyond Bank Group–led projects and transactions to facilitate the syndication of the financing gap, especially in generation for low-access countries.

Notes

[1] The estimates are indicative and are based on projected population growth and the following assumptions: average growth of connections during 2000–2010 continues until 2015; $800 per connection; and an added 46 percent for associated generation capacity (World Bank 2010a).

[2] Other instances of Bank Group off-grid efforts in remote areas are the provision of 68,000 solar home systems for nomadic herders in Mongolia, and off-grid components of projects in Lao PDR and Vietnam.

[3] Argentina, Renewable Energy in the Rural Market Project (1999-2012), P006043

[4] Peru, Rural Electrification Project (2006-2013), P090116.

[5] Mongolia, Renewable Energy for Rural Access Project (2006-2012),

[6] Nicaragua, Offgrid Rural Electrification (PERZA) project (2003-2012), P073246.

[7] Lao PDR, Southern Provinces Rural Electrification Project (1998-2004), P044973.

[8] Mali, Household Energy and Universal Access Project, (2004-2012) P073036.

[9] Vietnam, System Efficiency Improvement, Equitization and Renewables Project, (2002-2013), P066396.

[10] Mexico, Renewable Energy for Agriculture Project (1999-2006), P060718.

[11] Lao PDR, Southern Provinces Rural Electrification Project (1998-2004), P044973.

[12] Rwanda Prospectus and Kenya Prospectus.

[13] http://www.ppiaf.org.

[14] World Bank Group collaboration in the energy sector has been on-going prior to the endorsement in 2013 of the One-World Bank Group approach to achieve the twin goals. Intra-World Bank Group coordination in the form of sequential upstream-downstream project linkages, staff consultations at appraisal and in country assistance and sector strategies, providing inputs to appraisal/board documents, assistance with project structuring and government negotiations and follow-up were routinely practiced by operational staff at the three institutions. Crucially, the three institutions have provided parallel financing to numerous projects. IEG was able to identify 25 joint World Bank Group projects, discussed in this section and identified in Appendix S. However, the intra-World Bank Group collaboration prior to the 2013 World Bank Group Strategy was on a need or ad-hoc basis and mostly at the project or transaction level.

[15] Source: MIGA Business Development and Partnerships: Enhancing Effective Collaboration with IFC and across the World Bank Group. PowerPoint Presentation at MIGA Retreat, September 23, 2009, by Jean-Marie Masse (Head, Business Development and Partnerships, IFC-MIGA).

[16] In four years of its operations, the IFC-MIGA Partnership has mobilized a total of US$2.1 billion, focusing on investments in IDA and FCS countries.

[17] Several Joint Implementation Plans are under implementation and in the planning phase, including the power sector in Myanmar, Burundi, Nepal, Nigeria and Georgia.

5. Findings, Conclusions, and Recommendations

This evaluation assessed the Bank Group's support for increasing electricity access during 2010–2014, with a view to informing its strategy for supporting access-deficit countries to achieve the goals set by Sustainable Energy for All (SE4All). It sought to answer the question: To what extent has the World Bank Group been effective in the past and, going forward, how well is it equipped to put its country clients on track to achieve universal access to electricity that is adequate, affordable, and of the required quality and reliability?

The evaluation found that Bank Group engagement in, and assistance to, the electricity sector in low-access countries was relatively low compared with high- and universal-access countries. If the Bank Group is to accelerate progress towards universal electricity access in 15 years in low-access countries—especially in Sub-Saharan Africa—there is a clear and urgent need for two measures: to raise the scale, depth and speed of implementation of the Bank Group's own engagement in the electricity sector in low-access countries; and to help low-access countries mobilize other resources tailored to the universal access challenge, and that are several orders of magnitude greater than what has been mobilized in recent years.

The Bank Group's electricity sector portfolio during the past 15 years showed strong performance in the provision of physical infrastructure, and there have been significant achievements in generation, transmission and distribution (T&D), and connections during the period. For perspective, the grid-based connections supported by the Bank Group are estimated to be about 4.4 percent of all connections added during FY2000–2014 by all country clients, and 4.8 percent of all connections added by low-access country clients.

The Bank Group also pioneered off-grid electrification in low- and medium-access countries. The impact has been low with the exception of the good practice Solar Home Systems Program in Bangladesh, which installed and successfully serviced 2 million systems in the past decade and is reportedly adding 80,000 systems per month on a commercially viable and sustainable basis. Notably as well, this program is largely driven by private sector, albeit, enabled by the "light touch" of Government role, especially at the outset, within the framework of a public-private partnership. The good practice Bangladesh program experience is potentially relevant for several countries in Sub-Saharan Africa that are characterized by a fragile environment and dispersed populations, or where the main sector conditions are not yet minimally in place for systematic and fast scale-up by grid expansion. In such instances, and where a country expresses demonstrated commitment and

willingness to engage, the Bank Group's new strategy would need to initially focus on context-specific upstream support consistent with sector readiness; in parallel, it can support a pre-electrification program in commercially viable areas that are proximate to areas where the grid would otherwise represent the least cost solution for electrification, as well as potentially target priority interventions for electrification of health and educational facilities nationwide.

The Bank Group made little progress in improving the financial viability of electricity sectors as a whole for its country clients, despite strong analytical work and lending. The vast majority of development policy operations targeting the financial viability of electricity sectors were directed to high- and universal-access countries, of which about half performed satisfactorily. The relatively fewer investment operations that relied on covenants to stimulate financial discipline in country clients also did not achieve the intended results.

Attention to welfare and gender-related outcomes of electricity access interventions is increasing in World Bank projects and with satisfactory impacts, though much needs to be done for mainstreaming these issues in the project design and monitoring and evaluation (M&E). IFC has made a beginning in addressing these issues.

Best practice country experiences show that the transition from low to high or universal access can be made within two decades. In recent years, Indonesia, Lao PDR, and Vietnam have accomplished this feat. The Bank Group played a key role in this process for Lao PDR and Vietnam, and in the earlier stages of establishing momentum and accelerating new connections in Indonesia's program until access levels reached about 68 percent.

The Bank's approach to the electricity sector in Rwanda and Kenya is demonstrating the usefulness of a sectorwide program of sustained engagement in enabling systematic and fast scale-up. In keeping with international good practice principles, the Bank Group has helped the governments to develop national electricity access rollout plans based on geospatial mapping and using least-cost combinations of coordinated grid and off-grid electrification. The geospatially determined implementation plan in turn anchors the sector level Investment Financing Prospectus for access scale-up and facilitates the syndication of sufficient overall investment financing required for the access program on an ongoing basis. This approach, along with demonstrated government commitment, has led to very significant financing commitments from various development partners. After a long period of stagnation, the grid connected access levels have increased from 6 percent

to 15 percent in Rwanda, and 23 percent to 30 percent in Kenya over the past four years.

Lessons from successful country experience pointing to the principles of success are as follows:

- Planning the rollout of national electricity access needs to be comprehensive and synchronized, integrating grid and off-grid means and bringing development partners together within an organizing architecture of "many partners, one team, and one plan."
- Financial viability of the electricity sector and its agents depends on clear institutional roles and accountability, and may require appropriately targeted subsidies.
- Affordability, equity, and inclusion need to be addressed by targeting the poor and those in remote and inaccessible areas.
- Government vision and its enabling engagement in addressing all of the above issues is the crucial binding factor.

This evaluation holds a mirror to the Bank Group's performance record with improving electricity access during FY2000–2014 to inform its approach to helping countries move toward universal electricity access by 2030. In the large array of Bank Group efforts in this regard, several aspects are not aligned well with the scale and urgency for achieving the universal access goal.

First, continuing to follow a project- and transaction-based approach alone will not be sufficient for achieving SE4All universal access targets by 2030. The Bank Group's own experience with scaling up access shows that timely and efficient achievement of universal access requires a sustained sector-level engagement, with a programmatic framework for syndication of the entire investment financing that can be sustained for at least a decade and possibly longer.

Second, several strengths, and promising trends in the Bank Group's lending experience can be built upon. Among them are IFC's transactional experience and strength in investment financing for building electricity generation capacity projects, and its potential for promoting public-private partnerships. The World Bank's role contributed extensively in T&D in the past 15 years. MIGA built valuable experience in providing critical risk mitigation comfort through its guarantees, particularly in low-access and low-income countries. These strengths and country experiences hold promise for Bank Group cooperation that goes beyond joint projects to strategic engagement, particularly in supporting low-access countries to undertake

systematic national access rollout programs that will achieve the universal access goal within the next 15 years.

Recommendations

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 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 towards universal access in 15 years.

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 sector-wide organizing framework and process for mainstreaming the sustained engagement needed for implementing rapid access scale-up. The scope and timing of the sector-wide 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.

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, 2015–2030. 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, IBRD, IDA, IFC, and MIGA should draw upon their strengths and expertise in generation and in T&D, respectively, and tailor syndication mechanisms, differentiated as appropriate for generation investments financing, and otherwise for transmission and distribution investments.

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, SHS, 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 sector and country level, help country clients to appropriately enhance their M&E 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 M&E frameworks.

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Appendix A
Sustainable Energy for All

The Sustainable Energy for All (SE4All) initiative is a multi-stakeholder partnership among governments, the private sector, and civil society. Launched by the UN secretary-general in September 2011, the initiative is co-chaired by the World Bank. SE4ALL has three objectives, to be achieved by 2030:

- Ensure universal access to modern energy services
- Double the global rate of improvement in energy efficiency
- Double the share of renewable energy in the global energy mix.

The vision underpinning the initiative is that energy enables—from job creation to economic development, from security concerns to women's empowerment. The three objectives are intended to contribute to social and economic development, and though each one is important in its own right, they also reinforce each other in important ways. Greater access to modern energy reduces poverty and improves health and education. Energy efficiency increases energy security for countries without domestic fossil fuel resources, reduces costs, and frees up energy for alternative uses. Investing more in renewables contributes to reducing greenhouse gases emissions and pollution. Achieving the three objectives together should maximize development benefits and help stabilize climate change in the long run.

The SE4All initiative also supports the 2014-2024 Decade of Sustainable Energy for All declared by the UN General Assembly in December 2012.

To chart global progress in the years leading to 2030, the Global Tracking Framework was established, coordinated by the World Bank Energy Sector Management Assistance Program and the IEA in collaboration with experts from 15 organizations, and in public consultation with more than 100 stakeholder groups.

The first Global Tracking Framework Report was released in 2013, and it established a comprehensive baseline of energy data not previously available because of data fragmentation and inconsistency. The Global Tracking Framework provides regular biannual updates on trends in energy access, renewable energy, energy efficiency, and energy consumption.

The SE4All Global Tracking Framework built on available global databases, which only supported binary global tracking of electricity access (households either having electricity access or not). The definition of electricity access adopted to establish the

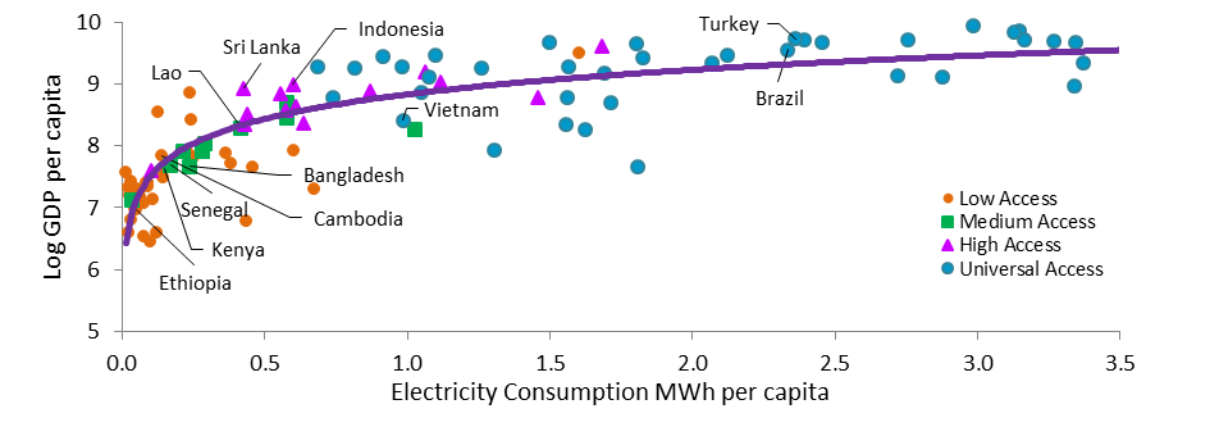
baseline was "availability of an electricity connection at home or the use of electricity as the primary source for lighting." However, the report acknowledges that although the binary approach serves the immediate needs of global tracking, there is growing consensus that "measurements of energy access should be able to reflect a continuum of improvement." For this reason, the first Global Tracking Framework Report established a multi-tier metric—complemented by a multi-tier framework capturing the use of key electricity services—in which the attributes for measuring household access to electricity supply and electricity services are quantity, duration of supply, affordability, quality, and legality.

For more information about the Sustainable Energy for All initiative, see the SE4All website at http://www.se4all.org/

For more information about the Global Tracking Framework, see the SE4All website at http://www.se4all.org/tracking-progress/

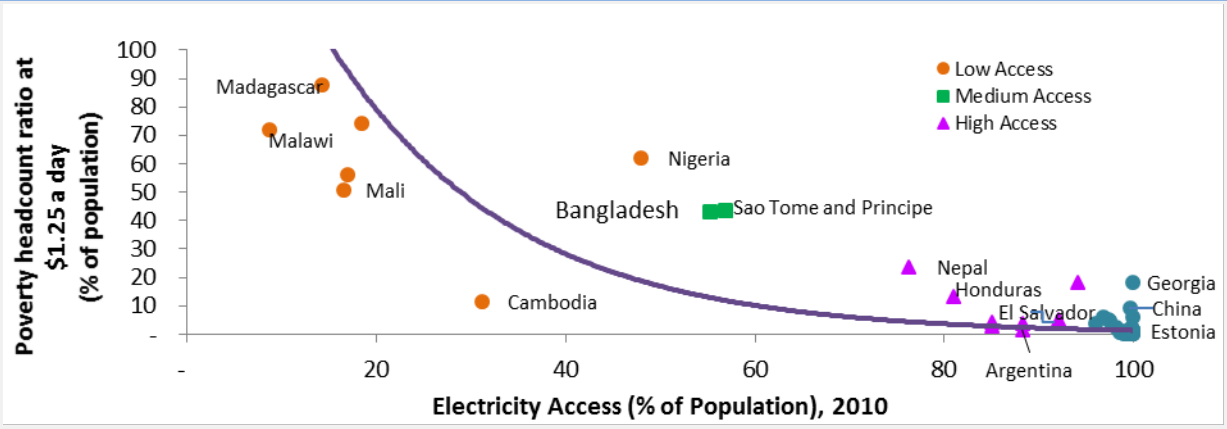
Appendix B
Relationship between Electricity Access and Income, Poverty, and Human Development

Figure B.1. GDP per Capita (PPP, constant 2011 $) is positively associated with Electricity Consumption



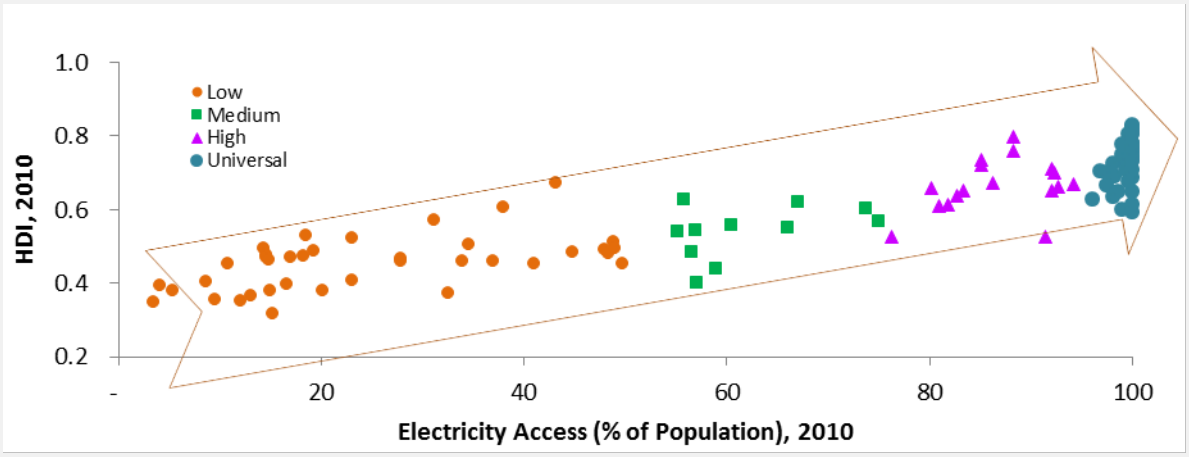
Source: World Bank World Development Indicators; data related to 2010.
Note: GDP = gross domestic product; PPP = purchasing power parity; MWh = megawatt hours.

Figure B.2. Poverty Headcount ratio at $1.25 a day (PPP, constant 2010 $) versus Electricity Access, 2010



Sources: World Bank World Development Indicators; UN 2012.
Note: PPP = purchasing power parity.

Figure B.3. Human Development Index improves with increased Electricity Access



Sources: United Nations Development Programme; UN 2012.

Appendix C
Country Classification by Electricity Access Level

Table C.1. Bank Group Country Clients: Basic Income, Electricity Access, and Sector Data, 2010

Country	Pop. with access (%)	Electricity access category [a]	Pop. without access (m)	FCS	Country income class.[b]	HDI	Electricity Projects approved, FY00–14 ($, m)	WBG commit. For Electricity Sector FY00–14 ($, m)
Republic of South Sudan	**2**	L	10	Yes	LM	n.a.	0	0
Chad	**4**	L	11	Yes	L	0.35	1	37
Liberia	**4**	L	4	Yes	L	0.39	4	221
Burundi	**5**	L	9	Yes	L	0.38	2	223
Central African Republic	**9**	L	4	Yes	L	0.35	1	8
Malawi	**9**	L	14	No	L	0.41	2	90
Niger	**9**	L	14	No	L	0.32	0	0
Rwanda*	**11**	L	10	No	L	0.45	6	350
Sierra Leone	**12**	L	5	Yes	L	0.35	1	90
Burkina Faso	**13**	L	14	No	L	0.37	5	227
Madagascar	**14**	L	18	Yes	L	0.49	4	39
Congo, Dem. Rep.*	**15**	L	53	Yes	L	0.32	3	1,202
Mozambique*	**15**	L	20	No	L	0.38	4	246
Papua New Guinea	**15**	L	6	No	LM	0.48	2	9
Tanzania*	**15**	L	38	No	L	0.46	6	583
Uganda*	**15**	L	29	No	L	0.47	18	1,388
Lesotho	**17**	L	2	No	LM	0.47	1	2
Mali*	**17**	L	12	Yes	L	0.4	7	303
Mauritania	**18**	L	3	No	LM	0.47	2	126
Solomon Islands	**19**	L	0	Yes	LM	0.49	2	19
Zambia*	**19**	L	11	No	LM	0.53	5	234
Guinea	**20**	L	9	No	L	0.38	4	88
Ethiopia*	**23**	L	67	No	L	0.41	8	1,218
Kenya*	**23**	L	32	No	L	0.52	21	1,700
Vanuatu	**24**	L	0	No	LM	0.62	0	0
Korea, Rep.	**26**	L	18	No	L	n.a.	0	0
Benin	**28**	L	7	No	L	0.47	3	131
Togo	**28**	L	5	Yes	L	0.46	1	14
Sudan	**29**	L	25	Yes	LM	0.46	0	0
Equatorial Guinea	**29**	L	0	No	H	0.56	0	0
Seychelles	**29**	L	0	No	UM	0.76	0	0
Somalia	**29**	L	7	Yes	L	n.a.	0	0
Gambia, The	**31**	L	1	No	L	n.a.	0	0
Cambodia*	**31**	L	10	No	L	0.57	2	59
Eritrea	**33**	L	4	Yes	L	0.37	1	68
Haiti	**34**	L	7	Yes	L	0.46	5	130
Angola*	**35**	L	13	No	LM	0.5	1	66
Swaziland	**35**	L	1	No	LM	0.53	0	0

Country	Pop. with access (%)	Electricity access category [a]	Pop. without access (m)	FCS	Country income class.[b]	HDI	Electricity Projects approved, FY00–14 ($, m)	WBG commit. For Electricity Sector FY00–14 ($, m)
Zimbabwe	**37**	L	8	Yes	L	0.46	0	0
Congo, Dem. Rep.	**37**	L	3	No	LM	n.a.	0	0
Timor-Leste*	**38**	L	1	Yes	LM	0.61	1	3
Afghanistan	**41**	L	17	Yes	L	0.45	3	457
Tuvalu	**41**	L	0	Yes	UM	n.a	0	0
Botswana	**43**	L	1	No	UM	0.67	1	368
Namibia	**44**	L	1	No	UM	0.61	0	0
Yemen, Rep.	**45**	L	13	Yes	LM	0.48	5	98
Comoros	**48**	L	0	Yes	L	0.48	1	5
Nigeria*	**48**	L	83	No	LM	0.49	8	1,057
Cameroon*	**49**	L	11	No	LM	0.49	12	694
Myanmar	**49**	L	27	Yes	L	0.51	2	142
Djibouti	**50**	L	0	No	LM	0.45	3	23
Bangladesh*	**55**	M	68	No	L	0.54	12	1,896
American Samoa	**56**	M	0	No	UM	n.a.	0	0
Fiji	**56**	M	0	No	UM	0.72	0	0
Kiribati	**56**	M	0	Yes	LM	0.6	0	0
Marshall Islands	**56**	M	0	Yes	UM	n.a.	0	0
Palau	**56**	M	0	No	UM	0.77	0	0
Micronesia, Fed. Sts.	**56**	M	0	Yes	LM	0.63	1	14
Guinea-Bissau	**57**	M	1	Yes	L	0.4	2	22
São Tomé and Príncipe	**57**	M	0	No	LM	0.54	1	0
Senegal*	**57**	M	6	No	LM	0.48	13	395
Côte d'Ivoire	**59**	M	8	Yes	LM	0.44	6	464
Ghana*	**61**	M	10	No	LM	0.56	8	423
Lao PDR*	**66**	M	2	No	LM	0.55	10	171
Cabo Verde	**67**	M	0	No	LM	0.62	2	52
Bhutan	**72**	M	0	No	LM	0.57	0	0
St. Vincent and the Grenadines	**73**	M	0	No	UM	n.a.	0	0
Nicaragua*	**74**	M	2	No	LM	0.6	6	94
India*	**75**	M	301	No	LM	0.57	85	6,429
Nepal*	**76**	H	6	No	L	0.53	10	331
Guyana	**78**	H	0	No	LM	0.63	0	0
Bolivia	**80**	H	2	No	LM	0.66	5	118
Honduras	**81**	H	1	No	LM	0.61	4	194
Gabon	**82**	H	0	No	UM	0.66	0	0
Guatemala	**82**	H	3	No	LM	0.61	2	81
Philippines*	**83**	H	16	No	LM	0.65	16	775
South Africa*	**83**	H	9	No	UM	0.64	5	3,966
Peru*	**85**	H	4	No	UM	0.72	5	436
Sri Lanka*	**85**	H	3	No	LM	0.74	7	148
Mongolia*	**86**	H	0	No	LM	0.67	6	70
Argentina*	**88**	H	5	No	UM	0.8	-	50
Panama	**88**	H	0	No	UM	0.76	1	45

Country	Pop. with access (%)	Electricity access category [a]	Pop. without access (m)	FCS	Country income class.[b]	HDI	Electricity Projects approved, FY00–14 ($, m)	WBG commit. For Electricity Sector FY00–14 ($, m)
Antigua and Barbuda	**88**	H	0	No	H	0.78	0	0
Aruba	**88**	H	0	No	H	n.a.	0	0
Bahamas, The	**88**	H	0	No	H	n.a.	0	0
Barbados	**88**	H	0	No	H	0.78		
Belize	**88**	H	0	No	UM	0.71	0	0
Cayman Islands	**88**	H	0	No	H	n.a.	0	0
Grenada	**88**	H	0	No	UM	0.75	0	0
St. Kitts and Nevis	**88**	H	0	No	H	n.a.	0	0
St. Lucia	**88**	H	0	No	UM	n.a.	0	0
Pakistan*	**91**	H	15	No	LM	0.53	18	2,899
Dominica	**91**	H	0	No	UM	0.72	0	0
El Salvador	**92**	H	0	No	LM	0.65	1	120
Jamaica*	**92**	H	0	No	UM	0.71	5	225
Tonga*	**92**	H	0	No	LM	0.7	1	5
Syrian Arab Republic	**93**	H	2	Yes	LM	0.66	1	1
Indonesia*	**94**	H	14	No	LM	0.67	14	1,955
Oman	**94**	H	0	No	H	0.78	1	0.07
Vietnam*	**96**	U	3	No	LM	0.63	16	2,881
Colombia	**97**	U	1	No	UM	0.71	6	444
Ecuador	**97**	U	0	No	UM	0.7	3	144
Paraguay	**97**	U	0	No	LM	0.67	1	100
Dominican Republic	**98**	U	0	No	UM	0.69	10	390
Iraq	**98**	U	1	Yes	LM	0.64	2	164
Iran, Islamic Rep.	**98**	U	1	No	UM	n.a.	0	0
Algeria	**99**	U	0	No	UM	0.71	1	18
Brazil*	**99**	U	2	No	UM	0.74	31	2,007
Costa Rica	**99**	U	0	No	UM	0.75	1	100
Jordan	**99**	U	0	No	UM	0.74	4	224
Macedonia, FYR	**99**	U	0	No	UM	n.a.	5	106
Mexico	**99**	U	1	No	UM	0.75	12	1,861
Moldova	**99**	U	0	No	LM	0.65	5	146
Morocco	**99**	U	0	No	LM	0.6	5	479
Trinidad and Tobago	**99**	U	0	No	H	0.76	0	0
Uruguay	**99**	U	0	No	H	0.78	0	0
Malaysia	**99**	U	0	No	UM	0.77	0	0
Albania	**100**	U	0	No	UM	0.71	13	484
Andorra	**100**	U	0	No	H	0.83	0	0
Armenia	**100**	U	0	No	LM	0.72	3	48
Azerbaijan	**100**	U	0	No	UM	0.74	1	48
Belarus	**100**	U	0	No	UM	0.78	4	409
Bosnia and Herzegovina	**100**	U	0	Yes	UM	0.73	4	104
Bulgaria	**100**	U	0	No	UM	0.77	4	385
Chile	**100**	U	0	No	UM	0.81	13	1,254
China	**100**	U	4	No	UM	0.7	35	2,310
Croatia	**100**	U	0	No	H	0.81	4	154

APPENDIX C
COUNTRY CLASSIFICATION BY ACCESS LEVEL

Country	Pop. with access (%)	Electricity access category [a]	Pop. without access (m)	FCS	Country income class.[b]	HDI	Electricity Projects approved, FY00–14 ($, m)	WBG commit. For Electricity Sector FY00–14 ($, m)
Cyprus	**100**	U	0	No	H	0.85	0	0
Czech Republic	**100**	U	0	No	H	0.86	0	0
Egypt, Arabic Rep.	**100**	U	0	No	LM	0.68	8	2,631
Estonia	**100**	U	0	No	H	0.83	0	0
Georgia	**100**	U	0	No	LM	0.73	7	278
Hungary	**100**	U	0	No	H	0.82	1	3
Kazakhstan*	**100**	U	0	No	UM	0.75	7	387
Kosovo	**100**	U	0	Yes	LM	n.a.	7	48
Kyrgyz Republic	**100**	U	0	No	L	0.61	3	65
Latvia	**100**	U	0	No	UM	0.81	1	36
Lebanon	**100**	U	0	No	UM	0.76	3	82
Libya	**100**	U	0	Yes	UM	0.8	0	0
Lithuania	**100**	U	0	No	UM	0.83	2	31
Maldives	**100**	U	0	No	UM	0.69	-	16
Mauritius	**100**	U	0	No	UM	0.75	0	0
Montenegro	**100**	U	0	No	UM	0.78	5	42
Poland	**100**	U	0	No	H	0.83	4	1,170
Romania	**100**	U	0	No	UM	0.78	7	381
Russian Federation	**100**	U	0	No	UM	0.77	2	3
Samoa	**100**	U	0	No	LM	0.69	0	0
Serbia	**100**	U	0	No	UM	0.74	4	75
Slovak Republic	**100**	U	0	No	H	n.a.	0	0
Slovenia	**100**	U	0	No	H	0.87	0	0
Suriname	**100**	U	0	No	UM	0.7	0	0
Tajikistan*	**100**	U	0	No	L	0.6	10	118
Thailand	**100**	U	0	No	UM	0.72	6	56
Tunisia	**100**	U	0	No	UM	0.72	1	55
Turkey*	**100**	U	0	No	UM	0.74	19	6,240
Turkmenistan	**100**	U	0	No	UM	0.69	0	0
Ukraine	**100**	U	0	No	LM	0.73	9	990
Uzbekistan	**100**	U	0	No	LM	0.65	3	385
Venezuela, RB	**100**	U	0	No	UM	0.76	2	105

Sources: Electricity Access: UN 2012; Country Income Classification: World Bank; Human Development Index: UNDP; Generation Capacity: US Department of Energy, EIA: Other Data: World Bank Business Intelligence

Notes: class. = classification; commit. = commitments; FCS = fragile and conflict-affected states; HDI = Human Development Index; m = millions; pop. = population. (*) = case study countries.

a. Country electricity access categories: L = low (≤ 50%); M = medium (50–75%); H = high (75–95%); U = universal (>95%).

b. Income classification: L = low; LM = low-middle; UM = upper-middle; H = high.

Appendix D
Project Performance Assessment Reports

Table D.1. List of IEG Project Performance Assessment Reports for Electricity Sector Projects (2000-2014)

PPAR year	Country	Project ID	Project name
2014	Bangladesh	P071794 P078707 P107797	Rural Electricity Renewable Energy Development Power Sector Development Technical Assistance Power Sector Development Policy Loan
2003	Bosnia and Herzegovina	P044395 P045483	Emergency Electric Power Reconstruction Second Electric Power Reconstruction
2005	Cambodia	P004032	Phnom Penh Power Rehabilitation
2010	China	P046829	Renewable Energy Development
2013	Croatia	P071464 P095389 P079978	Renewable Energy Resources District Heating Energy Efficiency
2010	India	P038334	Rajasthan Power Sector Restructuring
2003	Indonesia	P003910 P003916	Sumatera and Kalimantan Power Suralaya Thermal Power
2008	Lao PDR	P044973	Southern Province Rural Electrification
2004	Mozambique	P001764 P001793	Energy Technical Assistance and Rehabilitation Household Energy Credit
2002	Poland	P008614 P008576 P008568	Katowice Heat Supply and Conservation Heat Supply Restructuring and Conservation Energy Resources Development
2013	Senegal	P105279 P73477	Senegal Energy Sector Recovery Development Policy Financing Electricity Sector Efficiency Enhancement—Phase 1, APL-1
2004	Sri Lanka	P10498 P010386	Energy Services Delivery Power Distribution
2014	Sri Lanka	P076702	Renewable Energy for Rural Economic Development
2008	Uganda	P002929 P069840	Power III Third Power Supplemental
2014	Vietnam	P074688 P045628 P066396	Second Rural Energy Project Transmission, Distribution, and Disaster System Efficiency Improvement, Equitization, and Renewable

Source: World Bank Business Intelligence
Note: APL = Adaptable Program Loan; PPAR = Project Performance Assessment Report.

Appendix E
Methodology

The purpose of this electricity access evaluation study by the Independent Evaluation Group (IEG) is to obtain evidence-based findings, derive lessons of experience, and present an analytical and action agenda aimed at enhancing the Bank Group's effectiveness in meeting its declared commitments in support of achieving universal electricity access. These commitments are embodied in the WBG's Energy Directions Paper (2013e) aligning with those of the Sustainable Energy for All (SE4All). In this context, this study assessed the Bank Group's role in supporting country clients to achieve electricity access through the required physical investments in generation, transmission and distribution, and its instruments such as guarantees, policy advice, and analytical work and technical assistance to support enabling frameworks.

This study assessed what has worked well and what it would take to meet the SE4All goals and deliver on the electricity access agenda within its stated energy directions. First, the study assessed the Bank Group's effectiveness in fully delivering electricity access by going beyond basic connectivity and ensuring that, in an integrated and comprehensive manner, the electricity supply also has the attributes of adequacy, affordability, reliability, and quality. The study also analyzed the underlying drivers of successful performance and the extent to which consensus still needs to be built among many country governments as to what universal access means and requires. Second, since one size does not fit all, and electricity access development is highly complex, the study assessed the Bank Group's role in strengthening institutions and bolstering country-specific efforts to deliver access more effectively. The study evaluated the Bank Group's results in supporting the development of the national capacity to deliver electricity access with the required attributes. Third, since public resources are inadequate to meet the scale of access demand, the study assessed the Bank Group's role and effectiveness in leveraging the large amounts of private capital that need to be harnessed, and in helping to set the right regulatory and fiscal conditions for investors to come in, while ensuring the financial sustainability of the electricity sector, particularly the off-taker. Fourth, the study addressed the importance of having strong national commitment, for which the countries must be in the driver's seat.

The study brought out an analytical agenda to help the Bank Group while maintaining its selectivity, to focus more directly on the accelerated speed and scale necessary to meet SE4All goals. The study focused on the need to mobilize the private sector and the global development community toward delivering electricity access at much higher levels and faster rates than in the past. The study highlighted the work remaining to strengthen

capacity for rolling out programs that are country-specific in their goals and design, particularly for off-grid interventions. The study also assessed the issues and opportunities for achieving financial viability and sustainability at the utility and sector levels.

Achieving the desired speed and scale while enhancing selectivity would require more effective leveraging of synergies within the Bank Group. Consequently, the study was designed to take into account the clustering of Bank Group country clients into distinct groups of low, medium, high, and near-universal electricity access—each of which has specific underlying factors and lessons that explain their relative success or failure in access delivery. This knowledge proved important in determining where the Bank, IFC, and MIGA can best leverage their individual comparative advantages—or where they can work jointly—to achieve greater synergies and higher value added for clients.

In summary, the study derived findings and lessons to inform the Bank Group as it continues to engage in electricity access delivery and address the challenges of achieving effectiveness and efficiency, and the challenges of mobilizing the required capital and forging collaboration within the Bank Group itself. The study was conducted with a view to providing insights on how the Bank Group can build on its key areas of comparative advantage and thereby improve the synergy toward operating as One Bank.

Table E.1. Electricity Access in Previous IEG Studies Informing the Current Study

Previous IEG studies	Aspects already covered related to electricity access
Power for Development (2003)	• Portfolio review of Bank Group private sector development projects, focused on performance ratings • Assessment of monitoring and evaluation capacity, particularly with respect to targeting the poor
New and Renewable Energy (2006)	• Project-level performance of Bank renewable energy projects • Prospects for program scale-up
Welfare Impact of Rural Electrification (2008)	• Portfolio review of Rural Electrification Projects • Strength of evidence on welfare impacts of rural electrification
Climate Change Phase I (2008)	• Global environmental impacts of energy use • Review of Energy Policies supporting Renewable Energy Development
Climate Change Phase II (2010)	• Review of energy efficiency portfolio • Role of energy efficiency in improving access

Source: IEG

As seen in table E.1, much has already been covered by previous IEG studies that had aspects related to electricity access. This study avoids repetition and builds upon those prior analyses and their corresponding findings and lessons. For example, regarding the critical role of the private sector, this study takes project-level performance ratings into

account but places much stronger emphasis on analyzing the relative effectiveness of the Bank, IFC, and MIGA in low, medium, high, and universal-access countries; it also emphasizes analysis of their potentially synergistic strengths in leveraging much-needed private capital for delivering energy access. Similarly, this study goes beyond assessing the scope for scaling up the Bank's new and renewable energy interventions toward more comprehensive analysis of the role of off-grid solutions within electricity access rollout programs.

The evaluation study's primary audiences are the Bank Group Boards of Directors, management, and staff involved in electricity access operations; concerned civil society organizations, client governments, and beneficiaries of electricity access; and the Bank Group's partners in the bilateral donor and multilateral development bank community, especially those engaged in SE4All.

Main Evaluation Question, Approach, and Scope

The study addressed this overarching question: To what extent has the Bank Group been effective in the past and, going forward, how well is it equipped to put its country clients on track to achieve universal access to electricity that is adequate, affordable, and of the required quality and reliability?

COUNTRY-FOCUSED EVALUATIVE ANALYSIS AND OTHER INSTRUMENTS

The study mainly adopted a country-focused evaluative approach, which develops an integrated assessment of the electricity access effort using the country as the unit of inquiry. The analysis started with a holistic look at the electricity access effort in the country context. This country-focused evaluative analysis drew upon several evaluative instruments: project portfolio review, literature review, country strategy review, field-based inputs, a systematic review of impact evaluations, interviews with staff, government, and beneficiaries, and thematic notes. Evidence was triangulated across the various sources of information.

Thirty-five countries were chosen for in-depth country-focused analyses—including several field-based review—based on the importance of access issues, population without electricity access, potential lessons from successful and less successful national access programs, and Bank Group–wide involvement. The electricity access experiences of some countries that are not World Bank clients were also examined to draw lessons.

PROJECT PERFORMANCE ASSESSMENT REPORTS

To support learning lessons, the IEG study first assessed both quantitative and qualitative results data at the level of individual projects, investments, or guarantee operations. A

further step was to carryout in-depth Project Performance Assessment Reports (PPARs) for a sub-sample of countries and projects selected to represent major categories (Appendix D). To supplement this assessment at the project and country levels, the study also conducted in-depth analyses of important themes that emerge as drivers of performance for successful delivery of electricity access.

PERIOD OF THE STUDY

The study covered all projects, investments, guarantees, and non-lending technical assistance and advisory services supporting electricity access, and approved during the 15-year period from FY2000 to FY2014. The emphasis was on closed and mature projects and investments and other activities, and countries that received significant Bank Group support and offer potential for learning lessons. When this period started, the Bank Group had broadened its strategy from addressing mainly rural electrification toward scaling up electricity access nationwide, and supporting the energy infrastructure at its center. The 15-year period also allows for five-year period comparisons.

DEVELOPMENT OUTCOMES

This evaluation analyzed the development outcomes for electricity sector projects that closed (IBRD and IDA) or have reached early operating maturity (IFC and MIGA) with evaluations completed during FY2000–2014. These performance measures are based on the respective evaluation methodologies of the World Bank, IFC, and MIGA (Table E.2).

Table E.2 Summary Comparisons of the Bank Group's Project Evaluation Methodologies

IEG evaluation system	World Bank	IFC Investments	MIGA
Rating of overall development outcome	Objective based	Quantitative and qualitative benchmarks	Quantitative and qualitative benchmarks
Outcome Rating scale	6-point scale	6-point scale	4-point scale
Project financial viability and performance	Yes	Yes, for both the project and IFC	Yes, for project only
Separate assessment of institution's performance	Yes	Yes	Yes
E&S compliance and effects prominent as a separate dimension	No	Yes, can downgrade overall development outcome rating	Yes, can downgrade development outcome rating
M&E assessment	Yes, since 2006, based on design, utilization, and dissemination	Yes at project level only	Yes at project level only
Separate assessment of borrower's/sponsor's performance	Yes, borrower, co-financiers, and other partners contribute to projects' completion reports	Yes, especially project company financial performance, compliance to IFC covenants and E&S requirements	Yes, especially project company financial performance, compliance to guarantee contract and E&S requirements.
Public disclosure of IEG project assessment	Yes	No, because of confidentiality of client information	No, because of confidentiality of client information

Sources: IFC Expanded Supervision Reports Guidelines; MIGA Guidelines for Preparing Project Evaluation Report.
Note: E&S = environmental and social effects and compliance; M&E = monitoring and evaluation.

APPENDIX E
METHODOLOGY

PROCEDURE FOLLOWED FOR RATING KEY PERFORMANCE INDICATORS

Criteria for Classifying Key Performance Indicators

The study looked at all key performance indicators (KPIs) reported in the implementation completions reports (ICRs) for closed projects during FY2000-2014. The analysis classified KPIs according to access dimensions presented below. Such categorization informed the study on the Bank's portfolio performance *vis-à-vis* the SE4all agenda.

- **Access**: Number of customers, households, and public centers connected by grid or off-grid measures
- **Adequacy**: Provide, expand, increase, or upgrade generation capacity; alleviate power shortages
- **Reliability/quality**: Decrease system technical losses and voltage fluctuations
- **Affordability**: Improvements in electricity affordability, especially for the poor, addressing tariffs, connections costs, consumer and lifeline subsidies, cash transfers, etc.
- **Financial viability**: Improvements in system financial management, cost-reflective tariffs, decrease in nontechnical losses, improvements in bill collection rates, metering, and corporate governance
- **Welfare**: Income generation, gender equity, health, education, telecommunication, and safety measures and improvements associated with increased access to electricity.

Rating Key Performance Indicators

Ratings of key performance indicators were assigned according to the following scale:

4 = target overachieved
3 = target achieved by 50 percent or more
2 = target achieved by 25–50 percent
1= target achieved by 0–25 percent.

Ratings were assigned when a baseline, a target, and an achieved target were available, or at least a target and the achieved value. Revised targets were used where applicable.

GENERATION CAPACITY IN COUNTRY CLIENTS

For the World Bank, data from key performance indicators for additions in generation capacity in IBRD and IDA core projects closed during FY2000–2014 were considered, including either added or rehabilitated capacity (MW). IEG notes that the key performance indicators reported in WB implementation completion reports sometimes include generation numbers that can only partly be attributed to direct support by the Bank. The physical achievements supported by the Bank Group (based on the results reported at

completion in project documents) for projects that closed during FY2000- 2014 are reported in Table E.3.

The portfolio review covered: (a) IFC investments and advisory services projects with commitments during the FY2000-FY2014 period; and (b) MIGA guarantee projects issued during the same period. IEG also reviewed evaluative evidence from project-level evaluations of IFC investments, advisory services and MIGA guarantee projects completed in the FY2000-FY2014 period.

Table E.3 Installed capacity from projects supported by the World Bank Group (FY2000-2014) in country clients, by electricity access category (MW)

Institution	Low	Medium	High	Universal	WBG Installed capacity
IFC investment services	2,830	7,367	2,744	9,529	22,470
MIGA	900	1,774	210	4,594	7,478
WB	3,340	2,957	4,454	19,509	30,260
WBG Installed Capacity	7,071	12,098	7,408	33,632	60,208

Source: ICRs for the World Bank projects; for IFC and MIGA, IEG evaluations

The percentage contribution of the World Bank Group's MW addition considered total installed capacity of country clients as per EIA data during the period 2000-2014 (excluding China).

ELECTRICITY ACCESS FIGURES IN COUNTRY CLIENTS

To assess the Bank's contribution in providing access to electricity in client countries, data on KPIs for closed projects during FY2000-2014 were collected from ICRs. Indicators include grid based households (HH) connections, as well as off-grid connections via Solar Home Systems (SHSs), Solar PV and mini grid solutions. IEG notes that the KPIs reported in WB implementation completion reports sometimes include connections numbers that can only partly be attributed to direct support by the Bank.

Table E.4 World Bank connections in client countries, by electricity access category (millions)

Electricity access category	Customer/HH connections	HH connected via SHS/Solar PV	Connections to public and community institutions and centers	HH connected via mini grid	Sum of grid or off grid connections (HH)*
Low	1,374,075	21,100	2,508	78,187	1,461,269
Medium	1,291,481	1,256,455		5,111	2,548,139
High	1,568,630	258,171	8,234	30,219	1,733,125
Universal	4,516,000	626,741		460	5,143,201

Grand Total	8,750,186	2,162,467	10,742	113,977	10,885,734

Source: ICRs. *HH connections + solar + mini grid connections when the main indicator on connections already included either/or SHS or solar PV or mini grid connections, to avoid double counting.
Note: HH = households; SHS = solar home systems; Solar PV = solar photovoltaic. Two projects, for Pakistan and Indonesia respectively, were excluded from the count since the connections were achieved prior to 2000 as indicated in their ICRs

PROJECTIONS FOR 2030 AT CURRENT PACE

The source used for population projections figures for 2030 is the UN Department of Economic and Social Affairs- Population Division. As regards electricity access, IEG projections assume that new connections are added at the average annual rate achieved during 2000–2010. Assuming five people per household, figures on the percentage of population connected were derived, compared with the SE4all access data.

LIMITATIONS

The study covered non-energy sector World Bank projects, or projects that are primarily mapped to sectors other than the energy sector only to the extent that any of their objectives or components are directly or substantially relevant to delivering or improving electricity access. IFC and MIGA projects covered by this study include only those that categorized "Electric Power" and "Power" sub-sectors, respectively. Some Bank Group activities may not be intended to have a systemic impact on electricity access at the sector or country level. When such cases arose, the study recognized the specific objectives of those operations and assessed the direct project-level results and the indirect spillover effects. In some projects, this involved demonstration effects or increased competitiveness in productive sectors served by greater electricity access. As expected, the availability and quality of data for the various attributes of access varied widely across countries.

Appendix F
Interview Templates

Electricity Access Evaluation: Template for World Bank Task Team Leader Interview

1. Are you aware of ongoing evaluation by IEG of World Bank Group support for electricity access?
2. Have you seen/reviewed the Approach Paper? (hand over a copy)
3. Did (or Do) any project(s) measure welfare outcomes? List the projects.
4. How measured? (Key Performance Indicators, surveys, etc.)
5. If any impact evaluation carried out, what were the main findings?
6. Is the utility profit/loss making? For how long?
7. Are there fiscal issues due to sector financial losses?
8. How has World Bank addressed the financial viability and fiscal issues in the sector, and what have been the results? (DPLs, other?)
9. What knowledge products (AAA, ESW, etc.) were used, and how applied (e.g., specific country focus, regional focus, etc.)
10. Can you give a specific example of an influential AAA/ESW/etc.?
11. Is the sector structure aligned with country needs? (e.g., unbundling, regulatory agency, etc.)
12. How was the World Bank involved in the above aspects? (lending, nonlending, etc.)
13. How effective are mechanisms, if any, for supporting the poor to get access to electricity? (e.g., subsidies for connection, consumption, etc.)
14. How effective has been the World Bank involvement, if any?
15. What are some issues, if any, in measuring and reporting access in the country?
16. How are access outcomes of World Bank projects being measured?
17. What role did the World Bank Group play in mobilizing financing from other sources, including private sector, in the country?
18. How did the World Bank Group utilize global/regional partnerships for knowledge and capacity development of the country for access development?
19. What World Bank Group internal factors (e.g., policies, processes, etc.) or external factors (e.g., political economy, global events, etc.) influenced the outcomes and current status of sector/projects in the country—both positively and negatively?
20. What is the potential for private sector in the country?
21. How do you see the World Bank Group playing a role to support private sector in the country?
22. Are there joint projects with IFC/MIGA? What do they achieve that separate projects don't?
23. How did they come about? Who leads the project design and why?
24. Do collaboration issues complicate/delay World Bank Group responsiveness to clients?
25. How do clients see joint projects?

26. If there is one thing you want to highlight about electricity access in this country, what would that be?

Electricity Access Evaluation: Template for IFC/MIGA Task Team Leader Interview

1. Have you heard about SE4All?
2. What do you think SE4All means?
3. What comes to your mind when you hear the words "universal access?" How do you define access?
4. To what extent has electricity access development been a consideration in IFC/MIGA power projects you work in? What about:
    a. Adequacy
    b. Reliability
    c. Affordability
    d. Service Quality
5. Which of the above is most critical in the country(ies) you work in?
6. Based on your experience, do you have any suggestions on how to best use of IFC and MIGA instruments to achieve universal electricity access in the country(ies) you cover? Please cite specific examples.
7. To what extent do you think IFC IS/MIGA guarantees/IFC AS power sector projects/programs in the country(ies) you cover:
    a. Have been timely?
    b. Have sufficiently addressed key private sector constraints? If not addressed sufficiently, please explain. Please specify the key PS constraints you have encountered.
    c. Have achieved their intended results? If not, why?
8. Any suggestions on how to improve IFC/MIGA projects/programs effectiveness?
9. How are the Key Performance Indicators (KPIs)/core or Corporate Scorecard indicators and targets selected in the Board report?
10. Who is responsible for collecting data on these indicators? Are IFC/MIGA clients aware of KPIs/CS indicators? Are these indicators part of contractual obligations?
11. To what extent do you collect indicators on project beneficiaries? Welfare outcomes?
12. What has been your challenge in collecting data on these indicators? How much of your time is spent gathering/reporting on these indicators? How much of the project budget is spent on tracking KPIs/Corporate Scorecard indicators at the project level?
13. What development indicators matter most for your private sector clients? Any suggestions on convincing clients track IFC/MIGA Corporate Scorecard indicators?
14. Any suggestions on how best to track and report on project performance indicators of IFC/MIGA projects?
15. What has been the biggest impact of private investment in the power sector in the country(ies) you are working in? How did this happen?
16. How can IFC/MIGA expand potential for private sector investment in the country?

17. From your experience, how has the private investors' risk appetite evolved? What kind of innovations in risk mitigation has been developed in the country? Cite specific examples.
18. Can you attribute (a) to IFC/MIGA/World Bank Group involvement? What role did the government play? Other donors/DFIs?
19. What are IFC/MIGA/World Bank Group's comparative advantage vis-à-vis other DFIs in mobilizing PS investments? How do you coordinate with other financiers?
20. What is the biggest contribution of IFC's TA/AS projects in the country(ies)' electricity access development? What innovations/cutting-edge knowledge has been developed as a result?
21. Have these TA/AS projects adequately addressed key private sector and/or government capacity constraints? Are there missed opportunities? Please cite specific examples.
22. From your perspective, has overall quality of the power sector transaction(s), especially PPPs, in the country(ies) improved because of IFC AS support? (Note: Ask if applicable.)
23. Have been coordinated with support for PSD by other units of the World Bank Group (e.g., AAA, ESMAP, GPOBA, etc.)
24. What IFC/MIGA/World Bank Group *internal* factors or *external* factors influenced the outcomes and current status of sector/projects in the country—both positively and negatively?
25. What does World Bank Group Synergy or Collaboration mean to you? Based on your experience, when/where/how does it work and not work? Please cite a specific example.
26. Have you worked on a joint World Bank Group project? How did they come about? How long did it take you to reach financial closure/commitment? Who led the project design and why?
27. What has been the division of work between IFC, MIGA, or World Bank in joint projects? Any efficiency gains from joint projects/collaboration? Any conflict of interest issues that were raised?
28. Are there special conditions for undertaking joint World Bank Group project? Are there advantages/disadvantages in undertaking joint World Bank Group projects versus separate projects?
29. To what extent has IFC/MIGA staff been recognized, given incentives, provided adequate resources to undertake joint or collaborate over projects?
30. How do clients see joint projects? What difference has it made to their investments?
31. Are there ways to balance affordability, provision of electricity to the poor, sector viability, and fiscal sustainability?
32. What is the role of the private sector in terms of connecting the poor or the "bottom of the pyramid?"
33. How can electricity services to the poor be made bankable for the private sector?
34. How can/has IFC/MIGA help/helped address this balancing act?

35. If there is one thing you would highlight about PS role in electricity access development in this country, what would it be?

Any open topics, including project specific-topics, for TTL to offer comments or suggestions.

Appendix G
Off-Grid Support in Electricity Sector Projects

12Table G.1. World Bank Off-Grid Portfolio, Approved and Closed Projects, FY2000–2014

Country	Electricity access level	Project name	Approval FY	Lending commitment for electricity sector[a] ($, m)	Off- grid lending[b] ($ m)
Argentina	H	Renewable Energy in the Rural Market	1999	86	85
Bangladesh	M	Rural Electrification Renewable Energy Development	2002	501	243
Bangladesh	M	Rural Electrification and Renewable Energy Development II	2013	233	206
Bolivia	H	Decentralized Infrastructure for Rural Transformation	2003	13	10
Bolivia	H	Access and Renewable Energy	2014	50	13
Burkina Faso	L	Energy Access SIL	2008	39	13
Burkina Faso	L	Electricity Sector Support	2014	85	26
Cambodia	L	Rural Electrification and Transmission	2004	46	6
China	U	Renewable Energy Development	1999	135	30
Ethiopia	L	Energy Access SIL	2003	297	57
Ethiopia	L	Electricity Access Rural II SIL	2008	130	21
Ethiopia	L	Electricity Network Reinforcement and Expansion	2012	200	40
Ghana	M	Energy Development and Access SIL	2008	165	8
Guinea	L	Decentralized Rural Electrification	2003	5	6
Honduras	H	Rural Infrastructure	2006	22	9
India	M	Renewable Resources	1993	216	16
Indonesia	H	Solar Home Systems (GEF)	1997	24	5
Indonesia	H	Solar Home Systems	1997	20	2
Kenya	L	Agriculture Productivity and Agribusiness	2009	4	0.3
Lao PDR	M	Southern Province Rural Electrification	1998	35	1
Lao PDR	M	Rural Electrification Phase I	2006	14	2
Lao PDR	M	Rural Electrification Phase II	2010	22	4
Liberia	L	Electricity System Enhancement	2011	31	1
Mali	L	Household Energy and Universal Access	2004	74	52
Mali	L	Rural Electrification Hybrid System	2014	25	22

Country	Electricity access level	Project name	Approval FY	Lending commitment for electricity sector[a] ($, m)	Off- grid lending[b] ($ m)
Mexico	U	Alternative Energy (GEF)	2000	8	9
Mexico	U	Integrated Energy Services	2008	23	13
Mongolia	H	Renewable Energy for Rural Access	2007	7	6
Mozambique	L	Energy Reform and Access APL-1	2004	39	7
Mozambique	L	Energy Development and Access APL-2	2010	80	18
Nepal	H	Power Development	2003	160	6
Nepal	H	Kabeli Transmission	2011	38	1
Nicaragua	M	Off-Grid Rural Electrification	2003	14	11
Nigeria	L	Natural Energy Development SIL	2006	173	7
Pacific Islands	L/H/U	Sustainable Energy Finance (GEF)	2007	9	8
Papua New Guinea	L	Teacher's Solar Lighting	2006	1	0.2
Peru	H	Rural Electrification	2006	59	9
Philippines	H	Rural Power	2004	59	11
Rwanda	L	Sustainable Energy Development (GEF)	2010	5	0.4
Sri Lanka	H	Energy Service Delivery	1997	30	7
Sri Lanka	H	Renewable Energy for Rural Economic Development	2002	123	38
Tanzania	L	Energy Development and Access Expansion	2008	164	23
Uganda	L	Energy for Rural Transformation	2002	47	5
Uganda	L	Energy for Rural Transformation APL-2	2009	89	10
Vietnam	U	System Energy, Equitization, and Renewables	2002	256	12
Yemen, Rep.	L	Rural Energy Access Project	2009	25	4
Zambia	L	Increased Access to Electricity Services SIL	2008	57	13
Total		47 projects		3,937	1,097

Source: Derived from PADs, PDs, ICRs, ICRRs and other World Bank reports.
Notes: Country electricity access categories: L = low (≤ 50%); M = medium (50–75%); H = high (75–95%); U = universal (>95%).
APL = Adaptable Program Loan; FY = fiscal year; GEF = Global Environment Facility; ICR = Implementation Completion Report; ICRR = Implementation Completion Report Review; m = millions; PAD = Project Appraisal Document; PD = project document; SIL = Specific Investment Loan.
a. World Bank commitment for the electricity components of the projects, including related additional financing and linked GEF grants.
b. The amount attributable to the off-grid component within a larger electricity project. For closed projects, the figures are derived from ICRs and ICRRs. For active projects, the figures are derived from PADs and PDs.

Appendix H
Bank Group Coverage of Electricity Access Dimension in CAS/CPS

Table H.1. Bank Group Coverage of Electricity Access Dimensions in CASs/CPSs for FY2000-2014 (Significant Occurrences of Issues/Strategies)

Country	No. of CPSs covering FY2000-2014	Adequacy		Reliability and quality		Enabling sector framework/ progress in sector reform		National commitment		Private sector participation		Renewables		Sector finances		Subsidies for the poor		Targeting of rural areas for electrification		Welfare outcomes		Off-grid electrification	
		Issues	Strategy	Issues	Strategy	Issues	Strategy	Issues	Strategy	Issues	Strategy	Issues	Strategy	Issues	Strategy	Issues	Strategy	Issues	Strategy	Issues	Strategy	Issues	Strategy
Angola	4	1	1	0	0	4	3	1	0	1	4	1	0	2	1	1	0	2	1	1	0	1	0
Argentina	5	1	1	2	2	5	4	0	0	4	2	1	3	4	0	2	0	4	3	0	0	1	0
Bangladesh	4	1	1	2	2	5	5	1	1	4	3	0	1	5	1	1		2	2	3	2	0	2
Brazil	4	1	1	1	1	4	4	1	0	4	4	3	4	2	1	0	0	3	4	1	0	1	0
Cambodia	5	2	2	3	2	3	4	0	0	2	3	0	1	1	2		1	2	2	0	0	0	0
Cameroon	4	1	1	2	2	3	3	0	0	2	1	1	1	1	1	0	0	1	1	1	0	0	1
Congo, Dem. Rep.	2	2	2	2	2	1	1	1	0	0	1	1	1	1	0	0	0	1	1	0	0	1	0
Ethiopia	4	1	1	1	1	4	4	1	0	2	3	3	4	2	1	0	0	3	4	2	1	1	1
Ghana	4	1	1	1	1	5	4	1	0	3	3	3	1	5	4	1	1	5	3	1	1	1	1
India	7	2	2	2	2	4	4	1	1	4	4	2	4	4	4	1	3	3	3	2	2	1	1
Indonesia	5	0	0	1	1	3	4	0	0	4	5	2	5	4	5	3	3	2	4	1	1	1	0
Jamaica	3	0	0	0	0	3	2	1	0	1	2	0	1	2	1	0	1	0	0	1	0	1	0
Kazakhstan	4	0	0	1	1	3	4	3	1	2	2	1	2	2	2	0	0	0	1	0	0	0	0
Kenya	3	2	2	1	1	3	3	1	0	4	2	2	2	1	1	0	0	3	2	2	0	1	0
Lao PDR	5	3	3	1	1	3	3	2	0	3	1	3	3	2	3	1	0	2	3	1	0	1	1
Mali	4	4	4	1	1	5	4	0	0	4	3	2	2	4	2	2	0	3	3	2	0	2	0

APPENDIX H
COVERAGE OF ELECTRICITY ACCESS ISSUES AND STRATEGIES IN CAS/CPS

Country	No. of CPSs covering FY2000-2014	Adequacy		Reliability and quality		Enabling sector framework/ progress in sector reform		National commitment		Private sector participation		Renewables		Sector finances		Subsidies for the poor		Targeting of rural areas for electrification		Welfare outcomes		Off-grid electrification	
		Issues	Strategy	Issues	Strategy	Issues	Strategy	Issues	Strategy	Issues	Strategy	Issues	Strategy	Issues	Strategy	Issues	Strategy	Issues	Strategy	Issues	Strategy	Issues	Strategy
Mongolia	4	0	0	1	2	4	4	0	0	3	1	2	2	3	2	1	1	2	3	1	2	0	1
Mozambique	5	2	2	2	2	6	5	0	0	4	2	3	2	1	2	0	0	5	4	1	1	1	0
Nepal	2	1	1	0	0	1	2	0	0	1	2	1	1	0	1	0	1	1	2	0	0	0	2
Nicaragua	5	1	1	1	1	4	3	1	0	3	3	2	4	3	2	2	0	3	2	0	0	2	1
Nigeria	5	3	3	2	2	5	4	1	0	3	3	1	0	1	1	0	0	3	2	1	1	1	0
Pakistan	5	2	2	2	2	8	7	2	0	5	5	1	4	6	5	3	2	3	1	1	0	1	0
Peru	4	1	1	1	1	4	4	1	0	4	4	2	4	1	0	1	0	4	3	1	0	1	0
Philippines	4	0	0	1	1	4	4	2	0	4	4	1	4	3	4	0	1	3	4	0	0	2	1
Rwanda	3	1	1	1	2	3	3	0	0	3	2	1	1	3	1	1	1	4	3	1	0	0	0
Senegal	4	1	1	1	1	5	4	1	0	5	5	2	1	4	3	1	1	4	4	3	1	0	0
South Africa	2	1	1	1	1	1	1	0	0	1	0	2	2	0	0	0	0	2	0	0	0	0	0
Sri Lanka	6	0	0	0	0	2	3	0	0	5	2	2	2	4	2	2	0	4	2	2	2	0	1
Tajikistan	5	2	3	3	3	2	5	1	0	1	2	1	1	2	4	0	1	1	1	0	0	0	0
Tanzania	3	3	3	3	3	3	3	0	0	3	2	2	2	2	1	1	0	3	2	1	0	2	0
Tonga	2	0	0	1	1	1	1	0	0	1	1	0	1	1		1	0	1	0	1	0	0	0
Turkey	4	1	1	1	1	6	4	2	0	4	4	3	4	3	3	0	0	0	0	0	0	0	0
Uganda	4	4	3	3	2	4	3	1	0	2	4	2	2	2	1	0	0	4	4	0	0	0	2
Vietnam	4	1	1	3	3	5	4	0	0	4	4	3	4	3	3	1	0	4	4	0	0	1	0
Zambia	4	3	2	2	2	4	3	1	0	2	2	0	1	4	3	00	0	2	2	0	0	2	0
Total	142	49	48	50	50	130	123	27	3	102	95	56	77	88	67	26	17	89	80	31	14	26	15

Source: WB CAS/CPS documents

Appendix I
Global Programs' Contribution to Knowledge on Electricity Access

This appendix is a summary of an Independent Evaluation Group (IEG) learning product on global programs for electricity access covering the Energy Sector Management Assistance Program (ESMAP), Asia Sustainable and Alternative Energy (ASTAE), and the activities of the Global Partnership on Output-based Aid (GPOBA) and the Lighting Africa program.

The question posed by this learning product is: To what extent have the four programs contributed to knowledge on energy access? A common mandate for the creation, dissemination, and application of knowledge was expected to be a key added value of the four programs. Given this, the learning product reviewed in depth a sample including 13 reports published from 2009–2014 that cover issues related to electricity access.. The sample was purposely selected to include substantive publications from all four programs and cover a wide range of energy access issues at the global or regional level, along with a few publications that focused on field study countries of IEG's *Evaluation of the World Bank Group's Support for Electricity Access*.

The quality and relevance of the selected reports was assessed based on the following criteria (IEG 2007):

- Contribution to new knowledge that is not available from other sources (subsidiarity principle)
- Good use of the World Bank Group's comparative advantage (objectivity and global perspective)
- Readability
- Fitness for purpose.

Contribution to new knowledge that is not available from other sources

IEG's review found that 13 of the 20 sample reports made a significant contribution to the global body of knowledge on energy access. They generated new data, information, and analyses that are useful to inform policy, program, and project decisions for the promotion of universal access to energy. The contribution was modest in five publications and minor in two cases.

The greatest contributions to new knowledge tended to be made by reports that combined sound conceptual analysis with documentation of field-based evidence from surveys,

piloting, and experimentation. Precise and objective recording and interpretation of results from the ground offer the greatest contributions.

An excellent example is provided by a tightly focused ESMAP-funded paper on the issues associated with the estimation of electricity demand curves (World Bank 2011a). The paper presents a brief overview of the underlying theory and demonstrates its application with an econometric analysis using the database from a 3,000-household energy survey in the Republic of Yemen. The results are compared with those of similar studies in other countries and show the importance of basing electricity benefit estimates on survey data instead of the commonly employed shortcuts. Similarly, an ESMAP-supported evaluation of the impacts of a rural electrification project in Vietnam based on a representative survey of 1,200 beneficiaries in seven provinces solidly established that the benefits exceeded its costs (Khandker and others 2009). The statistical robustness with which this conclusion is supported makes it particularly valuable for future decisions on grid-based rural electrification in Vietnam and other countries with similar socioeconomic conditions.

Without ground truthing, even conceptual rigor can lead to inaccurate conclusions. For example, a GPOBA paper makes a tightly argued, theoretically sound case for the effectiveness and efficiency of results-based financing as an instrument for leveraging private investors to focus the delivery of energy services on the poor.[1] But the case is mainly based on logical reasoning with illustrative examples from a few World Bank projects. One of these involved the subsidization of solar home systems (SHS) in Bangladesh, which the paper asserts are "typically purchased by poorer consumers" since "by definition…off-grid consumers are low-income." The evidence from the follow-up impact evaluation, however, did not support this conclusion. The survey-based impact evaluation found that about one-third of the households, at most, purchased the system, and they tended to be the higher-income households in the villages where SHS had been offered—which themselves tended to be the more prosperous of the off-grid villages in the country (Asaduzzaman and others 2013).

Use of World Bank Group's comparative advantage

To what extent did the publications reflect sound analysis based on international good practice and unquestioned objectivity? The results are mixed. Just over half (11 of 20) of the reports provided an objective analysis of the issues based on international best practice, and the remainder did not fully meet this standard. The best reports take full advantage of the World Bank Group's ability to offer impartial analyses with a global perspective.

A good example is an ESMAP report on integrating gender into energy operations. The report consolidates available information into a step-by-step approach, each step supported with illustrations from the global experience and reference to additional online resources

(World Bank 2013). ESMAP and GPOBA also funded a comprehensive overview and analysis of the financial and technical issues associated with electricity connection charges—solidly grounded on data collected from every utility in Africa—which concluded with practical, actionable strategies for lowering these costs and enhancing their affordability by the poor (Golumbeanu and Barnes 2013).

In reports that fall short of the desired standard, the most common flaw is the lack of a sound analytical framework for deriving conclusions from facts and analysis. This can lead to important issues being left unaddressed in the concluding recommendations. For example, an ESMAP-supported review of World Bank's investments in modernizing energy services discusses the "inordinate effort" required to access grant funds for technical assistance needed in preparing energy access projects, but offers no insight on how to address this issue (Barnes, Singh, and Shi 2010).

A second common flaw is the omission of key aspects or information that should be essential for a balanced discussion of the issues. For example, an ASTAE-supported regional flagship report on how to achieve universal energy access in East Asia and the Pacific region by 2030 carefully considers the economic, financial, and institutional factors, and leads up to long-term investment scenarios for seven countries (World Bank 2011b). Surprisingly, the recommended scenarios take account of only capital costs and omit estimates of the required operational subsidies, even though they would be expected to be of a similar magnitude.

The credibility of some reports is undermined by an insufficiently sober and objective tone. For example, a diagnostic market assessment that underpins Lighting Africa strategy applies a bullish, excessively confident tone by using "will" instead of "may" about its findings ("…cost reductions *will* translate into lower prices" and "…industry leaders *will* consolidate"). This tone makes the assessment sound more like an advocacy piece than a balanced assessment of the market (Lighting Africa 2010). Similarly, an ASTAE-supported review of Vietnam's rural electrification strategies intended for policy makers and practitioners in other countries is characterized by a consistently positive slant that detracts from the credibility of the important messages emerging from the country's experience (Gencer and others 2011).

Readability

Most of the sample publications were found to the well-articulated and easy to understand for the appropriate audience. A frequent issue revolves around the need to reach the target audience through appropriate labeling or packaging of the report—as a policy note, working paper, discussion paper, research paper, knowledge brief, and so on. More than half (12 of 20) of the reports are written for well-informed decision makers and

practitioners. A few are quite technical and mainly intended for technical specialists. Three of the reports are technical, but also difficult to read except for the most dedicated specialists. Conversely, the raw, unedited candor and integrity of a few of the most densely written technical reports yielded some of the more robust and revealing contributions to the understanding of energy access issues.

A good example is an ESMAP-supported evaluation of the impacts of electrification on small- and microenterprises in Sub-Saharan Africa exemplifies a solid technical report (Mayer-Tasch, Mukerjee, and Reiche 2013). It provides a comprehensive survey of the global experience with electrification impact studies and of methodological issues associated with the estimation of benefits, illustrated with the example of three survey-based studies in Benin, Ghana, and Uganda. This analysis fills an important gap since the productive uses of electrification can, under certain circumstances, substantially contribute to the financial viability of rural electrification, and there have been few methodologically rigorous, survey-based studies that could provide a solid basis for decisions in this area.

Fitness for Purpose

The reports' fitness for purpose was assessed on the basis of the extent to which their conclusions, lessons, and recommendations are grounded in analysis and relevant for the intended objective. Fewer than half (8 of 20) of the sample publications fully met this benchmark. In several of the reports that fall short, their fitness for purpose is impaired by their lack of objectivity and analytical soundness, as previously noted. In a few additional cases, the value of the reports is limited by a failure to bring out the full implications of their findings, even when the underlying analysis was sound. Thus, the GPOBA-funded impact evaluation of SHS in Bangladesh found that the demand for SHS was highly inelastic, which suggests that the subsidies had been unnecessary, at least for the better-off portion of households that had benefitted from the program (Asaduzzaman and others 2013). But the implications of reducing or eliminating the subsidies are analyzed only from the perspective of the households that had already purchased the SHS, without any discussion of the potential welfare implications for the poorer two-thirds of households that had not purchased a SHS, which could have easily been derived from the available data.

Another example of fuzziness about the purpose is provided by a series of country notes that analyze policy and regulatory issues affecting the scale-up of the solar lighting market in Africa[1]. Intended in principle to "level the playing field" by removing existing distortions, the notes instead favor off-grid lighting solutions by advocating their exemption from all taxes and duties, without considering the potential impacts on competing fiscal priorities, and flying in the face of broader efforts to harmonize tax and tariff regimes across product categories.

Table I.1. Sample of Global Partnership on Output-based Aid (GPOBA) Electricity Access Activities

Country	Region	Project name	Grant ($, millions)	Start year (FY)	GPOBA type
Columbia	LAC	Natural Gas Distribution for Low-Income Families in the Caribbean Coast	5.09	2006	Subsidy
Armenia	ECA	Access to Gas and Heat Supply for Poor Urban Households in Armenia	3.10	2006	Subsidy+TA
Nepal	SAR	Biogas support Program in Nepal	5.00	2008	Subsidy
Bolivia	LAC	Decentralized Electricity for Universal Access	5.18	2008	Subsidy+TA
Bangladesh	SAR	Rural Electrification and Renewable Energy Development—Mini-Grid Project	1.10	2009	Subsidy
Bangladesh	SAR	Rural Electrification and Renewable Energy Development—Solar Home Systems Project	13.95	2009	Subsidy
Ethiopia	SSA	Ethiopia Electrification Access Rural Expansion Project	8.00	2009	Subsidy
Ghana	SSA	Solar PV Systems to Increase Access to Electricity Services in Ghana	4.35	2009	Subsidy+TA
India	SAR	Mumbai Improved Electricity Access to Indian Slum Dwellers Project	2.00	2010	Subsidy
Liberia	SSA	Monrovia Improved Electricity Access Project	10.00	2012	Subsidy+TA
Uganda	SSA	Uganda Grid-Based OBA Facility Project	6.00	2012	Subsidy+TA
Kenya	SSA	Kenya Electricity Expansion Project	5.00	2012	Subsidy+TA
Subtotal			68.77		
Regional	AFR	Lighting Africa Market Development and Quality Assurance (W1 support of RBF)	0.25	2011	TA to support RBF
Vanuatu	EAP	Vanuatu Electricity (W1 in support of W3)	0.35	2011	TA to support RBF mainstreaming
Philippines	EAP	Philippines Power Sector Strategy Advice (W1 support of RBF)	0.30	2011	TA to support RBF
Regional	AFR	Africa Electrification Initiative (W1 support RBF)	0.20	2012	TA to support RBF
Bangladesh	SAR	Impact Evaluation of SHS (W2)	0.25	2013	TA-KP
Nepal	SAR	Household Renewable Energy Access (W1 support W3)	0.23	2013	TA-KP
Subtotal			1.58		
Total			70.35		

Source: IEG
Note: AFR = Africa; EAP = East Asia and Pacific; GPOBA = Global Partnership on Output-based Aid; LAC = Latin America and the Caribbean; OBA = Output-based Aid; PV = photovoltaic; RBF = Results Based Financing; SAR = South Africa Region; SHS = solar home systems; SSA = Sub-Saharan Africa; TA = technical assistance; TA-KP

Table I.2. Countries with Lighting Africa Electricity Access Activities

Project ID	World Bank or IFC	Country	Project name	Amount ($, millions)	Approval FY
521198	IFC	Global	Lighting Africa Global	4.9	2007
555905	IFC	Kenya	Lighting Africa Kenya	2.7	2007
555906	IFC	Ghana	Lighting Africa Ghana	2.7	2007
557685	IFC	Global	Lighting Africa Web Portal	0.5	2007
P119893	WB	Ethiopia	Trade Finance Facility	20.0	2012
P124014	WB	Liberia	Supply-Side Subsidy	2.0	2012
P116289	WB	Regional	Market Development, Quality Assurance	3.04	2014
P128768	WB	Burkina Faso	Piloting a Lantern Library	1.5	2014
P131084	WB	Mali	Lantern Library and RBF scheme	2.5	2014

Source: World Bank Operations Portal; Lighting Africa team.
Note: FY = fiscal year; IFC = International Finance Corporation; RBF = Result Based Financing; WB = World Bank.

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Appendix J
Systematic Review

Access to Electricity for Improving Health, Education and Welfare in Low- and Middle-Income Countries: A Systematic Review
Kavita Mathur, Sandy Oliver, and Janice Tripney

Objective of the Systematic Review
The primary objective of this review is to critically analyze and synthesize the existing evidence to answer the following question:

> What is the impact of electricity access on health, education and welfare outcomes in low- and middle-income countries?

Literature Review
A review seeking studies investigating relationships between energy, welfare and gender captured predominantly observational studies with population samples sufficiently large to support multivariate regression for controlling potential confounders (Kohlin et al., 2011). The authors summarized desired outcomes from electrification as longer working days, better access to information, better and safer lighting, greater efficiency in domestic and caring responsibilities and expanded opportunities for income generation. Their putative pathway between household electrification and derived benefits were drawn from the literature, but were supported by few robust studies of impact:

In general, light and TV are the first common uses of electricity, accounting for at least 80 percent of rural electricity consumption. Electricity displaces more expensive candles and kerosene lamps, thereby reducing indoor air pollution and fire and burn risk, and provides higher quality light. Lighting and television help improve access to information, the ability to study, and extends the effective working day. Lighting also improves the productivity of many household activities.

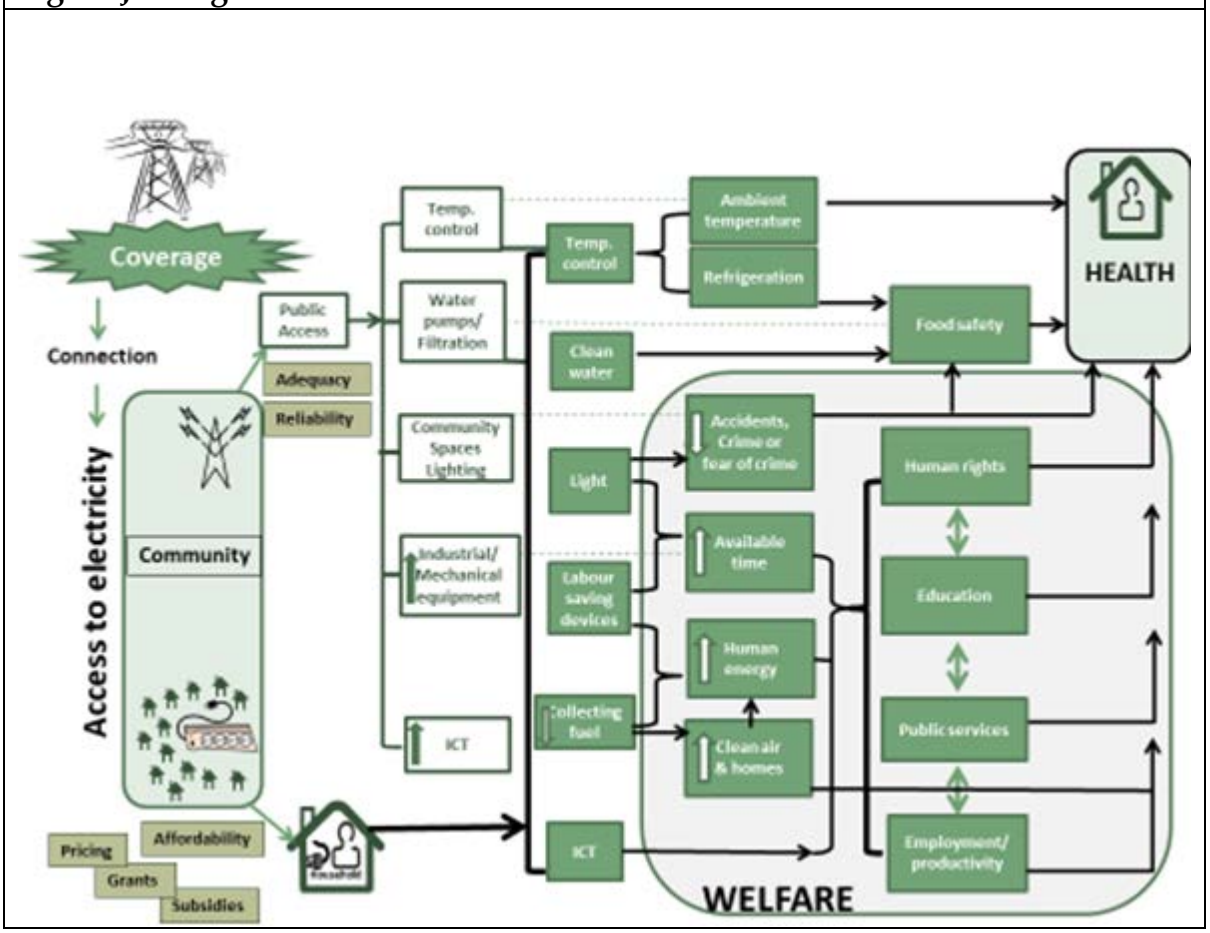
Kohlin et al. (2011) also found observational studies addressing electrification of communities. These indicated potential positive effects through better schools (where teachers are less absent and spend more time planning lessons), better health care (through refrigerated storage), better security (with street lighting, for example), greater social capital (through lighting for evening gatherings) and better economic opportunities (for example, through improved communication with the market and processing or storage facilities). Lastly, the generation and transmission of electricity offer employment opportunities.

This literature also suggests differential gender impact:
Providing electricity to communities and homes and motor power for tasks that are typically considered women's work can promote gender equality, women's empowerment,

and women's and girl's access to education, health care and employment. Kohlin et al. (2011) identified household studies that associated electrification with: reduced time spent by women collecting firewood and water; disproportionate increases in female employment, possibly by freeing women from time-consuming domestic tasks such as cooking; and even greater impacts when accompanied by social marketing, finance schemes for appliances, or enterprise schemes for women to access electricity services. Studies of rural electrification also indicate increased women's work outside the home, especially for younger women. Evidence of education and health benefits from electrification appear less differentiated by gender, although fertility rates are lower in rural areas with consequent benefits for women. Studies also implicate television as a route to women's empowerment possibly through exposure to role models of emancipated women in fictional TV dramas.

Figure J.1 illustrates the logic model employed to frame the review. The logic model was constructed based on investigation of the welfare gains associated with electricity access (IEG 2008b), and gendered analysis (Kohlin et al. (2011).

Figure J.1. Logic Model



Source: IEG

Types of studies included
Eligible research designs included those studies in which the authors used a control or comparison group, and in which: (i) participants were randomly assigned (using a process of random allocation, such as a random number generation); (ii) a quasi-random method of assignment was used where pre-treatment equivalence information was available regarding the nature of the group differences; (iii) participants were non-randomly assigned but matched on pre-treatment outcomes and/or time invariant variables such as relevant demographic characteristics (using observables, or propensity scores) and/or according to a cut-off on an ordinal or continuous variable (regression discontinuity design); or (iv) participants were non-randomly assigned, but statistical methods were used to control for differences between groups (for example, using multiple regression analysis, including difference-in-difference, cross-sectional [single differences], or instrumental variables regression). Studies using an experimental or robust quasi-experimental design were eligible for a detailed impact synthesis.

Ineligible study designs include:

- Single group, post-test only design.
- Single group, pre-test/post-test design (i.e., where participants act as their own controls).
- Non-equivalent comparison group design, with no additional controls (that is, design involves use of non-random treatment and comparison groups - concurrent or historical - but does not employ an appropriate method of statistical analysis for causal identification). Inappropriate methods include measurement of statistical association between participation and outcomes, such as ANOVA or bivariate regression-based studies without incorporation of additional control variables.
- Interrupted time-series with less than three periods of data collection both before and after the intervention.
- Studies that attempt to predict the impact of an intervention using data simulation techniques. Such 'hypothetical' studies are attempting to predict how something will behave without actually testing it in the real world (i.e., they are estimating parameters that have not been measured from field data).

The following types of studies were outside the scope of the review:

- Studies examining certain new energy sources, such as biofuels.
- Studies addressing commercial enterprises that built their own power transmission systems to access electricity for their own use only.

Types of participants
Studies were eligible if they included individuals, households, community-based organizations (for example, schools, health clinics, and community centers) or commercial

enterprises (except those that build their own power transmission systems to access electricity for their own use alone).

Studies were eligible if they were conducted in low- and middle-income countries, where low and middle income are defined in accordance with the current World Bank classification. Studies were eligible if they focused on people living in rural, peri-urban and/or urban areas. Participants of any age were eligible, and there were no restrictions on any other demographic characteristics.

Types of outcome measures

The review included studies that addressed the outcomes for individuals, households, community-based organizations (for example, schools, health clinics, and community centers) or micro, small- or medium-sized enterprises (SMEs) in the following areas:

- Health - mortality and morbidity;
- Education - educational achievement;
- Welfare - time use, livelihoods (including firm level production), human rights, and security.

Search Method Used for Identification of Studies

Electronic searches:

A comprehensive search strategy was used to search the international research literature for qualifying studies. To reduce the omission of relevant studies and ensure our search was unbiased, both academic and 'grey' literature were searched. Manual searching techniques were used to supplement the electronic searching of bibliographic databases and library catalogs.

We searched electronic databases, including general social science databases and subject specific data bases covering the energy sector. Because of time constraints we restricted ourselves to English language databases.

The following major commercial electronic bibliographic databases were searched:

- ProQuest: Applied Social Sciences Index and Abstracts (ASSIA)
- ProQuest: Education Resources Information Center (ERIC)
- ProQuest: International Bibliography of the Social Sciences (IBSS)
- ProQuest: Medline
- ProQuest: Sociological Abstracts
- EBSCO: Business Source Premier
- EBSCO Econlit
- EBSCO PsycINFO
- Thomson Reuters: Web of Science

For each bibliographic database, a tailored search query was developed using controlled vocabulary and/or free-text terms. A comprehensive list of terms related to the main

concept of this review (electrification) was used in the search. Database thesauri, were consulted to ensure that all relevant synonyms were included, and wildcards were applied as appropriate. A publication year filter to identify studies published since January1, 1994 was used.

Searching other resources:

Websites: The websites of relevant bilateral and multilateral organizations, including the Inter-American Development Bank and Asian Development Bank, were searched.

Backward citation tracking: The bibliographic information contained within the reference lists of included studies and relevant reviews was scanned to identify studies that meet the eligibility criteria.

Search engines: To ensure maximal coverage of unpublished literature, Google was used to follow up on potentially relevant named programmes. Google Scholar was used to track citations of included studies.

Conference proceedings, dissertations and theses: One specialist source for dissertations and theses searched was ProQuest Dissertations & Theses: UK & Ireland, and ERIC (for example, includes more than 14,000 dissertations/theses published since 1990). As part of the Web of Science search, a search for conference proceedings was also undertaken.

Search Results

The electronic searching of databases resulted in the identification of 16,250 citations, and 1,009 duplicate records were removed up front, resulting in 15,241 records. Non-electronic searching yielded an additional 98 studies. A total of 15,339 records were entered into EPPI Reviewer 4 and manually screened against the eligibility criteria on title and abstract. About 52 percent (8,039) studies were excluded because these studies were outside the scope of the review, that is, these studies were not about electricity as a domestic or commercial power source. These studies were about energy/electricity in biological sciences (medicine, and cardiac failure, for example); electrical safety; electricity with regard to testing voltages in lab settings; the role of energy in the body (purely biological); and technical aspects such as testing of solar cells in a laboratory setting (with no beneficiaries/participants). Since the focus of the systematic review is on low- and middle-income countries, 22 percent (3,413) of the studies were excluded because they were in high-income countries. Also, 1,478 studies were excluded because they were not primary empirical studies, and another 1342 studies were excluded because they were not impact evaluations.

In total 390 studies were identified for full report review. Of these 390 studies, there were 25 studies for which the full length reports were unavailable. The full length reports for 365

studies were retrieved and reviewed. From these 365 studies which were reviewed on full text, 263 studies were dropped because they were not robust impact evaluations, and 13 were excluded because they were focusing on ineligible outcomes. In all, fifty one studies met the inclusion criteria, of which thirty two unique studies were identified and were included in this review. There remaining nineteen studies were linked studies.

Selection of studies

The review management software, EPPI-Reviewer 4, was used to manage the entire review process (Thomas, Brunton, and Graziosi 2010). Potentially relevant items identified through the electronic search of bibliographic databases were imported into EPPI-Reviewer 4. Details of eligible studies identified through the non-electronic searches were also entered into the reviewing software manually.

Selection of primary studies was based on the pre-developed selection criteria to identify studies for full text screening. A guidance note for reviewers was prepared to assist the reviewers during the screening process. The criteria were piloted by two researchers who screened the studies on titles and abstracts. Six rounds of piloting were carried out covering 10 percent of the sample. Any differences of opinion were resolved through discussion.

Therefore, full texts were retrieved for all studies that appeared to meet the inclusion criteria on the basis of the information in their titles and abstracts, and each of these papers was reviewed by a minimum of two reviewers to determine eligibility. The final included/excluded studies were reviewed by all three researchers. Agreements were reached through discussion.

Study characteristics: country and regional composition

Most of the included studies, about 63 percent were conducted in middle-income countries (thirteen in lower-middle income countries and seven in upper-middle income countries). Twelve studies were in low-income countries. The studies covered twenty four countries from five regions – Sub-Saharan Africa (Fourteen); South Asia (nine); Latin America and the Caribbean (eight); East Asia (two); and Middle East and North Africa (one). There were no studies from Europe and Central Asia Region.

Only five of the included impact evaluation studies related to World Bank Supported programs. These are Asaduzzaman et al. (2013), Bangladesh; Banerjee et al. (2011), Nepal; Khandker et al. (2012), Bangladesh; Khandker et al. (2012), India, and Khandker et al. (2013), Vietnam.

Intervention characteristics

Of the thirty two included studies, the majority of the studies (twenty four) were on the provision of electricity through grid expansion. Only eight studies were for off-grid provision of electricity – of which six evaluated Solar Home Systems (SHS) and two

evaluated Micro Hydro projects. Most of the studies, about 85 percent focused on rural electrification.

In terms of specific interventions:

- Fourteen studies evaluated different projects/programs funded by the donors or the Governments of the country studied (table J.1);
- Ten studies compared different levels of coverage (table J.2);
- Six studies evaluated different levels of reliability /quality of electricity supply (table J.3); and
- Two studies investigated incentives for connecting to the grid (table J.4).

Table J.1. Studies That Evaluated a Named Programme, or Project

Study	Intervention
Asaduzzaman et al. (2013). Power from the Sun: An Evaluation of Institutional Effectiveness and Impact of Solar Home Systems in Bangladesh.	Off-grid: SHS The Infrastructure Development Company Limited (IDCOL) and its collaborating organizations called partner organizations (POs) installed SHS in rural areas in Bangladesh. The program was supported by the following development partners: World Bank, German Agency for Development Cooperation (GIZ), KfW Development Bank, EU, ADB, Inter-American Development Bank (IDB) and the Global Partnership on Output-based Aid (GPOBA), a multi-donor trust fund administered by the World By December 2012, more than 1.7 million SHSs were put in place by 30 POs.
Asian Development Bank (2010). Asian Development Bank's Assistance for Rural Electrification in Bhutan - Does Electrification Improve the Quality of Rural Life?	Grid: national rural electrification. ADB financed two rural electrification projects: Sustainable Rural Electrification Project (1999), and the Rural Electrification and Network Expansion (2003). The projects aimed at expansion and delivery of electricity to selected rural areas.
Banerjee et al. (2011). Power and People: The Benefits of Renewable Energy in Nepal.	Off-grid: micro hydro projects The World Bank and the United Nations Development Programme (UNDP) financed the Rural Energy Development Program (REDP). The first phase of REDP started in 1996 and the third phase (joint with the government of Nepal) became effective in 2007. The program provided energy through decentralized renewable energy technologies.
Bensch et al. (2011) Impacts of Rural Electrification in Rwanda.	Off-grid: micro hydro projects The Dutch-German Energy Partnership 'Energising Development' (EnDev) financed Private Sector Participation in Micro-hydro Power Supply for Rural Development Project (2006). The project aims at developing a private sector for micro-hydro-based power generation.
Bensch et al. (2013) Fear of the Dark? How Access to Electric Lighting Affects Security Attitudes and	Off-grid: SHS and mini grids GIZ, in cooperation with Agence Sénégalaise d'électrification rurale (ASER), financed the ESRN (*Electrification rurale pour le Sénégal*) project. The project was implemented in two phases: first phase (2005-2009) and the second

Night-time Activities in Rural Senegal.	phase (until the end of 2012). The projects disseminated SHS and installed solar-diesel hybrid mini-grids.
Dasso et al. (2013) The Effects of Electrification on Employment in rural Peru.	Grid: national rural electrification The government of Peru launched the Rural Electrification Program in 1993. The program was divided in two sub-periods: 1993-2004 and 2005-2010. The focus of the study is on the projects that were concluded in the period 2006-2010.
Dinkelman (2011). The Effects of Rural Electrification on Employment: New Evidence from South Africa.	Grid: regional electrification program South Africa's national electricity utility (Eskom) launched a National Electrification Programme (NEP) in 1995. The study focused on the former homeland communities in KwaZulu-Natal. This province is home to one-fifth of the population of South Africa and in the early 1990s, it contained about 30 percent of the entire African population living in homeland areas.
Grimm et al. (2014). Impacts of Pico-PV Systems Usage using a Randomized Controlled Trial and Qualitative Methods.	Off-grid: SHS This study evaluates the take-up behavior and impacts of a Lighting Africa-certificated Pico-PV kit marketed by the British company ToughStuff International.
Harsdorff et al. (2009). Impact Assessment of the Solar Electrification of Micro Enterprises, Households and the Development of the Rural Solar Market.	Off-grid: SHS GTZ and the government of Uganda funded the project Promotion of Renewable Energy and Energy Efficiency (2006-2008). The photovoltaic (PV) component of the program focused on access to PV systems for households, institutions (notably health centers) and microenterprises. The study was conducted more than three years after the start of the program's technical assistance in the development of rural markets for solar PV.
Khandker et al. (2012). The Welfare Impacts of Rural Electrification in Bangladesh.	Grid: national rural electrification The World Bank financed different phases of the Rural Electrification and Renewable Energy Development (RERED) program since the mid-1990s. The authors note that in the selection of villages and households, no distinction was made as to the project under which a village was electrified (that is, the RERED project or non-World Bank financing) since the grid extension and household-connection processes were the same, regardless of funding source.
Khandker et al. (2013). Welfare impacts of Rural Electrification: A Panel Data Analysis from Vietnam.	Grid: national Rural Electrification The World Bank financed the Rural Energy Project, initiated in 2000. The authors note that by 2005 it was impossible to distinguish between electricity provided by the World Bank's or the government of Vietnam's financing, and since all communes were part of the same rural electrification program implemented in the same way, the study did not distinguish between communes according to source of project financing.
Peters et al. (2013). Electrification and Firm Performance in Rural Benin: an Ex-ante Impact Assessment.	Grid: regional rural electrification The study is evaluating the project implemented by German Development Cooperation (GIZ), under the Energising Development (EnDev) programme.

Peters et al. (2013). Firm Performance and Electricity Usage in Small Manufacturing and Service Firms in Ghana.	Grid: regional rural electrification In Ghana, GIZ financed the Programme for Sustainable Economic Development (2007). The study evaluated the Energising Development or Industrial Zone Development component of the program.
Tracy et al. (2010) Illuminating the Pecking Order in Off-Grid Lighting. A Demonstration of LED Lighting for Saving Energy in the Poultry Sector.	Off-grid: SHS The Lumina Project and Lighting Africa conducted a full-scale field test involving a switch from kerosene to solar-LED lighting for commercial broiler chicken production at an off-grid farm in Kenya between August 6 and September 10, 2010.

Table J.2. Studies that Compared Different Levels of Coverage

Study	Intervention
Aguirre (2014). Impact of Rural Electrification on Education: a Case Study from Peru.	Grid: national rural electrification The study uses the 2013 Survey of Rural Household Energy Use (SRHEU) conducted by the Ministry of Energy and Mines of Peru.
Ayele et al. (2010) Infrastructure and Cluster Development: A Case Study of Handloom Weavers in Rural Ethiopia.	Grid: national rural electrification The study surveyed rural and urban handloom weaving clusters in 2008.
ESMAP (2002). Rural Electrification and Development in the Philippines: Measuring the Social and Economic Benefits	Grid: regional electrification The study measures the benefits of rural electrification. The authors of the study collected survey data from four regions located on the island of Luzon in the Philippines. Each region has a rural electric cooperative that distributes electricity to homes and businesses. About quarter of households in the sample of cooperatives lacks electricity.
Grogan et al. (2013). Rural Electrification and Employment in Poor Countries: Evidence from Nicaragua.	Grid: national rural electrification The data for the study is from the Living Standards Measurement Survey for Nicaragua from 1998-2005.
Guarcello et al. (2004). Child Labor and Access to Basic Services: Evidence from Five Countries.	Grid: national electrification This paper investigates the link between child labor and electricity access in five countries – El Salvador, Ghana, Guatemala, Morocco and Yemen. The investigation makes use of datasets from recent national household surveys containing detailed information both on children's activities and on basic services access.
Khandker et al. (2012). Who Benefits the Most from Rural Electrification? Evidence in India.	Grid: national rural electrification The study evaluated the impact of government-aided rural electrification over a considerable time period. The study uses the 2005 India Human Development Survey (IHDS).

Peters et al. (2010). Rural Electrification and Fertility - Evidence from Cote d'Ivoire.	Grid: national rural electrification The study uses Cote d'Ivoire living standards survey to investigate the determinants of fertility with a particular focus on the effect of electrification. As rural Cote d'Ivoire underwent a number of electrification projects in 1970's that terminated abruptly by the end of the decade, the study investigated the associated implications for fertility in a country where today some 40% of population still lacks electricity.
Rollin et al. (2004) Comparison of Indoor Air Quality in Electrified and Un-electrified Dwellings in Rural South African villages.	Grid: regional rural electrification The study compares electrified and non-electrified dwellings. Three rural settlements were surveyed in the North West province of South Africa in 2000.
Van de Walle et al. (2013). Long-term Impacts of Household Electrification in Rural India.	Grid: national rural electrification The study uses two India Rural Economic and Demographic Surveys (REDS), the first for the period 1981-82 and the second for the period 1998-99. This is the only long-period household panel data set available for a rural economy that underwent extensive electrification.
Wang et al. (2011). Quantifying Carbon and Distributional Benefits of Solar Home System Programs in Bangladesh.	Off-grid: SHS The study uses national household survey data and quantifies the carbon and distributional benefits of solar home system programs in Bangladesh.

Table J.3. Studies that Compared Different Levels of Reliability/Quality of Electricity Supply

Study	Intervention
Alcazar et al. (2007). Provision of Public Services and Welfare of the Poor: Learning from an Incomplete Electricity Privatization Process in Rural Peru.	Grid: national electrification The study evaluated the incomplete privatization process that resulted in selected private provision areas while the rest of the country was served by state-owned companies (1994 -2004). The study hypothesizes that privatization may lead to improvements in quality and supply of electricity provision which may lead to some efficiency gains in terms of the time allocation of the working labor.
Burlando (2014). Power Outages, Power Externalities, and Baby Booms.	Grid: national rural electrification The study examined the impact of a month-long power outage affecting the entire island of Zanzibar, Tanzania, between May and June of 2008.
Chakravorty et al. (2014.) Does the Quality of Electricity Matter? Evidence from Rural India.	Grid: national rural electrification The study analyses the change in the electrification rate between 1994 and 2005. It also compares different levels of quality of electricity supply: whether the household (i) received a continuous power supply, (ii) experienced on average one or two outages per week, or (iii) experienced on average more than two power outages per week.
Fetzer et al. (2013). An Urban Legend? Power Rationing,	Grid: national electrification

Fertility and its Effects on Mothers.	The study examined a particular black out in Colombia caused by the El-Nino droughts in1992, leading to a period of almost 12 months of daily rationing of electricity.
Gonzalez-Eiras et al. (2007). The Impact of Electricity Sector Privatization on Public Health.	Grid: national electrification All privatizations in the electricity distribution services in Argentina occurred between1992 to 1998. The study examined the impact of the privatization of electricity distribution on service quality improvements and its subsequent impact on health.
Rao (2013). Does (Better) Electricity Supply Increase Household Enterprise Income in India?	Grid: national electrification The study compared different levels of quality of electricity supply: (i) no access, (ii) 1-16 hours of electricity supply, and (iii) 17-24 hours of electricity supply. The survey was conducted in 2004 -2005.

Table J.4. Studies that Investigated Incentives for Connecting to the Grid

Study	Intervention
Barron et al. (2014). Short Term Effects of Household Electrification: Experimental Evidence from Northern El Salvador.	Grid: regional electrification program The Government of El Salvador grid extension and intensification program (2010). The grid extension and intensification program was designed to be rolled-out in three phases according to construction costs and accessibility. In this program, the El Salvadorian Government covered all the installation costs up to the electric meter, and households had to pay for their internal wiring and a connection fee. The study generated experimental variation in the connection fee by offering discount vouchers to a randomly selected subsample.
Bernard et al. (2014). Social Interaction Effects and Connection to Electricity: Experimental Evidence from Rural Ethiopia.	Grid: rural electrification The Ethiopian Government, started the Universal Energy Access Program in 2005. Since then it has provided new electricity supply to 1,000 non-electrified villages. The study conducted an experiment in which discount vouchers of 10 and 20 percent were randomly allocated to households in eight selected village communities in Southern Ethiopia that were soon to be electrified under the UEAP program.

Risk of Bias Analysis

A risk of bias analysis for included studies was carried out, focusing on the following key domains: selection bias and confounding; spillovers; outcome reporting bias; and analysis reporting bias. This involved use of a tool developed by researchers at the International Initiative for Impact Evaluation (3ie) specifically for assessing risk of bias in experimental and quasi-experimental designs based on statistical methods. The approach taken to formulate the summary assessments of risk of bias was adapted from Baird et al. 2013. Based on the risk assessment, 53% of the studies were classified as high risk, 44% medium risk and 3% as low risk.

Outcomes Evaluated

The thirty two studies covered in this review measured a large number of different outcomes under the main headings of health, education and welfare. These outcomes are listed in table J.5.

Table J.5. Included Studies and the Outcomes Evaluated

	Health	Education	Welfare
Aguirre (2014). Impact of Rural Electrification on Education: A Case Study from Peru.		• Children's study time at home	
Alcazar et al. (2007). Provision of Public Services and Welfare of the Poor: Learning from an Incomplete Electricity Privatization Process in Rural Peru.			• Number of hours worked (includes chores) • Number of hours worked (other) • Expenditure (per capita) • Time spent on leisure activities
Asaduzzaman et al. (2013). Power from the Sun: An Evaluation of Institutional Effectiveness and Impact of Solar Home Systems in Bangladesh.	• Contraceptive prevalence • Fertility	• Children's study time at home • Years of schooling completed	• Women's empowerment (mobility) • Women's empowerment (general decision-making) • Women's empowerment (economic decision-making)
Asian Development Bank (2010). Asian Development Bank's Assistance for Rural Electrification in Bhutan - Does Electrification Improve the Quality of Rural Life?	• Incidence/prevalence of physical disease or ill-health • Number of workdays missed due to ill-health • Use of firewood • Kerosene consumption • Fertility	• Years of schooling completed • Literacy rate • Children's study time at home	• Income (total, farm, non-farm) • Time spent collecting fuel (for example, firewood) • Women's empowerment (general decision-making) • Women's empowerment (economic decision-making)
Ayele et al. (2010). Infrastructure and Cluster Development: A Case Study of Handloom Weavers in Rural Ethiopia.			• Firm-level productivity
Banerjee et al. (2011). Power and People: The Benefits of Renewable Energy in Nepal.	• Incidence/prevalence of physical	• Children's study time at home	• Income (total, farm, non-farm) • Expenditure

	Health	Education	Welfare
	disease or ill-health • Fertility • Contraceptive prevalence	• Years of schooling completed	• Number of hours worked (in paid/self-employment) • Women's empowerment (mobility) • Women's empowerment (fertility and children's issues) • Women's empowerment (economic decision-making – monetary issues) • Time spent on leisure activities • Other time use outcome
Barron et al. (2014). Short Term Effects of Household Electrification: Experimental Evidence from Northern El Salvador.	• Incidence/prevalence of physical disease or ill-health • Indoor air pollution levels • Use of kerosene • Use of firewood for cooking	• School enrollment • Test/exam scores • Children's study time at home • Years of schooling completed	• Engagement in paid employment • Engaged in self-employment • Number of hours worked (including chores) • Income • Time spent on housework • Time spent on leisure • Number of household labour-saving devices • Other time-use outcome
Bensch et al. (2011). Impacts of Rural Electrification in Rwanda.		• Children's study time at home	• Income • Energy expenditure • Lighting usage – household
Bensch et al. (2013). Fear of the Dark? How Access to Electric Lighting Affects Security Attitudes and Nightime Activities in Rural Senegal.		• Children's study time at home	• Lighting usage – household • Security - expression of feeling safe/unsafe (afraid when outside after dark)
Bernard et al. (2014). Social Interaction Effects and Connection to Electricity: Experimental Evidence from Rural Ethiopia.		• Children's study time at home	• Time spent on agricultural work • Time spent on non-agricultural work • Time spent on leisure • Time spent on collecting fuel
Burlando (2014). Power Outages, Power Externalities, and Baby Booms.	• Fertility		• Time spent on leisure

	Health	Education	Welfare
Chakravorty et al. (2014). Does the Quality of Electricity Matter? Evidence from Rural India.			• Income
Dasso et al. (2013). The Effects of Electrification on Employment in Rural Peru.			• Engagement in paid employment • Engaged in self-employment • Number of hours worked (in paid/self-employment) • Income • Hourly wage • Likelihood of having more than one job
Dinkelman (2011). The Effects of Rural Electrification on Employment: New Evidence from South Africa.	• Access to adequate toilet facilities • Access to clean/safe water supplies • Use of firewood (for cooking)		• Engagement in paid employment • Income • Hourly wage • Number of hours worked (in paid/self-employment) • Lighting usage – household
ESMAP (2002). Rural Electrification and Development in the Philippines: Measuring the Social and Economic Benefits.		• Children's study time at home • Adults study time at home	• Adult's propensity to work • Time spent on leisure • Time spent on household chores
Fetzer et al. (2013). An Urban Legend?! Power Rationing, Fertility and its Effects on Mothers.	• Fertility		
Gonzalez-Eiras et al. (2007). The Impact of Electricity Sector Privatization on Public Health.	• Low birth weight • Child mortality (caused by diarrhea and food poisoning		
Grimm et al. (2013). Impacts of Pico-PV Systems Usage using a Randomized Controlled Trial and Qualitative Methods.	• Incidence/prevalence of physical disease or ill-health	• Children's study time at home	• Lighting usage • Security - expression of feeling safe/unsafe (afraid when outside after dark)

	Health	Education	Welfare
	• Contraceptive use • Use of kerosene		
Grogan et al. (2013). Rural Electrification and Employment in Poor Countries: Evidence from Nicaragua.			• Engagement in paid employment • Time spent collecting fuel
Guarcello et al. (2004). Child labour and Access to Basic Services: Evidence from Five Countries.		• School enrollment	
Harsdorff et al. (2009). Impact Assessment of the Solar Electrification of Micro Enterprises, Households and the Development of the Rural Solar Market.	• Incidence/prevalence of physical disease or ill-health (respiratory) • Use of kerosene (for lighting)	• School enrollment • Children's study time	• Firm Profits • Household income • Number of hours open for business • Energy expenditure • Lighting devices
Khandker et al. (2012). Who Benefits the Most from Rural Electrification? Evidence in India.	• Kerosene consumption	• School enrollment • Years of schooling completed • Children's study time at home	• Number of hours worked (in paid/self-employment) • Income • Expenditure • Time spent collecting fuel
Khandker et al. (2012). The Welfare Impacts of Rural Electrification in Bangladesh.		• Years of schooling completed • Children's study time at home	• Income (total, farm, non-farm) • Expenditure
Khandker et al. (2013). Welfare Impacts of Rural Electrification: A Panel Data Analysis from Vietnam.		• School enrollment • Years of schooling completed	• Income (total, farm, non-farm) • Expenditure
Peters et al. (2010). Rural Electrification and Fertility - Evidence from Cote d'Ivoire	• Fertility		
Peters et al. (2013). Firm Performance and Electricity Usage			• Firm income/profits

	Health	Education	Welfare
in Small Manufacturing and Service Firms in Ghana.			
Peters et al. (2013). Electrification and Firm Performance in Rural Benin: an Ex-ante Impact Assessment			• Firm income/profits
Rao (2013). Does (Better) Electricity Supply Increase Household Enterprise Income in India?			• Self-employment income/profits
Rollin et al. (2004) Comparison of Indoor Air Quality in Electrified and Un-electrified Dwellings in Rural South African villages.	• Indoor air pollution levels		
Tracy et al. (2010). Illuminating the pecking order in off-grid lighting: A demonstration of LED lighting for saving energy in the poultry sector.			• Firm income/profits
Van de Walle et al. (2013). Long-Term Impacts of Household Electrification in Rural India.	• Kerosene consumption	• School enrollment • Years of schooling completed	• Number of days worked • Energy expenditure • Expenditure
Wang et al. (2011). Quantifying Carbon and Distributional Benefits of Solar Home System Programs in Bangladesh.	• Use of kerosene		

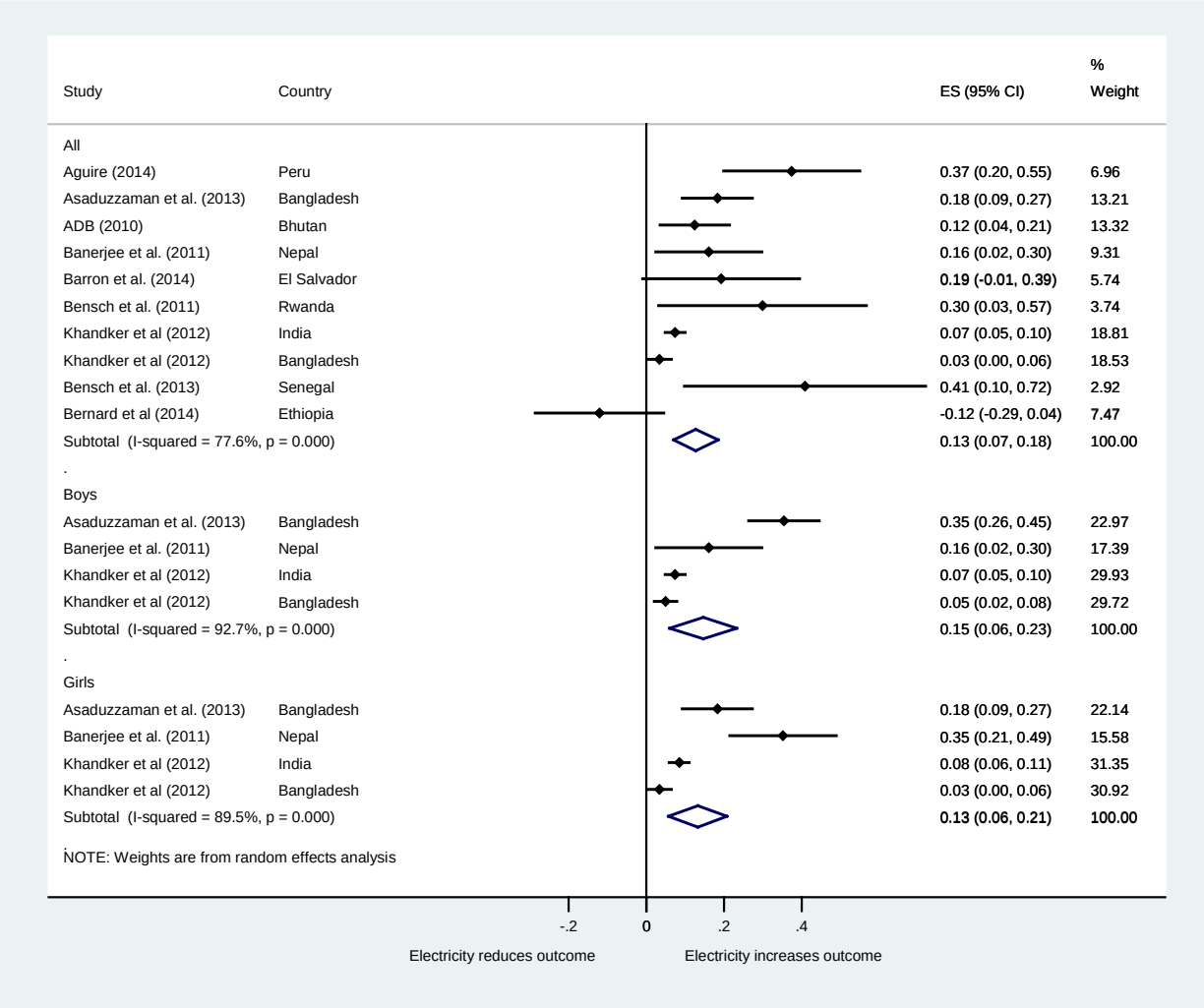
Findings

In this review, authors of included studies often did not provide all the necessary data for calculating effect sizes. Also, the studies did not measure exactly the same outcomes. The findings from the studies which had all the pertinent data and for which outcomes could be pooled together have been statistically combined using meta-analytic technique to analyze the impact of electricity on health, education and welfare outcomes[1].

Impact of electricity access on education outcomes

The systematic review found evidence that electricity access has a positive impact on children's study time at home, years of schooling, and school enrollment (figures J.2, J.3 and J.4).

Figure J.2. Impact of Electricity Access on Study Time at Home

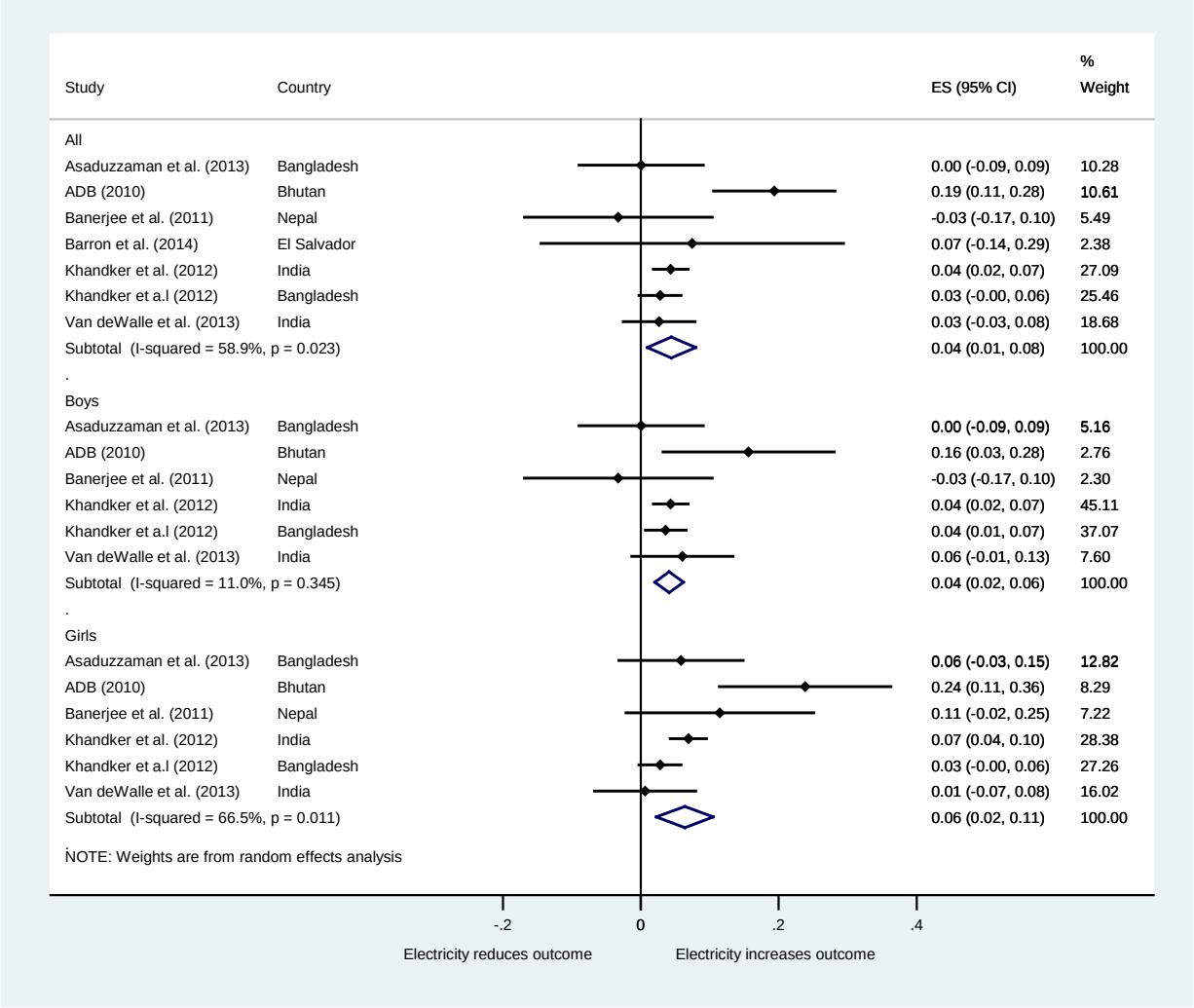


There were ten studies which measured the impact of electricity access on children's study time at home. The pooled estimate of effect (g=0.13) suggests that providing access to electricity is an effective intervention. Compared to children without access to electricity,

children with access to electricity increased the number of hours they studied at home (figure J.2).

Seven studies measured the effect of electricity access on years of schooling completed. The pooled estimate of effect (g=0.04) suggests that electricity access has a positive impact on years of schooling completed (figure J.3).

Figure J.3. Impact of Electricity Access on School Years Completed

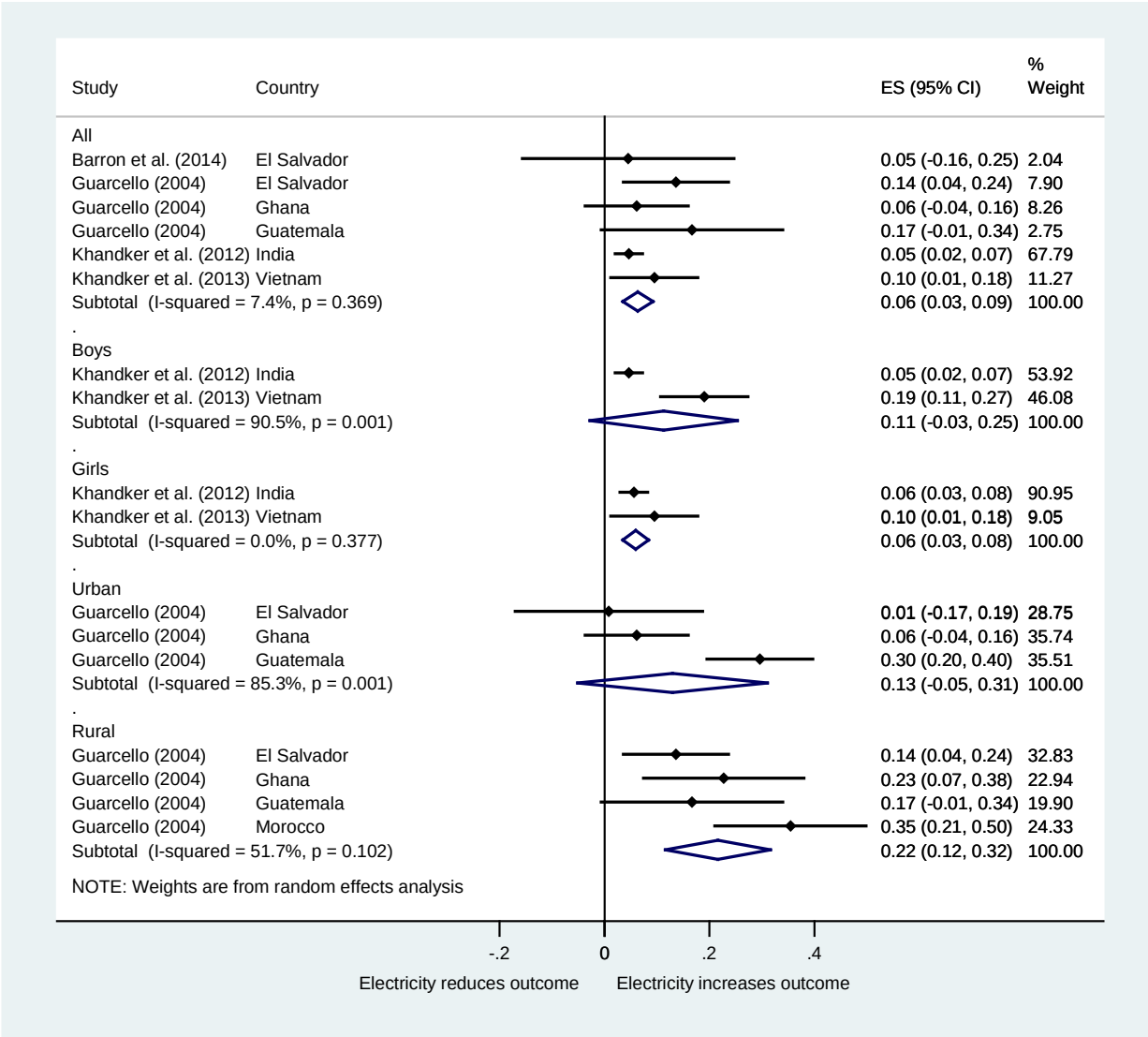


Note: Weights are from random effect analysis

There were four studies that measured the effect of electricity access on school enrollment. One of the studies Guarcello (2004) analyzes data from four countries and carried out urban and rural analysis. The pooled estimate of effect (g=0.06) suggests that electricity access has a positive impact on school enrollment (figure J.4). The sub-group analysis by

urban and rural areas suggests that the effect size for rural areas is larger than for urban areas, in former case it is statistically significant.

Figure J.4. Impact of Electricity Access on School Enrollment



Impact of electricity access on health outcomes

There are few studies measuring the impact of electricity access on health outcomes. This signifies the existence of an evidence gap and an area in which future impact evaluations could provide significant value-added. There is one study that found evidence that electricity access has significant impact on reduction in indoor pollution (Rollins et al. 2004). The Asian Development Bank (2010) study found that the incidence of cough,

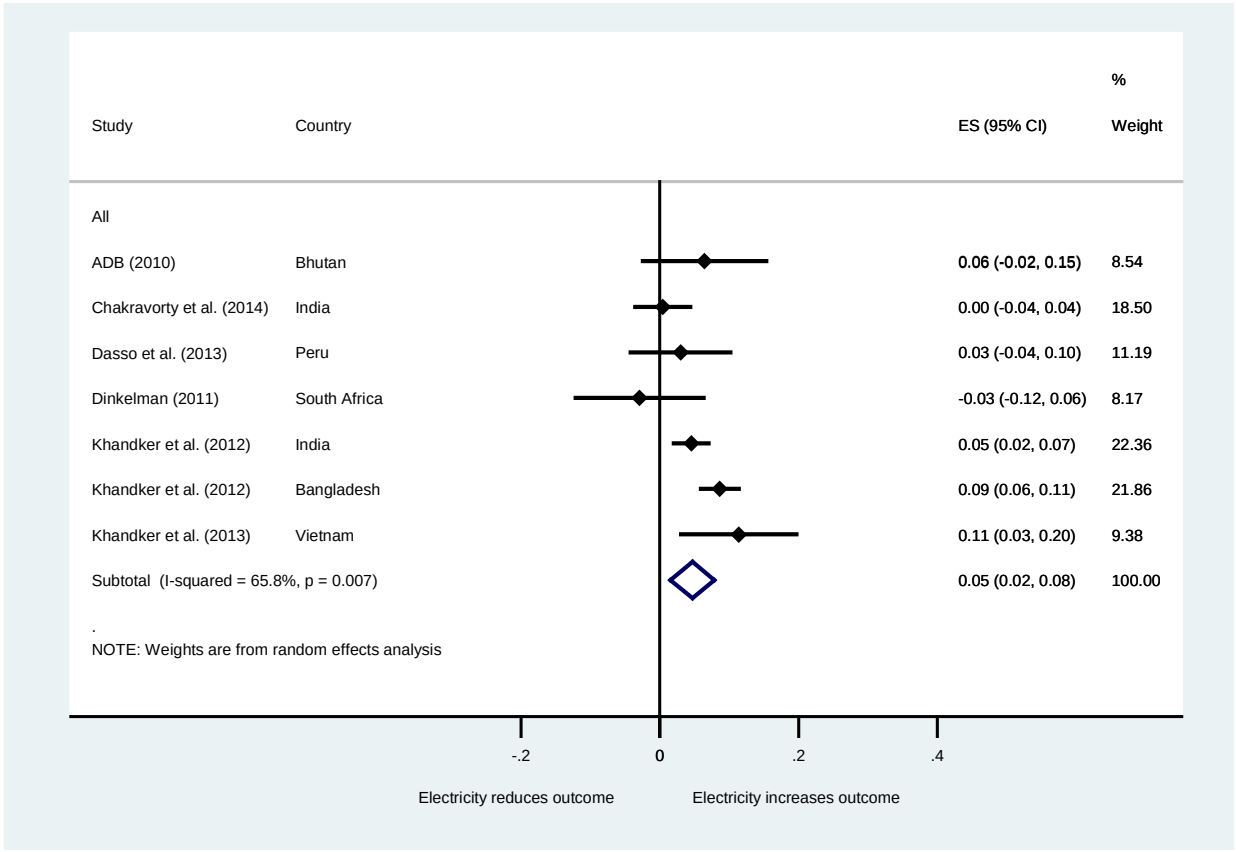
respiratory problems, eye irritation, and headache are lower in electrified households than in unelectrified households. The ADB study found that rural electrification had the greatest impact on the incidence of eye irritation compared with the incidence of coughs or respiratory ailments, since electrified households were 13.4 percentage points less likely to have suffered from eye irritation. Incidence of cough was reduced by 2 percent and respiratory ailments by 5 percent.

Five studies investigated the impact of electricity access on fertility and found mixed evidence. Two studies (Asaduzzaman et al. 2013 and ADB (2010)) show significant effect of electricity access on reduction in fertility. However, Banerjee et al. (2011) found no effect. Two studies (Burlando (2014) and Fetzer (2013) investigated the impact of power outages on fertility and found that power outages resulted in a significant increase in the number of children born.

Impact of electricity access on welfare outcomes

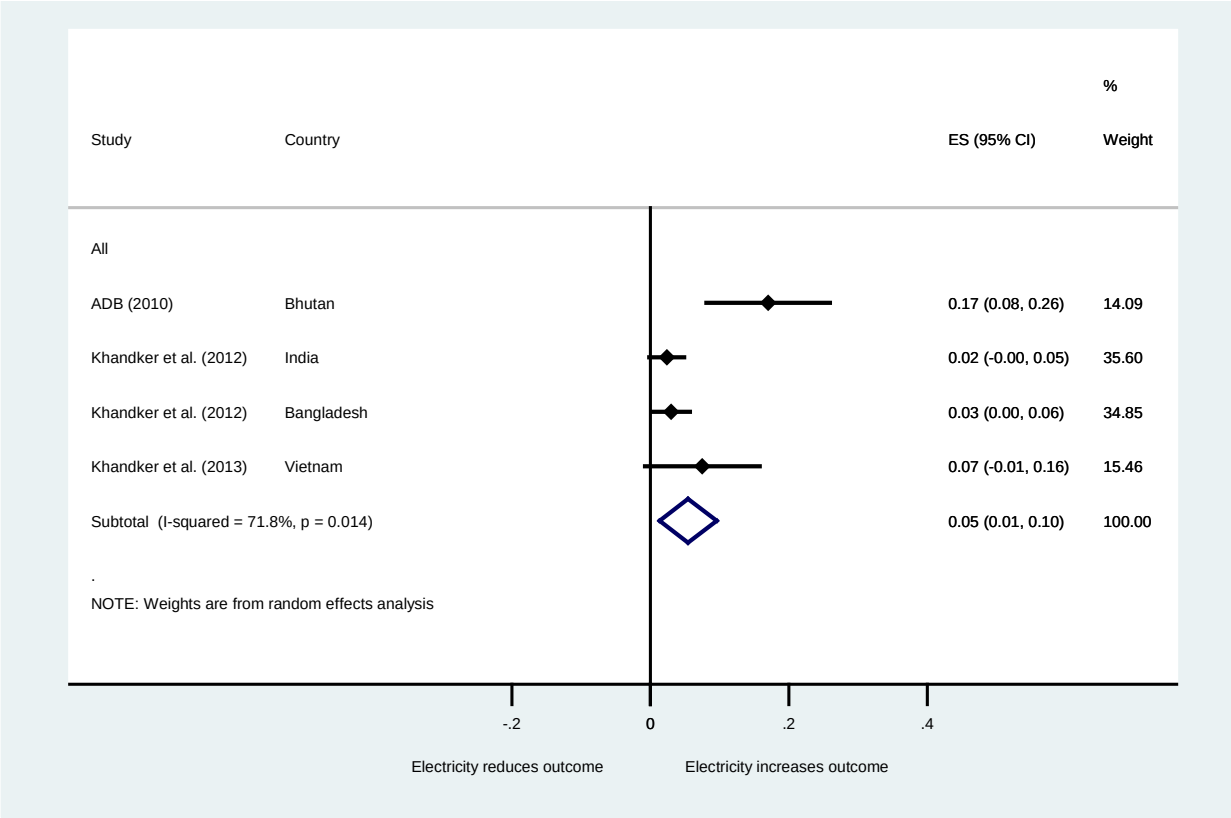
The evidence base for the impact of electricity access on microenterprise profits is thin. There are only four studies evaluating this. Peters et al. (2013) shows that in Benin the profits of connected microenterprises in five small villages are considerably higher than those of non-connected micro-enterprises in the other five small villages. However, two studies - Peters et al. (2013) for peri-urban region in Ghana and Rao (2013) for five states in India found no significant impact on profits. One study in Kenya examined the farmer profit through experimental design, randomizing three chicken sheds of the farmer with kerosene lamps, florescent lamps and LED solar lamps for raising chicken. The study found increased profits for the shed with LED solar lamps.

Figure J.5. Impact of Electricity Access on Household Income (Total)



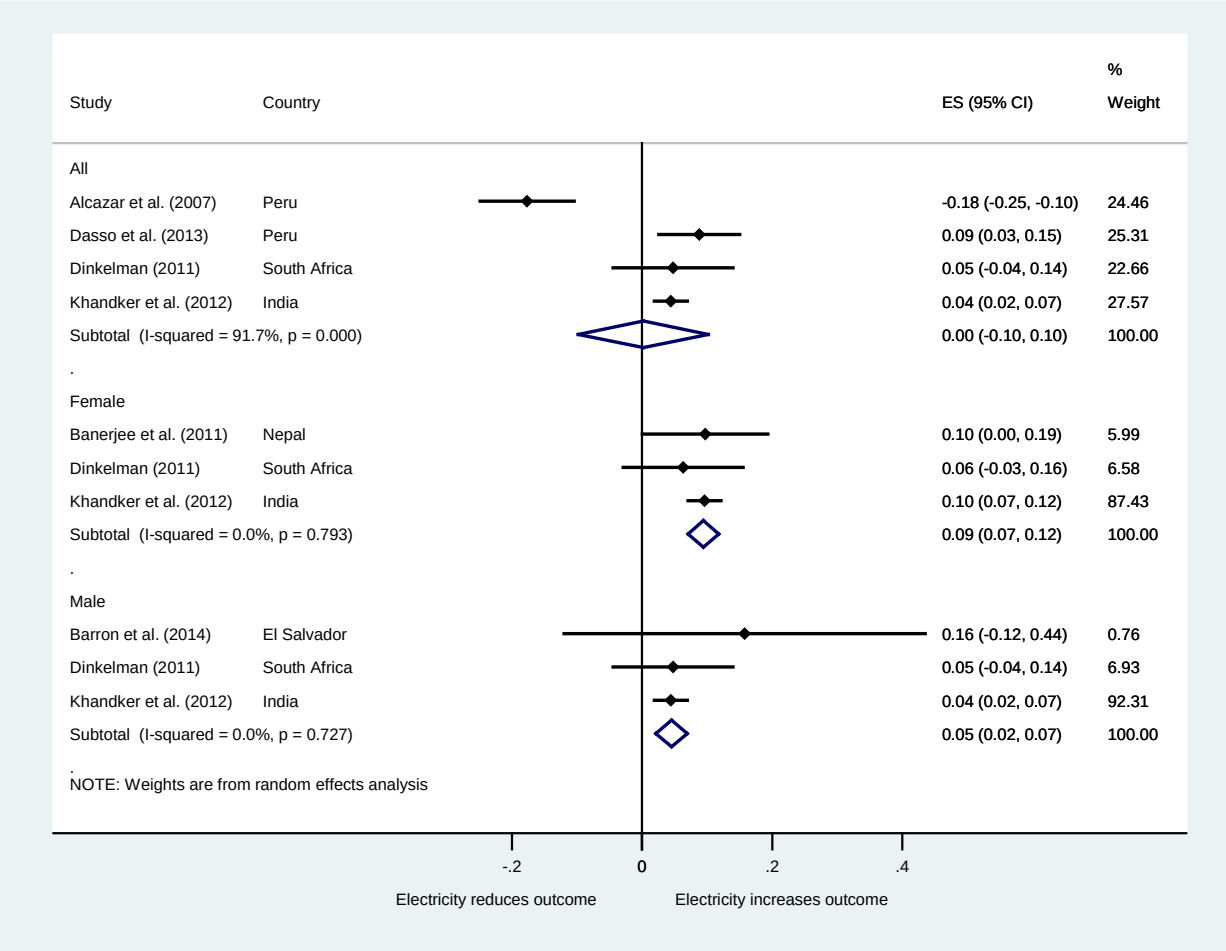
There are seven studies examining the effect on household income (logged form), and the pooled estimate of effect (g= 0.05) suggests electricity access has overall positive impact on total income (figure J.5). Four studies examined the effect on non-farm income and the pooled estimate of effect (g= 0.05) suggests that electricity access has positive impact on non-farm income too (figure J.6).

Figure J.6. Impact of Electricity Access on Household Income (Non-farm)



Four studies measured the effect of electricity access on number of hours worked. The pooled estimate of effect (g=0) suggests that electricity access has no impact on the number of hours worked (figure J.7). This is because Alcazar (2007) drives the overall effect to the null. Alcazar (2007) study in Peru investigated the effect of quality of electricity provision. In this study all the households have access to electricity, but the quality of service is different between treatment and comparison area. Consumers with better quality of service face fewer service failures (less dimming in electric services, fewer hours of blackouts, and a lower number of failures) and have more hours of electricity. This study found negative significant effect. This is puzzling, but the author speculates that better quality of electricity could allow individuals to increase their efficiency, reduce their total work burden, increase their leisure time, or earn more income using the same number of working hours. Electricity access is found to increase the number of hours worked for females, while for males it is not significant. Note that Alcazar (2007) does not have gender wise estimates, but if it had, it would affect the gender wise estimate.

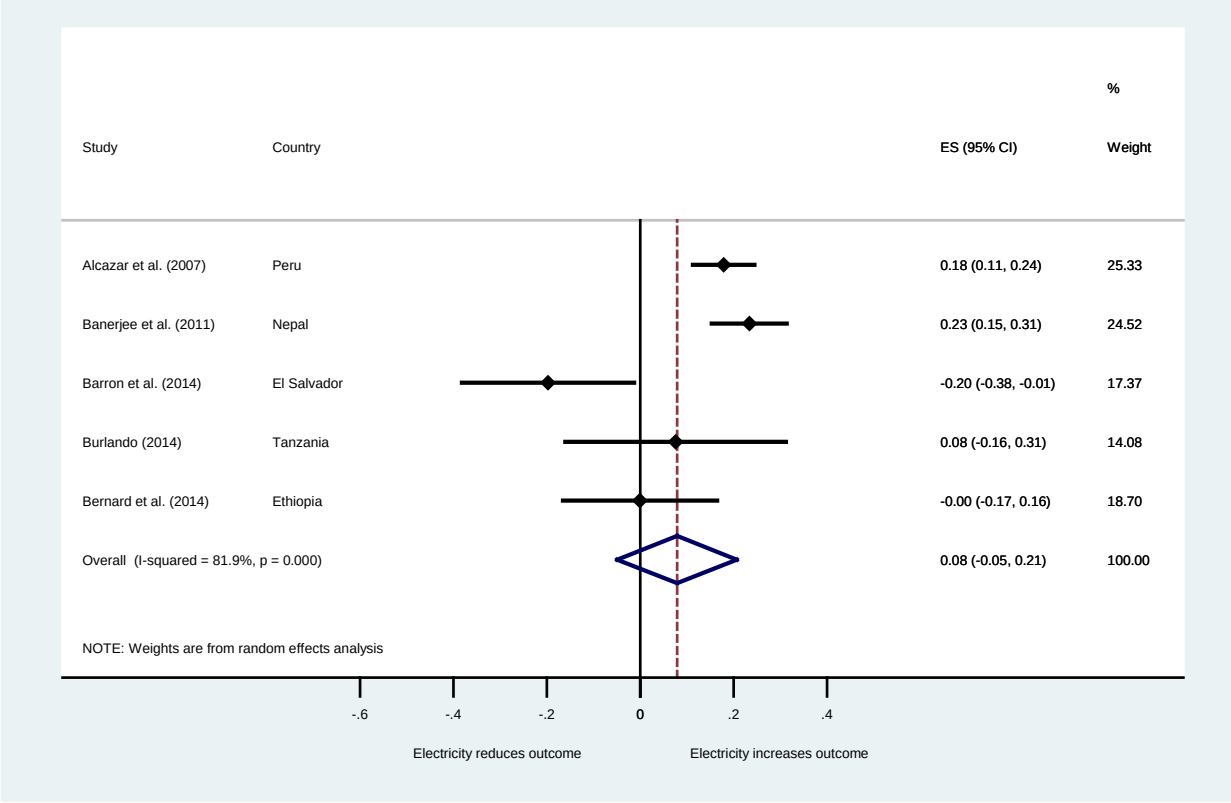
Figure J.7. Impact of Electricity on Number of Hours Worked



In terms of hours spent on leisure, five studies evaluated the time spent on leisure. The pooled estimate of effect (g=0.08) suggests positive impact but the confidence intervals do not exclude a negative effect (95% CI [-0.05, 0.21]) (figure J.8). The 2007 study on Peru by Alcazar shows a significant positive effect (this is for both males and females). The study on Nepal by Banerjee et al. (2011) looked at females only and found positive effect. Bernard et al. (2014) study on Ethiopia found no effect and Barron and Torero (2014) looked at males in El Salvador and found negative effect. The study found that adult males in the 30 - 40 age group reduce time allocated to leisure, while increasing time in other labor activities. This time reallocation is reflected in income impacts.

The findings from these studies raise questions that need to be further evaluated: Is the leisure effect different on men and women, and under what circumstances? Given the paucity of evidence in this aspect, further impact evaluations could provide interesting insights.

Figure J.8. Impact of Electricity Access on Leisure



Impact electricity access on women empowerment

The evidence base for women's empowerment outcomes is particularly thin. Overall, only three studies in Bangladesh, Nepal and Bhutan analyzed the impact of electricity access on different aspects of women's empowerment in mobility, general decision-making (children, family planning and health/education), and economic and financial decision making. First, the two studies in Bangladesh and Nepal that looked at mobility, found no impact on women's mobility in visiting family or friends. These studies also looked at mobility in visiting public places, and the Bangladesh study found a significant impact, but in the one in Nepal did not. Second, with respect to general decision making, both studies show that electricity access has significant impact on women's ability to make decisions regarding their children. About family planning, the Nepal study found a significant positive effect, but the study in Bangladesh found no significant effect. The Bhutan study is the only one investigating health and education decision-making, and it found significantly positive effects. Regarding effects on economic and financial decision-making, only the study in Bangladesh found a positive and significant effect (in the other two cases it was not significant).

Conclusion

The systematic review found that electricity access has significant positive effects on study time, years of schooling, as well as school enrollment, which are important inputs that may contribute to improved educational outcomes. The review finds mixed evidence on fertility. As for impact on health, women's empowerment, income, and firm profits, the evidence-base is thin. The only two studies identified that look at health effects show that electricity access reduces the incidence of cough, respiratory problems, eye irritation, and headache.

There are areas where more work is needed, such as health outcomes, women's empowerment, and the impact on microenterprise profits. The Bank contributed to the evidence base – five out of thirty two studies were funded by the Bank and evaluated Bank programs. However, this is not enough, and the Bank needs more impact evaluations to measure and build the evidence base for the benefits of electricity access. Also, there is little evidence on the effects of urban electrification.

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Appendix K
Financial Performance of Electricity Utilities for Selected Countries and Years

Table K.1 Net Income after Taxes of Electricity Utilities for Selected Countries and Years

No.	Country	2000	2010	2013
1	Angola	Loss	Loss	Loss
2	Argentina	Loss	Loss	Loss
3	Bangladesh	Loss	Loss	Loss
4	Botswana	Profit	Loss	Loss
5	Brazil	Loss	Profit	Loss
6	Cambodia	Loss	Profit	Profit
7	Cameroon	Loss	Loss	Loss
8	Dominican Republic	Loss	Loss	Loss
9	Congo, Dem. Rep.	Loss	Loss	Loss
10	Egypt	Loss	Loss	Loss
11	Ethiopia	Loss	Loss	Loss
12	Ghana	Loss	Profit	Loss
13	India	Loss	Loss	Loss
14	Indonesia	Loss	Profit	Loss
15	Jamaica	Profit	Profit	Profit
16	Kazakhstan	Loss	Profit	Loss
17	Kenya	Loss	Profit	Profit
18	Kyrgyzstan	Loss	Loss	Loss
19	Lao PDR	Loss	Profit	Profit
20	Mali	Loss	Loss	Loss
21	Mongolia	Loss	Loss	Loss
22	Mozambique	Loss	Loss	Loss
23	Nepal	Profit	Loss	Loss
24	Nicaragua	Loss	Loss	Loss
25	Nigeria	Loss	Loss	Loss
26	Pakistan	Loss	Loss	Loss
27	Philippines	Loss	Loss	Profit
28	Rwanda	Loss	Loss	Loss
29	Senegal	Loss	Loss	Loss
30	South Africa	Profit	Profit	Profit
31	Sri Lanka	Loss	Profit	Loss
32	Tajikistan	Loss	Loss	Loss

33	Tanzania	Loss	Profit	Loss
34	Timor-Leste	Loss	Loss	Loss
35	Tonga	Loss	Profit	Profit
36	Turkey	Loss	Profit	Profit
37	Uganda	Loss	Loss	Loss
38	Ukraine	Loss	Loss	Loss
39	Vietnam	Loss	Loss	Profit
40	Zambia	Loss	Profit	Profit

Source: Based on various sources, mostly on annual reports of national utilities or proxies when available, and Project Appraisal Documents, Country Assistance Strategies, Country Partnership Strategies, and other relevant sources.
Notes: In unbundled sectors with mixed state and private ownership, a major national utility (for example, KEGOC, the national transmission company for Kazakhstan) was chosen as proxy indicator. When data were not available for 2000, 2010, and 2013, the closest available year was chosen for which data could be found. Net income is after tax.

Appendix L
World Bank Development Policy Operations with Electricity Sector–related Objectives

Table L.1 World Bank Development Policy Operations with electricity sector-related objectives (FY2000-2014)

Project ID	Project name	Approval FY	Country	Total commitment amount ($, m)	Commitment for power sector projects	IEG outcome rating[a]	IEG risk to development outcome rating[b]
P074801	Development Support Credit IV/DPL	2007	Bangladesh	200	140	S	M
P090832	Development Support Credit III	2006	Bangladesh	200	130	S	M
P107797	Power Sector Development Policy Loan	2008	Bangladesh	120	120	MU	S
P108843	Development Support Credit IV—Supplemental Financing	2008	Bangladesh	75	59	S	M
P110110	Development Support Credit IV—Supplemental Financing II	2008	Bangladesh	100	25	S	M
P076905	Energy Sector Reform Loan	2002	Brazil	455	432	S	-
P082712	Power Sector Program Loan	2005	Dominican Republic	150	150	U	H
P113301	Economic Governance and Poverty Reduction Credit	2009	Ghana	300	249	S	M
P117924	Poverty Reduction Support Credit (PRSC-7)	2011	Ghana	215	133	MS	S*
P127314	Poverty Reduction Support Grant 8	2012	Ghana	100	57	MS	S*
P094288	Reform Implementation DPL	2008	Lebanon	100	73	U	H
P099618	Energy Sector DPL	2007	Morocco	100	78	MU	S
P090690	Poverty Reduction Support Credit II	2007	Pakistan	350	189	MU	S
P113372	Poverty Reduction and Economic Support Operation	2009	Pakistan	500	350	MU	H
P128258	Power Sector Reform DPC	2014	Pakistan	600	600	n.a.	n.a.

Project ID	Project name	Approval FY	Country	Total commitment amount ($, m)	Commitment for power sector projects	IEG outcome rating[a]	IEG risk to development outcome rating[b]
P098867	Poverty Reduction Support Credit I—Supplemental Financing	2006	Pakistan	150	78	n.a.**	n.a.**
P105279	Energy Sector Recovery Development Policy Financing	2008	Senegal	80	68	U	H
P128284	First Governance and Growth Support	2013	Senegal	55	32	-	-
P143645	First Power and Gas Sector DPO	2013	Tanzania	100	57	-	-
P121877	Energy Development Policy Operation	2011	Tonga	5	5	S	NL
P126453	Economic Recovery Operation	2012	Tonga	9	6	S*	S*
P110643	Programmatic Electricity Sector DPL	2009	Turkey	800	800	S*	S*
P117651	Second Environmental Sustainability and Energy Sector DPL2	2010	Turkey	700	350	n.a.**	n.a.**
P121651	Second Environmental Sustainability and Energy Sector DPL3	2012	Turkey	600	378	n.a.**	n.a.**
P115874	Power Sector Reform DPO	2010	Vietnam	312	312	n.a.**	n.a.**
P124174	Power Sector Reform DPO2	2012	Vietnam	200	200	n.a.**	n.a.**
P107218	First Poverty Reduction Support Credit	2010	Zambia	20	15	MS	S
P117370	Poverty Reduction Support Credit 2	2011	Zambia	30	15	MS	S
Total commitment				6,625	5,102		

Source: World Bank Group portfolio review, IEG Information Completion Report Reviews and Information Completion Reports.
Notes: DPC = Development Policy Credit; DPL = Development Policy Loan; DPO = development policy operation; PRSC = Poverty Reduction Support Credit; FY = fiscal year; m = millions; n.a. = not applicable (project is still ongoing); -= not available (project has recently closed and the Information Completion Report is not available yet).
* denotes Information Completion Report (ICR) ratings when IEG ICR Reviews (ICRR) were not available; ** denotes ICRs and ICRRs are now produced only at the end of the DPO series;
a. IEG outcome rating: S = satisfactory; MS = moderately satisfactory; MU = moderately unsatisfactory; U = unsatisfactory.
b. IEG risk to development outcome rating: NL = negligible to low; M = moderate; S = significant; H = high.

Appendix M
Joint World Bank Group Projects

Table M.1 List of Joint World Bank Group Projects (FY2000-2014)

Access level	Country	Project company name	Type of project	Project/ ownership structure	World Bank commitment/ exposure[a] ($, m)	World Bank commitment/ exposure[a] FY approval	IFC commitment ($, m)	IFC commitment)/ FY committed	MIGA gross exposure ($, m)	MIGA gross exposure)/ FY issued
L	Cameroon	Kribi Power Dev Company	Generation-heavy fuel oil and eventual conversion to natural gas	IPP; partly government-owned	PRG: 78.2	2011	Loan: 80	2012	78.2	2014
L	Cameroon	Dibamba Power Dev Company	Generation—heavy fuel oil	IPP; partly government-owned	n.a	n.a	Loan: 31	2010	31.5	2014
L	Cameroon	AES Sonel	Integrated utility	JV with government	n.a	n.a	Loan: 89.4	2006	180	2014
L	Kenya	Thika Power Limited	Generation–heavy fuel oil	IPP	PRG: 45	2012	Loan: 37	2012	61.5	2012
L	Kenya	Triumph Power Generating Company Limited	Generation–heavy fuel oil	IPP	PRG: 45	2012	n.a	n.a	113.6	2013
L	Kenya	Gulf Power Limited	Generation–heavy fuel oil	IPP	PRG: 45	2012	Loan: 55.8	2013, 2014	27.9	2014
L	Kenya	OrPower 4—Olkaria III Power Plant Expansion	Generation-geothermal	IPP	PRG: 26 (+5 option to expand)	2012	n.a	n.a	134	2012
L	Uganda	Umeme Limited	Distribution—privatization concession	Fully private; publicly- held company	PRG: 5	2005	Loan: 105.5	2009; 2013; 2014	46.9	2005; 2007

Access level	Country	Project company name	Type of project	Project/ ownership structure	World Bank commitment/ exposure[a] ($, m)	World Bank commitment/ exposure[a] FY approval	IFC commitment ($, m)	IFC commitment)/ FY committed	MIGA gross exposure ($, m)	MIGA gross exposure)/ FY issued
L	Uganda	Bujagali Energy Limited	Generation—large hydro	IPP	PRG: 115	2002; 2007	Loan: 131	2007; 2013	120.3	2007; 2013
M	Bangladesh	Bangladesh IPP/ Power Sector DPL	Transaction mandate and generation	IPP	DPL:120	2008	AS: 2	2006	n.a	n.a
M	Bangladesh	Khulna Power Development Company	Generation—diesel	IPP	n.a	n.a	Loan: 44.1	1999	29.34	1999
M	Côte d'Ivoire	Azito Energie S.A./Azito Thermal Phase 3	Generation—natural gas/combined cycle	IPP	n.a	n.a	Loan: 130	2013	116.1	2013
M	India	Maharashtra State Electricity Transmission Co. Limited	Transmission	Sub-national government	Loan: 1,000 TA (PPIAF and ESMAP): n.a.	2010	Loan: 50.1	2010	n.a	n.a
M	Lao PDR	Nam Theun 2 Power Company Limited	Generation—large hydro	IPP; JV with government	IDA PRG: 50 IDA grant: 20	2005	n.a	n.a	90.6	2005
M	Senegal	Kounoune Power S.A.	Generation—heavy fuel oil transmission line	IPP	IDA credit: 15.7 IDA PRG: 7.2	2005	Loan: 19.7	2006	n.a	n.a
M	Senegal	Comasel de Saint Louis S.A	Rural electrification distribution concession	PPP concession	IDA credit: 25.1	2005	Equity: 0.750	2010	n.a	n.a
H	Guatemala	Orzunil I de Electricidad Limitada	Generation—geothermal	IPP	n.a	n.a	Equity:1.3 Loan: 28.2 -1998 SWAp: 1	2000	11.8	2000
H	Jamaica	Jamaica Energy Partners	Generation—diesel	IPP	n.a	n.a	Loan: 70 Equity: 1.91	1995	56.5	1996; 1997

Access level	Country	Project company name	Type of project	Project/ ownership structure	World Bank commitment/ exposure[a] ($, m)	World Bank commitment/ exposure[a] FY approval	IFC commitment ($, m)	IFC commitment)/ FY committed	MIGA gross exposure ($, m)	MIGA gross exposure)/ FY issued
H	Nepal	Himal Power Limited	Generation—large hydro	IPP	n.a	n.a	Loan: 32 Quasi-equity: 3	1995	32	1996
H	Pakistan	Star Hydro Power Limited	Generation—large hydro	IPP	n.a	n.a	Loan: 60	2012	148.5	2012
H	Sri Lanka	Asia Power Private Limited	Generation	IPP	n.a	n.a	Loan: 19.8	1997	1.7	1998
U	Moldova	RED Chisenau, RED Centru, and RED Sud	Distribution privatization	Fully private/PPP concession	n.a	n.a	Loan: 50; 40	2002; 2010	61.1	2001
U	Tajikistan	Pamir Energy Company	Generation, T&D, and TA	Integrated utility	Loan:10	2002	Loan: 4.5 Equity:3.5 TAAS: $0.08m	2003	n.a	n.a
L	Africa	Lighting Africa IFC-World Bank JV	Off-grid Pico solar home systems		IDA: n.a.	n.a	AS: 4.52	207	n.a	n.a
L	World	Lighting Global	Off-grid Pico solar home systems		IDA: n.a.	n.a.	AS: 4.7	2014	n.a	n.a

Source: World Bank Business Intelligence: IFC and MIGA databases

Notes: Joint World Bank Group projects are projects that received parallel financial support from two or more World Bank Group institutions. Appendix includes approved/committed/issued and evaluated joint World Bank Group projects during FY2000–FY2014. Country electricity access categories: L = low (≤ 50%); M = medium (50–75%); H = high (75–95%); U = universal (>95%). IPP=Independent Power Provider; PRG= Partial Credit Guarantee; DPL= Development Policy Loan; AS=Advisory Service; TA=Technical Assistance; PPIAF= Public-Private Infrastructure Advisory Facility; ESMAP= Energy Sector management Assistance Program; IDA= International Development Association; PPP= Public-Private Partnership; SWAp= Sector Wide Approach; TAAS= Training and Advisory Services.

a. World Bank commitment/exposure reflects the prorated commitment amount allocated for power sector activities or the "Net of Power Sector" amount.

NOTE

[1] *Policy Study Report Note*, Lighting Africa, August 2011. *Policy Report Note – Ethiopia*, (by Marge and Econoler), Lighting Africa, August 2012. *Policy Report Note – Senegal,* (by Marge and Econoler), Lighting Africa, 2012. *Policy Report Note – Ghana,* (by Marge and Econoler), Lighting Africa, 2012. *Policy Report Note – Kenya,* (by Marge and Econoler), Lighting Africa, 2012

[1] The standardized mean difference and its confidence interval were computed by Comprehensive Meta-Analysis (CMA) software, and forest plot was produced by Stata "metan" command. When the overall estimate was not provided in the study, the conservative estimate (either boys or girls, urban or rural) was used as an overall estimate (if any).