

**Approach Paper**  
**The Power to RE new: Evaluation of the World Bank Group's  
Support to Electricity Supply from Renewable Energy Resources**  
**September 25, 2017**

## **INTRODUCTION**

1. The Independent Evaluation Group (IEG) is conducting an evaluation as to how effectively the World Bank Group (WBG) has supported clients navigate an evolving market for renewable energy (RE) for supplying electricity to meet energy and environmental needs. It covers a dynamic period from 2000 to 2017 during which RE markets for certain technologies evolved considerably, and there was a marked scale-up of WBG activities in the sector. The evaluation will help determine the ability of WBG to adjust its interventions to rapidly changing conditions and deliver state-of-the-art RE solutions to clients. The evaluation is being undertaken at a time when both the international community and the WBG are placing considerable importance on RE as a key contributor to addressing global climate change. RE, which supports several global development priorities, is vital to achieving inclusive and sustainable economic growth, as per the *Forward Look – A Vision for the World Bank Group in 2030*.

## **BACKGROUND AND CONTEXT**

### **Description of Context and Issues (The World Beyond the World Bank Group)**

2. **Adequate, reliable, and affordable energy supply is vital to attaining economic growth and improving living standards, and RE is an important contributor to this goal.** The United Nations' (UN's) Sustainable Development Goals (SDGs)<sup>1</sup>, further reinforced by the Sustainable Energy for All (SE4ALL) initiative<sup>2</sup>, recognize the importance of energy as a development imperative for economic growth, poverty alleviation, and reducing inequality. With the accelerated deployment of RE in recent years comes the additional expectation that it will create new markets and employment opportunities, and spur economic growth.<sup>3</sup> Such a perspective is also consistent with the World Bank Group's (WBG's) *Forward Look*<sup>4</sup> that aims to accelerate inclusive and sustainable economic growth as a key way to achieving its twin goals of eradicating extreme poverty and boosting shared prosperity. The availability of affordable and clean energy is both an explicit SDG (SDG7) and an interdependent goal, since it is "crucial for achieving almost all [16 other] SDGs" (UN) such as eradication of poverty, improvements in health and education, clean water supply, industrialization and innovation, and combating climate change. RE<sup>5</sup> features prominently within the SDG7 and SE4ALL, with the SE4All goal to double its share in the global energy mix by 2030.

3. **Global trends and development goals indicate that demand for electricity will continue to grow and that RE can provide an important source of supply.** The International Energy Agency (IEA) expects electricity consumption worldwide to increase in the range of 25 percent to 46 percent between 2014 and 2030<sup>6</sup>. RE can play an important role in meeting this demand, and deliver the following benefits:

---

<sup>1</sup> [www.sustainabledevelopment.un.org](http://www.sustainabledevelopment.un.org).

<sup>2</sup> Co-chaired with the World Bank, SE4ALL aims to help achieve universal access to sustainable energy "by increasing electricity access, expanding renewable energy, and improving energy efficiency". ([www.se4all.org](http://www.se4all.org))

<sup>3</sup> IRENA. Renewable Energy Benefits: Measuring the Economics. 2016.

<sup>4</sup> *Forward Look – A Vision for the World Bank Group in 2030*, 2016. World Bank Group, Washington, DC.

<sup>5</sup> Can be defined as energy that is generated from natural resources and is not depleted when it is utilized.

<sup>6</sup> Calculations based on IEA data, reflecting projections from three different demand scenarios, *World Energy Outlook 2016*.

a. **Increase access and supply of electricity**<sup>7</sup>: RE technologies can be useful options for producing electricity in order to facilitate universal access to the 1.1 billion people worldwide who presently lack service, in line with the goal in SDG7. Many live in rural and isolated areas,<sup>8</sup> making mini-grids and stand-alone systems using RE technologies, such as solar home systems and small-scale hydro solutions essential to providing access. In addition, RE can help meet some of the demand from existing household and business consumers and from those newly connected to the grid.

b. **Enhance security of power supply**: Since RE is an indigenous natural resource that is often used domestically, it serves as a hedge against fossil fuel prices uncertainties determined by international markets and benefit a country's trade balance by decreasing fossil fuel imports.

4. **Power systems generally include a mix of technologies, and these choices have global and local environmental implications.** Demand for electricity can be met by a number of available power generation options, including fossil-based technologies<sup>9</sup>, RE<sup>10</sup> or nuclear power. The technology mixes in countries have been mainly guided by least-cost planning methods. At present, the global power generation mix is dominated by fossil fuels, which produce 65 percent of the electricity. However, fossil fuels emit considerably more pollutants than RE. In 2014, the energy sector was responsible for 65 percent of the global greenhouse gas (GHG) emissions, of which, over 90 percent were related to the release of carbon dioxide (CO<sub>2</sub>)<sup>11</sup> into the atmosphere by fossil fuel combustion.<sup>12</sup> Use of fossil fuels also led to increases in local pollutants such as particulate matter (PM), sulphur oxide (SOx) and nitrogen oxide (NOx). Such pollutants are known to cause adverse health impacts, induce acid rain, and impose economic costs<sup>13</sup>. RE provides an opportunity to avoid such unwanted impacts by contributing towards climate change mitigation and by reducing local pollution. Utilizing more RE is an environmentally sustainable way to meeting global energy demand<sup>14</sup>.

5. **In 2015, nearly 25 percent of the electricity globally was produced from RE sources, predominantly through hydropower.** Many of the RE options that are prevalent today use mature and technically proven technologies, although some may not be fully financially viable yet. Historically, the dominant RE source for producing electricity has been hydropower. While its share of the total installed RE capacity declined globally from 86 percent to 65 percent in the decade from 2005 to 2014, hydropower still produces by far the largest proportion of electricity from RE (76 percent in 2014). Hydropower, when it includes a reservoir for storage, is a technology that can be flexibly dispatched to match power demand and system needs<sup>15</sup>. There are other long-standing RE technologies, such as biomass and geothermal power, but their global scale and rates of expansion remain modest<sup>16</sup>.

---

<sup>7</sup> It is important to note that the ability to integrate RE into power systems is based on specific technical and other requirements as well as the natural resource endowments in a given geographical location.

<sup>8</sup> Independent Evaluation Group. 2016. *Reliable and Affordable Off-Grid Electricity Services for the Poor: Lessons from the World Bank Group Experience*. World Bank, Washington, DC.

<sup>9</sup> Includes coal, gas, fuel oil, diesel.

<sup>10</sup> Includes biomass, geothermal, hydropower (all sizes), solar (photovoltaic and concentrated solar), and wind power.

<sup>11</sup> A GHG that negatively impacts climate change.

<sup>12</sup> Data for 2014. IEA, 2015. *World Energy Outlook Special Report: Energy and Climate Change*. Paris: International Energy Agency.

<sup>13</sup> World Health Organization, 2013. *Review of evidence on health aspects of air pollution-REVIHAAP Project*. Technical report, Copenhagen. *World Energy Outlook Special Report 2016: Energy and Air Pollution*. IEA.

<sup>14</sup> This is a rationale behind SDG7 and SE4ALL to utilize more RE and improve energy efficiency.

<sup>15</sup> As long as there is sufficient water availability, although rainfall and hydrological patterns are being affected by climate change with varying consequences for hydropower production efficiency, depending on plant location.

<sup>16</sup> In 2014, geothermal capacity represented 0.18 percent of total power capacity globally (slightly down from 0.2 percent in 2005), while corresponding numbers for biomass are 1.6 percent in 2014 (up from 1.2 percent in 2005).

6. **Recently, there has been a marked uptick in global RE development mostly due to the considerable scale-up in wind and solar power.** But these are intermittent technologies<sup>17</sup> that can create challenges integrating into power systems. Favorable policies, significant investment in research and development, and growing economies of scale have all led to steep cost reductions and significant market penetration by wind and solar power in a large number of countries and territories<sup>18</sup>, particularly in the last decade. Investments and participation by the private sector as independent power producers (IPPs) also helped facilitate scale-up. This expansion also benefitted from awareness and incentives as part of increasing efforts to mitigate global climate change. In 2015, RE accounted for more than half of the capacity in the world's newly installed power plants<sup>19</sup>. However, since the availability of intermittent sources cannot be directly controlled, solar and wind need to be complemented by other power sources less beholden to the weather (such as natural gas or hydropower). Intermittency was not a significant issue when RE markets were nascent and when challenges facing RE pertained largely to the adequacy of policies, cost recovery, bankability of investments, and mobilization of financing. As RE scales-up and the share of intermittent sources increases, maintaining a stable power system and reliable operations represents a key challenge. With the largest share of investments in newly built RE capacity shifting to the developing world (from 32 percent to 65 percent during the decade leading up to 2015), integrating intermittent RE has become a development challenge.

7. **As the investment climate for scaling-up RE continues to evolve and private sector interest in particular RE technologies has grown, a number of emerging disruptions in the sector present challenges and potential opportunities for the future deployment of RE.** While intermittent RE can pose system integration challenges, power storage could be a potential solution if the technology were to improve and become cost effective. In addition, power systems planning will need to transition from traditional least-cost methods to approaches that better account for the impact of intermittent technologies. Moreover, the current business models of power utilities could be significantly disrupted with the emergence of distributed generation<sup>20</sup>. While this could create greater opportunities for household level RE, it may lead to commercial uncertainty for utility-scale operations. Additionally, the Paris Agreement<sup>21</sup> on climate change could provide a catalytic push and exert pressure towards deploying RE<sup>22</sup>.

## **WBG Policies and Interventions**

8. **The WBG's work on RE development has evolved from a peripheral energy sector activity with a small number of sporadic operations into a major, mainstreamed strategic approach for addressing development issues in energy and environment.** The WBG's support to RE development has been dynamic, reflecting client demand, global trends in RE markets, and the emergence of environment considerations and climate action (refer to Figure 1 and Box 1 for more details). Since the 1990s, there have been dramatic strategic shifts in the WBG's policies for energy sector support. Until the mid-1990s, WBG support primarily aimed to improve the efficiency of public utilities. WBG energy policies then shifted to prioritize commercialization and private sector participation and to increase access to

---

<sup>17</sup> Technologies that are interruptible in availability due to factors beyond direct control (i.e. solar and wind power are available when the sun shines and wind blows, respectively). These technologies are a subset of variable renewable energy (VRE) sources, which also include technologies where availability fluctuates, such as hydropower without storage, due to seasonal variations.

<sup>18</sup> Based on Energy Information Administration (EIA) of the United States data for 2014, over 50 countries and territories have seen the share of solar and wind capacity increase to 7.5% or more, including in a range of countries that include China, the United States, India, Morocco, and Nicaragua.

<sup>19</sup> *World Energy Outlook*, International Energy Agency, 2015.

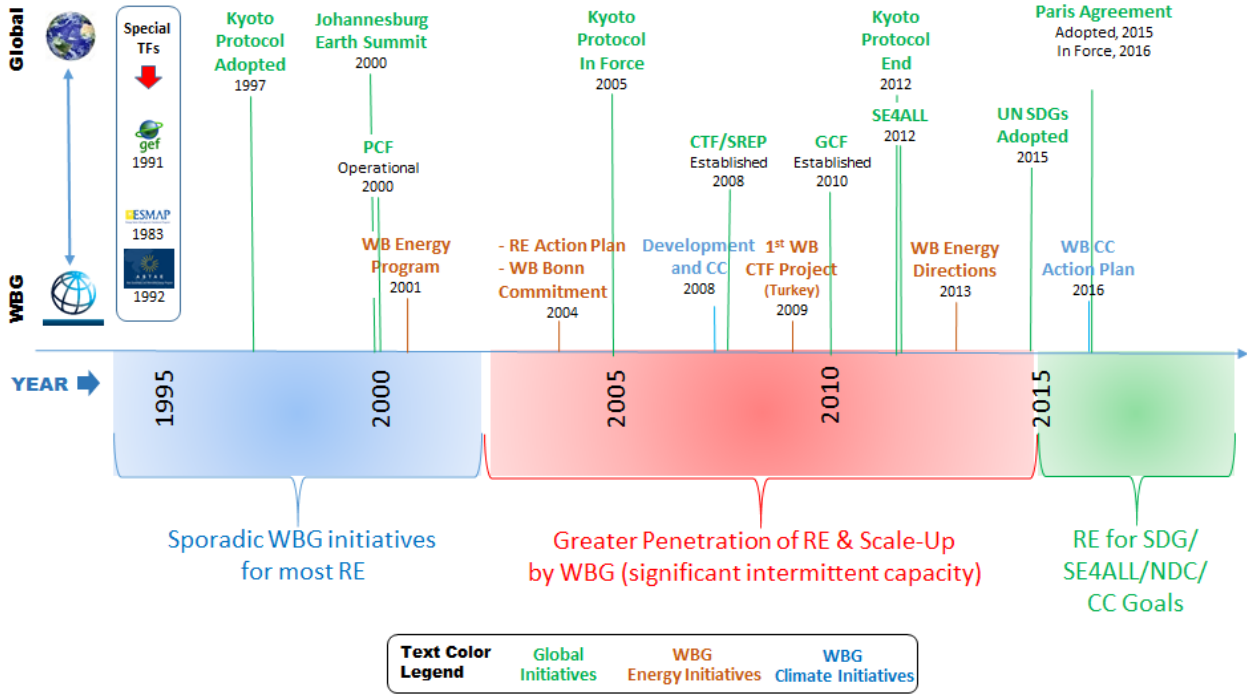
<sup>20</sup> Generating electricity at the household (consumption) level, and trading with the grid on a net metering basis.

<sup>21</sup> The Paris agreement was adopted in 2015 and entered into force in 2016.

<sup>22</sup> The RE share by 2040 would need to reach 37 percent to meet the Nationally Determined Contributions (NDCs), and 58 percent to limit global temperatures to 2° Celsius.

electricity, some of which relied on RE (off-grid, in particular). As the millennia changed, the stringent focus on sector restructuring and privatization gave way to a greater emphasis on removing barriers for energy sector development and electricity access, and to increased importance of environmental sustainability. A major turning point for RE came in 2004 at the International Conference for RE in Bonn, Germany, when the WBG committed to increase its RE lending by 20 percent annually over five years. This target was substantially exceeded, with WBG investments in a variety of RE technologies reaching more than US\$7 billion by 2009, compared to the initial goal of US\$1.9 billion (see following section and Attachment 6 on WBG RE portfolio for more details). By 2010, RE investments featured significantly in the WBG portfolio, and were prominent in WBG strategies that focused on sustainable energy.

Figure 1. Some Important Milestones that Influenced RE Development Over Time



9. While the WBG’s primary motive for developing RE was to meet clients’ energy needs, its policies and investments were influenced greatly by global environmental and climate change agreements and initiatives. The climate agreements signed in Kyoto, Japan (1997) and Paris, France (2015) bookend various climate related initiatives that bolstered the WBG’s RE support as a way to help mitigate climate risks. Some of the actions that supported RE include the execution of projects on behalf of the Global Environment Facility (GEF), establishment of the Prototype Carbon Fund (PCF), and implementation of investments that utilize the Climate Investment Funds (CIFs). The WBG’s 2016 Climate Change Action Plan converges with the institution’s latest energy policies and mainstreams RE, recognizing it as a key contributor in addressing both energy and environmental challenges.

10. The period since 2000 provides a rich set of experiences where the WBG has attempted to help clients navigate evolving global and local markets where nascent industries for various RE technologies have dynamically expanded to levels that they now face new and additional challenges to continue to scale-up. The early part of the period from FY2000 to FY2017 reflects an important time where the WBG was helping clients diversify into RE technologies beyond hydropower emphasizing development priorities such as access to electricity for the poor and environmental sustainability. It was also a period that operationalized international efforts to address climate change, where RE is an important contributor. Mobilizing investments where markets for various technologies were still at their infancy

posed particular challenges. The period since 2005 reflects a dynamic shift in WBG support for RE that is also consistent with global trends, where RE became increasingly mainstreamed with a substantial expansion of intermittent technologies such as solar and wind power. International funding for climate change mitigation were accessed to advance reforms and catalyze investments. The expansion in markets were promoted by the public sector and facilitated increasing private participation where barriers were eliminated and there were fewer risks. Going forward, RE is expected to be prominent in WBG energy sector investments, especially in light of the commitment to increase its climate-related portfolio from 21 percent in 2015 to 28 percent by 2020. However, the continued scale-up of RE is expected to face challenges as well as opportunities in an investment environment that also continues to evolve. Therefore, the WBG will need to position itself to deliver on its future commitments, which can be significantly informed by the experiences from FY2000 to FY2017 period.

## The WBG RE Portfolio

**11. RE has been an important part of the WBG’s portfolio in the power sector, with a substantial scale-up in the number of projects and commitments amounts during the period, FY2000 to FY2016.**<sup>23</sup> The International Bank for Reconstruction and Development/International Development Association (IBRD/IDA) investment lending for RE totaled over US\$10.6 billion during the period, out of an overall Energy and Extractive (EEX) GP portfolio of about US\$100 billion. Development Policy Financing (DPF), Program for Results (P4R), and World Bank guarantees that supported RE accounted for an additional US\$1.7 billion, US\$0.8 billion, and US\$0.9 billion respectively. IBRD/IDA also has supported 43 carbon-offset projects in RE with US\$322 million in commitments for purchasing emissions reductions (ERs). International Finance Corporation (IFC) investments in RE during the same period consisted of US\$5.6 billion in power generation (which represents nearly half of IFC’s US\$11.8 billion long-term investment portfolio in the power sector), and an additional US\$2.5 billion in investment in related sectors<sup>24</sup>, of which US\$1.7 billion was channeled through financial intermediaries. The Multilateral Investment Guarantee Agency (MIGA) issued guarantees covering 31 projects with gross exposure of US\$2.1 billion. The WBG, through the variety of these financial instruments, helps clients address various barriers to RE development, including providing financing, mitigating risks, and extending global knowledge. Of the 1,130 RE projects approved or committed during the period by all WBG institutions, 126 have been evaluated and validated by the Independent Evaluation Group (IEG). The evaluation will assess the outcomes, factors affecting project results and WBG work quality and emerging lessons from IEG’s review/validation of 65 World Bank Implementation Completion and Results Reports (ICRRs) (56 investment lending projects, eight DPF operations, and one carbon finance operation); 41 IFC Investment Expanded Project Supervision Reports (XPSRs); 11 IFC Advisory Services Project Completion Reports (PCRs), and 9 MIGA Project Evaluation Reports (PERs). IEG does not evaluate World Bank Advisory Services and Analytics (ASA).

**12. WBG support for RE in the early years were sporadic but instrumental in leading to the substantial scale-up across a range of technologies following the 2004 commitment to increase RE lending by 20 percent per year (see Attachment 6 for more details on portfolio).** Many of the early projects during the period of evaluation were associated with initiatives to increase electricity access, and reflects attempts to mobilize RE in nascent markets. A significant up-tick of nearly 90 percent of WBG investment from FY2000 - FY2016 came after the WBG’s pledge at the 2004 International Conference for RE in Bonn, Germany. The WBG total RE portfolio included a significant proportion of hydropower generation projects, which accounted for 40 percent of IBRD/IDA and IFC<sup>25</sup> commitments and nearly 70 percent of

---

<sup>23</sup> The evaluation will cover the period FY2000 to FY2017. Portfolio data will be updated to include FY2017 in the evaluation.

<sup>24</sup> See Attachment 5 for details and the definition of “Related Sectors.”

<sup>25</sup> The breakdown by technology type for IFC are for Power Generation only since such information is not available for “Other Sectors”.

**BOX 1: The Key Factors and Influential Milestones in the Evolution of the WBG's Strategies as it relates to RE**  
(please refer to Figure 1 for key milestones that influenced WBG policy)

**Before and through the 1990s**, RE played a modest role in WBG energy sector support, except for hydropower. Other technologies such as solar, wind and geothermal, which were referred to as “new” RE at the time, were sometimes piloted and their introduction then promoted, when economically viable. In the early 1990s, the WBG promoted RE as a “clean energy” in response to growing environmental concerns, and as way to provide off grid electricity sooner and at a lower cost compared with grid extension (World Bank, 1993). Since its establishment as a pilot program in 1991, the Global Environment Facility (GEF) has progressively increased financial support for RE projects, including through the WBG (Figure 1). Climate change became more prominent with the establishment of the UN Framework Convention on Climate Change (UNFCCC) in 1992. In the same year, the World Bank, with support from donors, established the Asia Sustainable and Alternative Energy Program (ASTAE), specifically designed to help regional client countries advance RE and energy efficiency. By the mid-1990s, the strategic objectives of the WBG's support to the development of the energy sector in client countries had shifted. Previously, the WBG aimed to help increase sector efficiency by improving operational and financial outcomes of public utilities. The shift was defined by a requirement to client countries to commit to restructuring the sector and transitioning towards commercialization and greater private sector participation, or full privatization under a regulated environment. The WBG also placed greater strategic emphasis on increasing access, including the deployment of RE in rural and remote areas where electrification projects often were not commercially viable and required public sector support. Climate change continued to gain traction in global discourse, as the 1997 Kyoto Protocol<sup>a</sup> (which would be ratified later in 2005) established an international carbon trading scheme where RE projects from developing countries could qualify to access funding. The World Bank was among the first to establish instruments under the Kyoto Protocol, when the Prototype Carbon Fund (PCF) began operating in 2000.

**Between 2000 and 2010**, the stringent focus on restructuring and privatizing the energy sector gave way to a greater emphasis on removing barriers for energy development and on increasing electricity access, in which RE began to play a more prominent role. During this period, increasing attention was paid to environmental sustainability (World Bank, 2001). The early part of the decade also saw a slowdown in hydropower investments as the WBG revised its approach to environmental and social safeguards related to the technology. A major turning point for RE came in 2004 at the International Conference for Renewable Energies in Bonn, Germany, when the WBG committed to increase its lending for RE by 20 percent per year over the next five years<sup>b</sup>. The target was exceeded substantially, reaching more than US\$7 billion by 2009, compared to the initial goal of US\$1.9 billion, as developing countries such as China and India significantly increased their RE investments. As the Kyoto Protocol entered into force in 2005, it activated the Clean Development Mechanism (CDM) which enabled carbon-offset financing, providing an additional funding source for qualified RE projects, while further bringing to the forefront the issue of climate change. In 2008, the WBG accessed the global Climate Investment Funds (CIFs)<sup>c</sup> for the first time, initiating a trend of channeling even greater climate funds to the development of RE. In the same year, the WBG also issued *Development and Climate Change*, a framework report highlighting the strategic relationship (World Bank, 2012). The result was a significant scale-up in RE lending by the WBG during 2006-10, when the RE share in energy sector lending increased from 16 percent to 23 percent<sup>d</sup>.

**After 2010**, RE expansion became a key priority in the energy sector of the WBG as well as in climate initiatives. The WBG's *Energy Sector Directions*, which guides its sector work, includes two key pillars specific to RE: (i) supporting and financing all forms of RE, and (ii) advocating globally to encourage developed countries to support research and development for new energy technologies (World Bank, 2013). RE's prominence in the global initiatives led by the UN (the adoption of SE4ALL in 2012 and the SDGs in 2015) has reinforced the WBG's strategic directions. RE is also considered a key solution in the climate change agenda. With the end of the Kyoto Protocol commitment period in 2012, a new agreement was reached between 197 countries in 2015 in Paris, France, to limit the rise in global temperatures to less than 2° Celsius above pre-industrial levels, initially through Nationally Determined Contributions (NDCs), a voluntary set of country targets (including a strong emphasis on RE) that can be reviewed and adjusted periodically. The goals in the *Paris Agreement* are reflected in the WBG's *Climate Change Action Plan (CCAP)* (World Bank, 2016). The CCAP defines climate change as a cross-cutting development priority, directing the WBG to support client countries implement their respective NDCs, and emphasizes the critical role of RE in climate change mitigation. CCAP commits the WBG to adding 20 GW of RE generation between 2015 and 2020 and to increasing the climate change-related share of the WBG portfolio from 21 percent to 28 percent during the same period. The strategic emphasis on RE is reflected in WBG operations as the annual average WBG lending for RE during 2011-16 was double that of the previous period of 2005-10. The CCAP placed even greater importance on RE development going forward.

<sup>a</sup> Kyoto Protocol to the UN's Framework Convention on Climate Change, agreed in 1997, issued in 1998.

<sup>b</sup> The initial target included RE as well as energy efficiency. In 2008, the RE lending target was further increased to 30 percent per annum and the commitment period extended to 2012.

<sup>c</sup> Two specific funds within the CIFs have supported RE, in particular: Clean Technology Fund (CTF) and Scale-Up Renewable Energy Program (SREP).

<sup>d</sup> Annual averages during this time period.

<sup>e</sup> At least 100 countries identified RE as a priority area in their NDCs while over 70 of them had specific RE deployment targets.

MIGA guarantees. Since 2010, the portfolio has also seen a considerable increase in support for intermittent power sources—solar PV and wind power—consistent with overall global trends (IRENA, 2016). This has resulted in an increase of the overall share of the solar PV portfolio for both IBRD/IDA and IFC to about 20 percent. Wind power has also become more prominent recently, especially for the IFC where it comprises nearly 30 percent of power sector investments. Geothermal, which is non-intermittent and well suited for base load power supply, was also represented in the portfolios of the three WBG institutions, for a 7 percent share of combined IBRD/IDA and IFC portfolio and 26 percent of MIGA guaranteed projects. Support for biomass is limited in the WBG portfolio. With growing private sector interest in some RE technologies in recent years, IFC has increased its RE portfolio outside its group dealing directly with the power sector, especially through financial intermediaries.

**13. Addressing both energy and environmental goals are the primary drivers for WBG’s support to RE.** Based on the initial portfolio screening, 83 percent of IBRD/IDA RE lending projects have a primary objective that is related to energy sector development (seven of 10 projects had only energy objectives, while the remaining projects include both energy and environmental goals). From an energy development perspective, more than half of the projects in the overall IBRD/IDA RE portfolio has objectives to increase power generation capacity to supply the electricity grid, and 37 percent to increase access to electricity<sup>26</sup>. Most IFC projects in the power sector focused on developing generation capacity for grid supply, while the objectives of RE projects outside of the power sector reflected the growing private sector interest in the broader RE market. MIGA’s RE related guarantees were also mostly aimed at supporting power generation.

**Table 1. Snapshot of WBG Portfolio of Activities Supporting Renewable Energy, by Institution (as of March 31, 2017)**

WBG Institutions and Types of Instruments	Approved, Committed or Issued Projects, FY2000-16		Number of Evaluated Projects from Portfolio
	Amounts (in US\$ millions)	Number of Projects	
<b>World Bank (IBRD/IDA/Trust Funds)</b>			
Investment lending <sup>1</sup>	10,588	183	56
Program for Results (P4R)	797	3	0
DPFs	1,660	14	8
Guarantees <sup>2</sup>	897	6	0
Carbon offset financing	322	43	1
World Bank ASAs <sup>3</sup>	90	328	.*
<b>IFC</b>			
Power sector RE Investments <sup>4</sup>	5,580	197	22
RE-investments in other sectors	2,455	143	19
Advisory Services	244	182	11
<b>MIGA Guarantees<sup>5</sup></b>	<b>2,149</b>	<b>31</b>	<b>9</b>
<b>TOTAL</b>		<b>1,130</b>	<b>126</b>

Sources: IEG Preliminary Portfolio Review; World Bank Business Intelligence, IFC IS and AS, and MIGA Guarantee databases.

Notes: (1) inclusive of recipient-executed technical assistance(TA); (2) refers to partial risk guarantees and other types of IBRD and IDA guarantee products; (3) WB ASAs include economic and sector work (EWS) and TA; (4) broad classification includes loans, equity, credit guarantees (partial credit guarantees, full credit guarantees and risk-sharing facilities); (5) political risk insurance only. \*WB ASAs are not evaluated at the project level.

**14. By sharing global experiences and expertise, convening partnerships for support, and providing financing, the WBG aims to help client countries address key barriers to RE development.** The WBG’s experience supporting RE development in nearly 100 countries worldwide (from FY2000 through FY2016). The WBG disseminates global knowledge in RE through a number of instruments including IFC

<sup>26</sup> This breakdown is not available for IFC and MIGA.

Advisory Services (AS) and WB Advisory Services and Analytics (ASA)<sup>27</sup>. IBRD/IDA also extends funding to clients for TA so that they can secure global expertise and strengthen their capacities. Between FY2000 and FY2016, IBRD/IDA carried out 328 RE-related ASAs at a cost of US\$90 million, in addition to providing US\$606 million<sup>28</sup> in funds to clients for TA. IFC has provided advisory services to 180 RE activities, totaling US\$244 million<sup>29</sup>. Based on a preliminary portfolio analysis and input from sector specialists, the WBG's global knowledge and financial products are mobilized to help client countries address the following critical barriers to RE development:

- **Inadequate Policy Environment and Investment Climate:** Through a combination of DPFs and TA (IFC AS, IBRD/IDA TA), the WBG helps clients improve their legal and regulatory frameworks and policies to facilitate the mobilization of investments in RE.
- **Investment Risks:** Along with policy reforms, the WBG helps mitigate investment and other risks to developing RE through investment lending, IBRD/IDA guarantees, IFC credit risk guarantees, and MIGA political risk insurance as well as through TA (IFC AS, IBRD/IDA TA).
- **Limitations in Institutional Capacity:** Clients often lack adequate capacity to design, develop, and implement RE projects and policies. WBG's TA (IFC AS, IBRD/IDA TA), along with investment lending, increases client capacities and can help to enhance the performance of RE activities.
- **Shortcomings in Technical Design to meet Industry Standards:** The WBG require clients meet industry and international standards in their investments, and often mobilize TA (IFC AS, IBRD/IDA TA) to help clients establish benchmarks and improve designs to enhance development outcomes.

15. **WBG frequently convenes stakeholders and leverages partnership to enhance its support for RE development.** Over half of the IBRD/IDA investments (54 percent of projects) are co-funded with other development partners, including global initiatives such as the GEF and the CIFs<sup>30</sup>, and other multilateral development banks (MDBs) and bi-lateral partners. Two-thirds of the ASA activities, which are executed directly by World Bank, also utilize development partner assistance. This includes two specialized programs that have played a significant role in supporting RE: The Energy Sector Management Assistance Program (ESMAP) and the Asia Sustainable and Alternative Energy Program (ASTAE).

## Results and the Theory of Change

16. **An initial conceptualization of the Theory of Change<sup>31</sup> (ToC) summarizes how the WBG contributes and adds value to client's efforts to develop RE so it can contribute towards achieving economic growth, improving quality of life and protecting the local and global environment.** (refer to Figure 2). The ToC maps the inputs of WBG interventions, which, together with support from partners, enable the WBG to make some *core contributions* for helping clients. These core contributions, through which the WBG brings global knowledge to help address key sector barriers and finance RE investments, are designed to *influence behaviors* (Expected Behavioral Change Process) of the stakeholders to improve outcomes. In the case of RE, changes in behaviors and choices made would result in the successful deployment of RE generation capacity and associated infrastructure (outputs), developed in-line with industry standards, to meet clients' energy needs. The development of RE capacity often displace fossil-based alternatives which, in turn, helps avoid pollution. The resulting outcomes from developing RE are: a) improved access to electricity, b) increased power supplies, c) enhanced energy security, and d)

---

<sup>27</sup> Includes Bank-executed Economic Sector Work (ESW) and Technical Assistance (TA)

<sup>28</sup> This number is included in the IBRD/IDA lending amounts above.

<sup>29</sup> Data on AS is available from FY2006. Prior to that, AS activities were referred to as Technical Assistance, for which there is only limited data. Therefore, pre-FY2006 AS activities are not included in this evaluation.

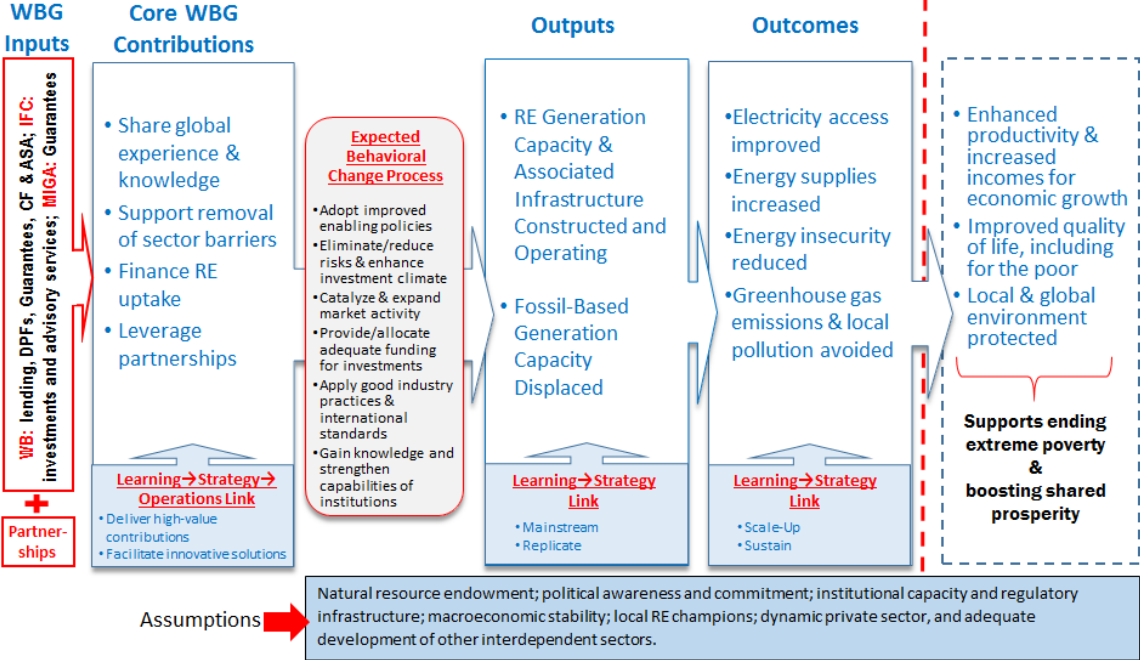
<sup>30</sup> Includes the Clean Technology Fund (CTF) and the Scale-Up Renewable Energy Program (SREP)

<sup>31</sup> This initial ToC will be refined further during the evaluation (please refer to Attachment 3, Causal Analysis of the Theory of Change).



avoided GHGs and local pollution. These energy and environment outcomes are interdependent with various other *assumed* developments in other sectors and, when applied in combination, can lead to a number of development impacts. They include: a) promotion of economic growth; b) improvement to quality of life, especially for the poor; and c) protection of the local and global environment. The impacts support WBG’s twin goals of ending extreme poverty and boosting shared prosperity through sustainable and inclusive economic growth, consistent with the WBG’s *Forward Look 2030* strategy.

Figure 2. (Preliminary) Theory of Change for WBG RE Interventions



NOTE: This change theory will be validated during the evaluation, through the development and assessment of standard Results Frameworks (inputs-outputs-outcomes-impacts) across selected interventions (e.g., off-grid solar PV, wind power), and through consultations with WBG staff

17. The ToC goes beyond the standard linear depiction of the input-output-outcome chain, by providing more transparency around the main evaluation questions and design. In the pathway from interventions to results, the study will focus its evaluative lens on the WBG’s core contributions (that result when WBG inputs are delivered successfully) and, just as importantly, the necessary behavioral shifts that must occur in order to achieve targeted outcomes, as shown in Figure 2. The ToC also accounts for the iterative learning and improvement that can result from these WBG’s engagements. For example, while the WBG shares global knowledge and experience, its staff is also learning from its clients’ experience, which can be operationalized further and disseminated for the benefit of additional clients (Learning-Strategy-Operational Link). Similarly, when clients develop RE power plants and infrastructure using WBG expertise, they also seek to mainstream skills and replicate outcomes (Learning-Strategy Link). Successful change processes and results can then inform future strategies for scaling-up RE.

**Previous Evaluations**

18. The proposed evaluation builds on a series of previous IEG work that integrated RE into the broader assessment of World Bank, IFC and/or MIGA support to electricity sector, climate change, rural electrification or other themes. Although RE has been a component in several IEG evaluations, this proposed assessment will be the first time that it is undertaking a sector evaluation focused exclusively on RE from a WBG perspective.<sup>32</sup> A summary of IEG evaluations related to RE is in Attachment 7.

<sup>32</sup> In FY2016, IEG produced a cluster note reviewing ten evaluated IFC RE investments; in FY2006, IEG assessed the performance of the portfolio of the World Bank’s ‘new’ RE projects, and, in FY1999, IEG evaluated the World Bank’s experience in financing 50 large dams.

19. **Past IEG evaluations that covered RE projects found that the World Bank, IFC and/or MIGA were successful in financing the construction of physical infrastructure, facilitating electricity access, easing market barriers in several countries, and in introducing innovative and pioneering projects at times.** Past evaluations also found that the WBG was successful in mobilizing and catalyzing private sector involvement in RE through provision of long-term financing, technical assistance, and risk mitigation support. However, there were shortcomings in the RE projects' environmental and social performance, focus on the poor, and financial and economic results were below expectations at times. There were also weaknesses in project design, supervision, adaptive management, and data collection during monitoring, making it difficult to determine the impact on end-users.

20. Recurring lessons from some of IEG's past evaluations that covered the WBG's RE portfolio highlighted the need to have well-designed projects and programs that are adequately funded and effectively supervised, strong government commitment, ensuring strong institutional capacities prior to or as a result of the WBG interventions, paying attention to environment and social aspects of the projects from design to supervision, prioritizing beneficiaries over technical solutions, conducting extensive consultations with civil society organizations; and focusing attention to country-specific contexts, in contrast to one-size-fits-all approaches.

## **Purpose, Objectives, and Audience**

### **Purpose and Objectives**

21. **The purpose of this evaluation is to obtain evidence-based findings as to how effectively the WBG helped its clients integrate RE in their overall power generation mix by navigating a dynamically evolving RE market and global initiatives; in order to meet energy and environment needs and contribute towards achieving inclusive and sustainable economic growth.** The evaluation will assess the WBG's RE related activities evaluating its ability to adjust to rapidly changing conditions to deliver state-of-the-art solutions; and learn from this experience so it can better calibrate future assistance where clients face a number of emerging challenges and opportunities for achieving successful development outcomes. The evaluation is being undertaken at an opportune time. It covers a critical period when RE markets for certain technologies have evolved considerably with shifts in market structure (refer to Figure 1). During this period there was a marked uptick in WBG activities in RE that provides a wealth of experience and examples. It is also being undertaken as the global community as well as the WBG is placing considerable prominence on RE going forward as a key contributor to climate mitigation and sustainable economic development. This includes taking actions towards meeting the SDGs and SE4ALL goals, meeting targets established through the Paris Agreement, and honoring the institutional commitment to increase WBG's climate-related investment share to 28 percent by 2020. As signatories to many of these agreements, WBG clients will also have commensurate needs in developing their RE resource endowments. The evaluative evidence can provide insights as to the WBG's preparedness for helping clients address key emerging challenges to the continued scale-up of RE in-line with their development challenges. The evaluation is timely for helping successfully implement the WBG's *Energy Sector Directions*, which feature RE prominently; and inform the design of any upcoming sector strategy. The evaluation is consistent with the WBG's *Forward Look* strategy<sup>33</sup>, specifically the aim to accelerate inclusive and sustainable economic growth - key development impacts sought through the development of RE.

---

<sup>33</sup> *Forward Look – A Vision for the World Bank Group in 2030*, World Bank Group, August 2016.

## Stakeholders and Audience

22. **The primary audience for this evaluation is the WBG Board of Executive Directors and WBG management and operational staff.** The Board’s interest stems from its oversight of the WBG’s performance and policy directions. WBG management and staff—in particular the Energy Extractive Industries Global Practice (GP), the associated water and environment GPs, the Climate Change Global Theme, the IFC’s Global Infrastructure and Power Group and Related Sectors, and MIGA’s Infrastructure underwriting team—would be provided evidence-based findings and lessons based on implementation experience to inform their strategic directions related to RE.

23. Other key audiences include development partners—especially bilateral donors and other MDBs that are committed to SE4All and SDGs and frequently co-finance investments with the WBG—which could use this evaluation to assess the performance of their support and recalibrate it accordingly. Special partners—such as GEF, CIFs, and donors who fund ESMAP and ASTAE—are also a potential audience who would benefit from ascertaining the performance of their support to WBG RE activities and might use the evaluation to inform the directions of their future support. WBG clients across governments and in the private sector would be an essential audience for findings and lessons on how to adapt strategies and respond flexibly to the constantly changing global and country-level RE landscape. Other important audiences include civil society organizations and beneficiaries impacted by the WBG’s RE activities.

## Evaluation Questions and Coverage/Scope

### Evaluation Questions

24. There are two overarching questions that IEG seeks to answer in this evaluation. First, *in what ways and how well has the WBG contributed to addressing its clients’ evolving RE needs?* This first question will be addressed by providing analysis and presenting evidence on the following subordinate questions:

- Sub-Question 1: How well aligned are the WBG’s interventions with the clients’ priority RE needs as they navigate changing RE markets and expanding global initiatives?
- Sub-Question 2: How has the WBG performed in addressing barriers and mobilizing finance for advancing RE development in meeting clients’ energy and environment needs?
- Sub-Question 3: How has the WBG positioned itself at global and country levels through its RE engagements by leveraging experience and partnerships?

25. Second, *what lessons can be learned from experience to strengthen the WBG’s role in helping clients achieve emerging goals in RE?* This question will be addressed by answering the following:

- Sub-Question 4: What does the evaluative evidence indicate about WBG preparedness to assist clients in meeting their future RE development needs?

26. The lines of analytical inquiry for foregoing subordinate questions are specified in Attachment 2.

### Evaluation Coverage/Scope

27. The evaluation will cover the entire WBG portfolio of RE projects approved, committed or issued from FY2000 to FY2017, a critical period when the sector went through a significant transformation globally as well as within the institution, as previously highlighted. The evaluation includes IBRD/IDA lending, non-lending and ASAs; IFC investments and advisory services and MIGA guarantees as well as multi-lateral and bi-lateral partnerships supporting RE during this period. The evaluation will focus on the WBG’s support to RE, its effectiveness in removing critical barriers to deploying RE, mobilizing financing for RE development and the extent to which WBG RE interventions helped increase electricity

access and supply, enhanced energy security and provided local and global environmental benefits. The evaluation will also consider to the extent possible the RE's contribution towards inclusive and sustainable economic growth to help alleviate poverty and boost shared prosperity.

28. The evaluation will cover the following major RE technologies—biomass, geothermal, hydropower, solar, and wind—but will not analyze the pros and cons inherent to each technology. With the evolution and mainstreaming of RE in the WBG's project portfolio, IEG will also review RE-tagged activities in other sectors. However, WBG support to other climate-related RE activities such as those for energy efficiency or for pollution management are excluded from the evaluation. Broad-based macroeconomic and fiscal interventions that affect RE versus non-RE energy choices are also excluded from the evaluation scope.

29. The evaluation rests on the premise that both private and public sectors play critical, mutually-reinforcing roles in scaling up RE globally, especially in achieving SDG 7 and SE4ALL goals and the Paris Agreement aspirations. Several recent WBG strategy documents and agreed approaches --- such as the *Forward Look*, IFC Strategy 3.0's focus on creating markets, and the "cascade" approach to prioritizing public and private funding, recognizes the importance of maximizing the comparative advantages of each WBG institution, thereby achieving synergies in deploying government and private sector led solutions. Viewed from this lens, the evaluation will assess the effectiveness of IFC, MIGA and WB's coordination and collaboration in (i) addressing key constraints and market failures for developing and mainstreaming RE; (ii) identifying public and private sector opportunities to scale-up the WBG's overall engagement in RE; (iii) mobilizing financing; and (iv) through selected country cases, identifying where partnerships have added value.

## **EVALUATION DESIGN AND LIMITATIONS**

30. Evaluating the WBG's support to RE can be complex given the multiple technologies and their respective technical characteristics, the need for in-depth assessment of WBG interventions in addressing key barriers in the sector, and for placing them in the context of evolving external global and country level market influences. Therefore, the evaluation will use a multi-level and mixed evaluation methods to sort through these complexities and bring different perspectives together in answering the evaluation questions and the corresponding lines of analytical inquiry. The evaluation will apply different data collection and analytical methods to assess the role and contribution of the WBG in addressing key barriers to RE development and its outcomes from three levels: global (or total RE portfolio), for selected countries, and for specific interventions. The main methodological approaches and evaluation design are detailed in Attachment 2, and the data collection and analytical methods are summarized below.

31. **Portfolio review and analysis (PRA)** provides the foundation for the evaluation by identifying WBG engagements in RE and its outcomes and performance. The PRA will also inform the selection of comparative case studies based on countries and specific interventions for in-depth analysis; and for purposive selection of key stakeholders for the semi-structured interviews. The PRA exercise will cover the following as a part of answering the evaluation questions:

- *Global level PRA* will analyze trends, map interventions identifying key barriers addressed as well as WBG's main role(s) in supporting the deployment of RE, identify the extent of collaboration within the WBG and the effectiveness of external partnerships, and analyze the results and sustainability of WBG interventions. (refer to Questions 1d, 2a, 2b, 2c, 3a, 3b in Attachment 2).
- *Selected country and intervention level PRAs* will also aid in the selection of specific interventions in selected countries for in-country data collection as part of the case study analysis (Question 2c), and for content analysis of IEG evaluations to assess collaboration within the WBG institutions in select countries (Question 3a).

32. **Desk and structured literature reviews**<sup>34</sup> will help address important knowledge gaps from the PRA by obtaining existing research and analyses from literature and other credible sources. Information from the literature review will also provide background material and inform in the selection of country and intervention level cases for in-depth analysis. The literature review will include the following analyses to assess WBG support for RE (Questions 1 to 4):

- *Global level* through (i) desk review (DR) of WBG strategy documents and policies relevant to RE to assess policy alignment within the institution (from global to country strategy) and its adaptation to evolving market conditions for RE (Question 1a, 1b, 1c, 1d); (ii) diagnostic review study that will evaluate the evolution of the RE markets from nascent industries to mainstreamed activities, including influences from key development and climate related global initiatives, in order to provide essential context and benchmarks for evaluating the WBG RE PRA. The diagnostic review study will also identify emerging challenges and opportunities that clients are likely to face in meeting future RE needs; and the WBG's positioning for assisting clients address these emerging needs. (Questions 1 and 4); (iii) DR of selected key institutions in RE, and to the extent possible, their roles in various global platforms, networks, partnerships on RE and the WBG's role in these constellations; (Question 3b, 3c); and (iv) to augment the limited availability of evidence about the impact of WBG RE interventions on end-users, in terms of accelerating economic growth and improving the lives of the poor, a Structured Literature Review (SLR<sup>35</sup>) of effectiveness on energy access, supply, and security, and meeting environmental objectives through the removal of key barriers (Question 2c).
- *Selected country and intervention level analysis* will make use of DR to (i) assess strategic alignment of WBG country level strategies and client RE needs (Question 1a, 1b, 1c, 1d); (ii) assess the effectiveness and role of the WBG in building, managing and using partnerships in selected countries to advance RE (Question 3b); and (iii) selected countries' national energy or RE plans (Question 1c). Content analysis of relevant IEG evaluation materials will complement the assessment of effectiveness and ratings of WBG support to RE on the basis of portfolio analysis (Question 2a).

33. **Comparative case study analysis**, selected based on findings from the portfolio and literature reviews, will enable in-depth assessment of selected interventions or countries to extract detailed experiences, validate evaluative findings, enable the generalization of results across the portfolio or provide illustrative examples of specific experiences. The case study analysis will be designed around a purposive representative sample of RE interventions across select countries, stratified according to the type of key barriers to RE that is consistent with the ToC (Figure 2). The case study analysis will include structured interviews with key stakeholders, as described in the next paragraph. Sampling will be conducted in tandem with the purposive selection of countries for data collection. Details of the data collection, analytical methods, and the sampling methodology are described in Attachments 3 and 4.

34. **Semi-structured interviews of key stakeholders** including relevant WBG management staff will be conducted to gain greater insights into their perspectives and validate findings from the portfolio and literature reviews. The interviews aims to increase the reliability of findings and conclusions through triangulation of findings from the portfolio and literature reviews. The interviews will focus on stakeholder views on the WBG's strategic alignment with client RE priorities and global mandates (Question 1), coordinated efforts and partnerships amongst the WBG institutions as well as external partners (Question 3), and factors that influence outcomes (question 2c). These same topics would be

---

<sup>34</sup> The DR will cover WBG strategy, policy, project and program documents, including IEG evaluations. The evaluation will also draw from external sources such as Bloomberg New Energy Finance, International Energy Agency, International Renewable Energy Agency, REN21, academia, donor partners and other credible sources, in order to supplement WBG information and knowledge gaps.

<sup>35</sup> SLRs of the RE effectiveness literature will have protocols specifying the search, identification, information extraction and synthesis process of the review. It will include existing systematic reviews on the impact of RE interventions, rural electrification, and related topics.

covered at the country and intervention level interviews during the comparative case studies for a more in-depth analysis. A questionnaire will be applied to ensure consistency.

35. **Global Expert Panel**, comprised of leading experts in RE and related fields, will validate and provide objective, expert perspective on the RE diagnostic review study prepared as part of the literature review. The global expert panel will confirm the historical findings and its implications in the global landscape for RE; and provide independent validation of the challenges and opportunities for continued scale-up of RE that clients will face going forward. The global expert panel review will help substantiate the WBG's preparedness and positioning for assisting clients address emerging challenges to deploying RE. The expert panel members will participate in a Delphi process involving anonymous responses to a standardized set of critical questions extracted from the diagnostic review study designed to converge towards a consensus on global trends and institutional landscape for expanding RE (Question 4).

36. **Sampling methods and criteria.** Purposive sampling considerations involve three analysis levels: (i) purposive sampling of countries for in-country data collection and analysis; (ii) purposive sampling of interventions for in-depth causal analysis; and (iii) purposive selection of individual stakeholders for semi-structured interviews. See Attachment 4 for details.

37. **Limitations and challenges.** The evaluation design comes with several limitations and challenges including (i) use of findings and lessons from evaluations of past WBG projects approved under different contexts, some of which may no longer be relevant; (ii) the highly contextual nature of REs based on country-specific resource endowments and varying institutional landscapes can make generalizations difficult; (iii) lack of evaluative evidence on the effectiveness and outcomes of the WB's RE-related ASAs and stand-alone Project-Based Guarantees (PBGs) leaves a large knowledge gap; (iv) differences in IFC, MIGA and the World Bank project evaluation methodologies can limit comparability and aggregation; (v) data collection and analysis pertaining to the case studies requires consistent and rigorous application to yield meaningful findings; (vi) potential for selection bias in the case study design; (vii) commitments and targets made under global agreements tend to be over-optimistic, and (viii) the WBG's effectiveness in utilizing partnerships for helping deploy RE will be assessed at the country level only through case studies. To address these challenges, the evaluation team endeavors to undertake continuous and extensive triangulation from different data sources. To ensure internal validity of findings, templates for the case study analysis, in-country visits and the semi-structured interviews of key stakeholders will be prepared in consultation with IEG's Methods Adviser. Team specialists assigned to conduct the case study analysis and stakeholder interviews will undergo orientation regarding the data requirements and the expected outputs. Quality control will be consistently applied on the information gathered.

## **QUALITY ASSURANCE PROCESS**

38. The RE evaluation will be subject to a number of quality control steps in addition to the IEG Management review, which includes the following:

- Distinguished panel of peer reviewers that include: a) Christine Lins, Executive Secretary, REN21 global renewable energy policy multi-stakeholder network; b) Anil Markandya, Distinguished Ikerbasque Professor, Basque Center for Climate Change; and c) Matthew Mendis, Senior Vice President, Nexant, consultancy providing solutions to utilities and energy enterprises.
- Engagement with the EEX and other related GPs, IFC and MIGA staff for validating data.
- Methodological approaches will be further developed with support from IEG Methods Advisor.

## **EXPECTED OUTPUTS, OUTREACH, AND TRACKING**

39. The final evaluation report will be disseminated internally (to Board/CODE and Operational Staff, as the primary audience) and externally (as the secondary audience). IEG will develop presentations and just-in-time products showcasing key findings, blogs, videos, and other products, as appropriate, for relevant audiences, including WBG staff, clients and partners, the private sector, and NGOs.

40. During the preparatory stages of the evaluation, the team will solicit feedback and comments from stakeholders, in particular WBG management and practitioners in industries and government agencies in client countries, as well as the Expert Panel on RE, to improve the evaluation's accuracy and relevance. During field missions, IEG will meet with a diverse set of stakeholders to inform the evaluation. To maximize the value and use of findings and recommendations to strengthen development outcomes, IEG will implement an outreach plan during the evaluation and after the completion of the report. IEG will take special consideration to ensure that dissemination efforts reach WBG staff and stakeholders located in countries, as well as other MDBs, donors, and partners.

## **RESOURCES**

### **Timeline and Budget**

41. The RE Evaluation will be submitted to CODE in Q1 FY19. The budget for the evaluation is estimated at US\$ 1.125 million, based on the specific activities proposed in the evaluation design. The proposed budget is consistent with other similar evaluations.

### **Team and Skill Mix**

42. The RE Evaluation team has extensive expertise in energy and evaluation techniques, with experience in both the public and private sectors. Energy sector experience is specific to renewable energy and encompasses all technology types, in countries that represent all regions of the world. Evaluation experience includes knowledge of methods and of statistical and portfolio analyses. Team members also have experience working across the WBG's three institutions, and have familiarity with the policies and operational procedures of those organizations.

43. The RE evaluation is being carried out by a team led by Migara Jayawardena (Lead Evaluation Officer for Infrastructure) and Aurora Medina Siy (Senior Evaluation Officer). The evaluation team includes Ebru Karamete (Evaluation Analyst), Mari Noelle Lantin (Evaluation Analyst), Fernando Manibog (Energy and Evaluation Specialist Consultant), Franz Loyola (Portfolio Analyst Consultant), Jozef Vaessen (IEG Methods Adviser), Maria Skharatan (Energy Specialist Consultant), Mitko Grigorov (Portfolio Analyst Consultant), Nouredine Berrah (Energy Advisor Consultant), Pranav Vaidhya (Portfolio Analyst Consultant), Rahul Srinivasan (Energy Specialist Consultant), Anil Cabraal (Renewable Energy Specialist Consultant), and Varadaran Atur (Energy Finance Advisor Consultant), and Richard Kraus (Program Assistant). Additional specialists will be recruited, as may be necessary, based on the needs of the evaluation. The evaluation will be prepared under the direction of Midori Makino, Manager, IEGSD, and José Carbajo Martinez, Director, IEGSP.





## Attachment 1

### References

Awojobi, Omotola and Glenn P. Jenkins. 2015. *Were the Hydro Dams Financed by the World Bank from 1976 to 2005 Worthwhile?* Energy Policy. USA.

Banerjee, Sudeshna Ghosh, Ruchi Soni, and Elisa Portale. 2014. *Measuring the results of World Bank lending in the energy sector. Live wire knowledge note series.* Washington, DC: World Bank.

Frankfurt School-UNEP Centre and Bloomberg New Energy Finance (BNEF). 2016. *Global Trends in Renewable Energy Investment 2016.* Frankfurt am Main: Frankfurt School.

--. 2017. *Global Trends in Renewable Energy Investment 2017.* Frankfurt am Main: Frankfurt School.

ICF International. 2014. *Independent Evaluation of the Climate Investment Funds.* Washington, DC: World Bank.

International Energy Agency (IEA) and International Renewable Energy Agency (IRENA). 2017. *Perspectives for the energy transition – investment needs for a low-carbon energy system.* Paris: OECD/IEA.

--. 2012. *Renewable Energy: Medium-Term Market Report.* Paris: OECD/IEA.

--. 2013. *Renewable Energy: Medium-Term Market Report.* Paris: OECD/IEA.

--. 2014. *Renewable Energy: Medium-Term Market Report.* Paris: OECD/IEA.

--. 2015a. *Energy and Climate Change: World Energy Outlook Special Report.* Paris: OECD/IEA.

--. 2015b. *Renewable Energy: Medium-Term Market Report.* Paris: OECD/IEA.

--. 2015c. *World Energy Outlook. Chapter 9: Renewable Energy Outlook.* Paris: OECD/IEA.

--. 2016a. *Energy Technology Perspectives.* Paris: OECD/IEA.

--. 2016b. *Renewable Energy: Medium-Term Market Report.* Paris: OECD/IEA.

--. 2016c. *World Energy Investment.* Paris: OECD/IEA.

--. 2016d. *World Energy Outlook. Part B: Special Focus on Renewable Energy.* Paris: OECD/IEA.

International Finance Corporation. IFC Strategy 3.0. December 7, 2016.

International Renewable Energy Agency. 2016. *Renewable Energy Benefits: Measuring the Economics.* Abu Dhabi: United Arab Emirates.

McKinsey & Company. 2009. *Pathways to a low carbon economy. Version 2 of the Global GHG Abatement Cost Curve.* McKinsey & Company.

--. 2010. *Impact of the Financial Crisis on Carbon Economics: Version 2.1 of the Global GHG Abatement Cost Curve.* McKinsey & Company.

McKinsey Global Institute. 2016. *Bridging Global Infrastructure Gaps.* McKinsey & Company.

Policy and Operations Evaluation Department (IOB). 2013. *Renewable Energy: Access and Impact, A Systematic Literature Review of the Impact on Livelihoods of Interventions Providing Access to Renewable Energy in Developing Countries*. Ministry of Foreign Affairs of the Netherlands.

The Intergovernmental Panel on Climate Change (IPCC). 2014. *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Geneva: IPCC.

The Renewable Energy Policy Network for the 21st Century (REN21). 2015. *The First Decade: 2004-2014. 10 Years of Renewable Energy Progress*. Paris: REN21.

--. 2016. *Global Status Report*. Paris: REN21.

United Nations Environment Program (UNEP). 2016a. *Renewable energy and energy efficiency in developing countries: contributions to reducing global emissions*. New York: UNEP

World Bank and International Energy Agency. 2014. *Sustainable Energy for All 2013-2014: Global Tracking Framework. Sustainable Energy for All*. Washington, DC: World Bank.

--. 2015. *Sustainable Energy for All 2015: Progress Toward Sustainable Energy*. Washington, DC: World Bank.

World Bank. 1993. *The World Bank's Role in the Electric Power Sector: Policies for Effective Institutional, Regulatory, and Financial Reform. A World Bank Policy Paper*. Washington, DC: World Bank.

--. 1996. *The World Bank's Experience with Large Dams, A Preliminary Review of Impacts*. Operations Evaluation Department. Washington, DC: World Bank.

--. 1998. *Mainstreaming The Global Environment in World Bank Group Operations. World Bank Group Draft Paper prepared for Presentation to the Executive Board, October 13, 1998 and at the GEF Council Meeting, October 14-16, 1998*. Washington, DC: World Bank.

--. 2000. *Fuel for Thought: An Environmental Strategy for the Energy Sector*. Washington, DC: World Bank.

--. 2001a. *Making Sustainable Commitments - An Environment Strategy for the World Bank*. Washington, DC: World Bank.

--. 2001b. *The World Bank Group's Energy Program Poverty Reduction, Sustainability and Selectivity*. Energy and Mining Sector Board. Washington, DC: World Bank.

--. 2003b. *Power for Development. A Review of the WBG Experience with Private Participation in the Electricity Sector*. Operations Evaluation Department, Operations Evaluation Group and Operations Evaluation Unit. Washington, DC: World Bank.

--. 2003d. *Private Sector Development in the Electric Power Sector: A Joint OED/OEG/OEU Review of the World Bank Group's Assistance in the 1990s*. Washington, DC: World Bank.

--. 2004. *Toward a Sustainable Energy Future: The World Bank Group's Renewable Energy and Energy Efficiency Action Plan*. Energy and Water Department. Washington, DC: World Bank.

- . 2006. *New Renewable Energy. A Review of the WB Assistance.* Independent Evaluation Group. Washington, DC: World Bank.
- . 2007. *Rural Electrification and Poverty Reduction.* Washington, DC: World Bank.
- . 2008a. *Development and Climate Change: A Strategic Framework for the World Bank Group Report to the Development Committee.* Washington, DC: World Bank.
- . 2008b. *Policy and Governance Framework for Off-grid Rural Electrification with Renewable Energy Sources.* Washington, DC: World Bank.
- . 2008c. *The Welfare Impact of Rural Electrification: A Reassessment of the Costs and Benefits. An IEG Impact Evaluation.* Independent Evaluation Group. Washington, DC: World Bank.
- . 2009. *Beyond Bonn: World Bank Group Progress on Renewable Energy and Energy Efficiency in Fiscal 2005-2009.* Washington, DC: World Bank.
- . 2010. *Climate Change Series. Phase II. The Challenge of Low-Carbon Development.* Independent Evaluation Group. Washington, DC: World Bank.
- . 2012. *Development and Climate Change: A Strategic Framework for the World Bank Group.* Washington, DC: World Bank.
- . 2013. *Toward a Sustainable Energy Future for All: Directions for the World Bank Group's Energy Sector.* Washington, DC: World Bank.
- . 2015c. *Reliable and Affordable Off-Grid Electricity Services for the Poor: Lessons from World Bank Group Experience. A Learning Product.* Independent Evaluation Group. Washington, DC: World Bank.
- . 2015d. *World Bank Group Support to Electricity Access, FY2000-2014. An Independent Evaluation, Volume I.* Independent Evaluation Group. Washington, DC: World Bank.
- . 2015e. *World Bank Group Support to Electricity Access, FY2000-FY2014. An Independent Evaluation, Volume II: Together for Energy: How Partnership Programs Support Energy Access.* Independent Evaluation Group. Washington, DC: World Bank.
- . 2016a. *Financial Viability of the Electricity Sector in Developing Countries: Recent Trends and Effectiveness of World Bank Interventions. A Learning Product.* Independent Evaluation Group. Washington, DC: World Bank.
- . 2016b. *Investments in Renewable Energy Generation. A Learning Product.* Independent Evaluation Group.
- . 2016c. *World Bank Group Climate Change Action Plan.* Washington, DC: World Bank.
- . 2016d. *Forward Look – A Vision for the World Bank Group in 2030.* Washington, DC: World Bank.
- . 2016e. *World Energy Perspectives: Renewables Integration.* London: WEC.
- . 2016f. *World Energy Scenarios - The Grand Transition.* London: WEC.
- . 2017a. *Forward Look: A Vision for The World Bank Group in 2030 - Progress and Challenges.* Washington, DC: World Bank.

## Attachment 2

### Evaluation Design Matrix

<i>Evaluation Questions and Lines of Inquiry</i>	<i>Information required</i>	<i>Information sources</i>	<i>Methods</i>	<i>Limitations and Challenges</i>
<p><b>Overarching Questions: “In what ways and how well has the WBG contributed to addressing its clients’ evolving needs in RE?” and “What lessons can be learned from experience to strengthen the WBG’s role in helping clients achieve emerging goals in RE?”</b></p>				
<p><b>Question 1: How well aligned are the WBG’s interventions with the clients’ priority RE needs as they navigate changing RE markets and expanding global initiatives?</b></p>				
<p>a) How have evolving RE markets influenced the WBG’s strategic directions and clients’ priorities for RE?</p> <p>b) How have global agreements on the environment (e.g. Climate Change Agreements) and sustainable development (e.g. SDGs) influenced the WBG’s strategic directions and clients’ priorities for RE?</p>	<ul style="list-style-type: none"> <li>• Evolution and major developments in the RE market from since 1990s.</li> <li>• WBG strategic directions and policies on RE with developments in RE markets.</li> <li>• Information on WBG official statements, commitments made in support of global agreements relevant to RE such as climate change agreements and others (SE4All, SDG7, etc)</li> <li>• Information on RE priorities of selected country clients or private sector clients (for IFC and MIGA).</li> </ul>	<ul style="list-style-type: none"> <li>• WBG strategy and policy documents</li> <li>• CASs, SCDs, and CPFs and corresponding IEG reviews (CASCRRs, CAEs, CLR).</li> <li>• Reports from BNEF, IEA, IRENA, REN21, academic papers and other credible sources</li> <li>• RE-relevant IEG sector/thematic, global partnership program evaluations.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Desk review</b> (WBG strategy documents relevant to RE; global/total portfolio and selected countries CAS/SCD/CPF)</li> <li>• <b>Desk review</b> (diagnostic review study commissioned by IEG on the evolution and major developments in RE and its implication on future overall WBG and each WBG’s institution’s sector strategy and operations; global/total portfolio)</li> <li>• <b>Semi-structured interviews</b> of select WBG staff, clients, implementing agencies; global/total portfolio and selected countries)</li> </ul>	<ul style="list-style-type: none"> <li>• Assessing changes in the WBG’s and WBG institutions’ strategies against sector or industry marked by rapid changes, shifts and approaches.</li> <li>• WBG and WBG institutions’ do not have strategy or strategic direction specific to RE.</li> <li>• Potential data inconsistencies among different sources.</li> <li>• Interviewees’ biases.</li> <li>• Over-optimistic commitment made by WBG institutions w.r.t. global agreements.</li> <li>• Targets in global agreements tend to be</li> </ul>

<i>Evaluation Questions and Lines of Inquiry</i>	<i>Information required</i>	<i>Information sources</i>	<i>Methods</i>	<i>Limitations and Challenges</i>
				<p>aspirational and not binding.</p> <ul style="list-style-type: none"> <li>• Clients' priorities specifically on RE may not be verifiable and for private sector clients, confidential.</li> </ul>
c) How have the clients' RE priorities been reflected in the WBG's strategies relevant to RE?	<ul style="list-style-type: none"> <li>• Information on various WBG interventions in RE</li> <li>• WBG corporate, sector or thematic strategies relevant to RE.</li> <li>• WBG country strategies for selected countries</li> <li>• Information on national development and energy plans of selected countries.</li> <li>• Information on private clients' RE priorities.</li> </ul>	<ul style="list-style-type: none"> <li>• WBG strategy and policy documents</li> <li>• CASs, SCDs, CPFs of selected countries</li> <li>• IEG evaluative materials (project, program, country and sector, thematic evaluations)</li> <li>• National development and energy plans of selected countries.</li> <li>• Company reports of selected private clients.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Desk review</b> (WBG strategy documents relevant to RE; national development and energy plans of selected countries; global/total portfolio and selected countries).</li> <li>• <b>Semi-structured interviews</b> of select WBG staff, development partners, clients, implementing agencies (global/total portfolio and selected countries)</li> </ul>	<ul style="list-style-type: none"> <li>• Internal and external validity and generalizability problems if the quality of in-depth analysis is uneven.</li> <li>• Difficulty in getting and validating private client RE plans and priorities.</li> <li>• Country clients RE priorities and needs may not be reflected in the stated objectives and results framework in the WBG's CASs/CPF's.</li> </ul>
d) To what extent have the WBG's RE activities aligned with its RE-relevant (including energy, climate change) strategic agenda?	<ul style="list-style-type: none"> <li>• WBG institutions' interventions and approaches in RE</li> <li>• WBG strategies and policies relevant to RE.</li> </ul>	<ul style="list-style-type: none"> <li>• WBG institutions' project portfolio databases, including WB ASA &amp; IFC AS.</li> <li>• Project approval documents (PADs, Board Documents, Concept Notes for ASA/AS)</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Portfolio analysis</b> (mapping of interventions; global/total portfolio)</li> <li>• <b>Desk review</b> (comparing global and country-level strategies (in selected countries) to composition of total portfolio and</li> </ul>	<ul style="list-style-type: none"> <li>• The WBG and its institutions does not have a strategy specifically for RE. RE agenda is embedded in other direction documents.</li> </ul>

<b>Evaluation Questions and Lines of Inquiry</b>	<b>Information required</b>	<b>Information sources</b>	<b>Methods</b>	<b>Limitations and Challenges</b>
		<ul style="list-style-type: none"> <li>Country, sector or industry reports from credible sources</li> <li>CASs, SCDs, CPFs of selected countries</li> <li>Other WBG strategic documents</li> <li>IEG evaluative materials (project, program, country and sector, thematic evaluations)</li> </ul>	<p>portfolio in selected countries; global/total portfolio and selected countries).</p>	
<p><b>Question 2. How has the World Bank Group performed in addressing barriers and mobilizing finance for advancing RE development in meeting clients' energy and environment needs?</b></p>				
<p>a) What can existing evaluations tell us about the effectiveness and sustainability of RE interventions?</p>	<ul style="list-style-type: none"> <li>Information on the different instruments or, combination of instruments deployed by the WBG institutions for RE</li> <li>Information on the approaches applied to address key barriers and risk.</li> <li>Information on the effectiveness (performance, results and outcomes) of WBG interventions in</li> </ul>	<ul style="list-style-type: none"> <li>Project documents including PADs, Board Documents and internal decision documents.</li> <li>ICRs, ICRRs, PPARs, XPSR/XPSR EvNotes, PESs, PCR/PCR EvNotes, and PERs/PER Validation Notes</li> </ul>	<ul style="list-style-type: none"> <li><b>Portfolio analysis</b> (identification and mapping of WBG interventions; global/total portfolio)</li> <li><b>Portfolio analysis</b> (conduct content analysis and use to the extent possible existing evidence on effectiveness and ratings to analyze causal pathways and effectiveness; global/total portfolio)</li> <li><b>Global expert panel</b> (evolving global</li> </ul>	<ul style="list-style-type: none"> <li>WB ASAs, standalone PBGs are not evaluated by IEG and their effectiveness and outcomes are not known.</li> <li>Differences in the evaluation methodologies of the IFC, MIGA and the WB limits aggregation and generalizability.</li> </ul>

<i><b>Evaluation Questions and Lines of Inquiry</b></i>	<i><b>Information required</b></i>	<i><b>Information sources</b></i>	<i><b>Methods</b></i>	<i><b>Limitations and Challenges</b></i>
	addressing these barriers.		agreements on the environment, sustainable development and review of IEG paper mentioned above; global/total portfolio).	
b) In what ways has the WBG addressed key barriers and risks to RE uptake such as (i) policy environment and investment climate constraints; (ii) institutional weaknesses; (iii) technical and design risks; (iv) investment viability risks; and (v) financial resource needs?	<ul style="list-style-type: none"> <li>• Categorization of RE projects according to the type of key barriers and risks being addressed.</li> <li>• Information on the WBG instruments and approaches used to address key barriers and risks.</li> <li>• Information on the effectiveness (performance, results and outcomes) of WBG interventions in realizing the aforementioned goals.</li> <li>• Information on the results and outcome of evaluated RE projects.</li> <li>• Benchmarks and good practices.</li> <li>• Impact of WBG RE projects.</li> </ul>	<ul style="list-style-type: none"> <li>• ICRs, ICRRs , PPARs, XPSR/XPSR EvNotes, PESs, PCR/PCR EvNotes, and PERs/PER Validation Notes</li> <li>• Project documents including PADs, Board Documents and internal decision documents.</li> <li>• Reports from BNEF, IEA, IRENA, REN21, academic and other credible sources.</li> <li>• Impact evaluations of donor partners.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Portfolio analysis</b> (identification/coding and mapping of interventions according to barriers/risks addressed; global/total portfolio)</li> <li>• <b>Portfolio analysis</b> (for each cluster of barriers/risks conduct content analysis and use to the extent possible existing evidence on effectiveness and ratings to analyze causal pathways and effectiveness; global/total portfolio, stratification by risks/barriers addressed).</li> <li>• <b>Global expert panel</b> (identification and inventory of key institutions in the field of RE and their roles in platforms, networks, partnerships on RE; role</li> </ul>	<ul style="list-style-type: none"> <li>• Conceptual difference between reducing key barriers and constraints, some of which may be one-off, and longer-term binding constraints.</li> <li>• WBG institutions' incremental contribution in removing barriers may be difficult to measure quantitatively as well as qualitatively.</li> <li>• Lack of information on the ex-post financial viability of WB lending projects.</li> <li>• WB ASAs and PRGs are not reviewed by IEG.</li> <li>• WB and IFC/MIGA follows different sustainability frameworks and different evaluation methodology for assessing environmental and social sustainability of the project, which could affect generalizability.</li> </ul>

<b>Evaluation Questions and Lines of Inquiry</b>	<b>Information required</b>	<b>Information sources</b>	<b>Methods</b>	<b>Limitations and Challenges</b>
			of the WBG in these constellations; global/total portfolio)	<ul style="list-style-type: none"> <li>Data availability</li> </ul>
<p>c) For a selected type of RE intervention by the WBG, in what ways and to what extent has this influenced the behavior and capacities of governmental and private sector actors in relation to RE? What can we say about the likely influence of WBG interventions on (a) electricity access and supply; (b) energy security; and (c) meet environmental objectives? What are the main explanatory factors that influence these processes and outcomes?</p>	<ul style="list-style-type: none"> <li>Categorization of RE projects according to the type of influence on behavior and capacities of clients.</li> <li>Information on the WBG instruments, approaches used to increase electricity access, energy supply and meet environmental objectives.</li> <li>Information on the effectiveness (performance, results and outcomes) of WBG interventions in realizing the aforementioned goals.</li> <li>Information on the results and outcome of evaluated RE projects, including drivers of results and WBG institutions' performance.</li> </ul>	<ul style="list-style-type: none"> <li>ICRs, ICRRs, PPARS, XPSR/XPSR EvNotes, PESs, PCR/PCR EvNotes, and PERs/PER Validation Notes.</li> <li>Project documents including PADs, Board Documents and internal decision documents.</li> <li>Impact evaluation literature from reliable sources such as 3ie; protocol-based literature searches of effectiveness/impact studies.</li> <li>Reports from BNEF, IEA, IRENA, REN21, academic and other credible sources.</li> <li>Impact evaluations of donor partners.</li> </ul>	<ul style="list-style-type: none"> <li><b>Comparative case study analysis</b>, encompassing the following elements: <ul style="list-style-type: none"> <li><b>Portfolio analysis</b> (based on the global portfolio exercise in 2b, mapping of selected type of RE interventions and their potential influence in addressing key constraints and risks to help clients achieve RE needs for increased electricity access, energy security and meeting its environmental objectives; global/total portfolio);</li> <li><b>Purposive (stratified) sample of interventions</b> addressing key barriers, in tandem with purposive selection of countries for in-country</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Attribution problems.</li> <li>Influence of the WBG institutions may be difficult to measure quantitatively and qualitatively; risk of relying on anecdotes as evidence, which may not be generalizable or replicable.</li> <li>RE is primarily determined by country-specific endowments thus, comparability across selected interventions and countries may be highly contextual and not generalizable.</li> <li>WBG support and its outcomes may not necessarily equate to having 'influence.'</li> </ul>



<b><i>Evaluation Questions and Lines of Inquiry</i></b>	<b><i>Information required</i></b>	<b><i>Information sources</i></b>	<b><i>Methods</i></b>	<b><i>Limitations and Challenges</i></b>
	<ul style="list-style-type: none"> <li>• Benchmarks and good practices.</li> <li>• Impact of WBG RE projects.</li> </ul>		<p>data collection and selected interventions in selected countries;</p> <ul style="list-style-type: none"> <li>○ <b>Structured literature review</b> (protocol-based review of the effectiveness literature (including existing systematic reviews) on energy access/security and meeting environmental objectives and addressing key barriers; selected type of interventions (reference) portfolio);</li> <li>○ <b>Development of causal theories of change</b> to represent the main causal pathways and underlying assumptions regarding how WBG interventions targeting key constraints are intended to influence energy access/security and meeting environmental</li> </ul>	

<i>Evaluation Questions and Lines of Inquiry</i>	<i>Information required</i>	<i>Information sources</i>	<i>Methods</i>	<i>Limitations and Challenges</i>
			<p>objectives (for selected type of interventions (reference) portfolio).</p> <ul style="list-style-type: none"> <li>○ Use of <b>statistical analysis</b>, to the extent possible, (on existing data sets relating to energy access/security etc.; selected interventions);</li> <li>○ <b>Semi-structured interviews of key actors/ stakeholders</b> (clients, partners, and other stakeholders) (selected interventions)</li> <li>● <b>Theory-based causal analysis</b> guided by ToCs, structured literature review, semi-structured interviews and any other available data that can be brought to bear on developing an understanding on causal pathways and effects; (selected interventions).</li> </ul>	
<p><b>Question 3: How has the WBG positioned itself at global and country levels through its RE engagements by leveraging experience and partnerships?</b></p>				
<p>a) To what extent are the IFC, MIGA and the</p>	<ul style="list-style-type: none"> <li>● Information on the types of collaboration and</li> </ul>	<ul style="list-style-type: none"> <li>● ICRs, ICRRs, PPARs,</li> </ul>	<ul style="list-style-type: none"> <li>● <b>Portfolio analysis</b> (identifying WBG-IFC-</li> </ul>	<ul style="list-style-type: none"> <li>● Lack of methodology for assessing the effectiveness</li> </ul>

<b>Evaluation Questions and Lines of Inquiry</b>	<b>Information required</b>	<b>Information sources</b>	<b>Methods</b>	<b>Limitations and Challenges</b>
WB coordinating and collaborating their efforts and identifying public and private sector opportunities to scale-up the WBG's overall engagement in RE?	<p>coordination by WBG institutions in RE and its effectiveness</p> <ul style="list-style-type: none"> <li>• Information on the modalities of WBG coordination and collaboration in RE.</li> <li>• Information on results, value-added and challenges of coordination and collaboration by WBG institutions in RE.</li> </ul>	<p>XPSR/XPSR EvNotes, PESSs, PCR/PCR EvNotes, and PERs/PER Validation Notes.</p> <ul style="list-style-type: none"> <li>• Project documents including PADs, Board Documents and other internal decision documents.</li> <li>• CASs, SCDs, CPFs, JIPs</li> <li>• Project supervision documents.</li> <li>• IEG sector or thematic evaluations relevant to RE and WBG collaboration.</li> </ul>	<p>MIGA collaborative efforts, ensure that these are reflected in purposive selection of countries for in-country data collection; global/total portfolio)</p> <ul style="list-style-type: none"> <li>• <b>Portfolio analysis</b> (content analysis of self-evaluations; selected countries)</li> <li>• <b>Semi-structured interviews of key actors/stakeholders</b> (WBG staff, clients, partners, implementing agencies) (global/total portfolio and selected countries)</li> </ul>	<p>of WBG internal collaboration from a One WBG perspective.</p> <ul style="list-style-type: none"> <li>• Different interpretation of what coordination and collaboration means at the operational level.</li> <li>• Attribution problems</li> <li>• Institutional biases</li> </ul>
b) To what extent has the WBG managed to build and used partnerships with key stakeholders, including through specialized trust funds (e.g. ESMAP, ASTAE, GEF, CIFs), in helping advance RE?	<ul style="list-style-type: none"> <li>• Role of the WBG and its effectiveness in building partnerships, managing/using specialized MDTFs at 2 levels: WBG portfolio-level and at the country level.</li> <li>• Information on the additionality of partnership programs in WBG RE projects.</li> </ul>	<ul style="list-style-type: none"> <li>• IEG evaluation of RE partnership programs.</li> <li>• Annual or status reports or review of ASTAE, CIFs, ESMAP, other MDTFs and GEF by donor partners and their management.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Portfolio analysis</b> (identification of partnerships; global/total portfolio)</li> <li>• <b>Desk review (global institutional mapping)</b> (identification and inventory of key institutions in the field of RE and their roles in various platforms, networks, partnerships on</li> </ul>	<ul style="list-style-type: none"> <li>• WB ASAs with support from specialized MDTFs are not evaluated.</li> <li>• Limited information on partnership programs.</li> <li>• Interviewees and evaluators' biases.</li> </ul>

<i>Evaluation Questions and Lines of Inquiry</i>	<i>Information required</i>	<i>Information sources</i>	<i>Methods</i>	<i>Limitations and Challenges</i>
	<ul style="list-style-type: none"> <li>Information on the effectiveness of WBG projects supported by partnership programs.</li> </ul>	<ul style="list-style-type: none"> <li>Self-evaluation of selected partnership programs.</li> </ul>	RE; role of the WBG in these constellations; for selected countries only) <ul style="list-style-type: none"> <li><b>Semi-structured interviews of key actors/stakeholders</b> (WBG staff and managers of MDTFs, donor partners, GEF management) (global/total portfolio and in selected countries)</li> </ul>	
c) In what ways and to what extent has the WBG played a leadership and catalyst role in advancing RE development at the country and global levels?	<ul style="list-style-type: none"> <li>Triangulated information on the WBG's role and where it has played a leading role at the global level and country level.</li> <li>Information on the areas where the WBG has been la leader (e.g., cutting-edge solutions etc).</li> </ul>	<ul style="list-style-type: none"> <li>IEG evaluative materials (project, program, country and sector, thematic evaluations)</li> <li>WBG staff, donor partners, government and private sector clients, implementing agencies in select countries.</li> </ul>	<ul style="list-style-type: none"> <li><b>Desk review</b> (selected key institutions in RE, web-based search and analysis of documents relating to selected milestone events on climate change and RE; global/total portfolio)</li> <li><b>Semi-structured interviews of key actors/stakeholders</b> (WBG staff, stakeholders from selected key institutions in RE, related to selected milestone events on climate change and RE; global/total portfolio)</li> <li><b>Semi-structured interviews of key</b></li> </ul>	<ul style="list-style-type: none"> <li>Lack of metrics to measure leadership and catalyst role.</li> </ul>

<b><i>Evaluation Questions and Lines of Inquiry</i></b>	<b><i>Information required</i></b>	<b><i>Information sources</i></b>	<b><i>Methods</i></b>	<b><i>Limitations and Challenges</i></b>
			<b>actors/stakeholders</b> (WBG staff, clients, partners, implementing agencies for selected interventions in selected countries)	
<b>Question 4: What does evaluative evidence indicate about WBG preparedness to assist clients in meeting their future RE development needs?</b>				
What does evaluative evidence indicate about WBG preparedness to assist clients in meeting their future RE development goals in consideration to deploy RE?	<ul style="list-style-type: none"> <li>• Lessons learned about the WBG's role in RE development and mainstreaming</li> <li>• Information on new opportunities and risks in RE.</li> </ul>	<ul style="list-style-type: none"> <li>• Evaluation findings on Questions 1, 2 and 3.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Synthetic (synthesis) analyses of evaluation findings</b> on evaluation questions 1, 2 and 3 (global/total portfolio, selected countries, selected interventions)</li> <li>• <b>Desk review</b> (diagnostic review study commissioned by the evaluation on the evolution and major developments in the RE market and its implication on future overall WBG and WBG's institution's sector strategy and operations; global/total portfolio).</li> <li>• <b>Global expert panel</b> (review of IEG commissioned paper; global/total portfolio).</li> </ul>	<ul style="list-style-type: none"> <li>• Internal and external validity and generalizability problems if the quality of analyses of the previous chapters is uneven.</li> </ul>

## Attachment 3

### Comparative Case Study Analysis Design

The evaluation will use comparative case study (in-depth) analysis to drill down on the effectiveness of WBG's RE interventions in influencing clients' behavior and capacities towards RE and the likely influence of such interventions on electricity access and supply, energy security and meeting environmental objectives. Through this method, the evaluation intends to extract the main explanatory factors that influence processes and outcomes (Question 2c). The in-depth analysis will also assess the effectiveness of intra-WBG collaboration in identifying public and private sector opportunities and in leveraging external partnerships to develop and scale-up renewable energy (Question 3).

The in-depth analysis will be conducted at the intervention level (the case) and the sample (comparative case study analysis). The analysis combines several data collection and analytical methods such as development of causal theories of change; portfolio review and analysis; desk and structured literature reviews; semi-structured interviews of key actors/stakeholders; and to the extent possible, statistical analysis. These data collection and analytical methods will be applied to different levels of analysis described briefly below.

**Causal theories of change**,<sup>36</sup> nested in the overall Theory of Change, will be developed for the different causal pathways linking the WBG's work on the removal of barriers or reduction of risks for RE investments with relevant outcomes and their underlying assumptions. In addition, the evaluation will also consider developing a theory of change around intra-WBG collaboration. Developing the causal theories of change combines several data collection and analytical elements including desk review of internal and external documents; semi-structured interviews with different project or program-level clients, development partners, and other stakeholders in selected countries; and a protocol-based structured literature review (SLR) on the effectiveness/impact literature (including existing systematic reviews) about the removal of key barriers to RE scale-up and intervention impacts on energy access and supply, energy security and the reduction of global greenhouse gas emissions and local pollution.

**Data collection and analysis at the global portfolio level.** Analysis at the global portfolio level starts with the mapping of selected type of interventions and their potential influence in addressing key barriers and risks to help clients achieve RE needs for increased electricity access, energy security and meeting their environmental objectives. The diversity and levels of WB, IFC and MIGA collaboration at the global portfolio level and the use of partnerships will also be considered in conducting the mapping exercise.

A **structured literature review** on the effectiveness literature (including existing systematic reviews) on behavioral change, institutional capacities, energy access, energy security and meeting environmental objectives and addressing key barriers and on partnerships will be conducted (depending on the scope of the literature and the WBG RE portfolio, the SLR may be restricted to a selected subset of interventions).

**Semi-structured interviews of clients, WBG partners and other key stakeholders** will be conducted on selected interventions and at the level of specific interventions in selected countries. Key actors/stakeholders will be purposively selected to ensure diversity in coverage.

---

<sup>36</sup> Defined as a set of causal assumptions on how intervention processes and activities are expected to lead to outputs and outcomes and under what conditions.

To the extent possible, the evaluation will apply **statistical analysis** on existing data sets for specific selected interventions to assess WBG effectiveness in influencing clients' behavior and capacities towards RE and their outcomes.

In summary, the **methodology for causal inference** will use a combination of data collection methods to build a **theory-driven causal analysis**. First, structured literature review plus portfolio review and analysis will be used to develop the initial theory of change on the different barriers and risks to RE development and scale-up. Semi-structured interviews of key actors/stakeholders, content analysis of relevant WBG and external documents plus data collected from selected interventions will provide additional empirical data. Based on the additional empirical data, the theory of change on each barrier and risk will be refined and tested to underpin the causal narrative on 'what works under what circumstances' in terms of WBG support to RE.

## Attachment 4

### Sampling Considerations

The evaluation encompasses data collection and analysis activities at four levels: global/total portfolio level, country level (for selected countries), intervention level (for selected interventions in selected countries), and the level of individual stakeholders or stakeholder groups. The criteria for selection and sampling are described below.

- **Selection of countries for in-country data collection and analysis** will use the following screening criteria:
  - a. adequate number and sufficient diversity of types and levels of WBG interventions in the country, including use of partnership programs;
  - b. sufficient diversity of country contexts along important dimensions such as, geographic/regional, technology type, country income classification, etc.;
  - c. pragmatic considerations such using desk reviews for country experience that have been extensively studied instead of country visits;
  - d. countries that were not selected as case studies by other on-going IEG evaluations that have some relevance to RE such as the respective evaluations of WBG support for Carbon Finance and Pollution Management;
  - e. level of WB, IFC and MIGA internal collaboration and coordination with external partners in identifying public and private opportunities to scale up WBG engagement in RE; and
  - f. countries highlighted by key actors/stakeholders such as WBG institutions' management and sector leaders.
  
- **Purposive sampling of interventions for in-depth causal analysis.** The comparative case study analysis will focus on the effectiveness of a purposive representative sample of RE interventions. The purposive sample will be determined by considering the following three main criteria:
  - **Stratification of the portfolio according to the major barriers/risks in RE addressed by the intervention.** The purposive sample will include sufficient interventions relating to specific barriers and risks to adequately reflect the overall diversity.
  - **Overall representativeness.** The purposive sample of interventions will reflect the overall (regional, technological, policy instrument, etc.) of the global RE portfolio.
  - **Alignment with country selection (see above)** to ensure the efficiency of the analysis in the light of resource and time constraints.
  - **Diversity and minimum number of intra-WBG collaboration and external partnerships.**
  
- **Purposive selection of key stakeholders for interviews at the global, country and specific intervention (in selected countries) levels** will cover relevant stakeholder groups, including WBG management and staff, for each interview exercise. The number of interviewees will be optimized to allow for large diversity in coverage while being mindful of cost and time implications. In addition to diversity, principles of triangulation and reaching the 'point of theoretical saturation' will be considered in deciding about the number of interviews.



## Attachment 5

### Renewable Energy Portfolio Stock-taking Methodology

IEG constructed the RE evaluation portfolio through a multi-stage process using based on four separate portfolio datasets: 1) WB lending portfolio (Table A5.1); 2) WB non-lending ASA portfolio (Table A5.1); 3) IFC Investment and Advisory Services portfolios (Table A5.2); and 4) MIGA portfolio (Table A5.3). IEG then forwarded the list of RE projects identified to the respective units of the IFC, MIGA and the World Bank for verification.

#### 1. Portfolio Identification: Methodology and Data Sources – World Bank

Different sources listed in Table 5.1 were used to identify the WB’s RE projects approved during the period FY00 to FY16 (approved RE projects in FY17 will be added as soon as the complete list is available). A total of 250 WB investment RE projects and 328 ASA RE projects were identified.

**Table A5.1. Summary of RE Database and Sources**

Portfolio Database	Sources	Sector Codes	Total # Projects
<b>WB Lending Portfolio (FY 2000-16)*</b>	i) WB Business Intelligence (BI) database ii) Project portfolio from Energy Global Practice iii) Carbon Fund Evaluation’s RE project portfolio iv) Project documents from Operations Portal v) IEG Datamart reports on IEG ratings, and project objectives and components	i) LH-Renewable Energy Hydro ii) LR-Other Renewable Energy iii) LE- Renewable Energy iv) LD-Power	250
<b>WB non-lending AAA database</b>	i) WB Business Intelligence (BI) database		328

*\*For the period FY 2000-16, 250 unique projects were identified. Projects approved in r FY 17 will be added to the list when complete information becomes available. . As of February 2017, 257 RE projects have been identified.*

#### **Group 1: IBRD and IDA Projects Supported by i) Investment Lending; ii) Guarantees; iii) DPF; and iv) Lending TA**

**Step 1: Review project portfolio from the World Bank’s Business Intelligence database:** The first stage included the identification of all World Bank projects that supported RE activities. An initial screening of relevant projects from the eligible universe was performed with the use of World Bank sector code classifications available in the BI system. IEG also consulted the Energy & Extractives (EEX) Global Practice (GP) regarding the appropriate sector codes to use for the portfolio identification. Next, all World Bank RE projects approved between FY2000-FY2017 were extracted from the Business Intelligence (BI) database using the screening criteria based on the following sector codes: i) LH-Renewable Energy Hydro, ii) LR-Other Renewable Energy, and iii) LE- Renewable Energy. As of February 2017, of the 8,997 projects<sup>37</sup>

<sup>37</sup> The 8,997 World Bank projects include all IBRD/IDA projects as well as projects funded by World Bank trust funds.

approved, 391 projects were mapped to these Sector Codes (including additional financings).

**Step 2: Data Cleaning and Coding:** The 391 projects were assessed in detail by reviewing various project-level documents (PADs, PCNs, ICRRs,) in order to understand their nature, i.e. specific RE technology, objectives and components, as well as commitment amounts. These information are not found in the World Bank’s BI database. As example, the BI data does not categorize RE projects by type of technology (except hydro), which the team had to extract from the project documents. The portfolio of projects includes the following technologies: hydropower, biogas, geothermal, solar (PV and CSP), and wind. Projects with multiple technologies which could not be separated were categorized under a general “renewables” heading. Projects related to energy in general such as biofuels, cooking stoves as well as energy efficiency, were excluded from the RE portfolio count.

The preliminary coding included the following variables:

- (i) Product Category: Investment, Technical Assistance, Guarantee, Carbon Finance, DPL
- (ii) Allocations of commitment amounts by different technologies; hydropower, biogas, geothermal, solar (PV and CSP), wind, multiple technologies.
- (iii) Allocation for TA for blended TA projects<sup>38</sup>;
- (iv) Off-Grid or On-grid projects (further coding and analysis is expected to be performed)
- (v) Objective Type: supporting energy access, energy supply, global and/or local environmental considerations
- (vi) Partnerships: GEF, CTF, SREP, SIDS DOCK, ASTAE, ESMAP, CF, GPOBA, Bilateral, Other MDBs, Others (the specific partnerships will be coded further)
- (vii) Type of intervention<sup>39</sup>: Pilot, self-standing, scale-up, risk mitigation, capacity building.

**Step 3: Further RE project review from EEX GP and Carbon Finance Unit:** IEG supplemented the list of projects by data from the Energy GP , who also maintains basic data on World Bank EEX projects. However, EEX GP’s database covers projects approved only between FY2010-16. Six additional projects were included to the database through this exercise.

In addition, five projects were identified from the database on purchase of emission reduction credits maintained by the Carbon Finance Unit.

The RE team also found a separate sector code, LD-Power, included RE projects, too. Using a keyword search on project development objectives of 131 projects mapped under this sector code, two additional projects were added to the portfolio.

**Step 4:** Lastly, IEG excluded projects that did not have any project document in the Operations Portal, and hence, could not be used for evaluative purposes<sup>40</sup>. Based on this criteria, 38 projects were dropped from the portfolio.

---

<sup>38</sup> Projects with both TA and Investment components.

<sup>39</sup> Pilot projects are small scale demonstration projects to test economic/technical viability. Scale up projects are mainly follow-up projects to expand the penetration/use of the technologies. Risk mitigation projects aim to reduce market and environmental risks.

<sup>40</sup> These are mainly small size projects (< US\$ 5 million), either Carbon offset projects, recipient executed ASA and/or small size GEF projects.

Combining all these steps, IEG identified a total of 312 RE projects (including additional financings) during FY 2000-17. Excluding additional financings and FY2017, which is not yet complete, the team identified **250 projects** supported by WB investment lending, guarantees, DPFs and Lending TA. (Table A5.1).

***Group 2 – Projects on Advisory Services and Analytics (ASA)***

**Step 1: Review project portfolio information from the World Bank’s Business Intelligence database:**

To identify these projects, the IEG team conducted a similar comprehensive assembly of the relevant World Bank analytical work that comprised RE sector activities during the same time period. The first stage involved the screening of relevant projects available in the BI system under Non-Lending Portfolio of the World Bank, Analytic and Advisory Activities (ASA). Using the same sector codes, there were 167 TAs and 161 ESWs, 328 AAA products in total during FY 2000-2016. As of Feb 2017, IEG identified 413 ASA products. However, data clean-up and technology mapping of these ASA products could not be conducted at this stage but will be completed during the evaluation stage.

**Step 2: Project portfolio information from the Energy GP:** The EEX GP does not track non-lending ASA portfolio, so verification on this aspect could not be obtained.

**2. Portfolio Identification: Methodology and Data Sources – IFC Investment (FY2000-16) and Advisory Services (FY2006-16)<sup>41</sup>**

IFC Investment and Advisory Services use of the same sector and industry codes facilitated IEG’s identification of its RE projects. Identification of IFC investment projects in RE included long-term investments only; projects related to swaps, rights issue, transfer of commitment to another project, portfolio split for IPO purposes, and equity sale entry are excluded. Using the MIS database for IFC Investments, IEG then applied a two-step exercise to identify IFC investment projects in RE. IEG used Primary Sector Name “Electric Power” as the first data filter and then Secondary Sector Name “Renewable Energy Generation” as the second data filter. Projects tagged as Renewable Energy Generation or had an RE component were counted as part of the evaluation. Using this methodology, IEG identified 197 RE interventions in the power generation sector (Table A5.2). A third filter was applied using the Tertiary Sector Name (sector codes V-BA to V-BJ), as a subset of Renewable Energy Generation, to identify IFC investment projects by type of RE technology, as well as RE portfolio type projects (Renewable Funds and Renewables through Financial Intermediaries).

Second, IEG identified projects in other sectors that had RE components and tagged as “Climate-Related” in iDesk in order to capture the breadth of IFC support for renewable energy activities. These RE projects in other sectors were grouped by industry groups and were manually reviewed using iDesk to determine the exact magnitude of the RE component in percentage terms and commitment amounts. Using this process, 143 additional projects were identified as RE investment.

Similar to the steps used in identifying IFC RE investment projects, IFC Advisory Services RE projects were also selected using “Electric Power” to filter the Primary Sector Name and then, applied “Renewable Energy Generation” using the Secondary Sector Name column in IFC AS project database. A third filter was also applied to determine the types of RE technology and other modalities (Sector Codes V-BA to V-BJ).

---

<sup>41</sup> Data on IFC Advisory Services in Renewable Energy are not available prior to FY2006.

Since IFC's Advisory Services Operations Portal (ASOP) does not identify specific funding percentages for RE under the Climate Change theme, the additional projects (RE Interventions in Other Sectors) for Advisory Services are further identified manually through the Business Area CAS-Energy.

**Table A5.2. IFC Investment (FY2000-16) and Advisory (FY2006-16) System Codes Identifying RE relevant Subset by Sector, Industry and Intervention Type**

Source:	
<b>Source:</b>	IFC Sector Names, Product Names, and Industry Group Codes from iDesk (MIS Extract) and ASOP (Project Product Detailed Listing)
<b>RE Interventions in the Electric Power Sector</b>	Sector Names: <ul style="list-style-type: none"> <li>• Electric Power               <ul style="list-style-type: none"> <li>○ Renewable Energy: V-BA to V-BJ</li> <li>○ V-**, excluding V-BA to V-BJ with Renewable Energy Component</li> </ul> </li> </ul>
<b>RE Interventions in the Other Sectors</b>	Sector Names: <ul style="list-style-type: none"> <li>• All, excluding Electric Power with Renewable Energy Component, triggered under Climate Change objective</li> </ul> Industry Group Codes: <ul style="list-style-type: none"> <li>• Finance &amp; Insurances and Collective Investment Vehicles</li> <li>• Industrial &amp; Consumer Products, Chemicals, Nonmetallic Mineral Product Manufacturing</li> <li>• Utilities, Professional, Scientific and Technical Services, Information, Wholesale and Retail Trade, Health Care, Education Services, and Accommodation &amp; Tourism Service</li> <li>• Agriculture &amp; Forestry, Pulp &amp; Paper, Food &amp; Beverages</li> </ul>

Source: IFC and IEG staff review

IEG shared the IFC RE project list to the portfolio managers of the relevant IFC industry groups for verification (currently awaiting confirmation).

### 3. Portfolio Identification: Methodology and Data Sources – MIGA Guarantees

Identification of RE projects guaranteed by MIGA initially used “Power Sub-Sector” column in the MIGA Guarantee Database as filter and then verified from project documents and MIGA Annual Reports those considered as RE, the RE technology, and the other salient information. The MIGA RE portfolio includes 31 projects, based on Project ID count (note that unlike in IBRD/IDA and IFC, additional coverage, modifications or amendments to MIGA projects bear the same project ID). These 31 projects are spread in five RE technologies (Table A5.3). RE technologies were identified from MIGA project documents and/or Summary of Proposed Guarantee (SPG) in MIGA’s external website.

**Table A5.3. MIGA System Codes Identifying RE relevant Subset by Sector**

<b>Source:</b>	MIGA Guarantee Database <a href="https://www.miga.org/Pages/Projects/AdvSearch.aspx">https://www.miga.org/Pages/Projects/AdvSearch.aspx</a> File from MIGA External web-site
<b>RE Interventions in the Electric Power Sector</b>	Sector Codes: Infrastructure, Power Generation, Renewable Energy <ul style="list-style-type: none"> <li>• Hydropower</li> <li>• Geothermal</li> <li>• Methane Capture</li> <li>• Wind</li> <li>• Solar</li> </ul>
<b>RE Interventions in the Other Sectors</b>	N/A

Source: MIGA and IEG staff review

## Attachment 6

### Preliminary IEG Portfolio Stock-taking of WBG RE Support (FY2000-2016)<sup>42</sup>

**Table A6.1. Snapshot of WBG Portfolio of Activities Supporting Renewable Energy, by Institution**

WBG Institutions and Types of Instruments	Approved, Committed or Issued Projects, FY2000-16		Number of Evaluated Projects from Portfolio
	Amounts (in US\$ millions)	Number of Projects	
<b>World Bank (IBRD/IDA/Trust Funds)</b>			
Investment lending <sup>1</sup>	10,588	183	56
Program for Results (P4R)	797	3	0
DPFs	1,660	14	8
Guarantees <sup>2</sup>	897	6	0
Carbon offset financing	322	43	1
World Bank ASAs <sup>3</sup>	90	328	.*
<b>IFC</b>			
Power sector RE Investments <sup>4</sup>	5,580	197	22
RE-tagged investments in other sectors	2,455	143	19
Advisory Services	244	182	11
<b>MIGA Guarantees<sup>5</sup></b>	2,149	31	9
<b>TOTAL</b>		<b>1,130</b>	<b>126</b>

Sources: IEG Portfolio Review; World Bank Business Intelligence, IFC IS and AS, and MIGA Guarantee databases.

Notes: (1) inclusive of recipient-executed technical assistance(TA); (2) refers to partial risk guarantees and other types of IBRD and IDA guarantee products; (3) WB ASAs include economic and sector work (EWS) and TA; (4) broad classification includes loans, equity, credit guarantees (partial credit guarantees, full credit guarantees and risk-sharing facilities); (5) political risk insurance only. \*WB ASAs are not evaluated at the project level.

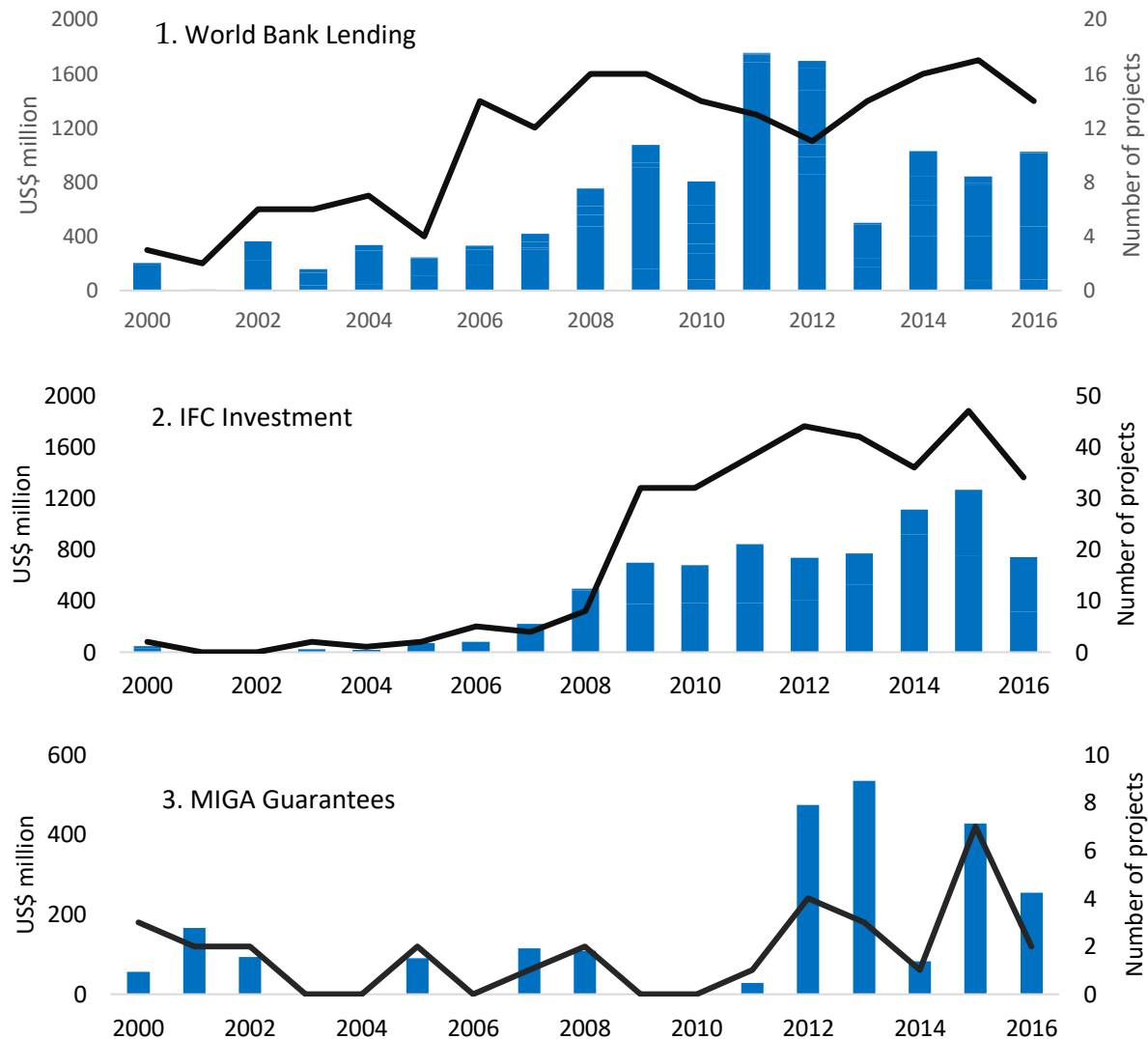
The World Bank Group's Renewable Energy (RE) engagement has seen substantial growth over the period examined in this evaluation (refer to Table A6.1). IBRD/IDA RE financing (including investment lending, P4Rs, and DPFs) totaled over US\$13 billion during FY2000-2016 period (out of an overall Energy and Extractive GP portfolio of about US\$ 100 billion). In addition, WB guarantee exposure in support of RE amounted to US\$ 0.9 billion. The WB also supported 43 carbon-offset finance projects in RE with \$322 million in commitments for purchasing emissions reductions (ERs). IFC investments in RE during the FY2000-16 period consisted of US\$5.6 billion in Power Generation (or nearly half of IFC's US\$11.8 billion total investment in the power sector) and an additional US\$2.5 billion investment in RE in other sectors. Nearly 70 percent of that investment amount in other sectors (or US\$1.7 billion) was channeled through Financial Intermediaries. During the same period, MIGA issued guarantees for 31 projects, with gross exposure of US\$2.1 billion.

RE financing has grown significantly over the past decade also reflected in the range of technologies. There was a sharp uptick in WBG support for RE post 2004, coinciding with the WBG's commitment in Bonn, Germany to increase RE lending by 20% per year (Figure A6.1). Indeed, 89% of the total WBG commitments in RE has been over the past decade from FY2006-16. Prior to 2006, WBG financing was mostly sporadic, primarily in hydropower and aimed at increasing access. The trend for MIGA is less clear,

<sup>42</sup> The scope of the portfolio review will be updated to include FY2017.

but its guarantees supported RE foreign direct investments primarily in high-risk, low-income countries.

**Figure A6.1. World Bank Group Commitments in Renewable Energy FY2000-2016**



Source: IEG portfolio review

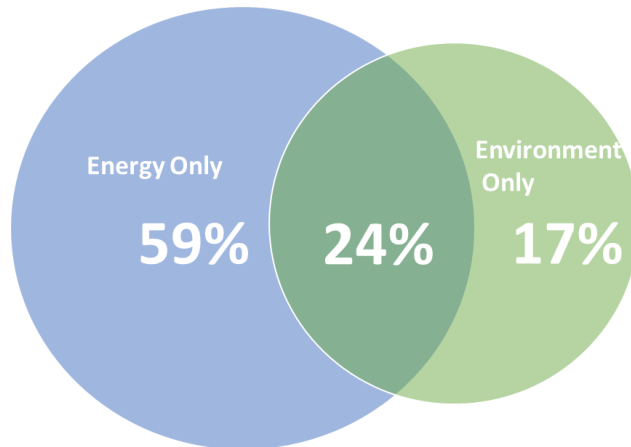
*Evaluated Projects.* Of the total 1,130 RE projects approved in the past 16 years, 126 projects have been evaluated by at least one WBG institution and reviewed or validated by IEG. These include 65 IBRD/IDA projects with ICRRs, 41 IFC investment projects with XPSR Evaluation Notes, 11 IFC advisory projects with PCR Evaluation Notes, and nine MIGA projects with PER or PER Validation Notes. Among the 65 IBRD/IDA projects with ICRRs, IEG conducted an in-depth review (with field mission) of 10 already evaluated projects as a PPAR.

### World Bank (IBRD/IDA) Portfolio in Renewable Energy

**Addressing energy and environmental goals are the primary development objectives stated in WBG RE projects.** Based on the initial portfolio screening, 59 percent of IBRD/IDA RE lending projects have energy only objective, with further 24 percent with a combined energy and environmental objective. The

remaining 17 percent focused exclusively on environmental goals. Half of the energy development projects aimed at increasing power generation, while one third were designed specifically to increase access to electricity<sup>43</sup>.

**Figure A6.2 Breakdown of WB RE project objectives by Energy and Environmental goals,<sup>44</sup> by number of projects**



Source: IEG portfolio review

**Hydropower absorbed the largest share of total WB lending for RE. It accounts for nearly 40 percent of total WB RE commitments (30 percent by total number of WB RE projects) in the past sixteen years.** Lending commitments to intermittent RE technologies (wind and solar PV) have grown and account for 13 percent of total Bank lending to RE during the period. WB support to geothermal power projects comprised 7 percent of the Bank's total RE lending commitments (5 percent by number of RE projects); while lending amounts to wind and biomass projects has been meager compared to other types of RE technologies (3 percent and 2 percent of total WB RE lending volume, respectively).

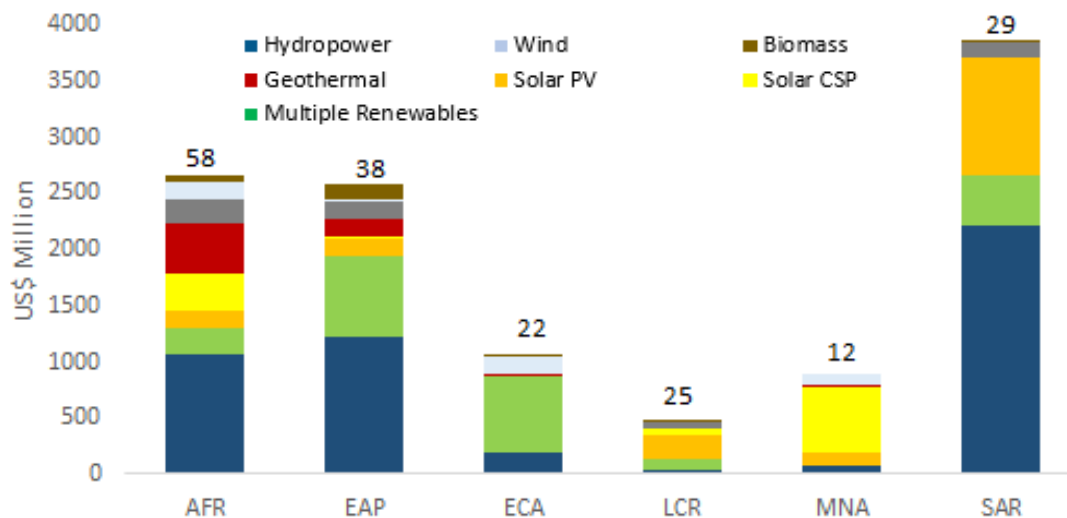
**The World Bank's investment lending were directed in SAR, AFR, and EAP regions.** The largest number of projects were in Africa and covered a range of technologies with many access off-grid projects. WB lending primarily focused on lower-middle (60%) and low (13%) income countries.

<sup>43</sup> This breakdown is not currently available for IFC and MIGA projects; this will be determined as part of the extensive portfolio review.

<sup>44</sup> The percentages are based on 183 IBRD/IDA investment lending projects.



**Figure A6.3. WB RE Lending by Region and Technology (FY2000-2016)**



Source: IEG portfolio review

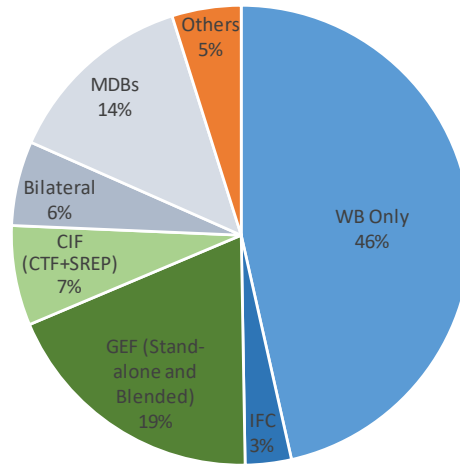
**WB provides assistance and global RE knowledge through Advisory Services and Analytics (ASA).** As part of the WB executed Technical Assistance (TA), Economic Sector Work (ESW) and Technical Assistance (TA) activities are carried out to provide direct advisory support to client RE development. WB supported 328 AAA projects amounting over \$90 million, of which 79 percent for TA and 21 percent for ESW. Over two thirds of this amount was channeled to Multi-Donor Trust Funds such as ESMAP and ASTAE. In addition, for client-executed TA, WB provided US\$606 million to stand-alone and blended-TA projects to help clients acquire expertise in creating enabling environment, in design and in implementing RE investments. Forty-five percent of these TA funds were directed towards hydropower-related activities, and 20% for solar power. Among the six regions, Africa received the largest funding share, representing 40 percent of the WB’s entire TA funding for RE.

**Table A6.2. A Snapshot of IBRD/IDA Advisory Services and Analytics (ASA)**

Type of Product	Amount (million US\$)	Number of Projects
Analytic and Advisory Services-TA	70.9	167
Analytic and Advisory Services-ESW	19.5	161
Lending TA (blended or stand-alone)	106	606

**WBG partnered with other development agencies to strengthen and expand support to RE globally.** During FY2000-16, over half of the 183 WB RE projects – worth US\$5 billion - include partnerships with other organizations. GEF, other MDBs, and bilateral projects were the primary modes of partnerships for Bank RE projects. Over 25 percent were supported by climate/environment fund (GEF + CIFs). IFC is also often the lead financier and syndicates RE investments with other partner financiers (not shown in graph).

**Figure A6.4. Breakdown of WB RE Projects with Partnerships (183 projects, FY2000-2016)<sup>45</sup>**



Source: IEG portfolio review

### IFC Investments in Renewable Energy

The IFC long-term investment portfolio in renewable energy contains 340 projects since 2000<sup>46</sup>. The majority of the projects (197 or 59 percent) are in the Electric Power Sector. They account for most of IFC investment commitments in RE, a total of US\$5.6 billion. In addition, US\$2.5 billion financed RE projects in other sectors (Figure A6.6). IFC's US\$5.6 billion RE investments in the power sector represents 47 percent of all IFC investments in power generation (US\$11.9 billion since FY2000)<sup>47</sup>.

**Greenfield projects (new construction) comprised a major share of IFC's investments in RE in terms of number of projects (219 out of 340 RE projects) and commitment amounts (US\$6.1 billion out of US\$8.1 billion total RE).** Electric Power Sector projects comprised a significant share of these greenfield RE investments the past 16 years: two-thirds (or 140 projects) by number of projects and three-quarters (US\$4.7 billion) in terms of volume. Applying a climate change lens, 155 of IFC's 197 RE power generation projects since FY2000 have been identified as having a climate change component. In addition, all 143 RE projects in the other sectors were identified by IFC as having a climate change component as described in the methodology section of this paper (See Attachment 5). Forty-nine projects are classified as green-bond projects<sup>48</sup> (27 for Power Generation purposes).

<sup>45</sup> Others include ASTAE, ESMAP<sup>45</sup>, SIDS DOCK, GPOBA, CF. Fourteen GEF projects are accounted for in joint CIF, bilateral and MDB category projects. MDB categories also include eight projects with bilateral partners.

<sup>46</sup> The project ID count exclude swaps, transfers of commitments, rights issues and portfolio project splits for IPO purposes.

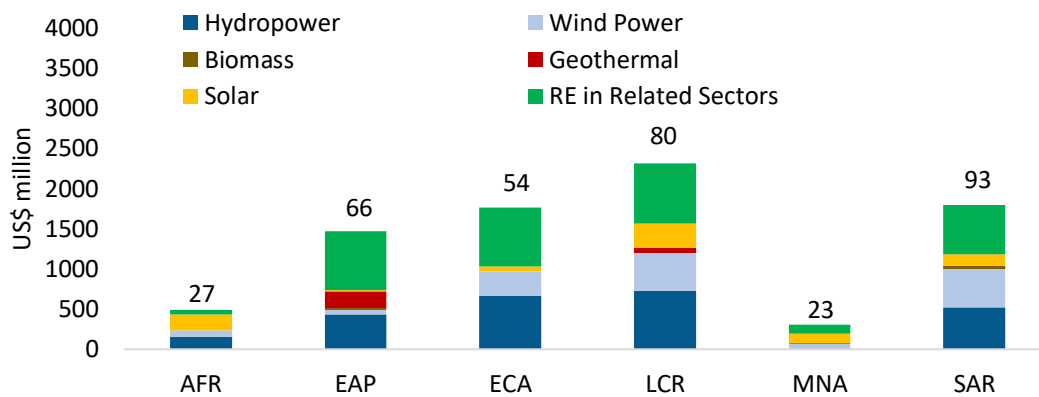
<sup>47</sup> RE has the highest investment commitment of all secondary sectors in electric power (followed by thermal power generation with US\$4.6 billion or 38 percent of the sector).

<sup>48</sup> The IFC is one of the earliest issuers of green bonds, launching a green bond program in 2010 to help catalyze the market and unlock investment for private sector projects that support renewable energy and energy efficiency. For further information, see ["Overview of IFC's Green Bonds."](#)

IFC investments in RE showed substantial growth (simple average of nearly 40 percent year-on-year), coinciding with the Bonn commitments in 2004 and the implementation of the IFC’s decentralization push that started in 2002 as part of its Strategy 2.0.

**By type of RE technology, wind and solar accounted for nearly half of IFC’s long-term RE investment commitments in recent years** (Figure A6.5). Wind and solar comprised 29 and 20 percent, respectively, of the IFC’s total RE investments in the power sector<sup>49</sup> since FY2000. Hydropower continues to require considerable investment amounts from IFC, accounting for a substantial share (over 40 percent) of its investments in RE power generation. This magnitude is consistent with global trends (IRENA, 2016). But the trend slightly differs from WB’s lending, where wind generation projects do not figure prominently in its RE portfolio.

**Figure A6.5. IFC Investments in Renewable Energy (FY2000-16) by Region and Technology**



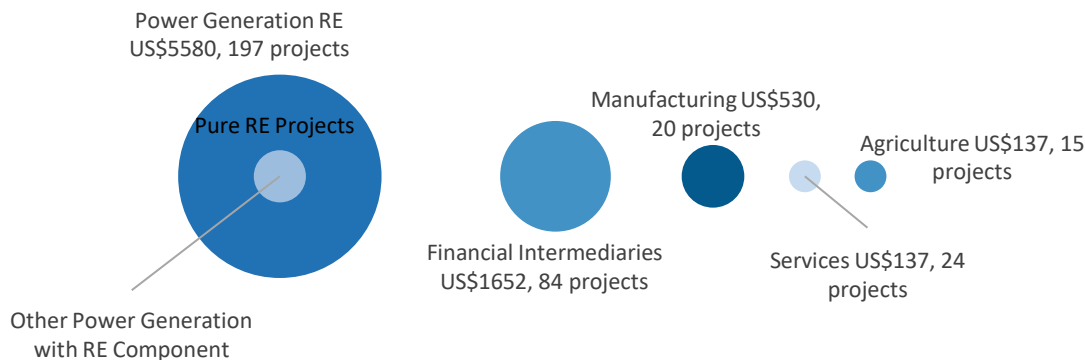
Source: IEG portfolio review

**Unlike the WB, the Latin America and the Caribbean Region (LCR) received the highest commitment amount among the six regions. But by number of projects, South Asia garnered the highest number (93 total) although these consisted mostly of small projects in India for solar (34) and wind (13) power generation.**

**IFC’s RE investments in other sectors have also increased (Figure A6.6) since 2008 with the mainstreaming of Climate Change objectives in the WBG.** Investments in financial intermediaries for on-lending or risk-sharing for RE activities accounted for the majority of IFC’s RE investments in other sectors albeit second only, in terms of volume, to the amounts committed for RE power generation.

<sup>49</sup> The percentage shares exclude investments in RE in related sectors, which are displayed in green color on the graph.

**Figure A6.6. IFC Investments in Renewable Energy (FY2000-16), by Sector<sup>50</sup>**



Source: IEG portfolio review

### IFC Advisory Services Support for Renewable Energy

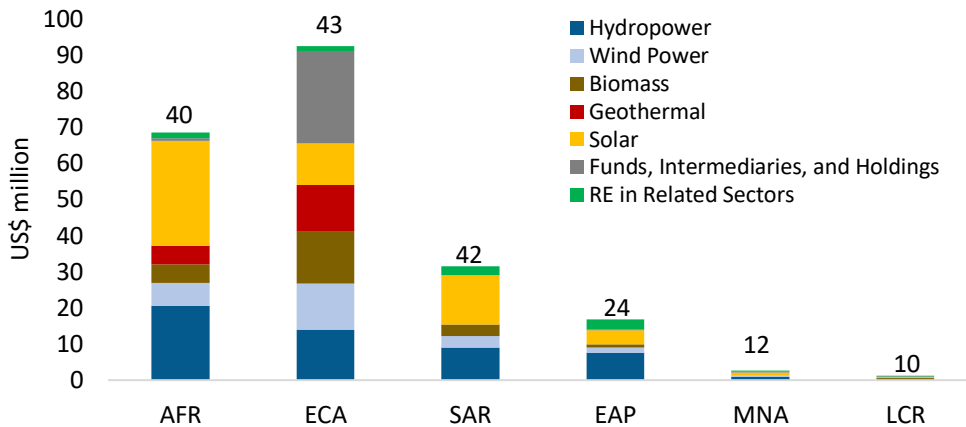
**IFC Advisory Services (AS) support for renewable energy also grown over the past sixteen years. to IFC's.** They complement, and in some cases have lead to, IFC investment projects. AS projects aim to strengthen clients' (public and private) performance and – in the case of IDA countries – create markets particularly in the poorest, fragile, or conflict-affected areas.

**Since the beginning of FY2006, the IFC has supported 180 AS projects<sup>51</sup>. Sub-Saharan Africa and Europe and Central Asia have been the main beneficiaries of AS in RE (Figure A6.7).** Advisory services in Africa was related to 17 solar projects, of which eight are part of [Lighting Africa](#). South Asia has also seen an increase in the number and magnitude of interventions. Of the 43 projects in SAR, 22 are in India, and out of those 17 are solar. LCR, the leading destination for IFC investment in RE, is nearly absent from AS.

<sup>50</sup> Amounts are in millions of US\$. Power Generation also includes projects in non-RE technologies with an RE component (12 additional projects); Financial Intermediaries includes Finance & Insurances and Collective Investment Vehicles; Manufacturing includes Industrial & Consumer Products, Chemicals, Nonmetallic Mineral Product Manufacturing, Pulp & Paper; Services includes Utilities, Professional, Scientific and Technical Services, Information, Food & Beverages, Wholesale and Retail Trade, Health Care, Education Services, and Accommodation & Tourism Services.

<sup>51</sup> Reliable data available starting FY2006 although IFC has supported technical assistance in earlier years.

**Figure A6.7. IFC Advisory Services in Renewable Energy (FY2006-16), by Region and Technology**



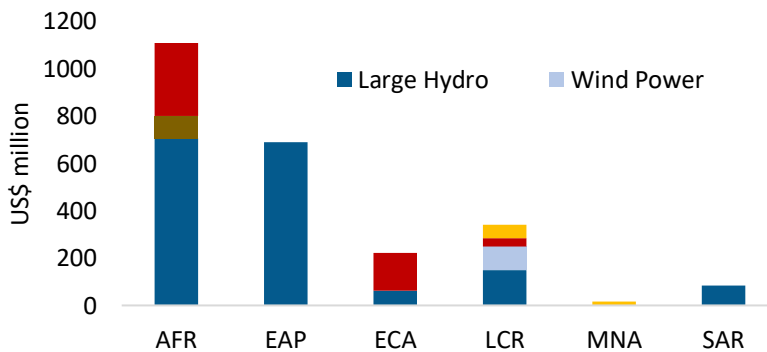
Source: IEG portfolio review

### MIGA Guarantees in Renewable Energy

**MIGA issued guarantees for cross-border investments in 31 renewable energy projects since FY2000, with a total gross exposure of US\$2.1 billion, mainly for power generation purposes.** Hydropower investments accounted for the bulk of its guarantee exposure compared to other types of RE technology (Figure A6.8). Gross exposure to geothermal power transactions comes as second highest. Taken together, both hydropower and geothermal projects accounted for nearly 90 percent of MIGA’s gross exposure in RE. Its coverage of solar and wind power investments are recent but growing. MIGA’s RE portfolio composition also differs slightly from IFC, with geothermal projects consisting a bigger share of its total number of RE projects.

**Demand for MIGA political risk insurance for RE investments was highest in Sub-Saharan Africa, which accounted for the largest share of MIGA’s total gross exposure in renewables, with East Asia and the Pacific in second.** The two regions combined accounted for nearly three quarters of all MIGA guarantees exposure since FY2000.

**Figure A6.8. MIGA Gross Exposure in Renewable Energy (FY2000-16), by Technology and Region**



Source: IEG portfolio review

## Attachment 7

### Review of Past Evaluations Relevant to RE

IEG has examined from different lenses the effectiveness, efficacy, relevance, value-added and lessons learned from WBG's support for RE in past evaluations.

Themes	Title of Relevant IEG Evaluation	FY
1. Off-grid electrification for the poor	Reliable and Affordable Off-Grid Electricity Services for the Poor, Lessons from World Bank Group Experience ( <b>Learning Product</b> )	2016
2. Financial viability of WB's support in the electricity sector, including RE interventions	Financial Viability of the Electricity Sector in Developing Countries: Recent Trends and Effectiveness of World Bank Interventions ( <b>Learning Product</b> )	2016
3. Performance of IFC's recent RE projects	Investments in Renewable Energy Generation (IFC Only) ( <b>Cluster Note</b> )	2016
4. Improving electricity access	World Bank Group Support to Electricity Access, FY2000-FY2014, An Independent Evaluation ( <b>Sector/Thematic Evaluation</b> )	2015
5. Energy partnership programs including dedicated partnerships for RE	World Bank Group Support to Electricity Access, FY2000-FY2014, An Independent Evaluation Volume II - Together for Energy, How Partnership Programs Support Energy Access ( <b>Global Partnership Evaluation</b> )	2015
6. Effectiveness of Climate Investment Funds designed for Res	Independent Evaluation of the Climate Investment Funds ( <b>Thematic Evaluation</b> with the independent evaluation units of ADB, AfDB, EBRD, IADB and WBG)	2014
7. Climate change perspective	Climate Change and the World Bank Group: Phase II: The Challenge of Low-Carbon Development ( <b>Thematic Evaluation</b> )	2010
8. Welfare impact of WB support for rural electrification, including RE	The Welfare Impact of Rural Electrification: A Reassessment of the Costs and Benefits, An IEG Impact Evaluation ( <b>Impact Evaluation</b> )	2008
9. Portfolio review of WB's interventions in 'new' RE	New Renewable Energy Evaluation: A Review of World Bank's Assistance ( <b>Sector/Thematic Evaluation</b> )	2006
10. Removing barriers to private sector investments through WBG support for power sector reforms	Power for Development: A Review of the World Bank Group's Experience with Private Participation in the Electricity Sector ( <b>Sector/Thematic Evaluation</b> )	2003
11. Desk review of 50 large dams financed by the WB	The World Bank's Experience with Large Dams: A Preliminary Review of Impacts ( <b>Thematic Evaluation</b> )	1996