

Delphi Technique

How Expert Panels Predict
Emerging Opportunities
and Challenges in
Renewable Energy

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EVALUATION GROUP

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Migara Jayawardena, Enno Heijndermans, Maurya West Meiers, Ryan Watkins, Joy Butscher, Shenghui Feng, and Nouredine Berrah

Independent Evaluation Group

January 2022

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ABBREVIATIONS

CO ₂	carbon dioxide
DG	distributed generation
IEG	Independent Evaluation Group
PV	solar photovoltaics
QCA	qualitative comparative analysis
RE	renewable energy
SDG	Sustainable Development Goal
ToC	theory of change
VRE	variable renewable energy

ACKNOWLEDGMENTS

The paper was prepared by the Independent Evaluation Group (IEG) for international development specialists, with both evaluation professionals and energy sector practitioners in mind. It delves into issues of renewable energy investments and the strategic context for those investments. It remains, however, a methods-focused paper that also examines in detail the sector-specific evidence, describing the approach and process for designing and carrying out the Delphi experiment and the analysis of results and key conclusions drawn from the findings.

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Although many people contributed to the Delphi exercise and the preparation of this paper, the findings, interpretations, and conclusions expressed in this paper are entirely those of the authors and should not be attributed in any manner to the Bank Group or to members of its Board of Executive Directors or the countries they represent.

OVERVIEW

This paper describes how a panel of global experts on renewable energy (RE) was convened to anticipate the big opportunities and major challenges facing the scale-up of RE to meet sustainable development and climate goals. The panelists participated in a Delphi process through which their views and perceptions were shared, aggregated, and analyzed. The Delphi analysis was a part of a comprehensive, multimethod evaluation (RE evaluation) that was carried out by the Independent Evaluation Group (IEG) of the World Bank Group. The primary purpose of the RE evaluation was to assess the institution's performance in supporting the development of renewable energy from 2000 to 2017, examining how well the Bank Group is positioned to help clients overcome emerging challenges and seize future opportunities for scaling up various renewable energy technologies. It is an important global development consideration, since the United Nations' Sustainable Development Goals and the Paris Agreement on climate change expect that renewable energy will be a key solution in an anticipated clean energy transition. The Delphi panel specifically helped contextualize the future of rapidly evolving RE markets, against which the Bank Group's readiness to help clients could be assessed. By doing so, the Delphi panel also identified critical barriers that, when triangulated with results sourced from other methods, charted a pathway for scaling up RE for achieving global energy and climate goals. The paper is organized as follows:

Chapter 1: Background and Context. This chapter sets out the energy sector context under which the overall multimethod evaluation was carried out.

Chapter 2: Rationale for Undertaking Delphi. This chapter explains the strategic rationale for opting to apply a Delphi method with a global panel of experts on renewable energy, and how it strategically fit with and contributed to the overall multimethod evaluation.

Chapter 3: Designing and Planning for Delphi. This chapter describes the strategic planning and design undertaken before administering the Delphi process.

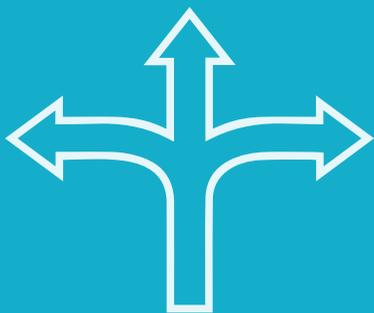
Chapter 4: Administering the Delphi Feedback Process. This chapter details how the Delphi process was administered in the case of the global expert panel on renewable energy, highlighting how the feedback process was managed to ensure integrity of the approach and credibility of the results. This chapter is the most relevant to evaluation professionals who may want to conduct a Delphi exercise.

Chapter 5: Analyzing Results. This chapter presents the analyses of the raw data, delving into issues confronted by energy practitioners to identify key sector findings. It provides a sector narrative that arises from the Delphi panel results.

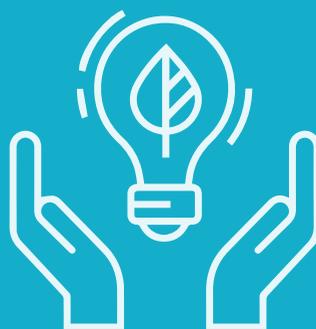
Chapter 6: Formulating Conclusions. This final chapter highlights important findings from the Delphi process and illustrates how they were triangulated with results from other applied methods to draw conclusions in the broader multimethod RE evaluation.

1

BACKGROUND AND CONTEXT



Pathway to achieving
the clean energy
transition



World Bank Group
commitment to
renewable energy

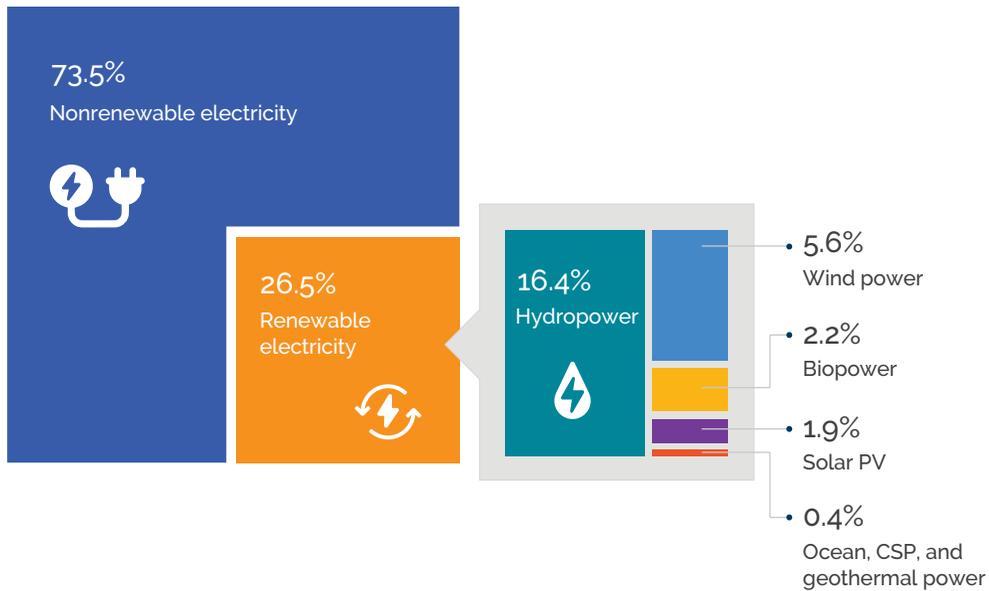


Shifting fuel sources
for global production
of electricity

Renewable energy (RE) is central to achieving the Sustainable Development Goals (SDGs) and responding to the urgency of climate change. According to the United Nations, the availability of affordable and clean energy (SDG 7) is an explicit and interdependent goal “crucial for achieving almost all [16 other] SDGs,” such as eradicating poverty, improving health and education, supplying clean water, industrialization, and combating climate change. These are further emphasized through SDG 13 on climate action (UN 2018). The Paris Agreement on climate change, which became effective in 2016, places even greater prominence on scaling up RE as a key solution to limiting global temperature rise to no more than 2°C by 2100 and to “make best efforts to limit warming to 1.5°C” (World Bank, IFC, and MIGA 2016).

RE has experienced a dynamic expansion over the years through the development of multiple technologies and has the potential to scale up further in the future. The major RE technologies—hydropower, solar power, wind power, geothermal power, and biopower—produce over a quarter of the world’s electricity (figure 1.1). Hydropower, which has been the dominant technology by scale, makes up the highest proportion in the global RE mix, with a 62 percent share in 2017 (or 16.4 percent of total global electricity production). Around 2000, wind power began to expand at a globally significant scale, followed by a major scale-up of solar photovoltaics (PV) starting around 2008. Together, wind and solar PV made up 7.5 percent of global electricity produced in 2017. For the same year, biopower and geothermal—two long-standing technologies—produced less than 3 percent of global electricity. RE markets experienced a major transformation during the period assessed, with multiple technologies now showing a significant global impact (box 1.1). Future expansions of RE will need to navigate this anticipated continued market volatility.

Figure 1.1. Renewable Energy Share of Global Power Generation, 2017



Source: REN21 2018.

Note: CSP = concentrated solar power; PV = photovoltaic.

A very large scale-up in RE is required to achieve global energy and environment goals, which needs to be set in motion immediately and sustained for several decades. Despite the expansion of RE, electricity produced from fossil fuels makes up nearly three-quarters of the global generation mix, since these technologies have also continued to grow. Therefore, the expansion of RE will need to accelerate and be sustained so that the growth of fossil-based technologies can be reduced without locking in a less sustainable pathway to meeting energy demand. Several studies propose different pathways to achieving such goals, but all options involve an unprecedented scale-up in RE.¹ One such analysis by the International Energy Agency used in a 2019 report by the Intergovernmental Panel on Climate Change estimates that the RE share in the global energy mix will need to more than double by 2030 (consistent with the SDGs) and further accelerate to almost quadruple by 2040—a program of action commonly referred to as the clean energy transition (table 1.1). The 2019 Intergovernmental Panel on Climate Change report calls for “rapid and far-reaching” transitions in the energy sector (among others) to limit global warming to 1.5°C. It is estimated that such an expansion will double the present global level of investments in RE, from \$300 billion to \$600 billion (IEA 2017, 2019; IRENA 2017).

Table 1.1. A Pathway to Achieving the Clean Energy Transition

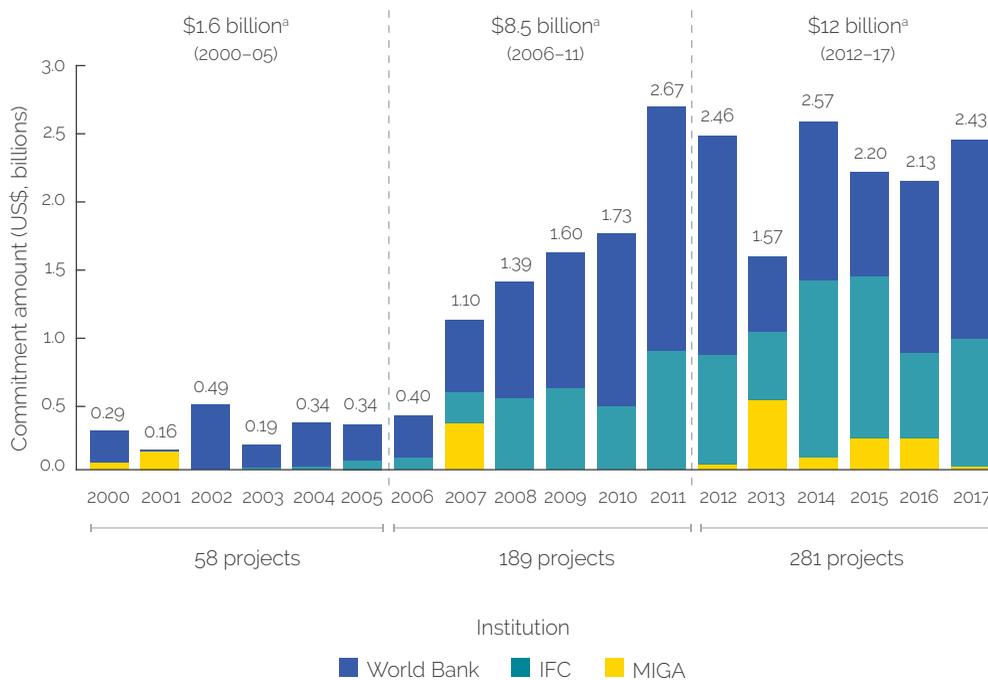
Renewable Energy Technology	Installed Capacity (GW)			Average Annual Increase (percent)	Average Capacity Addition (GW/year)	Electricity Produced (TWh)		
	2016	2030	2040			2016	2030	2040
Hydropower	1,241	1,723	2,060	2.1	34.0	4,070	5,688	6,928
Wind	466	1,706	2,629	7.5	90.0	981	4,193	6,950
Solar PV	299	1,846	3,246	10.4	123.0	303	2,732	5,265
Biopower	127	243	347	4.3	9.2	570	1,209	1,807
Geothermal	13	44	82	8.0	2.9	86	292	563
CSP	5	92	328	19.0	13.5	11	287	1,066

Source: Based on International Energy Agency forecasts for its Sustainable Development Scenario.

Note: 2030 represents a target consistent with meeting the Sustainable Development Goals. CSP = concentrated solar power; GW = gigawatt; PV = photovoltaic; TWh = terawatt-hour.

The World Bank Group has mainstreamed its support to RE and is committed to the SDGs and the climate goals in the Paris Agreement. The institution has a long history of financing hydropower, but its support for other RE technologies was initially modest and mostly for increasing electricity access, particularly in rural areas not served by the power grid. However, in 2004, the president of the Bank Group made a commitment at the Renewable Energy Conference in Bonn, Germany (the Bonn Commitment) to increase its lending for RE by 20 percent over five years (figure 1.2). This commitment coincided with the global expansion in wind and predated the boom in solar power that followed. After the Bonn Commitment, there was a notable uptick in the Bank Group’s financial support to RE covering all major technologies, averaging about \$2 billion per year. The scale-up in funding extended to the greater involvement of the private sector, including through the International Finance Corporation and the Multilateral Investment Guarantee Agency—two institutions within the Bank Group. Although the Bank Group’s financing for RE is dwarfed by the \$300 billion in annual global flows into the sector, the institution’s significant international role in supporting reforms, convening partners and mobilizing financing, and disseminating global experiences is a unique position of influence. It also explains the Bank Group’s interest in evaluating its performance in support of RE so that it is optimally geared to help client countries successfully navigate the clean energy transition.

Figure 1.2. World Bank Group Commitment to Renewable Energy, 2000–17



Source: World Bank Group 2018.

Note: The renewable energy portfolio evaluated includes 18 additional projects that had been approved previously and were evaluated in 2000 or later. IFC = International Finance Corporation; MIGA = Multilateral Investment Guarantee Agency.

a. Total commitment amounts do not include issuances of MIGA guarantees.

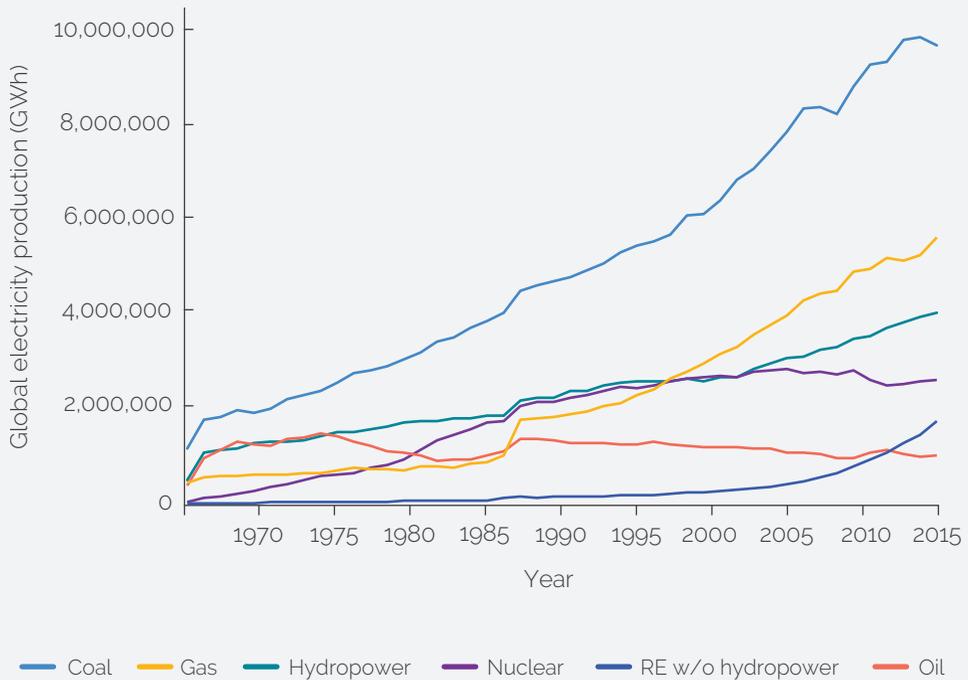
Box 1.1. The Evolution of Renewable Energy and Other Generation Technologies

The global power supply has evolved over time, with renewable energy (RE) playing an increasing role. Global electricity production grew more than fourfold over the 45 years between 1970 and 2015, with shifts in the mix of generation technologies (IEA; figure B1.1.1). Thanks to its reliability and low production cost, **coal** grew steadily to the main nonrenewable source of global power generation, representing nearly 40% of total production by 2015. **Hydropower** is a long-standing RE technology that has also continued to increase, although its share of global electricity declined from 23 to 17 percent over 1970–2015, as fossil fuel use grew more rapidly over the same period.

(continued)

Box 1.1. The Evolution of Renewable Energy and Other Generation Technologies (cont.)

Figure B1.1.1. Shifting Fuel Sources for Global Production of Electricity, 1971–2015



Source: Independent Evaluation Group, based on International Energy Agency data.

Note: GWh = gigawatt-hours; RE = renewable energy.

Decreases in prices led to a rise in the use of oil for power generation in the early 1970s, followed by a decline later in the decade resulting from global oil shocks.

Nuclear power, viewed as an alternative to fossil fuels, expanded until the 1990s, but several accidents progressively led to a slow-down in its growth out of safety concerns. **Natural gas** was used sparingly for power generation, with a global share of only 13 percent in 1971, mostly confined to countries that produced the fuel. However, technological advances in extraction and more efficient means of transportation allowed natural gas to overtake hydropower as the second-largest fuel source for power production by the late 1990s.

(continued)

Box 1.1. The Evolution of Renewable Energy and Other Generation Technologies (cont.)

RE technologies such as **wind power** and **solar photovoltaics** were initially developed at small scale or for demonstration purposes before their rapid global expansion began in 2000. Electricity produced from these sources grew from negligible shares in the early 2000s to reach a combined share of 7.5 percent of global electricity produced by 2017. Other more niche RE technologies, such as **geothermal power**, **concentrated solar power**, and **biopower**, are not globally significant by scale, but some make important contributions in specific countries.

Endnotes

1 The Intergovernmental Panel on Climate Change 2019 Report considers the following studies: the Energy Technology Perspectives (ETP) (series IEA 2014, 2015, 2016, 2017), the IEA and IRENA reports (OECD/IEA and IRENA 2017), and the Shell Sky Scenario (Shell International Finance B. V. 2018).

Shell Corporation, 'Sky' scenario (2019): www.shell.com/skyscenario, accessed April 2021.

2

RATIONALE FOR UNDERTAKING DELPHI



Methods used in the
renewable energy
evaluation



Comparative
case studies



Semistructured
interviews

The Delphi technique is a widely used systematic forecasting technique for achieving convergence of opinion by soliciting information from experts on a certain subject through an interactive, iterative, and anonymous approach. It was originally developed by the Rand Corporation in the 1950s, primarily for military purposes. The technique, which is rooted in the premise that “[more] heads are better than one” (Dalkey and Rourke 1972), is a group communication exercise that aims to examine a specific issue for goal setting, policy examination, and **forecasting of future events** (Ulschak 1983; Turoff and Hiltz 1996; Ludwig 1997). Regular surveys explore “what is”; the Delphi technique attempts to address “what could/should be” (Miller 2006)—its name is derived from the ancient Greek oracle who could predict the future. The Delphi technique typically seeks to (i) shed light on alternatives; (ii) correlate expert insight on a specific subject; (iii) provide background information for decision-making; and (iv) reveal consensus in expert opinion (Watkins, West Meiers, and Visser 2012).

“The Delphi method uses informed, intuitive judgment to analyze the future.”

—Rand Corporation (original developer of technique)

The Delphi approach is different from regular surveys. It employs several rounds of data collection, usually through a questionnaire and **controlled feedback** to encourage reflection of one’s own contributions and those of others (Hsu and Sandford 2007). During the first round, the group of experts independently share their views with a facilitator, who reviews the data and provides a synthesis or summary. The experts review this summary and are requested to provide updated inputs through one or more additional rounds. Throughout the process, the experts have a complete record of what insights and forecasts others have shared during each round, without attribution to any specific individual, to maintain anonymity. This allows each expert to (i) review the aggregated inputs of the group; (ii) reassess their initial judgments; (iii) generate additional insights; and (iv) clarify the information developed by previous iterations (Hsu and Sandford 2007). Anonymity is an important aspect of the Delphi technique, since it ensures free expression of opinion and helps prevent potential pitfalls of conventional means of pooling group opinion, for example, reluctance to revise opinions, the influence of dominant individuals, and group pressure for conformity—either real or perceived (Dalkey and Rourke 1972). The emphasis on anonymity and confidentiality makes the Delphi technique particularly suitable for online facilitation.

The Delphi technique seeks to find convergence of opinion by asking experts to prioritize emerging issues, which enables quantitative analysis of the opinions (Thangaratinam and Redman 2005), making the process more like problem-solving. A Delphi panel continues until a significant level of consensus is reached—typically two to four rounds. Even if consensus is not reached to an adequate level, this itself can indicate that there is not significant consensus of expert opinion related to the question being asked.

The Bank Group’s Independent Evaluation Group (IEG) undertook a Delphi exercise as a part of a broader evaluation of RE. A key aim of the evaluation was to assess the institution’s readiness to help clients navigate the clean energy transition described in chapter 1. Although the objectives of the transition are clear, there is less certainty as to how the RE markets, which have experienced a considerable evolution since around 2000, will unfold. Therefore, as one element of the evaluation, IEG wanted to identify the key emerging opportunities related to RE that the institution should help clients seize and challenges on the horizon that developing countries would require help to overcome. To establish this future scenario, IEG convened a global panel of experts on RE. The goal was to apply the Delphi technique with the panel in an attempt to generate consensus of expert perspectives on the future of RE, against which the Bank Group’s readiness to help clients navigate the transition could be evaluated. The Delphi panel was one methodology in the multimethod RE evaluation to assess the Bank Group’s performance in supporting RE (see box 2.1). It is expected to inform the future direction of the institution’s support to client countries in scaling up RE to meet globally established SDGs and climate goals.

Box 2.1. Multimethod Evaluation of World Bank Group Support to Renewable Energy Development

The renewable energy (RE) evaluation was designed to assess the World Bank Group’s performance during 2000–17 in supporting clients in developing and scaling up their RE resources (World Bank 2020). Specifically, the RE evaluation attempted to answer the following questions: (i) In what ways—and how well—has the Bank Group contributed to addressing the evolving RE needs of its clients?; and (ii) What lessons from experience can be identified to strengthen the role of the Bank Group in helping clients achieve their emerging RE goals (that is, the Sustainable Development Goals and the clean energy transition)?

(continued)

Box 2.1. Multimethod Evaluation of World Bank Group Support to Renewable Energy Development (cont.)

Figure B2.1.1. Methods Used in the Renewable Energy Evaluation



Source: Independent Evaluation Group.

Note: AS = advisory services; ASA = advisory services and analytics; CAS = Country Assistance Strategy; CBA = cost-benefit analysis; CPF = Country Partnership Framework; QCA = qualitative comparative analysis; PPAR = Project Performance Assessment Report; RE = renewable energy; SLR = structured literature review.

Multiple methods were applied to triangulate findings into robust conclusions. These methods included the following:

- » **Structured literature review.** An assessment of the evolution of RE markets; a literature review of barriers to developing RE, the energy and environment outcomes of electricity produced from RE, and development impacts.

(continued)

Box 2.1. Multimethod Evaluation of World Bank Group Support to Renewable Energy Development (cont.)

- » **Portfolio review and analysis.** A review of 546 investment projects in the Bank Group's RE portfolio, select World Bank advisory services and analytics and International Finance Corporation advisory services from a portfolio of 245 activities and 19 Project Performance Assessment Reports, and an in-depth review of hydropower.
- » **Comparative case studies.** Nine purposefully selected, in-depth country case studies, and a qualitative comparative analysis of the case results to validate the theory of change and identify critical pathways to expanding RE.
- » **Semistructured interviews.** Interviews with public and private stakeholders, development partners, and key Bank Group managers, and a survey of a purposive sample of Bank Group staff working on RE.

In addition, a global panel of experts on RE were convened to help predict emerging trends in RE:

- » **IEG global expert panel on RE.** A structured, iterative Delphi process with a set of global experts who helped identify and prioritize emerging RE opportunities and challenges, to establish a future scenario against which the Bank Group's capacity and position to influence can be evaluated.

3

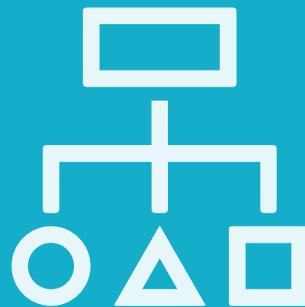
DESIGNING AND PLANNING FOR DELPHI



Conceptualizing the
Delphi process



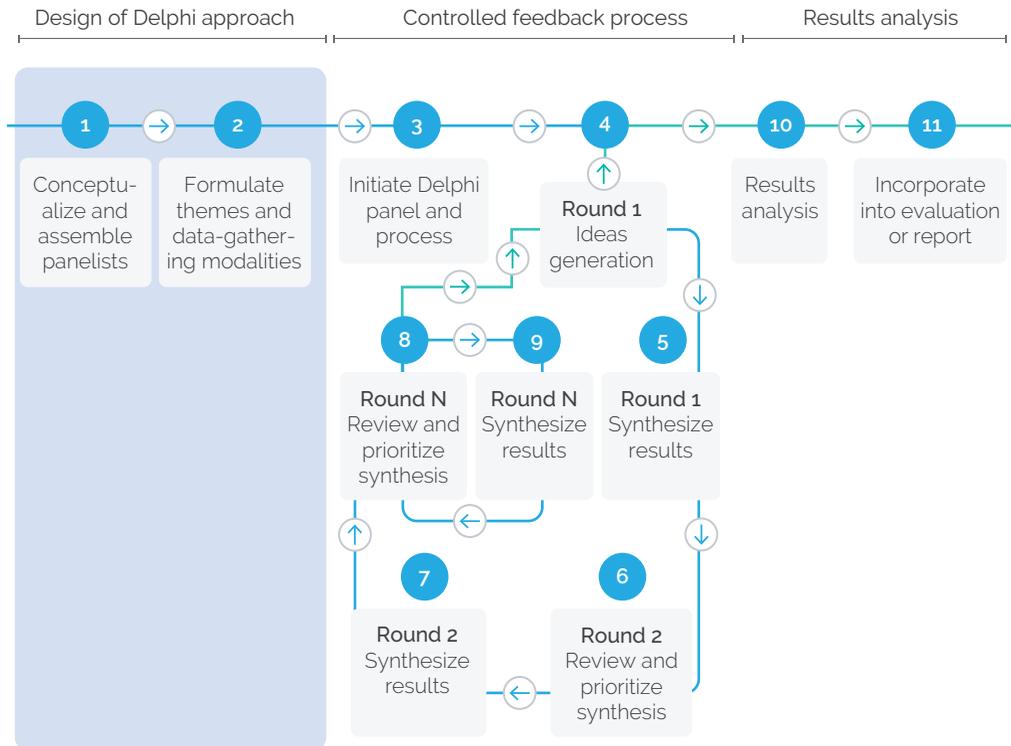
Formulating key themes
and questions



Structure of feedback
template

The successful application of a Delphi technique requires careful **design and planning**, a tightly administered **feedback process**, and robust **analysis of results** to formulate conclusions. The illustration in figure 3.1 diagrams the key steps to completing a Delphi process.

Figure 3.1. The Delphi Process—Design Stage



Source: Independent Evaluation Group.

This section focuses on the **first stage** of applying a Delphi process (highlighted in blue in figure 3.1), which is to design and plan the approach. The aim is to develop the strategy and the preparatory steps needed to effectively capture feedback from experts and analyze the results. The specific approach that was applied in the RE evaluation is detailed for each step.

Conceptualize the Delphi Process

Conceptualizing the Delphi process requires rationalizing the purpose of using a Delphi process with a panel of experts and how the results would be used, whether in a stand-alone manner or as a part of a multimethod evaluation, as was the case with the RE evaluation (figure 3.1, 1). It is also useful to consider the time frame and budget needed to carry out the Delphi activities.

In the RE evaluation, the Delphi technique was selected as a key method specifically to help frame the responses to a key evaluation question: What lessons from experience can be identified to strengthen the role of the Bank Group in helping clients achieve their emerging RE goals (that is, scale up for meeting SDGs and the clean energy transition)? To answer this question, more than an assessment of the Bank Group's capacity and position of influence was needed; it required a prediction of the investment climate that would prevail in developing country RE markets in the coming years. The decision by IEG to assemble a global panel of experts on RE and lead them through a Delphi process was an essential element of making such a forecast. It would help determine the Bank Group's readiness to help clients navigate future RE markets based on its capacity assessed against the predictions of the Delphi panel. The findings from the Delphi process could then help draw conclusions when triangulated with results from other methods, such as a qualitative comparative analysis (QCA), a project portfolio review, and interviews with Bank Group staff and developing country stakeholders.

Administering a Delphi panel also fit within the schedule of the overall RE evaluation. Although the Delphi approach was conceptualized early in the process of preparing the overall RE evaluation, most of the other methods were already underway by the time IEG assembled the global panel of experts in RE. It was anticipated that the Delphi approach could be completed in two to three iterative rounds before the results could be analyzed for incorporating into the RE evaluation. The anticipated costs were also budgeted, including payments for panel members and expenses for administering the Delphi process.

Assemble Panel of Experts

The identification of suitable panelists (figure 3.1, 1) is a critical element to the successful application of a Delphi process, since the results crucially rest on the panel. It is vital to include specialists who have strong reputations with regard to their expertise on the subject matter. This may be straightforward when exploring a narrow subject with well-understood industry norms. Appropriate representation can be more complex when the subject is broader (possibly at the congruence of multiple subjects, such as climate change) or less well defined. The size of panels ranges widely based on Delphi-related literature; some are more akin to smaller focus groups, and others can be large and almost surveylike. A consideration for smaller groups is ensuring that there are not significant dropouts over the multiple rounds, as this may compromise the integrity of the results. With very large groups, it may be asked whether the highest level of expertise on the subject is so widely dispersed.

The RE evaluation was exploring the sector at the energy and environment nexus as a key solution to sustainably meeting energy demand and helping mitigate global climate change. This made the subject matter wider than delving into the narrower area of RE, requiring broader expertise within the Delphi panel to provide a global environmental perspective. Therefore, several overarching criteria were applied when inviting experts to participate in IEG's global expert panel on RE:

- Extensive knowledge, applied experience, and globally recognized expertise in issues of energy, climate change, or both.
- A mix of representation within the panel from developed countries, where much RE development has occurred, and developing countries, which represent the lion's share of future expansion (and make up the Bank Group's clients).
- A combination within the panel of experts in private sector development of RE, which is expected to make a significant contribution to the clean energy transition, and those with deep knowledge of public sector initiatives in policy and investments, which are likely to be important in facilitating the expansion of RE in developing countries.
- Experience addressing climate change at the global level and an understanding of the implications for it of scaling up RE.

The aim was not to be dogmatic about the criteria but to ensure that the overall global panel of experts on RE would adequately represent these important consider-

ations, so that panelists would take into account a diversity of perspectives related to RE in arriving at conclusions. Ultimately, IEG's global panel of experts on RE included eight members. The panelists were from developing and developed countries, representing both the public and private sectors. The private sector was represented by a RE investor in emerging markets and the leader of a global RE equipment manufacturer. Large developing countries with a significant global environmental footprint and ambitious RE targets, such as China and India, were represented, as were smaller, less polluting countries at different stages on the development spectrum. Several experts from globally significant carbon dioxide (CO₂) emitters and from those countries most urgently affected by climate change participated in the panel. Each of them had played a prominent role in the Paris Agreement negotiations. Some experts also represented global think tanks on energy and academia. One shortcoming in the panel was gender balance. Despite efforts by IEG, some invited female participants declined because of scheduling difficulties, and in one case, a possible conflict of interest. Perhaps inviting more female panelists earlier in the process would have resulted in better gender balance.

Formulate Key Themes and Questions

Based on the conceptualization, determine what themes the panel of experts is expected to explore through the Delphi process (figure 3.1, 2). Once the themes are selected, it will be important to carefully craft the specific questions posed to the panel, ensuring that they are clearly formulated to prevent ambiguous interpretations. Jargon that might be variously interpreted should be clarified or entirely avoided, but commonly understood industry terminology is appropriate.

In the RE evaluation, the objective was to explore in greater depth certain aspects of the theory of change (ToC) that were developed by IEG based on global (including Bank Group) experience. The ToC, elements of which are described in more detail in box 3.1, was predicated on investments in RE resulting in (i) benefits to consumers from the increase in electricity supplied, and (ii) contributions to mitigating global climate change stemming from the displacement of alternative fossil-based power generation sources that would have otherwise emitted CO₂ (a causal link that was subsequently confirmed through a separate QCA). However, mobilizing investments in RE can be hindered by several key barriers, according to the ToC. Therefore, adequately addressing these barriers was vital to achieving the energy and climate goals. The dynamic evolution of RE markets over the evaluation

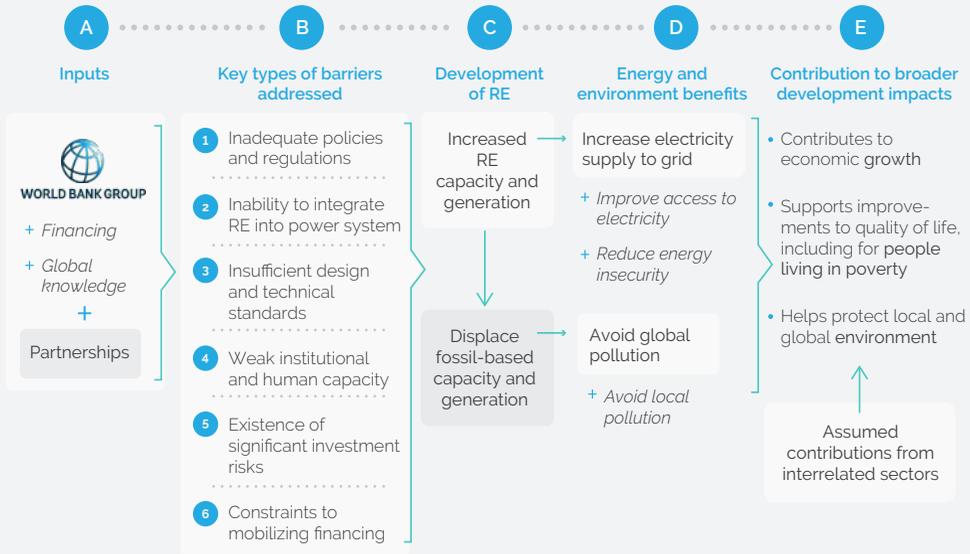
period also changed the nature of these barriers to RE, while other opportunities for scaling up various technologies emerged. Similar market shifts are expected to continue and change the future investment landscape in the sector. Through IEG's global expert panel on RE, the RE evaluation sought to identify these future changes in RE markets that may help or hinder the envisaged scale-up in the sector by proposing the following questions:

- What are the main emerging opportunities to further develop RE around the developing world for power generation to meet climate and SDGs (and why)? An opportunity was defined as a specific condition that is favorable or conducive to scaling up RE per the clean energy transition, including but not limited to technological advances, improving market conditions, changes in demand patterns, shifts in policy, and influences outside the RE space (such as shifts in fossil fuel prices or the impact of climate change).
- What are the main emerging challenges that could hold back developing countries from further development of RE for power generation, and hamper their ability to meet climate and SDGs (and why)? A challenge was defined as a specific constraint or barrier that countries are likely to face in attempting to scale up RE per the clean energy transition, which, if not addressed, will hamper their ability to achieve RE development goals.
- For the emerging opportunities and challenges that are predicted by the respective panelist, what specific key action(s) should be taken by developing countries to seize each opportunity and address each challenge? The aim was to solicit potential solutions that could be implemented by developing countries.

Box 3.1. Theory of Change for RE Evaluation

The following theory of change (ToC) was developed by the Independent Evaluation Group to define the causal relationship for expanding renewable energy (RE), incorporating the World Bank Group's role in supporting clients achieve their energy and environmental goals.

Figure B3.1.1. Theory of Change for Renewable Energy Development



Source: Independent Evaluation Group.

Note: RE = renewable energy.

The ToC is most easily understood beginning with the column labeled C, which depicts an *output* of increasing investments in RE technologies, which essentially means the construction and operation of RE power plants and associated infrastructure such as transmission lines to evacuate the electricity for supplying consumers (that is, to load centers). Column C also illustrates that investments in power generation from renewable sources lead to the displacement of an equivalent amount of alternative generation capacity from fossil fuels.

(continued)

Box 3.1. Theory of Change for RE Evaluation (cont.)

Column D identifies the *outcomes* that result from this increase in investments in RE and the displacement of fossil-based power generation. The primary **energy benefits** are accrued to grid-based consumers from the increase in supply as a result of RE-based power generation. Additionally, RE-based electricity can also help increase access to those who currently are not connected; and, as indigenous resources, RE-based electricity can reduce energy insecurity that arises from greater reliance on fossil fuel imports. The **environmental benefits** are derived from the displacement of fossil fuel-based generation by RE, which helps curtail carbon dioxide greenhouse gases that would have been otherwise emitted, contributing to global climate change (that is, avoided global pollution). Additionally, the displacement of fossil fuels also helps avoid local pollution from the emission of sulfur oxide, nitrogen oxide, and particulate matter, which can lead to respiratory illnesses and other health impacts. Column E illustrates how the energy and environmental outcomes, interdependently with outcomes from other development efforts, contribute to larger development impacts.

Although mobilizing investments in RE, as depicted in column C, is a major contributor to meeting energy needs while protecting the environment, the ToC suggests that this is dependent on adequately addressing several major barriers that affect the investment climate for RE, as illustrated in column B. The ToC also suggests that a major contribution of the Bank Group to expanding RE is to help clients address these key barriers through disseminating global knowledge, extending financing, and mobilizing partnership support using its global convening capacity, as illustrated in column A.

Members of the Independent Evaluation Group's global panel of experts on RE were requested to share their expertise, primarily on addressing barriers to RE development (column B) and the World Bank's readiness to support clients in this effort (column A), although they were free to comment on any aspect of the ToC.

The previously mentioned themes aimed to elicit perspectives on the energy sectors in developing countries, irrespective of the involvement of the Bank Group. They reflect *challenges* that must be overcome by countries seeking to scale up RE, *opportunities* they could seize to do so, and the actionable solutions they could undertake toward these ends. However, IEG also wanted to explore the extent to which the Bank Group can support clients in successfully implementing these actions or solutions identified by the global panel of experts on RE. It was recognized that, although the panelists were sector experts who were aware of the Bank Group's global

role in supporting RE, their knowledge regarding the institution could vary across the panel. However, when triangulated with evidence from other methodological sources, expert perspectives could provide meaningful insights into the readiness of the Bank Group to help clients navigate future RE markets that continue to evolve. Therefore, IEG’s global panel of experts on RE was asked to assess, *for each of the actions or solutions* identified (for addressing *challenges* and seizing *opportunities*), the Bank Group’s position to influence and capacity to help clients:

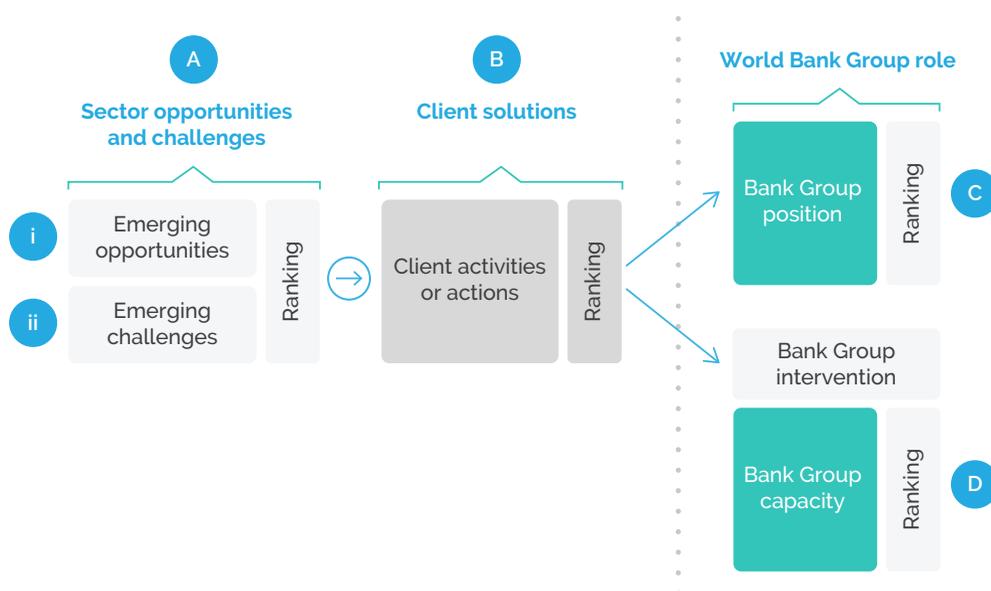
- Identify how well the World Bank Group is positioned to help clients to successfully carry out [each] action/solution. The aim was to identify the institution’s sphere of influence and the corresponding comparative advantage to support clients in implementing reforms, recognizing that there are other actors that can shape actions, including the clients themselves.
- Identify specific interventions/engagements the World Bank Group can take to support clients more successfully implement each respective action/solution. The Bank Group could support clients in a range of ways that include sharing of global experiences and knowledge transfer, financial support, and mobilizing additional support from other partners based on the institution’s global convening capacity.
- Identify the current capacity of the World Bank Group to successfully undertake each intervention/engagement for supporting client actions/solutions. The aim was to identify whether the institution has the expertise and experience to adequately help clients undertake their specific actions or solutions for scaling up RE.

Design Data Gathering Modalities

Once the questions are clearly defined, the next key step is to determine how the feedback from panelists will be gathered (figure 3.1, 2). Typically, a questionnaire or template is prepared, which can be administered electronically or on paper. It is at this stage that the designers of the Delphi process will determine the structure through which panelists will prioritize or score various inputs and how these results will be (statistically) evaluated to form conclusions. Panelists’ familiarity with different technological modalities is a consideration when designing feedback questionnaires or templates, as is the simplicity and ease with which they can respond to others.

In the RE evaluation, the questionnaire was formulated as a Microsoft Word template, given a diverse international panel’s likely familiarity with that software. An option to develop a web-based interface was discussed and discarded, as such a prototype was not needed and the effort to manage such feedback from a relatively small panel could not be justified. The template that was created played an important role in maintaining control and structure in obtaining feedback, so that results were comparable and could be aggregated with consistency. Two templates were used, one to capture perspectives on emerging opportunities and the other to solicit views on challenges facing the scale-up of RE (figure 3.2, i and ii). The blank templates used for the information initially gathered from IEG’s global expert panel on RE are presented in appendix B. Figure 3.2 also highlights the main structure of each of the two templates, emphasizing the areas where expert opinions were solicited from the panel, consistent with the themes identified in the previous section.

Figure 3.2. Structure of Feedback Template



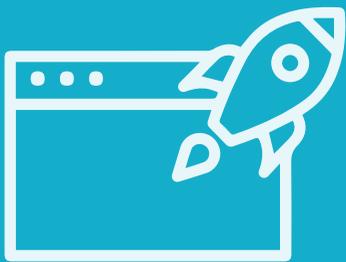
Source: Independent Evaluation Group.

- Identify specific opportunities or challenges facing the expansion of RE, including rationale for the significance of the selection (figure 3.2, A). The panelists were also requested to provide a score ranking for each selection to ascertain their initial prioritization. The responses were open ended, although each panelist was restricted to a maximum of 10 opportunities and 10 challenges, to maintain a sense of priority.

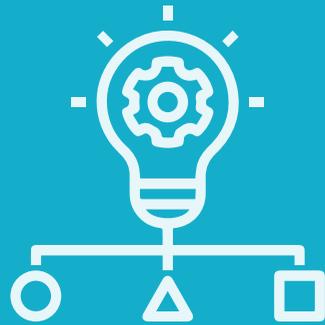
- For each of the *opportunities* and *challenges* identified, indicate up to three actions or solutions developing countries could undertake to expand RE (figure 3.2, B). Ideas for actions or solutions were only solicited at the initial stage, and later stages requested the panelists to prioritize actions or solutions.
- The remainder of the templates focused on the Bank Group's readiness to support clients in undertaking their respective actions or solutions identified by panelists for each opportunity or challenge. This included obtaining expert opinions on how well the institution is positioned or placed, especially when compared with other development partners, to influence the changes identified as actions or solutions (figure 3.2, C). The panelists were asked to score the strength of the institution's place or position to undertake each intervention.
- The templates also solicited up to three specific potential Bank Group interventions or support that could help clients successfully undertake their respective actions or solutions.
- For the same actions or solutions, panelists were requested to provide their views on the Bank Group's existing capacity to help client countries successfully design and implement such actions or solutions through specific interventions (figure 3.2, D). The capacity could include a combination of the institution's skills and experience, and ability to convene and influence stakeholders and extend financial support. The panelists were asked to score the institution's level of capacity to undertake each intervention.

4

ADMINISTERING THE DELPHI FEEDBACK PROCESS



Kicking off the
Delphi process



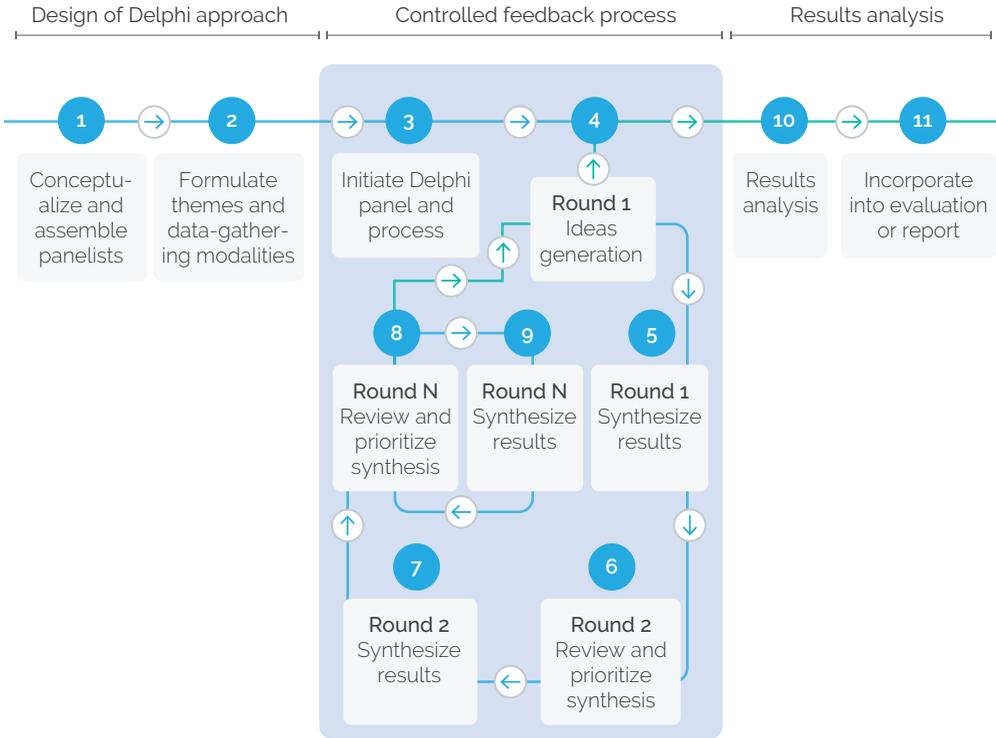
Idea generation



Delphi panel-generated
ideas for RE

The objective of the **second** stage is to tightly administer the controlled feedback process to ensure that there is structure and order to the expert opinions solicited through the Delphi technique. Adequately administering this stage is vital for maintaining the integrity of findings and working toward convergence in opinions. Areas covered in this chapter are shaded blue in figure 4.1.

Figure 4.1. The Delphi Process—Feedback Stage



Source: Independent Evaluation Group.

In the RE evaluation, a virtual meeting via videoconferencing proved to be more conducive, given the different international locations of the panelists. IEG initiated the meeting with a presentation that introduced the Delphi process to the panelists, explaining the context in which the results will be used in the RE evaluation. The presentation defined their roles as global experts in RE and clarified what was expected from the panel. The panelists were informed of the key questions they were expected to answer about scaling up RE in developing countries and the Bank

Group's readiness to support its clients with related endeavors. Some publicly available data on global RE markets were also distributed to ensure panelists' shared understanding of the facts. It is important to note that panelists were informed that they were not expected to carry out any additional research unless they wanted to of their own accord. Instead, it was stressed that IEG's interest in the Delphi exercise was to take advantage of their existing RE knowledge and expertise related to achieving the clean energy transition.

The virtual kick-off meeting also provided an opportunity to clarify the Delphi panel's feedback process. A step-by-step demonstration of the Microsoft Word questionnaire template familiarized panelists with the format for providing their feedback in the first round. They were requested to complete the template individually and confidentially; it was confirmed that any data IEG shared with the panel in later rounds would also be confidential and aggregated without attribution to specific individuals. IEG also informed the panel of an email account that was established specifically for corresponding with the global expert panel on RE, which was the primary means of communications and where completed templates were to be submitted. Panelists' other questions were also answered during the meeting. Additionally, the panel was given information for contacting the IEG team leader and other team members administering the Delphi process should they have questions or concerns during the feedback process.

Kicking Off the Delphi Process

It is important to ensure that all panelists clearly understand the purpose of their participation in the Delphi, the process and the time commitment required, and the modalities through which they will interact with those administering the process (figure 4.1, 3). Typically, this can be accomplished through a face-to-face or virtual meeting where they can ask questions and seek clarification. It is important to share with them the overall schedule and indicate the estimated required effort and time, including contingencies, since the exact number of required rounds or iterations can be uncertain. It is also important to stress the anonymity and confidentiality of the panel's feedback or data. After the kick-off meeting, the round 1 questionnaires or templates can be shared, initiating the feedback process.

An important understanding reached during the virtual kick-off meeting was the time frame for implementing the Delphi process. The schedule included a planned two iterative rounds and a contingent plan for an optional third round and a wrap-up meeting, as necessary. The IEG team recognized that there should be sufficient time to complete the tasks at each stage but that the process should not drag on unduly, especially considering the demanding schedules of a prominent group of global experts. For the same reason, both IEG and the panelists needed to adhere to the agreed schedule. The following schedule was agreed for the first two rounds, to be completed within a month:

- Distribution of round 1 response templates to panelists *by IEG*—immediately after virtual kick-off meeting.
- Completed round 1 response templates submitted *by panelists* to IEG—12 days after kick-off meeting.
- Synthesis of round 1 responses and issuance of round 2 templates with synthesized information to panelists *by IEG*—7 days after receipt of round 1 response templates.
- Completed round 2 response templates, including rescoring priorities, submitted *by panelists* to IEG—7 days after issuance of round 2 template with synthesized information.

The panelists were also informed of contingent steps (a possible third round of feedback and wrap-up meeting) in the feedback process should the need arise, although a specific time frame for these activities was not established at kick-off.

Round 1—Idea Generation

The next step is for the panelist to proceed individually to complete the round 1 questionnaire or template (figure 4.1, 4). This first round asks open-ended questions intended to generate ideas from the experts. The panelists include their responses in the template and submit them to the administrators for further action.

In the RE evaluation, immediately after the virtual kick-off meeting the panelist received by email two questionnaire templates—one for *opportunities* and one for *challenges* facing the scale-up of RE. Examples of the blank templates that were shared with the panel in round 1, which followed the structure illustrated in figure 3.2, are provided in appendix A. Although the template provided structure for data input, it

was not populated with any data, providing panelists with an open-ended opportunity to freely express their individual predictions (capped at 10 priority *challenges* and *opportunities*). The panelists were also asked to prioritize their responses by allocating 100 points among them, with more points indicating an item of higher importance. As the panelists separately prepared their feedback, the IEG team communicated with them to maintain the agreed schedule. All eight panelists submitted a completed set of questionnaires. Overall, the round 1 submission of responses proceeded smoothly and concluded successfully.

Synthesis of Round 1 Results

The administrators of the Delphi process now play the crucial role of synthesizing the various expert responses, grouping them if feasible (since multiple experts can have similar opinions; figure 4.1, 5). Any initial prioritization can also be assessed, and aggregated scores could be shared for subsequent rounds. Subject matter expertise within the team administering the Delphi process is vital at this stage to decipher responses and synthesize the information into a cohesive set reflecting the views of the overall panel. Once the synthesis is completed, a revised template is prepared. The revised template follows a similar structure, but unlike the initial one that was blank for open-ended responses, it is now populated with the synthesized responses of the panelists without individual attribution (they will see the ideas of others but not know whose ideas they are). The aim is to share with the panel the synthesized results to inform the panel of the broader suite of responses by other panelists, which may influence any subsequent feedback and (re)prioritization. The anonymity of individuals is important, so that panelists are influenced by the ideas rather than the expert who may have originated them.

In the RE evaluation, the team prepared the basic structure of the round 2 template before receiving the completed round 1 questionnaires, aware that the schedule allowed only seven days to complete the synthesis. Two team members were designated to synthesize the feedback—one subject matter specialist in RE with experience leading similar focus groups and one from IEG’s methods team who was familiar with the Delphi technique. Once the templates were received, the first challenge was to group multiple responses in which similar *opportunities* or *challenges* were highlighted, and then categorize them into broad areas of reforms. In this case, most responses (27) were grouped according to barriers that were identified in the ToC described in box 3.1, and a few outliers (3) were grouped separately. Round 1

resulted in 14 opportunities and 16 challenges identified by the panel, as indicated in figure 4.2.

Figure 4.2. Delphi Panel–Generated Ideas for RE—Round 1

The **emerging opportunities** put forward by the panel for Round 1, grouped by reform areas or barriers

Policy and Regulation

- Desire to meet national and international emission reduction commitment
- Address local environmental concerns
- Achieve energy access goals
- Improve security of power supply with use of indigenous resources

Integration of RE into Power Systems

- Integrated planning of power systems
- Utilization of technology and smart grids
- Firming up (variable) RE capacity by combining complementary RE systems or addition of electricity storage
- Increase distributed generation in which RE can play a key role

Investment Risk Mitigation

- Mitigation of upfront investments costs/risks of RE through public finance and pooling of resources, for more affordable and greater private sector participation

Mobilizing Finance

- Strong interest in developing market for RE by developer, development partners, and climate financing sources
- Liberalization of power markets that increase private RE interests
- Declining technology costs of RE and emergence of power storage

Other Opportunities

- Income generating potential of RE
- Integration of RE and EE in power systems planning

The **emerging challenges** put forward by the panel for Round 1, grouped by reform areas or barriers

Policy and Regulation

- Existing interests that may hinder development of RE
- Inadequate and unstable policy and regulatory infrastructure
- Lack of "real" commitment to decarbonize power system
- Need bankable projects and PPAs

Integration of RE into Power Systems

- Difficult to integrate large amounts of RE, especially those of variable/intermittent nature, without developing flexibility of power systems, which can be costly

Improvement to Design and Technical Standards

- Need local industry to create strong interest in RE promotion

Institutional Capacity

- Need champion to drive RE development process
- Strengthen capacity for transparency and accountability to address corruption and governance
- Improve systems and capacity to reduce project delays
- Capacity within government agencies to support and develop RE

Investment Risk Mitigation

- Vulnerability of RE systems to extreme weather and climactic events

Mobilizing Finance

- Affordability of offgrid equipment and aftersales care for poorer populations
- Difficulty mobilizing financing for RE in less lucrative, smaller markets for developers
- Regulatory and counterparty risks keep cost of capital high
- Rapid decline in technology costs could lead to slower uptake as utilities and developers take wait-and-see approach

Other Challenge

- Large land requirements for developing RE

Source: Independent Evaluation Group.

Note: EE= energy efficiency; RE = renewable energy.

Soliciting Round 2 Responses

Once the panelists receive the synthesized results, they are requested to reprioritize the set of aggregated responses from round 1, by selecting either their own response or ones identified by others (figure 4.1, 6). A scoring system is typically applied.

In the RE evaluation, the panelists were presented with two round 2 templates—one for *opportunities* and another for *challenges*, for scaling up RE. However, unlike in round 1, these templates were populated with the synthesized results reflecting the combined views of the entire panel without attribution to any specific panelist. Although the round 2 templates shared round 1 input from all panelists, panelists were requested to rescore the 14 *opportunities* and 16 *challenges*. This is an important aspect of the iterative feedback process in a Delphi technique, where each panelist can now reprioritize with the benefit of input from other experts, potentially being influenced by them. The panelists rescored by allocating 100 points across each of the 14 opportunities and another 100 points across the 16 challenges; more points indicated a higher priority. The panelists were also asked to score the same opportunities and challenges using a five-point Likert scale, and to likewise score the corresponding actions or solutions, which were also prepopulated based on the round 1 synthesis. Similar Likert scale ratings were requested for the Bank Group’s readiness to support clients with specific reforms (actions or solutions), reflected as its position of influence and capacity. The prepopulated templates and scoring scales can be accessed in a supplemental annex on the IEG website.

Since there was already significant convergence in round 1 among panelists, the IEG team saw an opportunity to explore some key emerging issues with the experts in greater depth. Therefore, round 2 included a separate supplemental questionnaire seeking the panel’s responses to a couple of specific RE-related questions. The questions were as follows; panelists were free to respond in essay format:

- Given the trade-off between (i) decreasing costs of RE technologies, particularly wind and solar; and (ii) increasing costs on power systems to ensure adequate flexibility for a smooth integration of variable or intermittent RE generation sources,

- How can developing countries manage this trade-off?
- What are the prospects for availability of economical electricity storage solutions (for example, thermal, batteries), and how will this affect the trade-off indicated above?
- If the Paris Climate Agreement and its emission reduction commitments are a significant opportunity that can support the development of RE, how important is the mobilization of the funds committed in the Agreement by developed countries (that is, \$100 billion per year by 2020) to deploy RE generation in developing countries to meet the climate change goals?

Synthesis of Round 2 Results

The synthesis for round 2 includes evaluating the rescored (reprioritized) ideas by the panel (figure 4.1, step 7). At this point, the administrators will need to determine whether there is sufficient convergence in prioritization of responses or whether further rounds are required. It is possible at this stage to discard ideas that no longer garner support. It is also possible to seek additional information related to any specific priorities that may be emerging.

In the RE evaluation, the feedback was broadly completed promptly. Two panelists required follow-up conversations for clarifications, which delayed obtaining all of the submissions by a couple of days. More important, there were no dropouts, as all panelists submitted completed questionnaires or templates (including the supplemental questionnaire). In a single case, a panelist inadvertently copied other members when submitting his responses. IEG had no reason to believe that there was undue influence as a result, since most panelists had already submitted their submissions by then. A quick review of the submissions confirmed that there was sufficient information and consensus in most of the submissions, and that the panel results could now be analyzed to formulate conclusions. The panelists were duly notified and thanked for sharing their expert opinions for the RE evaluation; without their commitment to RE and the evaluation, the Delphi process could not have been successful.

Additional Iterative Rounds of Feedback

Round 3 and any subsequent rounds will follow an iterative process similar to round 2, until a sufficient degree of consensus is developed among panelists' predictions (figure 4.1, 8 and 9). Convergence may not be attainable, especially in the case of some new or contentious subjects, which itself is a finding (that there is a significant divergence as to its importance or prioritization). Successive rounds may be time consuming and costly, and may not bring about greater alignment of perspectives—important factors for administrators to consider. It is also possible that the design of the Delphi process or the way questions are phrased are key reasons for divergence of opinions (for example, panelists may have different interpretations of a question); in such circumstances, the Delphi process may need to be redesigned, although panelists may be reluctant to participate in a reconfigured effort.

In the RE evaluation, further iterative rounds were not needed because of the significant number of ideas that were generated through the process and the relatively clear convergence across the panel on members' collective priorities. Therefore, it was decided to use the data on hand at the end of round 2 and proceed with analyzing results and drawing conclusions to be used in the RE evaluation, which are presented in the next chapter. The optional wrap-up meeting was also omitted.

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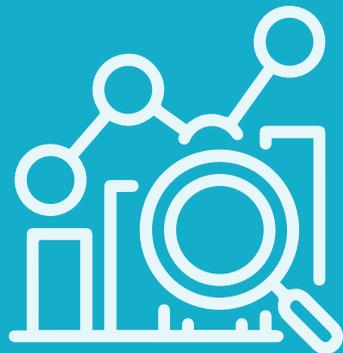
ANALYZING RESULTS



Analyzing opportunities
and challenges



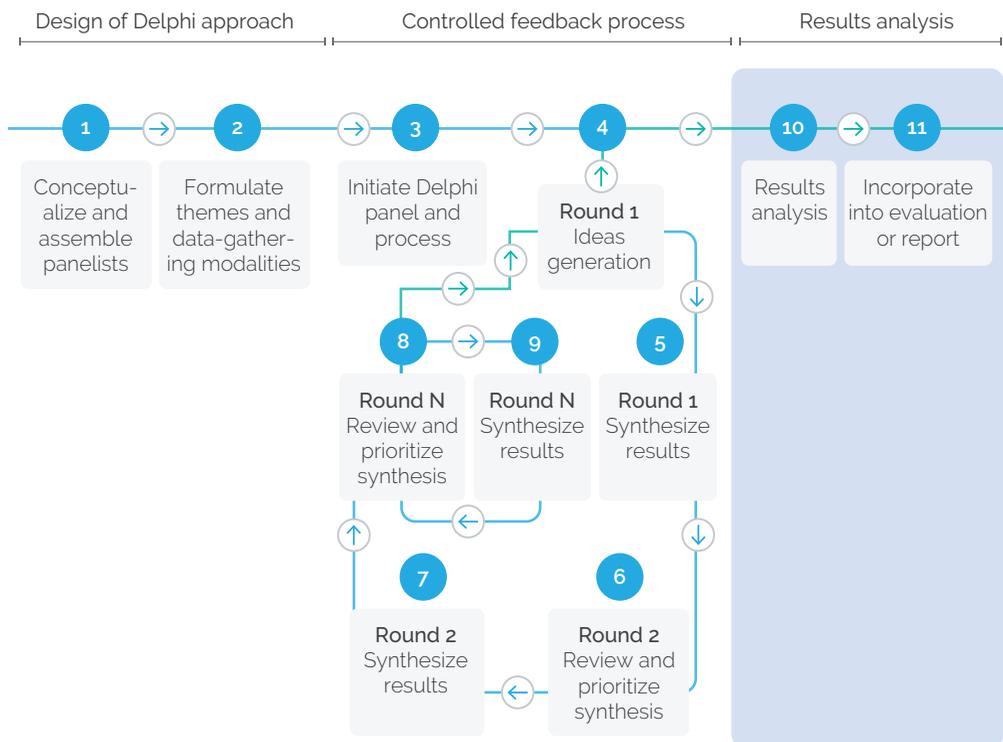
Results analysis
stage



Analyzing actions
or solutions

The **third** and final stage is to analyze results from the Delphi process and triangulate them with other methods in the RE evaluation to draw conclusions. This chapter focuses on analyzing the results, and chapter 6 describes what conclusions were drawn from the results and how they were integrated into the broader RE evaluation. Greater subject matter focus was provided, given that the results needed to be analyzed using an energy sector perspective. At this stage, no further iterations nor participation by the panelists are required except to seek specific clarifications regarding their responses as needed. The analysis is carried out by the team administering the Delphi process. The Delphi process step covered in this chapter is marked 10 in the blue-highlighted area in figure 5.1.

Figure 5.1. The Delphi Process—Results Analysis Stage



Source: Independent Evaluation Group.

Analyze Results to Extract Key Findings

The ideas generated and the data on prioritizing these opinions can now be summarized, represented visually, and analyzed statistically to draw key conclusions from the Delphi exercise (figure 5.1, 10). This can be typically carried out using spreadsheet and other data analysis software. Subject matter expertise and a basic understanding of statistics are important at this stage of the process to formulate robust conclusions.

In the RE evaluation, a combination of quantitative and qualitative approaches was used to analyze results. Basic data analytics or statistics were used to calculate the average (mean) scores to rank priorities collectively for the panel and standard deviations from the mean to ascertain the degree to which panelists reached consensus related to specific responses. The qualitative interpretation and contextualization beyond statistical measures relied heavily on sector expertise within the evaluation team to decipher the subject matter knowledge embedded in panelists' responses. The Delphi results from IEG's global panel of experts on RE were analyzed in three steps:

1. Future opportunities and challenges for scaling up RE for achieving the clean energy transition.
2. Reform actions or solutions related to these opportunities and challenges.
3. The Bank Group's readiness to support clients in implementing actions or solutions.

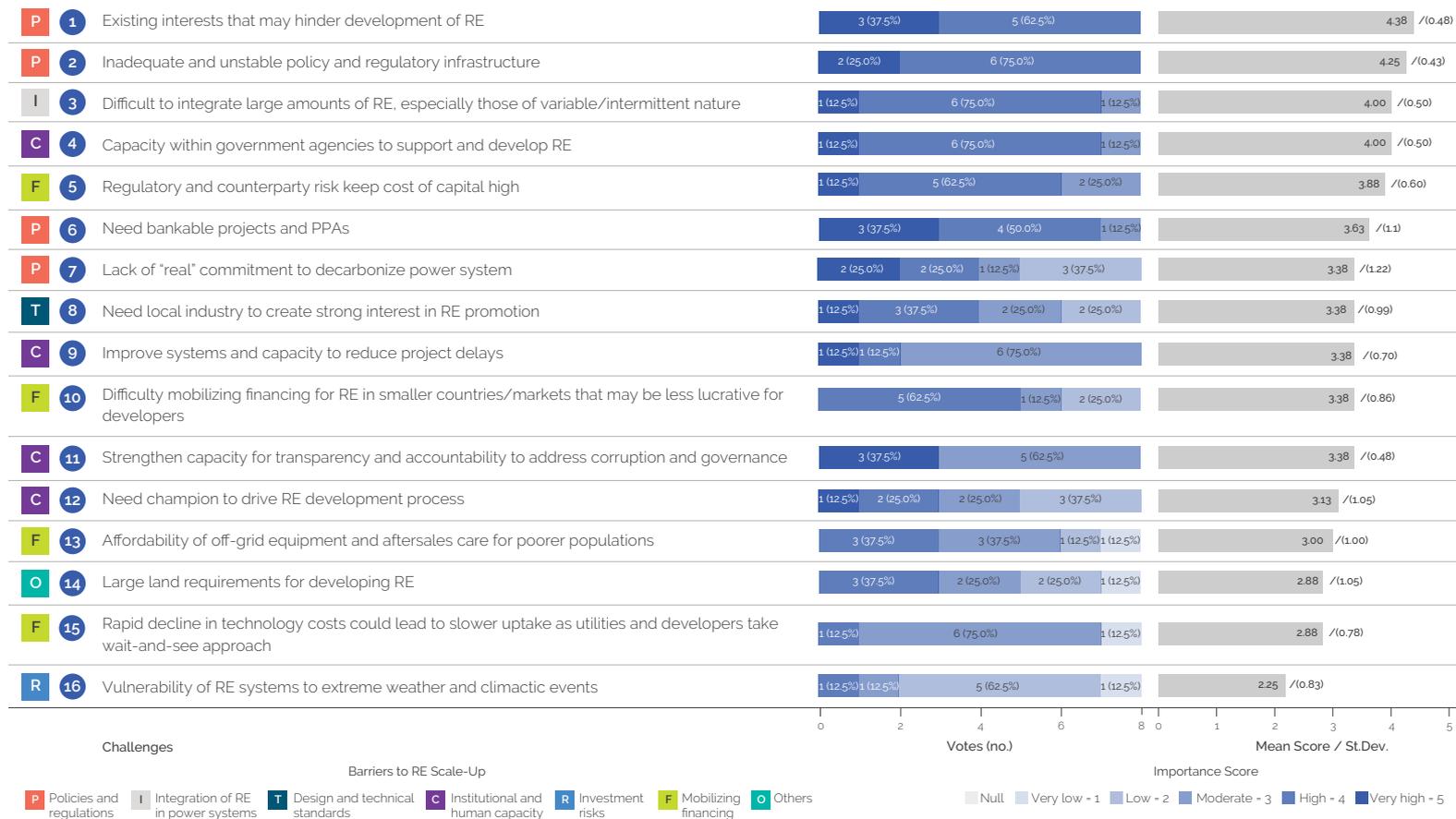
Analyzing Opportunities and Challenges

The **first step** was to analyze the major conclusions that can be drawn from the 14 *opportunities* and 16 *challenges* that were identified by the panel. The responses were analyzed based on a combination of scores on importance (indicated by average of the five gradations of Likert scale scores from very low to very high), and dispersion of scores across the panel (indicated by standard deviation from the average Likert score) as a proxy for the degree of consensus among the experts. The two parts of figure 5.2 summarize the results from the panelists' feedback for the *challenges* that are expected to confront the future expansion of RE and for emerging *opportunities* that developing countries can seize to scale up the sector. Often, *opportunities* identified by the panel highlighted the need to address corresponding challenges. In some instances, opportunities reflected emerging options for addressing some of the future *challenges* RE will face. In other instances, lower-priority items reinforced related higher-order *challenges* or *opportunities*. The following section accounts for these links in analyzing the feedback from the panelists. It presents conclusions that are an amalgamation of *challenges* and *opportunities*, broadly paraphrasing the views expressed by IEG's global panel of experts on RE.

The desire to meet national and international commitments to reduce greenhouse gases will open up greater opportunities for scaling up RE, although existing interests for maintaining the status quo can greatly hinder progress. IEG's global panel of experts on RE noted the greater global awareness of climate change and the associated nationally determined commitments made by countries to reduce CO₂ after the Paris Agreement as a high-ranking (third of 14) *opportunity* for scaling up RE. Greater consideration of carbon prices can also create a level playing field for RE in relation to other technologies. However, the top *challenge* that could stymie the expansion of RE, according to the panel, is resistance from vested interests. The opposition could be from coal and other fossil fuel-based interests that stand to be displaced by greater market penetration by RE. These industries could end up with stranded (existing) assets and suffer job losses as a result. Some power utilities may also resist a transition to increased generation from RE. This could occur when the scale-up occurs through independent power producers, which may be perceived as a loss of dispatch control within their operations, or if utilities are compelled to make additional costly investments in dispatchable capacity for integrating RE, especially variable renewable energy (VRE).

Figure 5.2. Prioritization of Challenges to and Opportunities for Scaling Up RE

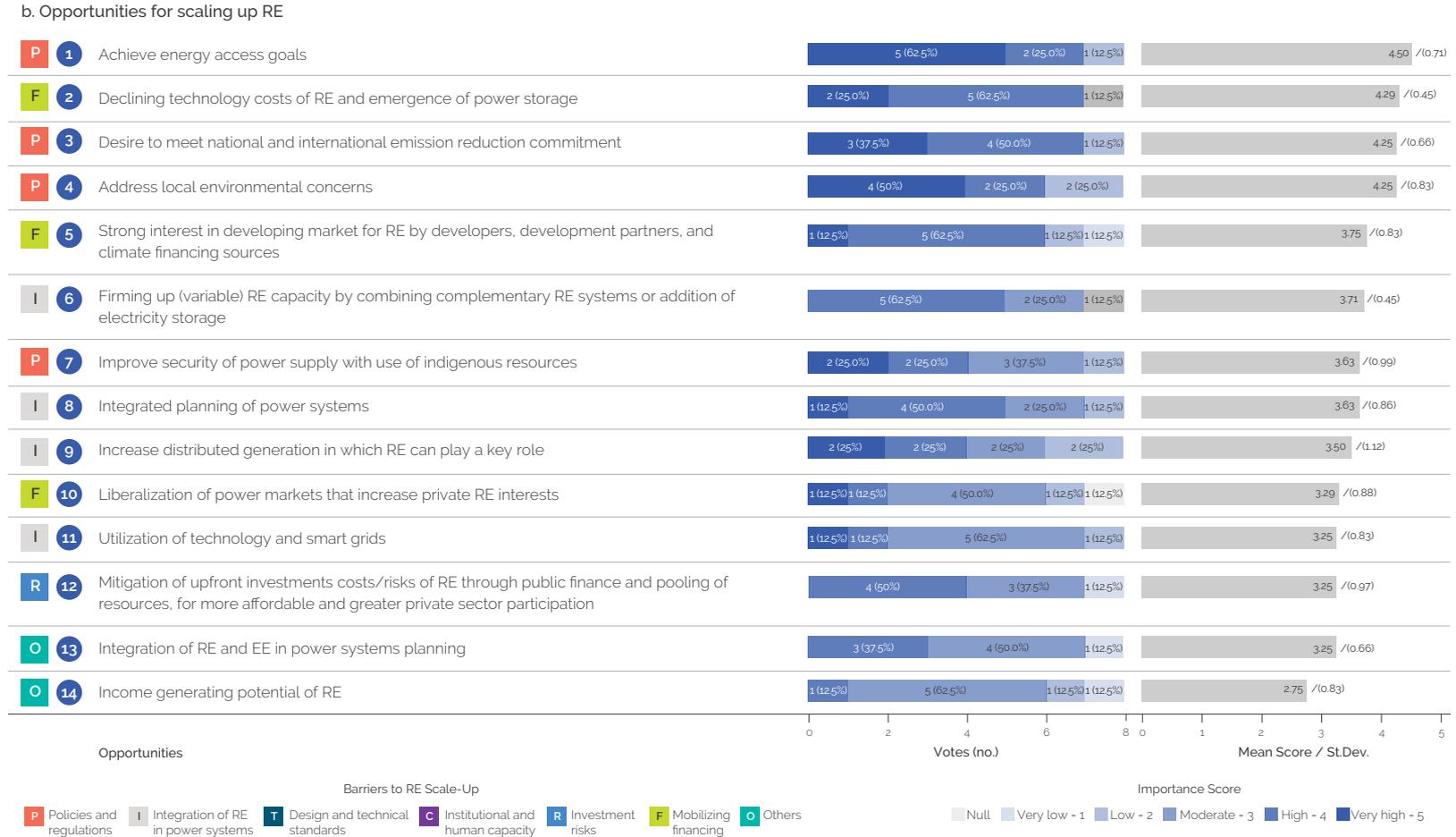
a. Challenges for scaling up RE



Source: Independent Evaluation Group.

Note: EE = energy efficiency; RE = renewable energy; PPA = power purchase agreement; VRE = variable renewable energy.

Figure 5.2. Prioritization of Challenges to and Opportunities for Scaling Up RE (cont.)



Source: Independent Evaluation Group.

Note: EE = energy efficiency; RE = renewable energy; PPA = power purchase agreement; VRE = variable renewable energy.

Several specific barriers, consistent with the ToC for the RE evaluation, were predicted to prominently challenge the scaling up of RE as the sector quickly expands and markets continue to evolve. Therefore, to achieve the targets in the clean energy transition, countries and RE stakeholders will need to adequately address these barriers to mobilize investments in the sector. The panel stressed the following:

- **Inadequate and unstable policy and regulatory framework.** All panelists viewed the importance of this barrier as high or very high. They perceived a stable RE policy framework, in which the direction of the sector is predictable, as a requirement for scaling up RE, especially for gaining the confidence of private investors. The enforcement of policies, including through an independent regulator, was seen as vital for attracting high-caliber developers. The panel also recognized that fair pricing policies are needed to ensure the financial viability of utilities and to attract investors, including the availability of bankable RE projects and adequate offtake agreements. Also, lack of transparency in procurement and other related processes can result in governance issues that can stymie competition and dissuade qualified developers from participating in the RE sector.

Inadequate policy and regulatory framework

Shortcomings in the policy and regulatory environment established by governments can hinder public and private investments in RE, especially when they do not provide adequate opportunities or incentives for investors.

Barrier as defined in the RE evaluation

Difficulties integrating large amounts of RE, especially those of a variable or intermittent nature, without enhancing the flexibility of power systems. Nearly 90 percent of the panelists scored this barrier as having high or very high importance, ranking it as one of the top three challenges for scaling up RE. This reflects the decreasing technology costs for solar PV and wind power, leading to a global expansion of VRE. This trend is expected to accelerate as reflected in the sizable share of the two technologies incorporated in the clean energy transition. Integrating increasing shares of VRE requires greater flexibility in power systems to accommodate intermittent availability of these RE resources. Although integrated planning of power systems garnered less significance on its own as a barrier, the panel acknowledged that a holistic approach is an important part of enhancing system flexibility

to avoid bottlenecks and speed up RE deployment. Improved planning specially to integrate VRE should include building out transmission networks to supply demand centers, and where feasible, interconnection of power grids (within country or with other countries) to create future regional networks. There was extensive input by the panel on energy storage and its prospects (including from responses to additional question on the subject), which, together with other tools for integration, will have a significant impact on achieving the clean energy transition. The panel emphasized that the cost of battery storage at utility scale is already declining but acknowledged that this is presently uneconomical for most systems as a solution for integrating VRE (and that these costs should be included as part of the investment costs of VRE technologies). However, there was considerable consensus that economical battery storage is a clear and emerging trend, with some indicating a near- to medium-term time horizon when it will be cost-effective at large scale. There was also a call for developing hydropower (including pumped storage), which is presently an economical solution for sustainably enhancing system flexibility. Another emerging trend is the expansion of distributed generation (DG) from RE (including ambitious targets established in countries such as China and India), which can help integrated RE by injecting electricity directly into the distribution system and bypassing potential short-term transmission bottlenecks.¹ The panel was divided and unable to reach consensus on the subject, since half viewed DG from RE as important or highly important and the other half thought its significance was moderate or low.

Inability to integrate RE into power systems

Inadequate planning, transmission bottlenecks and insufficient capacity, limited scope for power trading and pooling, inability to store electricity—can all result in inflexibility of power systems to smoothly and efficiently integrate RE, especially as the share of VRE such as wind power and solar PV increases.

Barrier as defined in the RE evaluation

- **Inadequate capacity within governments to implement their RE development plans, including facilitating private investment mobilization.** Most panelists viewed this as a shortcoming of high significance, as it leads to implementation delays and higher costs of projects and programs. Limited experience and capacity within energy ministries and other related institutions on RE-related issues was seen to disadvantage governments when negotiating with investors. The capacity constraints that extend the time

necessary to design, build, and commission investments lead to higher costs that can compromise their economic viability. This is especially the case when mobilizing investments in advanced RE and related technologies, according to the panel.

Weak institutional and human capacity

In many developing countries, various institutions involved in the development of RE do not have sufficient capabilities to undertake new investments or operate ongoing projects.

Barrier as defined in the RE evaluation

- **Regulatory and counterparty risks can increase the cost of developing RE.** This is especially the case given the capital intensity (for example, high up-front costs) for many RE technologies. As noted by the panel, this can limit or make expensive available financing for RE projects; driving up costs of investments makes RE-based generation options less competitive. The panel indicated that countries with similar natural resource potentials have widely different levels of RE investments and costs as a result. Some panelists saw an opportunity to mitigate some of these risks through public financing (initial investments and then divesting) and pooling resources. Such initiatives were viewed as being especially useful for mobilizing private investments in RE.

Existence of investment risks

Even with improved policies and enhanced institutional capabilities, there may be residual risks that projects face, either on a transitional basis while reforms are being implemented or permanent risks that are outside the control of developers, and which may discourage investments (such as commercial or off-taker risks, political risks, RE resource risks).

As defined in the RE evaluation

- **Several other challenges to overcome were identified, which may have significance in specific environments for developing RE.** The need to de-

velop local industries in RE was rated by some panelists as being high in importance. Although such efforts to develop local capacity propelled a country such as China to become a global leader in RE development, it may be a lower priority for smaller countries with less resource potential, smaller markets, and more limited human capacity. The challenge of mobilizing financing in smaller countries or markets was also raised, since these may be less lucrative for developers to invest in (ranked 10th out of 16 challenges). Further down the list of priorities was the potentially large land requirement for developing utility-scale RE, which can be a unique but important challenge in geographically smaller countries or densely populated areas. There was also acknowledgment that mobilizing supply-side solutions to climate change through the development of RE is only a partial pathway to achieving the greater objective of mitigating climate change, and that efforts should be combined with energy efficiency initiatives for better demand-side management of electricity use.

Although the overarching premise for the clean energy transition is to supply electricity sustainably through RE and avoid global environmental pollution, it is also an opportunity to achieve several other local development priorities prevalent in select circumstances. IEG's global panel of experts on RE highlighted several energy and environmental benefits that are also part of the RE evaluation ToC that may accrue from scaling up RE (box 3.1):

- **Achieve energy access goals.** The highest-rated *opportunity* from expanding RE among the 14 identified was the ability to achieve energy access goals, echoing one of the key objectives of SDG 7. It was scored by over 60 percent of the panel as having very high importance and seen as an opportunity to connect the nearly 1 billion people presently living without electricity. The decreasing technology costs of RE were seen as a way of more affordably expanding electrification to people living in poverty. Off-grid RE was also seen as a solution to overcoming various institutional and other constraints facing conventional grid expansion, through household-level connections and from the rollout of self-standing minigrids as a regional electrification pathway in areas with little or no access to electricity in developing countries.
- **Address local environmental concerns.** The panel noted that fossil-based generation “presently contributes to three million premature deaths, which may increase to between six and nine million fatalities by 2060,” if current trajectories continue. As a result, addressing local pollution was ranked

fourth among the 14 *opportunities* identified for expanding RE, with half the panelists placing very high importance on the matter. Recent challenges facing large cities such as Beijing, China, and New Delhi, India, underscore the importance of addressing local pollution from power generation and point to RE as a key solution. Ultimately, the direct benefits of avoiding local pollution may be as much a factor for countries developing their RE resources as global climate considerations.

- **Improve security of power supply with the use of indigenous resources.** The use of indigenous RE resources can enhance energy security by limiting exposure to the volatility of international markets, since it reduces reliance on fossil-based alternatives that are subject to price fluctuations typical of tradeable commodities. However, this ranked in the middle of the list of opportunities identified by the panel (seventh of 14). Although 25 percent of the panelists found energy security from developing RE to be of very high importance, half of the group viewed the *opportunity* as moderate or low in significance.

Analyzing Actions or Solutions

The **second step** was to analyze the actions or solutions that IEG's global panel of experts on RE mapped to different challenges and opportunities to scale up RE. Therefore, the primary focus of this section is the actions or solutions that correspond to the priority challenges and opportunities highlighted in the previous section. The conclusions and sector narrative are drawn from the priority actions or solutions identified by the panelists based on the corresponding numeric Likert scale scores: (i) solid rating of important or very important (a Likert scale average score of 4.0 or higher marked as **green** in tables 5.1 to 5.5); (ii) a rating of important at the lower end (a Likert scale average between 3.5 and 3.99 marked as **yellow** in tables 5.1 to 5.5); and (iii) a rating of moderate importance or lower (a Likert scale average below 3.5 marked as **blue** in tables 5.1 to 5.5). As in the previous section, the standard deviations from average scores were used to gauge the consensus within the panel for the selected actions or solutions. Panel responses were interpreted into a narrative based on subject matter expertise and sector context.

Phasing out existing fossil-based power plants and avoiding construction of new ones will need to consider and address the concerns of stakeholders affected by the transition, including power utilities and investors with stranded assets. IEG's global panel of experts in RE affirmed the need to strategically displace fossil fuels

over time. The highest-rated actions included phasing out the most polluting power plants, especially in hotspots where they are a major contributor to poor local air quality. To a lesser degree, the panel also called for the cessation of constructing new fossil-based power plants and the removal of fossil fuel subsidies that exist in some 40 countries worldwide.² The resulting unmet demand can then be supplied from RE sources. However, the panel clearly recognized that such actions will generate resistance from fossil-based interests, which stand to lose business and suffer potential losses as a result of stranded assets. As noted previously, these existing interests were identified by the panel as the most important *challenge or barrier* that could hinder the expansion of RE. Therefore, a successful transition would need to address these concerns, including alternative opportunities for investments and employment in RE and other areas. Furthermore, the panel placed a high level of importance and reached considerable consensus on the need for a long-term view and targets agreed with power utilities, since their operations can also be affected by greater use of VRE resources, increases in distributed generation, and, in some cases, the growing supply from independent power producers. Ultimately, it was proposed that clear policies and legislation will be required to set targets for expanding RE and displacing fossil-based generation. There was a recognition of opportunities to learn from the experiences in other countries in resolving these issues and transitioning smoothly.

Table 5.1 provides a list of key proposed actions or solutions as prioritized by the panel for addressing existing interests that may constrain the expansion of RE.

Table 5.1. Actions or Solutions to Address Existing Interests That May Hinder Development of Renewable Energy

	Actions or Solutions Proposed by Delphi Panel	Priority Ranking <i>mean (std. dev.)</i>
Existing interests may hinder development of RE	Phase out fossil fuel power plants over time, starting with the most polluting ones	4.38 (0.70)
	Closure of strategically located coal-based power stations ^a	4.25 (0.66)
	Legislate clear long-term RE targets and agree with utility how to achieve these targets	4.13 (0.33)
	Create alternative employment for areas affected by removing fossil electricity production	4.00 (0.50)
	Identify hotspots where power generation is a major contributor to local air quality and provide strong incentives for switch to RE ^a	4.00 (0.71)
	Legislate market liberalization to allow IPPs	4.00 (1.00)
	Stop building fossil fuel-based power plants	3.88 (1.17)
	Bring off-grid options into long-term electrification plan	3.75 (1.09)
	Learn from successes of other countries	3.63 (0.48)
	Remove subsidies on kerosene	3.63 (1.22)
	Increase awareness on job creation potential of RE	3.38 (0.70)
	Experiment with off-grid electrification concessions	3.25 (1.09)
	Provide incentives to convert conventional power plants into RE, storage, or both	3.25 (1.20)
	Remove VAT and import duty on solar	3.00 (1.12)

Source: Independent Evaluation Group.

Note: IPP = independent power producer; RE = renewable energy; VAT = value-added tax.

a. Reflects a related action or solution identified for seizing an opportunity.

The significance of rectifying an inadequate policy and regulatory framework to improve the investment climate for mobilizing investments in RE was underscored by the strong consensus within the panel that all corresponding actions or solutions identified by them are important. This includes modernizing the policy framework for promoting RE, with new or revised legislation and policies regarding national strategies on energy that align with the goals in SDG 7. The panel also called for avoiding or removing statutory or regulatory policies that can be barriers to the deployment of RE, and for fair and predictable implementation of policy through greater independence of regulators. The likely need to streamline permitting and development processes was recognized, especially for accelerating RE development through the private sector. Reforms were proposed for tender processes, including consideration of competitive bulk procurement for RE capacity, and for factoring life cycle costs and the potential for avoiding greenhouse gases in investment decision-making. Such approaches need to be supported by strong anticorruption laws and robust and consistent enforcement so that market confidence is enhanced to attract investments. The selected developers should also be subject to adequate environmental review and land acquisition. Depending on the extent of these reforms and the existing market structure, electricity market restructuring may be required. Table 5.2 provides a list of proposed key actions or solutions as prioritized by the panel for overcoming an inadequate and unstable policy and regulatory framework that affects the investment climate for RE.

Table 5.2. Actions or Solutions to Address Inadequate Policies and Regulations

	Actions or Solutions Proposed by Delphi Panel	Priority Ranking <i>mean (std. dev.)</i>
Inadequate and unstable policy and regulatory infrastructure	Facilitate easier finance for RE by reducing policy-based risks to such investments ^b	4.50 (0.50)
	Create enabling environment for investments in RE—modernized legislation, energy policy, independent regulator ^b	4.38 (0.48)
	Develop stable policy frameworks that support RE development	4.38 (0.70)
	Amend procurement or tendering practices to allow for consideration of life cycle costs when making decisions ^b	4.13 (0.33)
	Do not erect statutory or regulatory barriers to the deployment of hybrid technologies ^b	4.13 (0.60)
	Establish independent electricity regulator	4.13 (0.78)
	Undertake electricity sector restructuring	4.13 (0.78)
	Encourage rule of law through strong anticorruption laws and robust, consistent enforcement ^a	4.13 (0.78)
	Inclusion of GHG price (as a cost) in cost-benefit analysis for new generation capacity ^b	4.13 (0.78)
	Develop national RE strategies and long-term plans	4.00 (0.71)
	Align national energy policy to achieve targets in SDG 7 to receive official development assistance ^b	4.00 (0.71)
	Repeat bulk procurement of RE electricity on a competitive basis to accelerate price reductions with increasing volumes ^b	4.00 (0.71)
Streamline permitting and development processes, including adequate environment review and land acquisition ^a	4.00 (0.87)	

Source: Independent Evaluation Group.

Note: GHG = greenhouse gas; RE = renewable energy; SDG = Sustainable Development Goal.

a. Reflects an action or solution related to addressing a different challenge.

b. Reflects an action or solution related to seizing an opportunity.

Integrated planning and strengthening grid infrastructure for transporting RE to demand centers was seen as vital for expanding RE, followed by measures for balancing power and especially for assimilating VRE. The panel placed the highest importance on prioritizing grid infrastructure investments to improve the transmission and distribution networks to accommodate RE. There was a similar call to modernize grid operations and governance and strengthen the capacity of grid operators. Given the anticipated expansion of VRE, the panel placed high importance on solutions to support the integration of solar PV and wind power. Key proposed solutions included the promotion of pumped-storage hydropower and battery storage. Integration of grids within regions or countries was also viewed as an important solution for scaling up RE, since it can present more options for balancing power. Although the adoption of grid integration protocols, especially for RE DG, can ease some of the transmission bottlenecks and support load balancing in the short term, there was a divergence of views within the panel, as previously noted, on the significance of DG as a major long-term solution for scaling up RE. As the penetration of VRE increases in power systems, it may be necessary to reconfigure electricity markets to provide for price discovery of the balancing energy market. Although a key to integrating VRE is creating greater generation flexibility, the panel also recognized the complementary role that demand-side energy efficiency measures can play. Table 5.3 provides a list of proposed key actions or solutions as prioritized by the panel for better integrating RE into power systems.

Table 5.3. Actions or Solutions to Address Integration of Renewable Energy into Power Systems

	Actions or Solutions Proposed by Delphi Panel	Priority Ranking <i>mean (std. dev.)</i>
Difficult to integrate large amounts of RE, especially those of variable/intermittent nature, without developing flexibility of power systems, which can be costly	Improve transmission and distribution network	4.38 (0.70)
	Prioritize grid infrastructure investments ^a	4.38 (0.70)
	Integrate grid systems	4.25 (0.66)
	Ensure adequate grid capacity for RE; modernize operations and governance of grid ^a	4.25 (0.66)
	Balance load to optimize local RE and grid electricity capacity ^a	4.25 (0.66)
	Develop and adopt grid integration protocols ^a	4.13 (0.60)
	Make it easier to integrate VRE sources into grid and support solutions that involve storage ^a	4.13 (0.60)
	Strengthen capacity of grid operators	4.00 (0.50)
	Promote pumped storage and battery storage	3.75 (0.97)
	Undertake long-range transmission planning	3.63 (0.86)
	Unlock flexibility in generation and the demand side by creating appropriate market incentives	3.63 (0.70)
	Reconfigure electricity markets to provide for price discovery of balancing power	3.50 (0.87)
	Monetize future loss reduction to pay for RE DG installations now	3.50 (1.09)
	Develop smart grids	3.38 (0.70)
	Develop risk guarantee mechanism to compensate fossil-based plants for capacity cost when use is too low to recover these costs because of preference for RE electricity	3.13 (0.60)
Progressively move to reflect full RE costs, especially as its share in energy generation rises	3.13 (0.60)	

Source: Independent Evaluation Group.

Note: DG = distributed generation; RE = renewable energy; VRE = variable renewable energy.

a. Reflects an action or solution related to seizing an opportunity.

Strengthening the capacity within government agencies would improve the implementation of public projects and also make them better partners in facilitating private investments in RE. IEG’s expert panel on RE placed very high importance on the capacity to plan, implement, and monitor and evaluate RE investments—spanning the spectrum of a typical project cycle. Given the fast-evolving RE markets, similar significance was placed on training businesspeople, managers, and engineers, so they are familiar with the latest developments. Although such voids can be filled to an extent by mobilizing domestic and foreign private actors, the capacity within governments to negotiate such agreements is often lacking. The panel proposed seeking development partner assistance as a solution. They stressed that many countries have national plans but often lack the human capacity to implement them. The *actions or solutions* proposed by the panel for strengthening capacity were, however, limited and general, as shown in table 5.4—a deviation from the extensive suggestions made for other high-ranking challenges.

Table 5.4. Actions or Solutions to Develop Capacity for Supporting Renewable Energy

	Actions or Solutions Proposed by Delphi Panel	Priority Ranking <i>mean (std. dev.)</i>
Capacity within government agencies to support and develop RE	Capacity within government agencies to support and develop RE	4.50 (0.71)
	Training on RE for businesspeople, managers, and engineers	4.00 (0.87)
	Seek support from development partners to assist with negotiations to be undertaken	3.75 (0.97)

Source: Independent Evaluation Group.

Note: RE = renewable energy.

Approaches to reducing counterparty risks can facilitate financing for RE by making projects more bankable for investors. There was significant consensus regarding the high importance placed by the panel on actions to de-risk or minimize counterparty risks faced by RE investors, including using grants or concessional finance, and consideration of life cycle costs in decision-making. The highest score given by the panel for risk mitigation actions was for developing a clear and robust investment framework, although there was considerable divergence of opinions

within the panel regarding the solution. A specific proposal was that smaller countries could pool similar projects within a region to generate greater investment interest through economies of scale. A less significant solution was to have a risk guarantee mechanism to compensate fossil fuel plants for underuse of capacity resulting from preference for RE, so that they will not present a roadblock for scaling up RE as an alternative. Table 5.5 provides a list of proposed key *actions or solutions* as prioritized by the panel for better mitigating investment risks.

Table 5.5. Actions or Solutions to Mitigate Regulatory and Counterparty Risks

	Actions or Solutions Proposed by Delphi Panel	Priority Ranking <i>mean (std. dev.)</i>
Regulatory and counterparty risks keep cost of capital high	Create a clear and robust investment framework	4.25 (0.83)
	Amend procurement or tendering practices to allow for consideration of life cycle costs when making decisions ^b	4.13 (0.33)
	Minimize counterparty risk	4.00 (0.50)
	Explore opportunities for de-risking investments through the use of grant or concessional financing ^a	4.00 (0.50)
	Organize small countries to pool similar projects in same region ^a	3.75 (0.97)
	Develop risk guarantee mechanism to compensate fossil-based plants for capacity cost when use is too low to recover costs because of preference for RE electricity ^a	3.13 (0.60)

Source: Independent Evaluation Group.

Note: RE = renewable energy.

a. Reflects an action or solution related to addressing a different challenge.

b. Reflects an action or solution related to seizing an opportunity.

Analyzing the Bank Group: Readiness to Support Clients

The **third step** was to analyze the Bank Group’s role in terms of its readiness to support the clean energy transition. IEG’s global panel of experts on RE shared their perception of the Bank Group’s *position* (to influence the outcome) and its *capacity* (expertise and experience) to support clients, for each action or solution for addressing challenges and seizing opportunities. Therefore, the primary focus of this section is the institution’s readiness to support clients in implementing various reforms (ac-

tions or solutions) identified by the panel. It is important to interpret this information with greater caution, and ensure it is ultimately corroborated with other methodological sources. Although the panel has extensive expertise in RE development globally and each member is familiar with the work of the Bank Group, their respective understanding of the institution and its functions and their own experience with it may vary considerably. Therefore, the views of the panel on the institution's role may be less generalizable.

The Bank Group's position and capacity to support clients to implement specific actions or solutions is scored on a different scale. The panel was presented with a four-point Likert scale (instead of a five-point scale). The scale for the Bank Group's position to influence outcomes was 4—extremely well, 3—very well, 2—moderately well, and 1—poorly; the scale for institution's capacity to support clients undertake actions or solutions was 4—very high, 3—high, 2—moderate, and 1—low. In both cases, each panelist had the option to not opine (by responding “Do not know” or “No opinion”), although the response rate with a perspective was 84 percent (89 percent for position and 79 percent for capacity). As for previous sections, the results were analyzed based on priorities identified through panel scores (mean, standard deviation).

Overall, the Bank Group was moderately well to very well positioned and had moderate to high capacity to help clients navigate the clean energy transition.

The average score for the Bank Group's *position* to influence the 16 *challenges* was 2.61 and the 14 *opportunities* was 2.56, which is at the lower end of “very well”, barely surpassing “moderately well.” The institution's *capacity* to support clients to undertake actions or solutions was only slightly better, for *challenges* at 2.66 and for *opportunities* at 2.73, at the threshold between “moderate” and “high.” The panel did not view the Bank Group to be extremely well positioned or possess very high capacity to influence the clean energy transition. Mitigating regulatory and counterparty risks was the only priority *challenge* where the Bank Group was perceived to be clearly very well placed with high capacity to support clients. The panel viewed the institution as very well positioned (mean 3.13, std. dev. 0.72) and having a high level of capacity (mean 3.00, std. dev. 0.88) to help clients develop a clear and robust investment framework and help minimize regulatory and counterparty risks, which likely reflects the multiple instruments available within the Bank Group for risk mitigation (guarantees, political risk insurance, concessional financing, and ability to mobilize grants). The score was also likely based on the institution's role helping improve the regulatory and policy frameworks in client countries (another

high-ranking challenge, noted previously). Risk mitigation also garnered one of the highest levels of consensus for a *challenge* within the panel.

The Bank Group's readiness to support clients in addressing other priority *challenges* was perceived with greater ambiguity within the panel. Most were scored by the panel as being moderately well and very well placed and having moderate to high capacity to support clients. There was also a diversity of views that did not represent a definitive consensus, which may reflect the different experiences of panelists with the institution. The Bank Group's readiness to help clients overcoming other priority barriers include the following:

- **Inadequate policy and regulatory infrastructure.** In the case of this barrier, the Bank Group's capacity fell just below the threshold for a clearly high rating. Within the specific barrier, the institution was viewed as clearly having high capacity to help clients develop RE strategies and long-term plans and to support power sector restructuring where there are clients committed to such reforms, although its ability to help establish and support independent regulators was rated modest. The Bank Group was seen to have between moderate and high capacity for helping develop a stable policy framework for RE.
- **Integration of RE to power systems.** Although the overall rating for capacity to help clients overcome this barrier was mostly modest, integration of grid systems and promoting pumped-storage hydropower and battery storage were specific actions where the Bank Group was viewed to have high capacity (and was very well positioned). Integrated systems and long-range transmission planning capacity was also perceived to be high, although the institution was seen to be less influential with clients in this regard. The Bank Group had more moderate capacity for many other related actions or solutions, including unlocking flexibility in generation and reconfiguring power markets for price discovery for balancing power; developing smart grids; strengthening capacity of grid operators; increasing RE DG; and even to some extent improving the transmission and distribution networks.
- **Lack of capacity within governments to develop RE.** The Bank Group was very well placed with high capacity for training various officials in developing RE, which in turn would also help establish the public sector as a credible partner for the private sector to invest in RE. The institution was seen to be less capable in terms of supporting the public sector to negotiate various aspects of RE development with the private sector.

The Bank Group is very well positioned to mobilize financing for RE, especially in smaller countries or markets, according to the panel. Capital flows may be more limited in such markets, especially for financing emerging technologies or solutions. The institution was rated close to high in its ability to use grants and concessional financing to supplant such gaps. However, it is more modestly capable of organizing smaller countries to pool projects to attract financing.

The Bank Group is well placed to share successful experiences from other countries. The panel recognized the institution's global footprint as positioning it very well to disseminate global knowledge based on its high level of experience in RE from other countries. It was seen as a way of contributing to overcoming existing interests that may hinder the expansion of RE.

The panel did not view the Bank Group as being particularly well positioned to help clients achieve electricity access and local environmental goals—two highly ranked *opportunities* that can be achieved by expanding RE. In both of these areas, the institution was moderately well positioned with moderate capacity. Within the actions or solutions for increasing access, the highest capacity rating was for helping clients align national policy with SDG 7. With regard to the local environment, the rating was highest for facilitating electricity-powered transport for reducing pollution. The panel gave a higher score for enhancing energy security using indigenous RE resources, although it was ranked as a lower-priority *opportunity*.

Endnotes

- 1 However, scaling up of solar photovoltaics, in particular, will increase the share of variable renewable energy, which can, in turn, generate the need for more flexibility in power systems through additional dispatchable capacity of energy storage options.
- 2 The list includes countries that provide direct subsidies for coal, oil, natural gas, and electricity. There are additional countries that may provide tax breaks and other incentives for fossil fuels, which can also undermine the competitiveness of renewable energy.

6

FORMULATING CONCLUSIONS



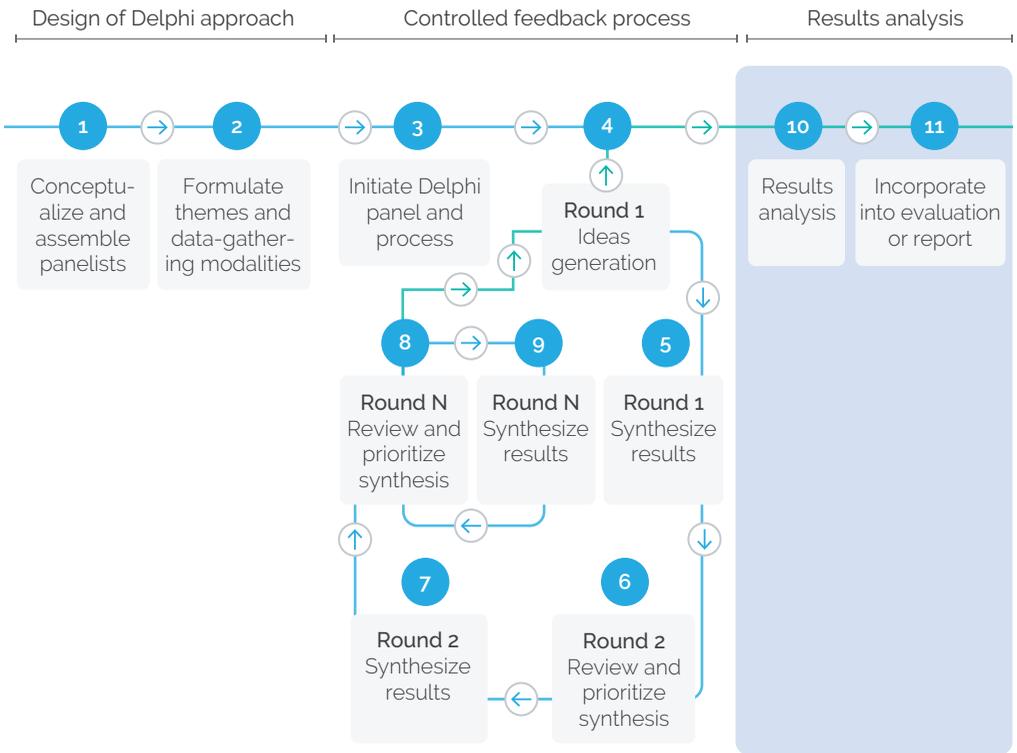
Results analysis stage



Incorporate results into
the evaluation or report

This chapter continues with the **third** and final stage, focusing on the major conclusions drawn from the Delphi exercise and how they were integrated into the broader RE evaluation. It is based on the results analyzed in chapter 5 and continues to apply a subject matter perspective, but it triangulates the conclusions from the Delphi process with findings from other methods to formulate conclusions. The Delphi process step covered in this chapter is marked 11 within the blue-highlighted area in figure 6.1.

Figure 6.1. The Delphi Process—Results Analysis Stage



Source: Independent Evaluation Group.

Incorporate Results into the Evaluation or Report

Once the results from the Delphi panel are analyzed, the key findings can be triangulated with the results from other methods to formulate the overall conclusions on the subject matter being evaluated (figure 6.1, step 11). These conclusions can form the basis of recommendations made to effect change.

In the RE evaluation, the Delphi exercise with IEG’s global expert panel on RE provided useful insights and helped established the key emerging challenges and opportunities facing the scale-up of RE as envisaged in the clean energy transition. The RE evaluation was able to triangulate findings with the results drawn from other previous methods and come to several key conclusions (box 2.1). These conclusions reflect the emerging direction of RE markets and also where the Bank Group may be best placed to support clients in navigating the sector. This section summarizes the major conclusions that were reached from the multiple methods used in the RE evaluation, to which the Delphi results contributed.

- Addressing existing interests, especially from fossil fuel generators and power utilities, will create headwinds for scaling up RE, and require a comprehensive approach to addressing their concerns so that investments in RE can advance. Although some RE-specific reforms are necessary to improve the investment climate for developing the sector, a more comprehensive and sustained approach is needed to address challenges that may be posed by competing and complementary sectors. Fossil fuel-powered generators, along with electricity utilities, have at times displayed resistance to expanding RE, because of potential business losses, technical challenges to integration, or concerns about higher power system costs, especially when assimilating VRE. There may also be pushback from local communities and other concerned stakeholders if RE technologies such as hydropower adversely affect the environment and those who may be displaced are inadequately compensated.¹ These vested interests can manifest in some of the barriers identified in the ToC in box 3.1. Case studies and portfolio reviews of the Bank Group RE engagements found them to be more effective in achieving development outcomes when the institution takes a more comprehensive and sustained approach to addressing barriers to sector expansion.
- Although the overarching global impetus for scaling up RE is to mitigate adverse climate impacts, local considerations such as increasing electricity access and avoiding local air pollution may be a greater motivator for developing the sector. However, the panel did not perceive the Bank Group to be well positioned to help clients capitalize on these aspects. Increasing electricity access through RE to nearly a billion people around the world was the top-ranked *opportunity*. However, the Bank Group’s capacity to support such efforts was perceived to be modest by the Delphi panel, although a review of the institution’s RE portfolio found increasing access an objective in 22 percent of the 465 projects, with nearly 80 percent of these investments achieving their access goals. The Delphi panel had a similar perception about

another high-priority *opportunity*: that the Bank Group was not well positioned to help clients address local pollution. This conclusion is consistent with the RE portfolio review, which found few investments that aimed to avoid local air pollution. A recent IEG evaluation on pollution found that local environmental issues were underresourced within the institution, further corroborating the Delphi panel’s view (World Bank 2017). The Bank Group may want to strengthen its support to local energy considerations as a way of scaling up RE, since a review of country investment strategies as a part of the RE evaluation found them to be the primary country-level motivator for developing the sector, over global considerations.

- The Bank Group has a comparative advantage in disseminating global knowledge, which can significantly contribute to clients’ efforts to successfully scale up RE. The Delphi panel saw the Bank Group as very well positioned to share lessons from its extensive global experience, to inform clients about and help them successfully navigate the emerging RE landscape. This conclusion was further validated by a review of the RE portfolio, which found that the Bank Group shared global knowledge and international experiences with 78 countries in their design and approach to RE development. In addition, the institution operates several global platforms that disseminate knowledge and development experiences related to RE, such as the Energy Sector Management Assistance Program, the Carbon Finance Group, and the Asia Sustainable and Alternative Energy Program.²

The conclusions drawn regarding the major barriers to scaling up RE, as identified by the Delphi panel and corroborated with findings from other methodological sources, are detailed below:

- A key pathway to scaling up RE, particularly through private participation, identified three major barriers to overcome: inadequate policies and regulations, integration of RE into power systems, and addressing any residual risks through specific mitigation measures. As previously noted, the Delphi panel identified these three barriers as the top *challenges* to address in scaling up RE in developing countries (along with capacity building). A QCA carried out for the RE evaluation also independently confirmed overcoming the three-barrier combination as a key pathway to mobilizing investments in RE for achieving energy supply and global environmental objectives. A subsequent separate analysis by the International Energy Agency identified the same set of barriers as “the three main challenges” that need to be addressed to “accelerate significantly” RE growth for meeting the long-term goals established under the SDGs and the Paris Agreement (IEA 2019).

Renewable electricity growth still needs to accelerate significantly to meet long-term sustainable energy goals

This growth is possible if governments address the three main challenges to faster deployment: policy and regulatory uncertainty; high investment risks in many developing economies; and system integration of wind and solar PV in some countries.

IEA 2019

- An adequate policy and regulatory environment for RE is an essential factor for mobilizing investments in the sector—an area where the Bank Group has considerable experience, although there is a need to continually adapt to evolving market conditions. The Delphi panel ranked an unstable policy and regulatory framework as the second-most significant challenge facing the expansion of RE. The QCA identified addressing the same barrier as a requisite (near-necessary) one to overcome in scaling up RE. The Delphi panel also assessed that the Bank Group has high or near high capacity to help client countries with several of the key reforms needed to improve policy frameworks. This finding was underscored by a portfolio review, where a third of the Bank Group’s 217 public sector interventions included support to policy and regulatory reforms.³
- The integration of RE, in particular VRE technologies such as solar PV and wind power, is emerging as a major barrier to achieving the clean energy transition, yet the Bank Group has limited project-level experience in this area. This is among the top three challenges for scaling up RE identified by the Delphi panel. The QCA found integration to be the other essential (near-necessary) barrier (along with policies and regulations) to be addressed to mobilize investments in RE. Despite its significance, the Delphi panel found the Bank Group to have only moderate capacity to help with most related *actions or solutions*. This assessment is reinforced by a portfolio review, which found that less than 7 percent of the institution’s RE projects included activities to address this barrier.⁴ The limited experience with integrating RE also reflects the circumstance that many developing countries are only beginning to reach high shares of VRE, which is sure to exacerbate the integration challenge in the future. Among the solutions suggested by the Delphi panel in this regard, two emerging ones stand out:

- » Energy storage is becoming an increasingly important approach to balancing power for integrating VRE. The need for storage underscores the immediate importance of hydropower, especially pumped storage, and there was consensus that battery storage will progressively become an economical solution. Although battery storage technologies continue to advance, with steadily declining costs, there was acknowledgment that hydropower, especially pumped-storage technology, is presently economically viable and should be considered when developed to industry and international standards. The Delphi panel also identified a clear trend and predicted that battery storage technologies will continue to innovate and scale up in the near to medium term as they become more economically viable at utility scale. An in-depth review of hydropower undertaken in the RE evaluation found the Bank Group to have extensive experience helping clients deploy the technology, since it makes up nearly 40 percent of its RE portfolio. Although 90 percent of evaluated hydropower projects complied with environment and social policies, the institution could more consistently implement best practices in these policies and development of local communities that extend beyond minimal safeguard requirements. Nevertheless, the review found substantial direct economic benefits from its hydropower portfolio as a result of avoided costs from alternative generation and sizable climate benefits from avoided CO₂. Although the Bank Group is more recently supporting clients in deploying utility-scale battery storage, most of its experience during the evaluation period was confined to household-level solutions in projects aiming to increase electricity access. It validates the more moderate ratings by the Delphi panel for the institution's capabilities in this regard.

- » DG from RE resources is a rapidly emerging approach to scaling up RE while addressing transmission bottlenecks, but there was a divergence of views within the Delphi panel on its significance. Panelists did not reach consensus regarding this emerging trend to have more dispersed generation nodes that can help scale up RE by directly supplying distribution grids, bypassing potential transmission constraints. They were divided; half viewed RE DG as important or highly important and the other half thought its significance was moderate or low. This could be due to rapid expansion of VRE from RE DG (mostly from solar PV) progressively exacerbating the integration challenge as the share of intermittent electricity increases. The

Delphi panel's view contrasted with the perspectives of Bank Group energy sector staff surveyed for the RE evaluation, where 80 percent placed high importance on RE DG. It would be prudent to carefully consider the institution's presently expanding activities in RE DG and its implications for power systems so that potential unintended adverse consequences can be avoided.

- **Mitigating RE and country-specific risks can be vital, especially for mobilizing private investments, and the Bank Group has a suite of options to support clients in this regard.** There was considerable consensus within the Delphi panel regarding the high importance of minimizing counterparty risks as a way of mobilizing investments in RE. The significance of this barrier also highlights the need to improve the policy and regulatory environment, which can be a source of uncertainty for investors, and the need to use other approaches to minimize any residual risks. Mitigating RE risks was rated by the Delphi panel as the barrier the Bank Group is best placed to address. The panel's high level of confidence may reflect the suite of instruments that the institution can deploy to help clients mitigate investment risks, including guarantees, political risk insurance, concessional financing, and the ability to mobilize grant funds. It likely indicates why the Bank Group was perceived to be very well positioned to mobilize financing in small countries and markets, where risks can be high.
- **Inadequate human capacity for designing, developing, and operating RE is an important barrier to overcome, but it can often be augmented through external support.** Nearly 90 percent of the Delphi panel placed high importance on developing institutional capacity for developing RE, particularly within government agencies. The QCA also found a causal link between adequate capacity and the realization of RE investments, although it was not found to be a near-necessary condition for expanding RE. This potential contradiction between the Delphi panel and the QCA results may exist because, although developing long-term internal capacity in RE is important, shortfalls can also be augmented with external support on a transitional basis. The Bank Group plays a key role in this regard, since nearly half of the investments in its RE portfolio included activities to strengthen client capabilities.⁵ The Delphi panel opined that the institution has high capacity for training various officials on RE, although it was perceived to have less capability in helping clients negotiate with the private sector.

Endnotes

- 1 The World Commission on Dams (2000) recommended that hydropower be implemented with a broader development objective as a goal rather than narrowly focusing only on its energy benefits. The World Bank Group has adopted most of these recommendations, and the RE evaluation found that when projects adhered to these principles, they had more successful development outcomes.
- 2 The Asia Sustainable and Alternative Energy Program was a stand-alone multidonor-supported program that operated within the World Bank during the evaluation period, although it has since merged with and now operates as a part of the Energy Sector Management Assistance Program.
- 3 Nearly all investment interventions to support policy and regulatory reforms within the World Bank Group portfolio were understandably undertaken through public sector projects supported by the International Development Association and the International Bank for Reconstruction and Development.
- 4 The World Bank Group has a long history and sizable portfolio supporting transmission and distribution of electricity, which is a key part of integrating generation into power systems. Many of these investments are not classified as renewable energy projects, although some could directly or indirectly facilitate the integration of renewable energy.
- 5 The public sector projects aimed to improve technical design and implementation capacity (including strengthening governance and fiduciary capabilities), and private sector investments primarily helped comply with environmental and social requirements.

FINAL REMARKS ON THE DELPHI TECHNIQUE

The Delphi technique outlined in this paper provides a valuable means of systematically achieving a convergence of opinion from a panel of reputable subject-area experts. The method provides a robust, iterative, and anonymous group communication approach designed to shed light on alternatives, correlate expert insights on a specific subject or challenge, generate background information for decision-making, and reveal hidden consensus relevant to the forecasting of future events.

In the context of the multimethod evaluation of renewable energy sources explored here, the technique provided an opportunity to incorporate expert knowledge and experiences from global thought leaders and practitioners to enhance evaluative findings. Specifically, the panel perspectives helped (i) establish future scenarios for the rapidly evolving industry, which helped (ii) identify critical barriers that need to be overcome to scale up RE, and (iii) formulate a set of priority reforms countries can undertake to overcome these challenges, against which (iv) the Bank Group's readiness to help clients was assessed.

Though active steps were taken to offset potential response biases from participants (for example, confirmation, satisficing, bandwagon effects), more could have been done to ensure balanced representation in the panel of experts, particularly with respect to gender.

In addition, it should be noted that findings may be subject to the Von Restorff effect — in appraising challenges or opportunities, respondents may unconsciously bias responses towards more visible, severe, or otherwise distinctive issues. This would be of greatest concern with respect to the actions or solutions proposed in response to challenges. While the predictions generated via the Delphi technique may not always prove to be accurate, the primary challenge in implementing such a process involves the respondents themselves.

The panel's findings are ultimately a product of the collective knowledge of the assembled experts. As such, they reflect the biases, misperceptions, or knowledge gaps the panelists may possess. Nonetheless, thoughtful question design and the rigorous implementation of the iterated data collection procedure can help minimize the risks posed by these challenges.

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APPENDIX A

**SAMPLE RESPONSE
TEMPLATES FOR
ROUND 1 (BLANK)—
IDEAS GENERATION
FOR OPPORTUNITIES
AND CHALLENGES**

World Commission on Dams. 2000. *Dams and Development: A New Framework for Decision-Making*. London and Sterling, VA: Earthscan Publications.

[Please note that each original template had 10 rows, since panelists could submit up to 10 opportunities and 10 challenges. The samples in this attachment show fewer rows for illustration purposes only.]

The Power to RE-new: Evaluation of the World Bank Group's Support to Renewable Energy Development

Delphi High-Level Global Expert Panel on Renewable Energy: Response Templates

TEMPLATE 1: OPPORTUNITIES

GUIDELINES FOR COMPLETING RESPONSE TEMPLATES

1. The evaluation is limited to renewable energy (RE) for producing and supplying electricity, both for grid connected, mini-grids and household-level solutions. The scope of the evaluation does not cover other areas such as RE for transport, cooking, etc.
2. For the purposes of this evaluation, RE is defined to include biomass, geothermal, hydropower (all sizes, run-of-the-river as well as those with reservoirs for storage of water), solar (photovoltaic and concentrated solar), and wind power. However, the evaluation does not intend to assess each technology for its adequacy, but rather, how various countries can best develop a combination of available RE resources to supply electricity and reap environmental benefits in line with climate and Sustainable Development Goals (SDGs).
3. The panelists are encouraged to consider information and experiences from throughout the world in formulating their advice as global experts on RE. However, the inquiries from the Global Expert Panel on RE are related to helping developing countries (that is, World Bank Group client countries) achieve their RE development goals.

Round 1 Response Templates

Please note: There are two response templates—one for Opportunities and one for Challenges

4. You are separately provided with two templates in Microsoft Word format to facilitate your responses. The templates are based on specific questions that are being asked of you, and they are color coded to make it easier to navigate within them. The first template is designed to capture your

responses to the emerging **opportunities** to further scale up RE, whereas the second template is seeking your views on the emerging **challenges** that could hold back further expansion of RE.

5. An **opportunity** can be defined as a specific condition that is favorable or conducive to developing and scaling up RE, including but not limited to technological advances, improving market conditions, changes in demand patterns, shifts in policy, and influences outside the RE space (that is, shifts in fossil fuel prices, impact of climate change).
6. A **challenge** can be defined as a specific constrain or barrier that countries attempting to develop and scale up RE going forward are likely to face, which, if not addressed, will hamper their ability to achieve RE development goals. These could be, but are not limited to, natural resource constraints, technological limitations, technology or power systems related costs, technological or market risks, affordability and shifts in demand, changing market conditions, financing, challenges from civil society, and influences from outside the RE space (that is, improvements in fossil-fuel technologies, availability and costs of fossil fuels).
7. Please note that, at the end of each template, you will have space for sharing observations and recommendations that do not directly respond to the questions asked, but that you believe are important for the future development of RE.
8. For guidance, we have also provided you two examples of a completed matrix entry—one for emerging **opportunities** and one for emerging **challenges** to further developing RE to produce electricity. These examples can be found in Attachment 2 of the Objective, Approach, and Guidelines Note.

Template 1 of 2: Emerging Opportunities to Scaling Up RE Going Forward

9. Template 1 consists of 8 columns that reflect your responses related to each **opportunity** selected by you.
10. The first (1) column of the template is a numerical count of the major emerging opportunities that you identify for further developing RE in countries around the world. You have space for a maximum of 10 such **opportunities**, although the number you enter should be based on what you determine to be **opportunities** that, if seized, can potentially have significance for expanding RE in a substantial way around the world. You are not required to enter all 10 unless you wish to do so.

11. The next four (4) columns are for you to provide your responses related to each (up to 10) of the RE SECTOR **opportunities** that you have identified:
 - a. **Column 2:** Insert by typing *precise* detail and *concise* text indicating the **opportunity** identified by you. Please be as brief as possible but provide sufficient detail for us to understand what exactly you mean.
 - b. **Column 3:** Insert by typing the rationale as to why you identified the **opportunity** as being important to the further development of RE. Let us know why you think it is an emerging opportunity that, if seized, will have a significant impact on expanding RE development in countries around the world. Please provide sufficient detail so that we can understand the reasoning behind your thinking.
 - c. **Column 4:** Please insert by typing a numerical score between 1 and 100, to distribute a total of 100 points for each of the identified **opportunities**. You should award more points to **opportunities** that you think are more important and fewer points to the ones you feel are not as important. Please ensure that the total score in the column adds up to exactly 100.
 - d. **Column 5:** For each identified **opportunity**, please insert by typing text to identify up to three specific actions that can be undertaken either globally or within countries in order to seize/realize the **opportunity**.

12. Columns six (6) through eight (8) are designated to get your views on the World Bank Group and its ability to help client countries successfully undertake each of the actions you proposed for seizing/realizing the identified **opportunities**:
 - a. **Column 6:** For each proposed action, please indicate how well the Bank Group is positioned/placed, especially when compared with other development partners, to influence development outcomes related to RE with various stakeholders either at the country, regional, or global level.
 - i. Please note that to respond to the above question, you are asked to answer by selecting one of five options:
 - » 4: The Bank Group is EXTREMELY WELL positioned to help clients seize the opportunity.

- » 3: The Bank Group is VERY WELL positioned to help clients seize the opportunity.
 - » 2: The Bank Group is MODERATELY WELL positioned to help clients seize the opportunity.
 - » 1: The Bank Group is POORLY positioned to help clients seize the opportunity.
 - » X: Do not know/no opinion.
- b. **Column 7:** Please insert by typing text to identify up to three specific potential interventions/support to seize each **opportunity** to develop RE resources for producing electricity. This may include activities that harness and share global knowledge, help mobilize financial resources, mitigate risks, and convene stakeholders within countries or around the world to address mutual concerns. Please be precise in your answer.
- c. **Column 8:** For each proposed action, please indicate the current capacity of the Bank Group to help client countries successfully design and implement such action in order to seize each **opportunity** to develop its RE resources for producing electricity. The capacity of the Bank Group may include a combination of skills and experience, ability to convene and influence stakeholders, and ability to mobilize financial resources.
- i. Please note that to respond to the above question, you are asked to answer by selecting one of five options:
 - » 4: The Bank Group has VERY HIGH capacity to help clients seize the opportunity.
 - » 3: The Bank Group has HIGH capacity to help clients seize the opportunity.
 - » 2: The Bank Group has MODERATE capacity to help clients seize the opportunity.
 - » 1: The Bank Group has LOW capacity to help clients seize the opportunity.
 - » X: Do not know/no opinion.

Response Template 1 of 2: Opportunities

Emerging *Opportunities* to Developing RE Going Forward

RE Sector Opportunities and Actions				
No.	Main emerging opportunities to further develop RE in developing countries (Please be concise)	Rationale for selection of opportunities (Why?) (Please provide details)	Priority score: Between 0 and 100 (Column total must be 100)	What action(s) should be taken by developing countries to seize the opportunity?
1	Click here to enter an opportunity.	Click here to enter your rationale.	Click here to enter your score.	Click here to enter an action. Click here to enter an action. Click here to enter an action
2	Click here to enter an opportunity.	Click here to enter your rationale.	Click here to enter your rationale.	Click here to enter an action Click here to enter an action Click here to enter an action
... 10	Click here to enter an opportunity.	Click here to enter your rationale.	Click here to enter your rationale.	Click here to enter an action Click here to enter an action Click here to enter an action
			TOTAL: 100	

Response Template 1 of 2: Opportunities (cont.)

Emerging Opportunities to Developing RE Going Forward (cont.)

World Bank Group Positioning and Capacity to Help Client Countries			
No.	How well do you think the World Bank Group is positioned to help clients successfully carry out the action(s) to seize the opportunity? (Using the 4-point scale in the drop-down list)	What intervention(s) should the Bank Group undertake to help clients implement the action? (Please be specific and provide details)	How do you assess the current capacity of the Bank Group to successfully implement each intervention? (Using the 4-point scale in the drop-down list)
1	Choose an item.	Click here to enter a Bank Group intervention.	Choose an item.
		Click here to enter a Bank Group intervention.	Choose an item.
		Click here to enter a Bank Group intervention.	Choose an item.
	Choose an item.	Click here to enter a Bank Group intervention.	Choose an item.
		Click here to enter a Bank Group intervention.	Choose an item.
		Click here to enter a Bank Group intervention.	Choose an item.
	Choose an item.	Click here to enter a Bank Group intervention.	Choose an item.
		Click here to enter a Bank Group intervention.	Choose an item.
		Click here to enter a Bank Group intervention.	Choose an item.
2	Choose an item.	Click here to enter a Bank Group intervention.	Choose an item.
		Click here to enter a Bank Group intervention.	Choose an item.
		Click here to enter a Bank Group intervention.	Choose an item.
	Choose an item.	Click here to enter a Bank Group intervention.	Choose an item.
		Click here to enter a Bank Group intervention.	Choose an item.
		Click here to enter a Bank Group intervention.	Choose an item.
	Choose an item.	Click here to enter a Bank Group intervention.	Choose an item.
		Click here to enter a Bank Group intervention.	Choose an item.
		Click here to enter a Bank Group intervention.	Choose an item.
... 10	Choose an item.	Click here to enter a Bank Group intervention.	Choose an item.
		Click here to enter a Bank Group intervention.	Choose an item.
		Click here to enter a Bank Group intervention.	Choose an item.
	Choose an item.	Click here to enter a Bank Group intervention.	Choose an item.
		Click here to enter a Bank Group intervention.	Choose an item.
		Click here to enter a Bank Group intervention.	Choose an item.
	Choose an item.	Click here to enter a Bank Group intervention.	Choose an item.
		Click here to enter a Bank Group intervention.	Choose an item.
		Click here to enter a Bank Group intervention.	Choose an item.

TEMPLATE 2: CHALLENGES

Template 2 of 2: Emerging Challenges to Scaling Up RE Going Forward

1. Template 2 also consists of 8 columns that reflect your responses related to each challenge selected by you.
2. The first (1) column of the template is a numerical count of the major emerging challenges that you identify, which could hold back further development of RE around the world. You have space for a maximum of 10 such challenges, although the number you enter should be based on what you determine to be challenges of significance that, if they are not addressed, can be a major drawback to expanding RE in a substantial way around the world. You are not required to enter all 10 unless you wish to do so.
3. The next four (4) columns are for you to provide your responses related to each (up to 10) of the RE SECTOR challenges that you have identified:
 - a. **Column 2:** Insert by typing *precise* detail and *concise* text indicating the **challenge** identified by you. Please be as brief as possible but provide sufficient detail for us to understand what exactly you mean.
 - b. **Column 3:** Insert by typing the rationale as to why you identified the **challenge** as being a significant emerging obstacle for further development of RE. Let us know why you think it is an emerging challenge that, if not sufficiently addressed, will have a significant impact on stymieing RE development in countries around the world. Please provide sufficient detail so that we can understand the reasoning behind your thinking.
 - c. **Column 4:** Please insert by typing a numerical score between 1 and 100, to distribute a total of 100 points, for each of the identified **challenges**. You should award more points to **challenges** that you think are more important and fewer points to those you believe to have a less significant impact. Please ensure that the total score in the column adds up to exactly 100.
 - d. **Column 5:** For each identified **challenge**, please insert by typing text to identify up to three specific actions that can be undertaken either globally or within countries in order to address the **challenge**.

4. Columns six (6) through eight (8) are designated to get your views on the World Bank Group and its ability to help client countries successfully undertake each of the actions you proposed for addressing the identified **challenges**:
 - e. **Column 6**: For each proposed action, please indicate how well the Bank Group is positioned/placed, especially when compared with other development partners, to influence development outcomes related to RE with various stakeholders either at the country, regional, or global level.
 - i. Please note that to respond to the above question, you are asked to answer by selecting one of five options:
 - » 4: The Bank Group is EXTREMELY WELL positioned to help clients address the challenge.
 - » 3: The Bank Group is VERY WELL positioned to help clients address the challenge.
 - » 2: The Bank Group is MODERATELY WELL positioned to help clients address the challenge.
 - » 1: The Bank Group is POORLY positioned to help clients address the challenge.
 - » X: Do not know/no opinion.
 - f. **Column 7**: Please insert by typing text to identify up to three specific potential interventions/support to address each **challenge** to developing RE resources for producing electricity. This may include activities that harness and share global knowledge, help mobilize financial resources, mitigate risks, and convene stakeholders within countries or around the world to address mutual concerns. Please be precise in your answer.
 - g. **Column 8**: For each proposed action, please indicate the *current* capacity of the Bank Group to help client countries successfully design and implement such action in order to address each **challenge** to developing its RE resources for producing electricity. The capacity of the Bank Group may include a combination of skills and experience, ability to convene and influence stakeholders, and ability mobilize financial resources.

- h. Please note that to respond to the above question, you are asked to answer by selecting one of five options:
- » 4: The Bank Group has VERY HIGH capacity to help clients address the challenge.
 - » 3: The Bank Group has HIGH capacity to help clients address the challenge.
 - » 2: The Bank Group has MODERATE capacity to help clients address the challenge.
 - » 1: The Bank Group has LOW capacity to help clients address the challenge.
 - » X: Do not know/no opinion.

Response Template 2 of 2: Challenges

Emerging *Challenges* to Developing RE Going Forward

RE Sector Opportunities and Actions				
No.	Main emerging challenges that would hold back further development of RE in developing countries (Please be concise)	Rationale for selection of challenge (Why?) (Please provide details)	Priority score: Between 0 and 100 (Column total must be 100)	What action(s) should be taken by developing countries to address the challenge?
1	Click here to enter a challenge.	Click here to enter your rationale.	Click here to enter your score.	<div style="background-color: #e0e0e0; padding: 5px; margin-bottom: 5px;">Click here to enter an action.</div> <div style="background-color: #e0e0e0; padding: 5px; margin-bottom: 5px;">Click here to enter an action.</div> <div style="background-color: #e0e0e0; padding: 5px;">Click here to enter an action.</div>
2	Click here to enter a challenge.	Click here to enter your rationale.	Click here to enter your rationale.	<div style="background-color: #e0e0e0; padding: 5px; margin-bottom: 5px;">Click here to enter an action.</div> <div style="background-color: #e0e0e0; padding: 5px; margin-bottom: 5px;">Click here to enter an action.</div> <div style="background-color: #e0e0e0; padding: 5px;">Click here to enter an action.</div>
... 10	Click here to enter a challenge.	Click here to enter your rationale.	Click here to enter your rationale.	<div style="background-color: #e0e0e0; padding: 5px; margin-bottom: 5px;">Click here to enter an action.</div> <div style="background-color: #e0e0e0; padding: 5px; margin-bottom: 5px;">Click here to enter an action.</div> <div style="background-color: #e0e0e0; padding: 5px;">Click here to enter an action.</div>
			TOTAL: 100	

(continued)

Response Template 2 of 2: Challenges (cont.)

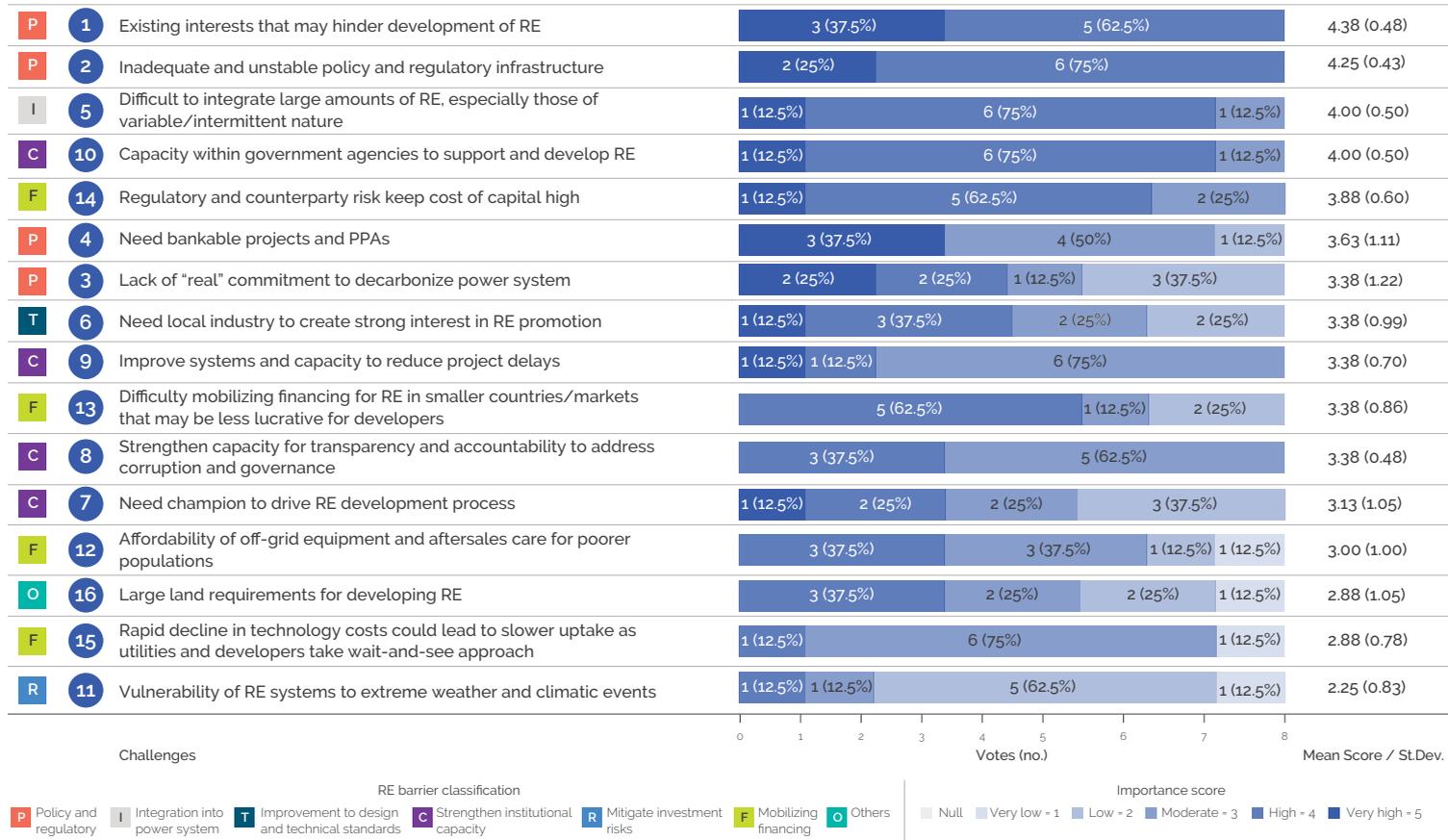
Emerging *Challenges* to Developing RE Going Forward (cont.)

World Bank Group Positioning and Capacity to Help Client Countries			
No.	How well do you think the World Bank Group is positioned to help clients successfully carry out the action(s) to seize the opportunity? (Using the 4-point scale in the drop-down list)	What intervention(s) should the Bank Group undertake to help clients implement the action? (Please be specific and provide details)	How do you assess the current capacity of the Bank Group to successfully implement each intervention? (Using the 4-point scale in the drop-down list)
1	Choose an item.	Click here to enter a Bank Group intervention.	Choose an item.
		Click here to enter a Bank Group intervention.	Choose an item.
		Click here to enter a Bank Group intervention.	Choose an item.
	Choose an item.	Click here to enter a Bank Group intervention.	Choose an item.
		Click here to enter a Bank Group intervention.	Choose an item.
		Click here to enter a Bank Group intervention.	Choose an item.
	Choose an item.	Click here to enter a Bank Group intervention.	Choose an item.
		Click here to enter a Bank Group intervention.	Choose an item.
		Click here to enter a Bank Group intervention.	Choose an item.
2	Choose an item.	Click here to enter a Bank Group intervention.	Choose an item.
		Click here to enter a Bank Group intervention.	Choose an item.
		Click here to enter a Bank Group intervention.	Choose an item.
	Choose an item.	Click here to enter a Bank Group intervention.	Choose an item.
		Click here to enter a Bank Group intervention.	Choose an item.
		Click here to enter a Bank Group intervention.	Choose an item.
	Choose an item.	Click here to enter a Bank Group intervention.	Choose an item.
		Click here to enter a Bank Group intervention.	Choose an item.
		Click here to enter a Bank Group intervention.	Choose an item.
... 10	Choose an item.	Click here to enter a Bank Group intervention.	Choose an item.
		Click here to enter a Bank Group intervention.	Choose an item.
		Click here to enter a Bank Group intervention.	Choose an item.
	Choose an item.	Click here to enter a Bank Group intervention.	Choose an item.
		Click here to enter a Bank Group intervention.	Choose an item.
		Click here to enter a Bank Group intervention.	Choose an item.
	Choose an item.	Click here to enter a Bank Group intervention.	Choose an item.
		Click here to enter a Bank Group intervention.	Choose an item.
		Click here to enter a Bank Group intervention.	Choose an item.

APPENDIX B

**ANALYSIS OF
DELPHI RESULTS**

Figure B.1. Prioritization of Challenges to Scaling Up RE

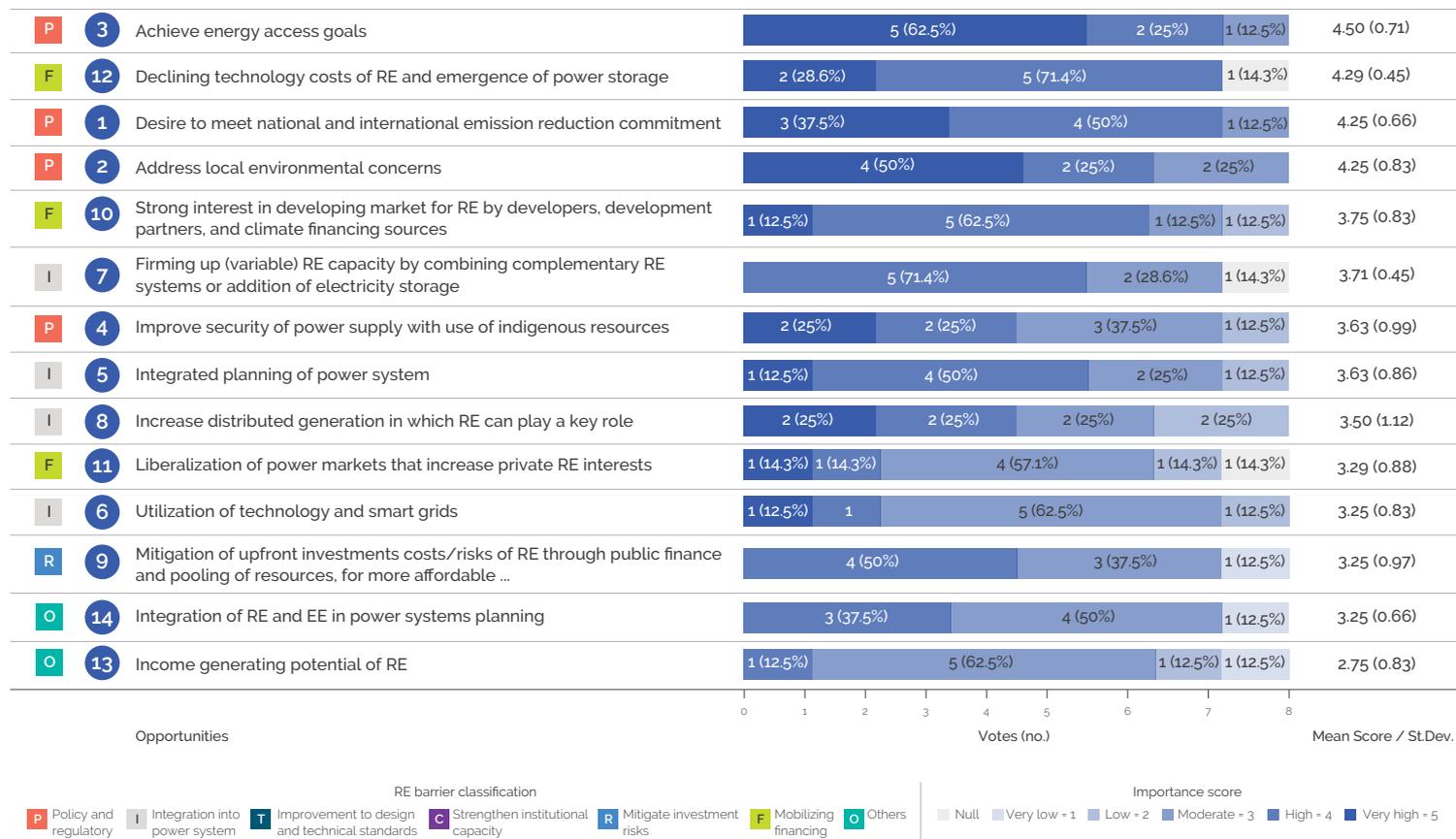


Source: Independent Evaluation Group.

Note: PPA = power purchase agreement; RE = renewable energy.

Figures B.1–B.7 show the analysis of the Delphi results.

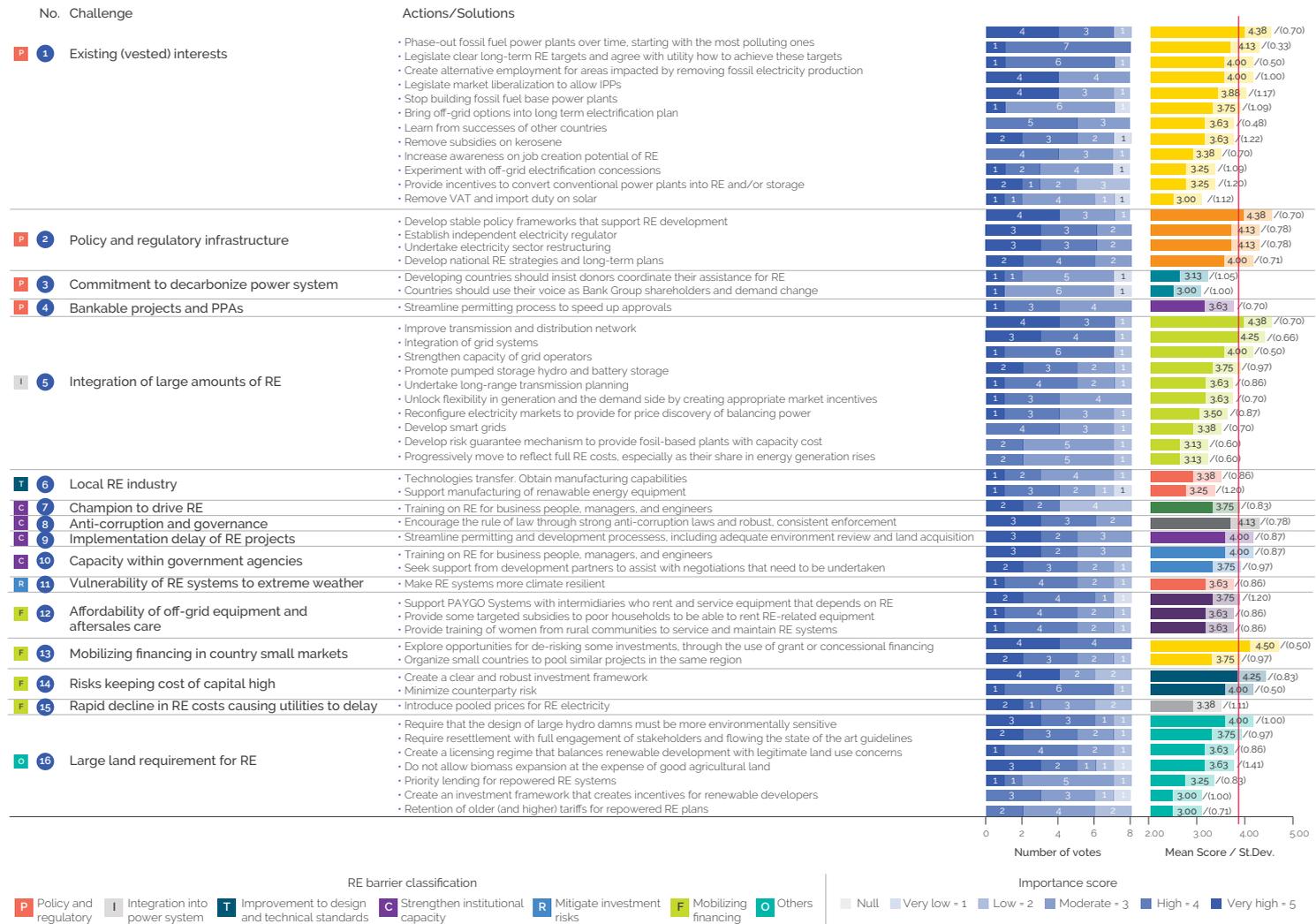
Figure B.2. Prioritization of Opportunities to Scaling Up RE



Source: Independent Evaluation Group.

Note: EE - energy efficiency; RE - renewable energy.

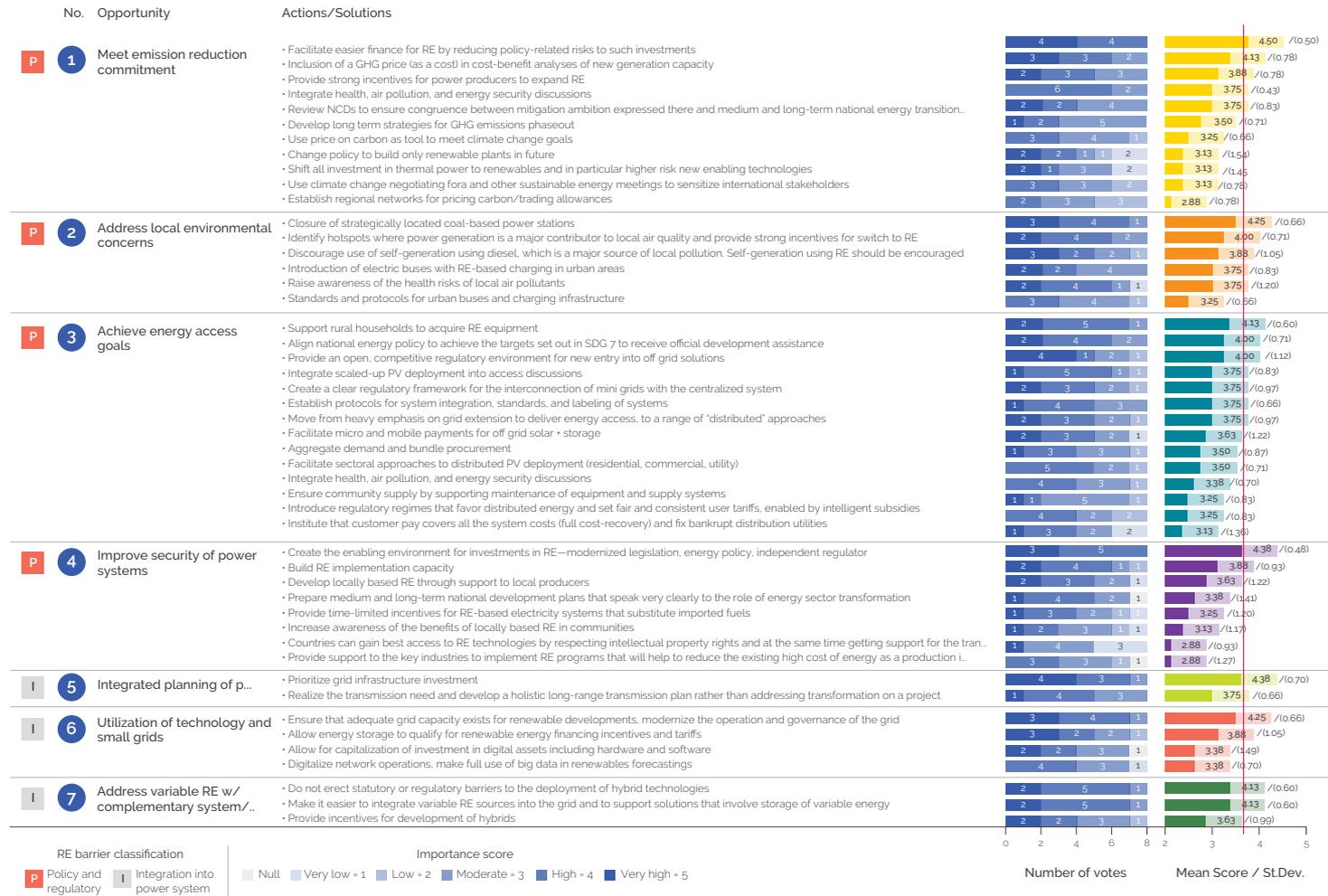
Figure B.3. Prioritization of Actions or Solutions for Addressing Challenges to Scaling Up RE



Source: Independent Evaluation Group.

Note: IPP = independent power producer; PPA = power purchase agreement; RE = renewable energy; VAT = value-added tax.

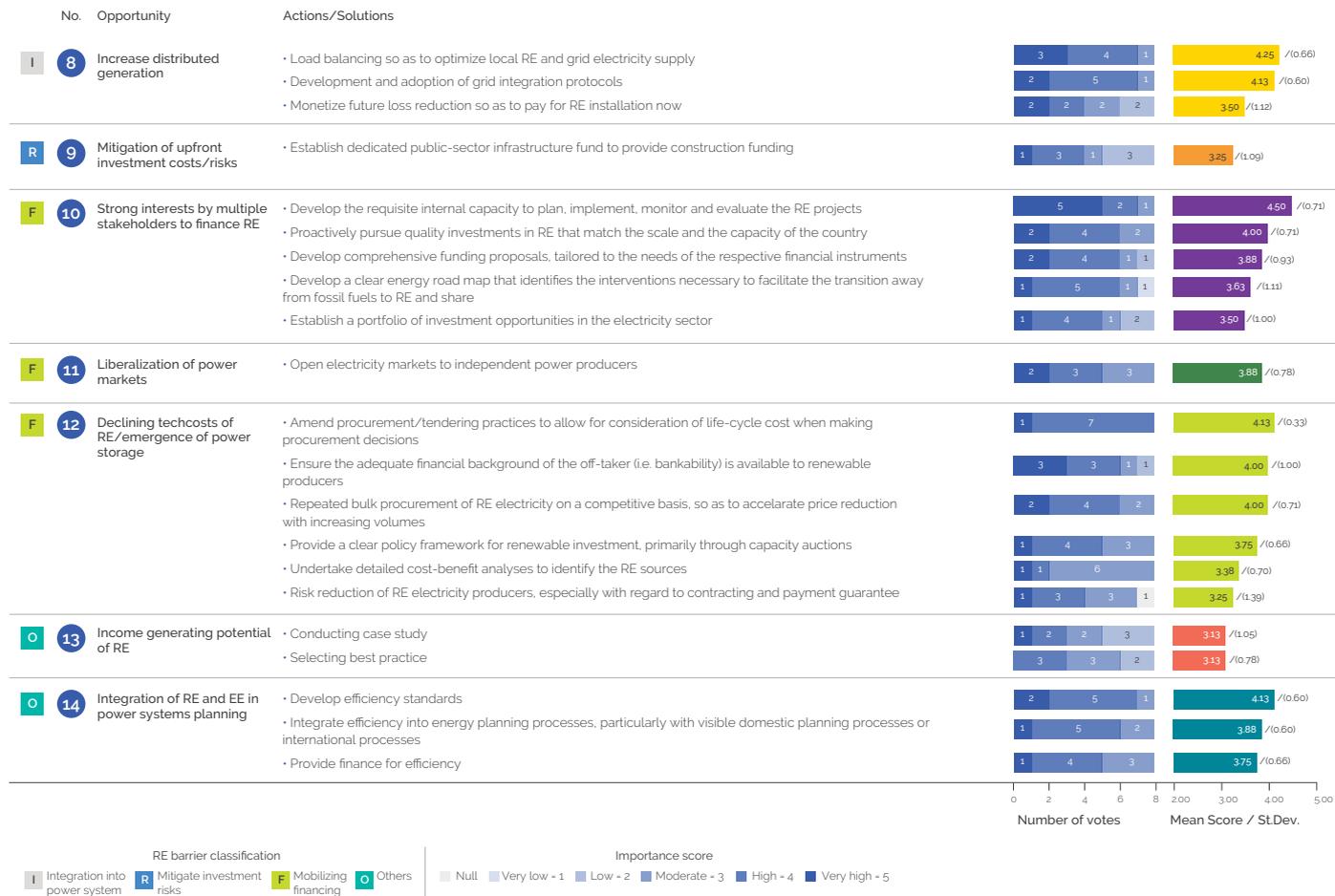
Figure B.4. Prioritization of Actions or Solutions for Seizing Opportunities to Scaling Up RE (1-7)



Source: Independent Evaluation Group.

Note: GHG = greenhouse gas; NCD = nonconvertible debentures; PPA = power purchase agreement; PV = photovoltaics; RE = renewable energy; SDG = Sustainable Development Goal.

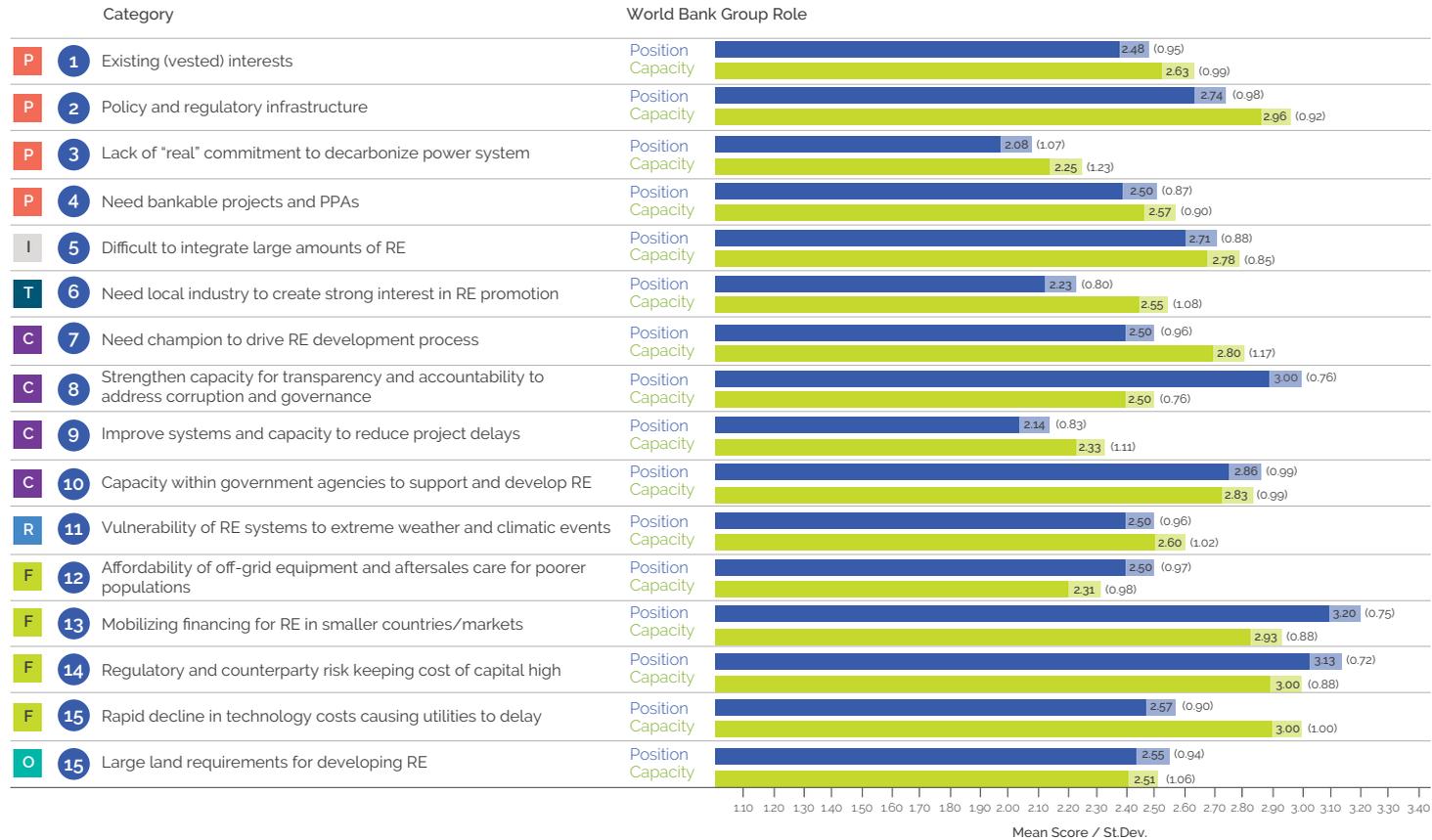
Figure B.5. Prioritization of Actions or Solutions for Seizing Opportunities to Scaling Up RE (8–14)



Source: Independent Evaluation Group.

Note: EE = energy efficiency; RE = renewable energy.

Figure B.6. Prioritization of Bank Group Position and Capacity for Addressing Challenge to Scaling Up RE



RE barrier classification

P Policy and regulatory	I Integration into power system	T Improvement to design and technical standards	C Strengthen institutional capacity	R Mitigate investment risks	F Mobilizing financing	O Others
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Level of positioning:

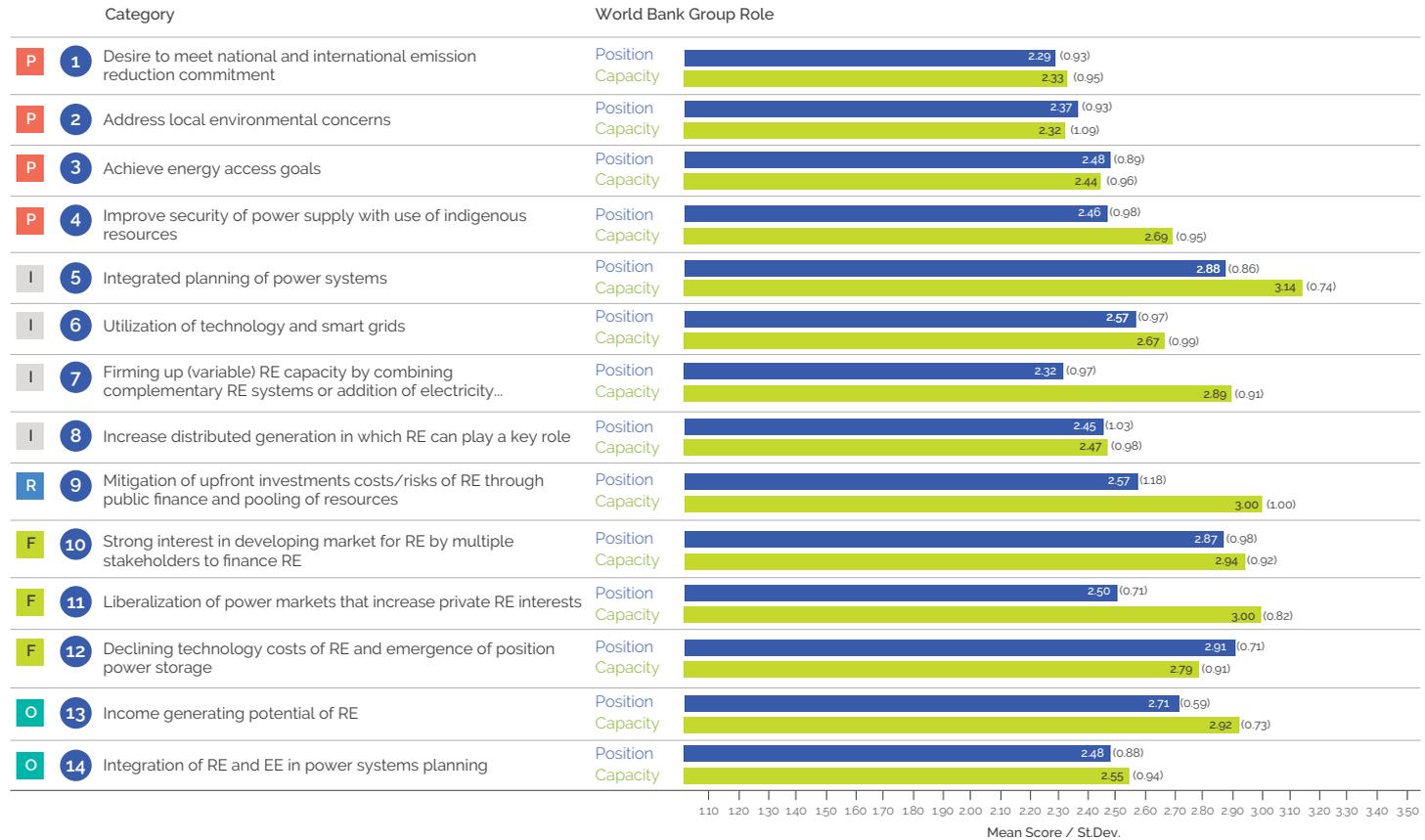
- Extremely well—4
- Very well—3
- Moderately well—2
- Poorly—1
- Do not know / No opinion

Level of capacity:

- Very high—4
- High—3
- Moderate—2
- Low—1
- Do not know / No opinion

Source: Independent Evaluation Group.
 Note: PPA = power purchase agreement; RE = renewable energy.

Figure B.7. Prioritization of Bank Group Position and Capacity for Seizing Opportunities to Scaling Up RE



RE barrier classification

- P Policy and regulatory
- I Integration into power system
- T Improvement to design and technical standards
- C Strengthen institutional capacity
- R Mitigate investment risks
- F Mobilizing financing
- O Others

Level of positioning:

Extremely well—4

Very well—3

Moderately well—2

Poorly—1

Do not know / No opinion

Level of capacity:

Very high—4

High—3

Moderate—2

Low—1

Do not know / No opinion

Source: Independent Evaluation Group.

Note: EE = energy efficiency; RE = renewable energy.



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