



ASSESSING THE POST-2020 CLEAN ENERGY LANDSCAPE

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SUMMARY

This technical note outlines the methodology, data sources, and calculations used to quantify the post-2020 clean energy plans of Brazil, China, the European Union, India, Indonesia, Japan, Mexico, and the United States. These countries/regions collectively account for more than 65 percent of the world’s primary energy demand.

Using data from the International Energy Agency and other published data sources including government publications, we estimate that total annual clean energy supply (in terawatt-hours per year or TWh/year) in these eight countries/regions will more than double by 2030, from approximately 8,900 TWh/year in 2012 to 19,900 TWh/year in 2030, if their plans are fully achieved. This level of energy supply would be 17 percent higher than Reference Scenario projections, demonstrating the relative ambition of these plans.

Brazil, India, Japan, Mexico, and the United States are also set to increase total renewable capacity levels by nearly four times by 2030, from 246 GW in 2012 to 856 GW in 2030. This is 19 percent above Reference Scenario projections.

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Technical notes document the research or analytical methodology underpinning a publication, interactive application, or tool.

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INTRODUCTION

Increased use of clean energy¹ will be essential to tackling the problem of climate change—not only to reduce greenhouse gas (GHG) emissions, but also to improve energy security, sustain the growth of the global economy, and provide energy access to the billions of people still living without modern energy services (IEA and the World Bank 2015). With fossil fuels still meeting more than 80 percent of the world’s primary energy demand, and energy production and use accounting for roughly two thirds of the world’s GHG emissions (IEA 2014), energy sector trends will play a large role in defining the world’s future emissions trajectory.

In recent years, progress has been made in developing cleaner, more efficient energy technologies. Growth has been driven by several factors, including supportive policies and the increasing cost-competitiveness of energy from renewable sources (REN21 2015). We are already seeing signs that economic growth and energy-related emissions, which, historically, have been closely correlated, are starting to decouple (IEA 2014).

In the last year alone, more than one hundred countries publicly announced clean energy targets, goals, or information (collectively referred to here as plans) to be achieved between 2020 and 2030. These plans were communicated through countries’ Intended Nationally Determined Contributions, press statements, and/or national policies. This technical note assesses these plans: first at the global level, looking at the type of plan proposed, and then at the country level, quantifying the clean energy plans published by eight of the world’s top GHG emitters—Brazil, China, the European Union, India, Indonesia, Japan, Mexico, and the United States. These countries/regions collectively account for 62 percent of global emissions (CAIT 2015) and more than 65 percent of the world’s primary energy demand (IEA 2015).

COUNTRY INDCS AND THE GLOBAL SHIFT TOWARD CLEAN ENERGY

In preparation for the 21st Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC), all countries agreed to publicly outline their post-2020 climate action plans—known as Intended Nationally Determined Contributions or INDCs.² Several countries opted to include information in their INDCs about plans to further advance the uptake of renewable and/or nuclear energy between 2020 and 2030. These clean energy plans may provide countries a means, among other aims, to:

- Support an overall GHG reduction target
- Present a holistic climate change response that is inclusive of mitigation and adaptation components. Some countries view access to energy as an important adaptation contribution, and commit to improving the resilience (through fuel diversification) of existing energy systems and ensuring delivery of energy services under changing climatic conditions³
- Demonstrate enhanced levels of ambition, by going beyond setting a single GHG target
- Foster transparency, because tracking progress of a clean energy plan can be achieved by monitoring key performance indicators such as installed capacity, total final energy consumption, and primary energy demand
- Support a focus on transformative change rather than a short-term measure to meet GHG targets

In general, the clean energy plans communicated through countries’ INDCs have taken the form of either actions or outcomes.

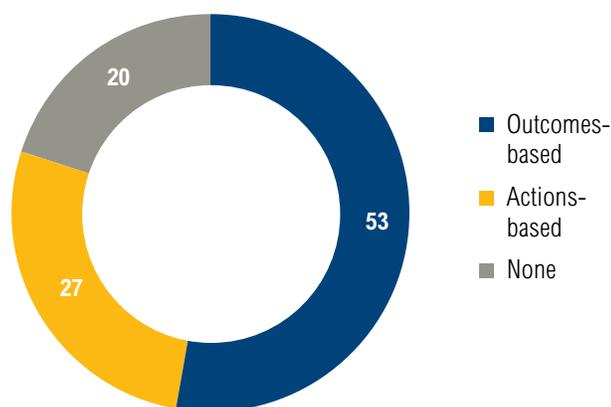
Actions are intentions to implement specific means, and refer to interventions taken or mandated by a government, institution, or other entity, and may include laws, directives, and decrees; regulations and standards; taxes, charges, subsidies, and incentives; information instruments; voluntary agreements; implementation of new technologies, processes, or practices; and public or private sector financing and investment (Greenhouse Gas Protocol 2014). Although actions provide clarity on countries’ plans for increasing their levels of clean energy supply, they are challenging to quantify.

Outcomes or targets are intentions to achieve a specific result, for example, to increase clean energy supply to a specific level. Outcomes-based clean energy plans target a certain quantity or percentage, and are generally framed in the context of:

- increasing the share of clean energy in the national energy⁴ mix;
- increasing the share of clean energy in the national electricity mix; or
- installing new/additional capacity.

Of the 127 INDCs⁵ submitted by October 26, 2015, 80 percent include text relating to clean energy: 67 INDCs (53 percent) refer to clean energy plans that involve outcomes, and 35 INDCs (27 percent) refer to clean energy plans that involve actions. This is a promising signal regarding countries' intentions to transform their energy mixes and increase investments in clean energy.

Figure 1 | **Types of Clean Energy Plans Communicated Through Country INDCs (Percent)**



Note: Countries that mention clean energy in the context of both outcomes and actions are classified as having outcomes-based plans, because these plans have less ambiguity and are easier to track.

It is also encouraging to see how many countries view clean energy as an important element in the transition toward a low-carbon economy. This holds true across the board—for major developed economies, emerging

economies, Small Island States, and Least Developed Countries. New Zealand, for example, states in its INDC that, “we are making progress towards reaching our target of 90 percent of electricity coming from renewable sources by 2025.” Bolivia’s INDC communicates its plans to increase the share of renewables in the energy mix to 79 percent by 2030, up from 39 percent in 2010. The Marshall Islands’ INDC includes goals of “reducing fossil fuel imports” and supporting the “uptake of renewable energy and further energy efficiency” which are “expected to replace more than one third of fossil fuels for electricity and transport by 2030.” Eritrea, in its INDC, states its intention of “raising the share of electricity generation from renewable energy to 70 percent of the total electricity generation mix (wind, solar, and geothermal) by 2030.” (See Appendix I for all INDC texts relating to clean energy.)

Finally, it is important to note that some of the largest energy-consuming countries/regions—the United States, the European Union, and Mexico—have not mentioned clean energy in their INDCs (and therefore are categorized as “No mention of clean energy plan in INDC” in Figure 1), but have announced their plans in press statements or national-level policies. See the section below for more information.

ASSESSING THE CLEAN ENERGY PLANS FOR THE TOP 10 GHG EMITTERS

In the last year, eight of the world’s top 10 GHG emitters—Brazil, China, the European Union,⁶ India, Indonesia, Japan, Mexico, and the United States—announced plans to scale up clean energy between 2020 and 2030. These plans have been communicated through their respective INDCs, either as a “headline” target or supporting information, or in national-level policies or statements, summarized in Table 1.

Two of the top 10 emitters were not assessed. Canada has yet to communicate a post-2020, national-level clean energy plan, despite adopting several sub-national policies, and remains one of the top countries for total installed renewable electrical capacity (REN21 2015). Russia has communicated that 4.5 percent of all electricity produced and consumed in 2020 will be generated from renewable energy sources, but has not presented a post-2020 clean energy plan.

Table 1 | **Clean Energy Plans for Brazil, China, the European Union, India, Indonesia, Japan, Mexico, and the United States**

	WORLD RANKING: GHG EMISSIONS (CAIT 2015)	WORLD RANKING: ENERGY CONSUMPTION (IEA 2015)	CLEAN ENERGY PLAN	SOURCE
Brazil	7 th	7 th	“To adopt further measures that are consistent with the 2°C temperature goal, in particular, in the energy sector, achieving 45% of renewables in the energy mix by 2030.” This includes “expanding the use of non-fossil-fuel energy sources domestically, increasing the share of renewables (other than hydropower) in the power supply to at least 23% by 2030, including by raising the share of wind, biomass and solar”	Supporting information, INDC (Government of Brazil 2015)
China	1 st	1 st	“Increase the share of non-fossil fuels in primary energy consumption to around 20% by 2030”	“Headline” target, INDC (Government of China 2015)
European Union	3 rd	3 rd	At least a 27% share of renewable energy consumption by 2030	European Union’s 2030 Energy Strategy (European Commission 2014)
India	4 th	4 th	“To achieve about 40% cumulative electric power installed capacity from non-fossil-fuel based energy resources by 2030 with the help of transfer of technology and low-cost international finance including from Green Climate Fund” ⁷	“Headline” target, INDC (Government of India 2015)
Indonesia	6 th	11 th	“At least 23% coming from new and renewable energy by 2025.” [The Government of Indonesia’s National Energy Policy targets a 23% renewable contribution to primary energy in 2025 from the baseline of 4% in 2014. (UNDP 2015)]	Supporting information, INDC (Republic of Indonesia 2015)
Japan	8 th	6 th	To increase renewables in total power [electricity] generation to approximately 22–24% by 2030 ⁸	Supporting information, INDC (Government of Japan 2015)
Mexico	10 th	16 th	[Unofficial translation] The Ministry of Energy, in coordination with the Federal Electricity Commission and the Energy Regulatory Commission, promotes the increase of clean energy ⁹ sources in the national electricity generation mix to 35% by 2024	Ley General De Cambio Climático (LGCC) (Diario Oficial de la Federación [Official Gazette] 2012)
United States	2 nd	2 nd	“Increase the U.S. share of renewables, beyond hydropower, in the electricity generation mix to the level of 20% by 2030”	Joint statement by the United States and Brazil, June 30, 2015 (The White House, Office of the Press Secretary 2015)

METHODOLOGY

A step-wise, analytical process was followed to quantify the post-2020 clean energy plans for Brazil, China, the European Union, India, Indonesia, Japan, Mexico, and the United States. This process included classifying the type and coverage of each clean energy plan, collecting relevant data, and calculating indicative changes in renewable and nuclear energy supply levels.

Classifying Clean Energy Plans

Countries/regions communicate their clean energy plans in different ways. Brazil, China, the European Union, and Indonesia refer to increasing the share of clean energy in the national energy mix, whereas Japan and the United States mention the electricity mix. India's clean energy plan refers to growing electrical capacity. These nuances present important distinctions that define the scale and ambition of these clean energy plans.¹⁰ See Box 1 for the definitions that apply to this analysis.

Table 2 classifies the clean energy plans for Brazil, China, the European Union, India, Indonesia, Japan, Mexico, and the United States in terms of coverage (renewables, or renewables and nuclear) and type (electrical capacity, electricity generation, or energy supply). This step defines the data to be collected in subsequent steps.

Table 2 | **Classification of Clean Energy Plans**

	COVERAGE	PLAN TYPE
Brazil	Renewables	Energy supply and electricity generation
China	Renewables and nuclear	Energy supply
European Union	Renewables	Energy supply
India	Renewables and nuclear	Electrical capacity
Indonesia	Renewables	Energy supply
Japan	Renewables	Electricity generation
Mexico	Renewables and nuclear	Electricity generation
United States	Renewables (excl. hydro)	Electricity generation

Box 1 | Definitions

Electrical capacity The maximum electrical output that can be produced, generally presented in this technical note in terms of gigawatts (GW).

Electrical capacity factor The ratio of actual electrical output over a period of time, to its potential output when operating at full nameplate capacity continuously over the same period of time.

Electricity generation The amount of electricity a generator produces over a specific period of time, generally presented in this technical note in terms of terawatt-hours per year (TWh/year). The amount of electricity that can be produced is dependent on the electrical capacity and the capacity factor. For example, a nuclear power plant may have a nameplate capacity of 100 MW and an annual average capacity factor of 90 percent. Therefore, the electricity generated is calculated by multiplying the nameplate capacity by the capacity factor and the number of hours in a year: 100 MW (nameplate capacity) x 0.9 (capacity factor) x 8,760 hours/year (number of hours in a year) = 788,400 MWh per year.

Energy supply The amount of energy supplied to the market over a specific period of time, presented in this technical note in terms of terawatt-hours per year (TWh/year). "Energy supply" includes the total primary energy supplied by coal, oil, gas, nuclear, hydro, bioenergy, and other renewables. Energy supply figures are typically reported in units of million tonnes of oil equivalent per year (Mtoe/year). For the purposes of this analysis, these figures were converted to TWh/year using the conversion factor of 1 Mtoe = 11.63 TWh.^a

Clean energy Non-fossil-fuel based energy, or "zero-carbon" energy, which includes nuclear energy and renewable energy.

Renewable energy Includes bioenergy, geothermal, hydropower, solar photovoltaic (PV), concentrating solar power (CSP), wind, and marine (tide and wave) energy.

a. See IEA's Unit Converter webpage, accessible at: <https://www.iea.org/statistics/resources/unitconverter/>.

Recording Data

2012 levels

International Energy Agency (IEA) data were used to record 2012 levels of electrical capacity,¹¹ electricity generation, and energy supply for Brazil, China, the European Union, India, Indonesia, Japan, Mexico, and the United States, depending on the type of clean energy plan.¹² IEA data were selected for this analysis because they cover multiple countries, and include historical and projected data through 2030, ensuring a consistent approach. The drawback of using IEA data, however, is that the most recent data are for 2012.

Post-2020 levels under a Reference Scenario

BRAZIL, CHINA, THE EUROPEAN UNION, INDIA, JAPAN, AND THE UNITED STATES

The IEA uses scenarios to prepare detailed quantitative projections of long-term energy trends. Three scenarios, differing in their assumptions about the evolution of government policies with respect to energy and the environment, are presented in the “World Energy Outlook 2014” report: the New Policies Scenario, the Current Policies Scenario, and the 450 Scenario (IEA 2014).

The New Policies Scenario was used for this analysis, because it “takes into account the policies and implementing measures affecting energy markets that had been adopted as of mid-2014, together with relevant policy proposals, even though specific measures needed to put them into effect have yet to be fully developed” (IEA 2014). Depending on the type of clean energy plan, 2030 levels of electrical capacity, electricity generation, or energy supply were recorded for Brazil, China, the European Union, India, Japan, and the United States. (The IEA scenario work does not extend to country-level analysis for Indonesia and Mexico.) Japan’s INDC also provides information about the country’s projected electricity generation levels to 2030. While IEA data were used for analysis of Japan (to ensure a consistent approach across all countries/regions) there is a small variance between the two sets of reported data. The IEA projects Japan’s total electricity generation to be 1,119 terawatt-hours per year (TWh/year) in 2030, while the INDC reports it as 1,065 TWh/year (4.8 percent difference).

INDONESIA AND MEXICO

Government publications were used to record Indonesia’s and Mexico’s forecast levels of electrical capacity, electricity generation, and energy supply for 2025 and 2024, respectively (the target years for these countries’ clean energy plans).

Calculating Clean Energy Totals on the Basis of Communicated Plans

For energy supply plans: Post-2020 clean energy supply levels were calculated by multiplying total projected levels of energy supply by the indicative quantitative targets contained in the clean energy plan.

For electricity generation plans: Post-2020 clean electricity generation totals were calculated by multiplying total projected levels of electricity generation by the indicative quantitative targets contained in the clean energy plan. For example, the United States’ plan to increase renewables (beyond hydropower) in the electricity mix to 20 percent by 2030 was calculated by multiplying the United States’ total forecast electricity generation in 2030 by the target of 20 percent. Electricity generation levels were transformed into electrical capacities using country-specific average capacity factors for renewables, or renewables and nuclear, as appropriate, based on IEA data.

Assumptions and Caveats

Despite best efforts to quantify post-2020 clean energy plans as accurately as possible, there are still several assumptions and caveats.

General assumptions and caveats:

- IEA data were used for most of the analysis. These data may differ from official government projections. This is especially true in the case of China, which uses a different methodology from the IEA to calculate non-fossil fuels in primary energy consumption.
- Renewable electricity generation levels were equated to renewable electrical capacity figures using average renewable capacity factors (per country), calculated from Reference Scenario projections. This approach does not consider the complexities of calculating technology-specific capacity factors, such as base-load management, supply and demand curves, and the availability of renewable resources. This approach also

assumes that we will see the same mix of renewables and nuclear in 2030 as predicted by countries'/regions' Reference Scenarios.

Country-specific assumptions and caveats:

- India requires appropriate technological and financial support to implement its clean energy plan. In this analysis, it is assumed that these needs are fully met.
- Indonesia and Mexico set 2025 and 2024 as their respective target years in their clean energy plans. Totals are extrapolated to 2030 by calculating the annual growth rate of clean energy suggested by each country's plan, and applying this growth rate to the periods of 2025-2030 and 2024-2030, respectively.
- Japan presents an indicative target of reaching 22–24 percent renewables in the national electricity mix by 2030. A mid-point target of 23 percent was used for the analysis.

RESULTS

All eight focus countries/regions communicate goals of increasing renewable energy supply in their clean energy plans, while the plans of three countries—China, India, and Mexico—also suggest increasing nuclear energy supply levels. As such, this section is presented in sub-

sections: three renewable energy sub-sections (energy supply, electricity generation, and electrical capacity) and a nuclear energy sub-section, with all “clean energy” results summarized in Figure 6. Full calculations are presented in Appendix II.

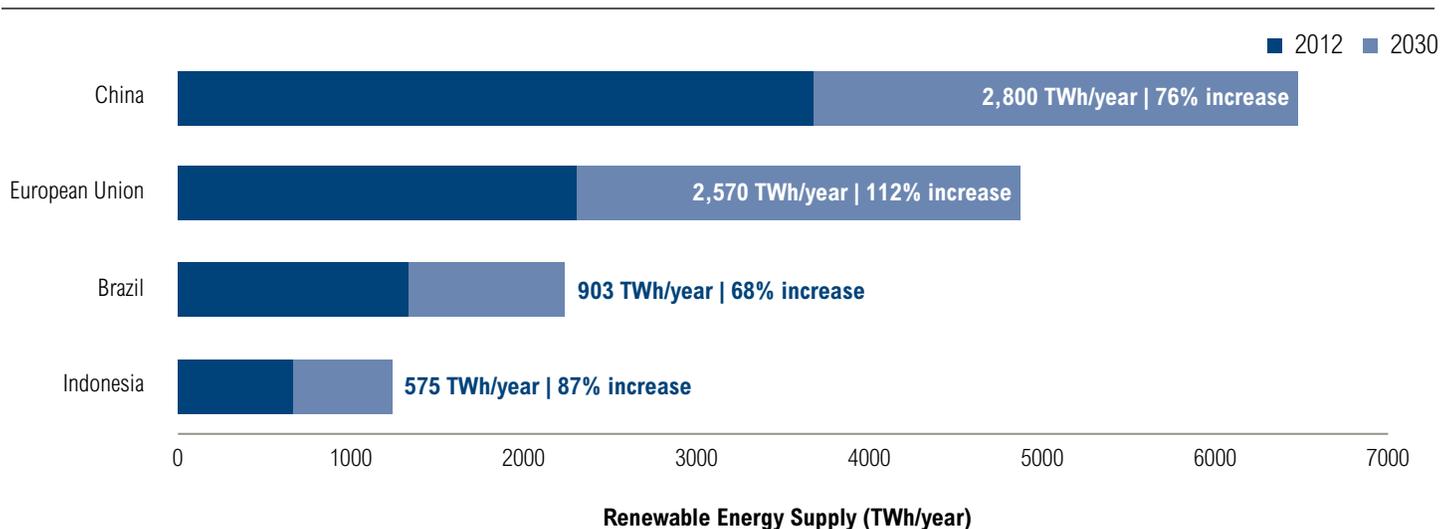
Renewable Energy Supply

Brazil, China, the European Union, and Indonesia plan to improve the share of clean energy in their respective national energy mixes. Figure 2 presents the increase in renewable energy supply by 2030 calculated for these countries/regions.

Assuming that these proposed clean energy plans are achieved, total annual renewable energy supply in Brazil, China, the European Union, and Indonesia will nearly double by 2030.

Cumulative renewable energy supply levels in Brazil, China, the European Union and Indonesia are set to increase from 7,980 TWh/year in 2012 to 14,830 TWh/year in 2030. This is a 6,850 TWh/year (or 86 percent) increase. This is also approximately 2,290 TWh/year (or 15 percent) higher than Reference Scenario projections.

Figure 2 | **Calculated Increases in Renewable Energy Supply by 2030 if Clean Energy Plans Are Met**



Renewable Electricity Generation

Brazil, India, Japan, Mexico, and the United States plan to improve the share of clean energy in their respective national electricity mixes. Figure 3 presents the increase in renewable electricity generation levels by 2030 calculated for these countries/regions.

Assuming these proposed clean energy plans are achieved, total annual renewable electricity generation in Brazil, India, Japan, Mexico, and the United States will increase by nearly four times between 2012 and 2030.

Cumulative renewable electricity generation in Brazil, India, Japan, Mexico, and the United States are set to increase from 630 TWh/year in 2012 to 2,250 TWh/year in 2030. This is a 1,620 TWh/year (or 255 percent) increase. This is also approximately 400 TWh/year (or 22 percent) higher than Reference Scenario projections.

Renewable Electrical Capacity

Brazil, India, Japan, Mexico, and the United States have communicated plans to increase the share of renewables in their electricity mixes. To give an approximation of the related metric of total renewable energy installed capacity, renewable electricity generation levels (see Figure 3) were equated to renewable electrical capacity figures using average renewable capacity factors (per country), calculated from Reference Scenario projections. See Figure 4 for the estimated renewable electrical capacity increases per country.

The installed electrical capacity from renewable sources for these five countries may increase from 246 gigawatts (GW) in 2012 to 856 GW in 2030—a 610 GW (or 248 percent) increase. This is also roughly 142 GW (or 19 percent) higher than Reference Scenario projections.

Figure 3 | **Calculated Increases in Renewable Electricity Generation by 2030 if Clean Energy Plans Are Met**

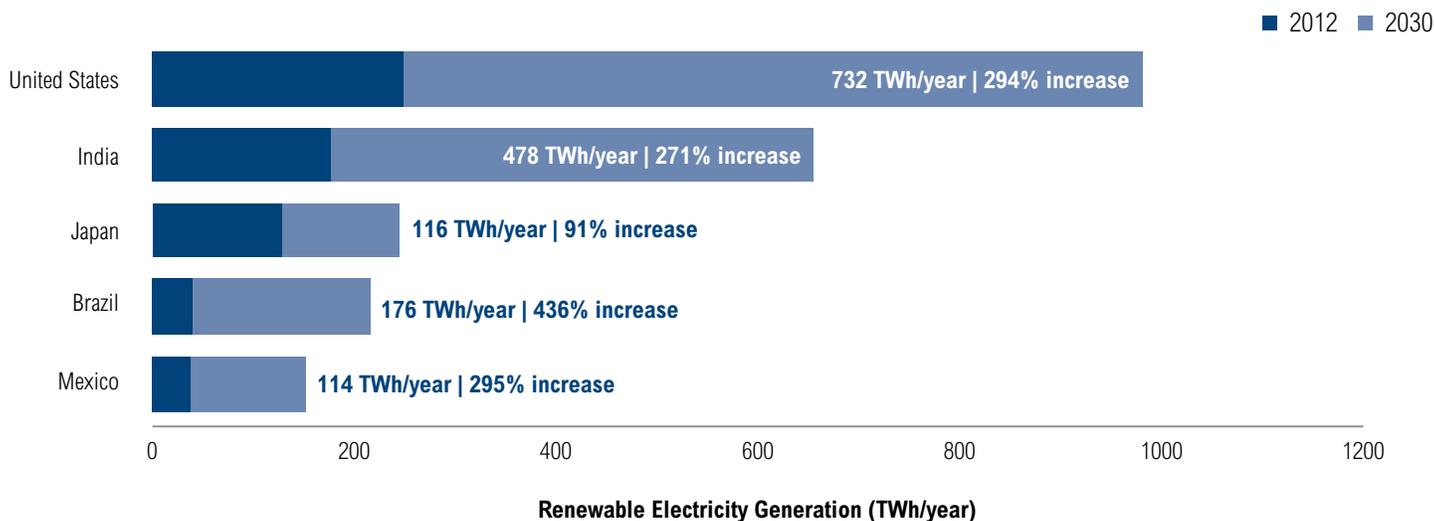


Figure 4 | Suggested Increases in Renewable Electrical Capacity by 2030 if Clean Energy Plans Are Met

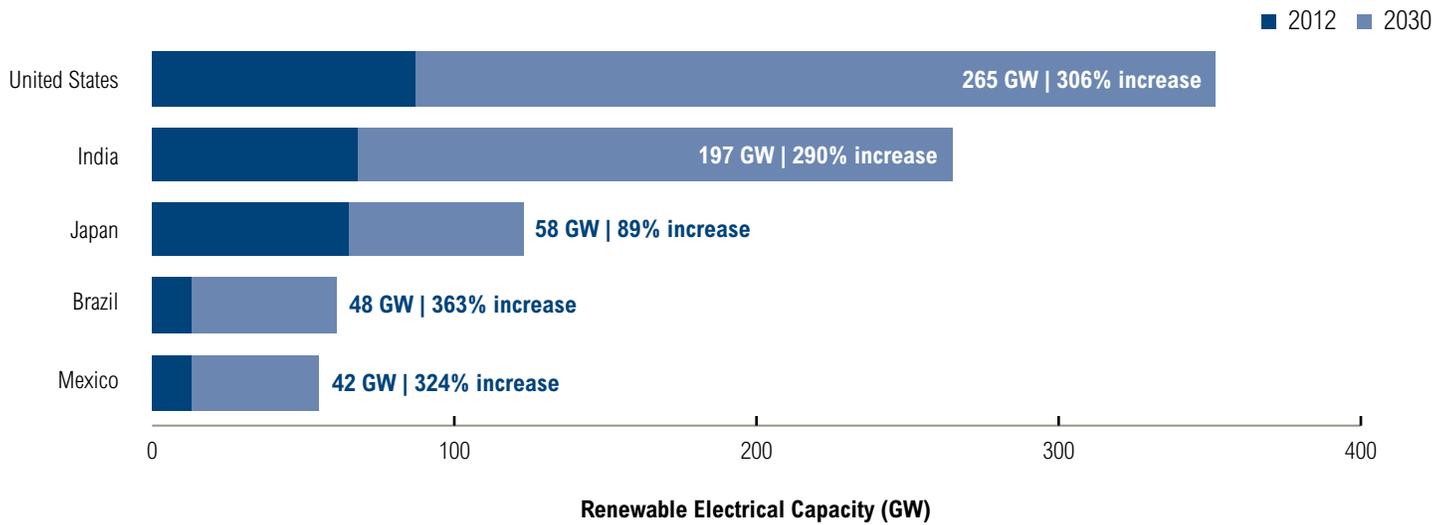
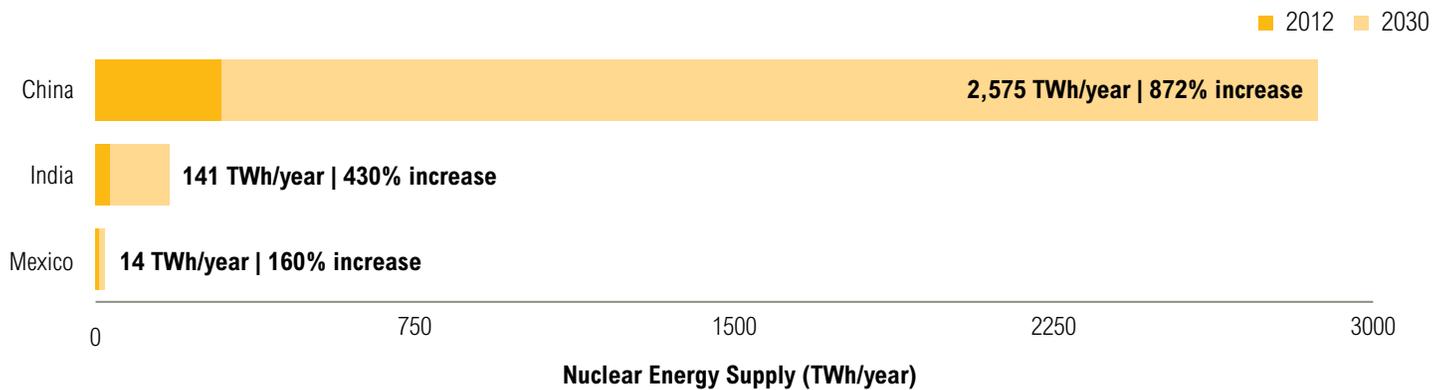


Figure 5 | Calculated Increases in Nuclear Energy Supply by 2030 if Clean Energy Plans Are Met



Nuclear Energy

The clean energy plans of China, India, and Mexico also suggest increasing nuclear energy supply levels by 2030. Figure 5 presents these calculated increases.

Assuming these proposed clean energy plans are achieved, total annual nuclear energy supply in China, India, and Mexico will increase by nearly tenfold between 2012 and 2030.

Cumulative nuclear energy supply in China, India, and Mexico are set to increase from 340 TWh/year in 2012 to 3,070 TWh/year in 2030. This is a 2,730 TWh/year (or 811 percent) increase. This is also approximately 320 TWh/year (or 12 percent) higher than Reference Scenario projections.

Clean Energy: Aggregated Results

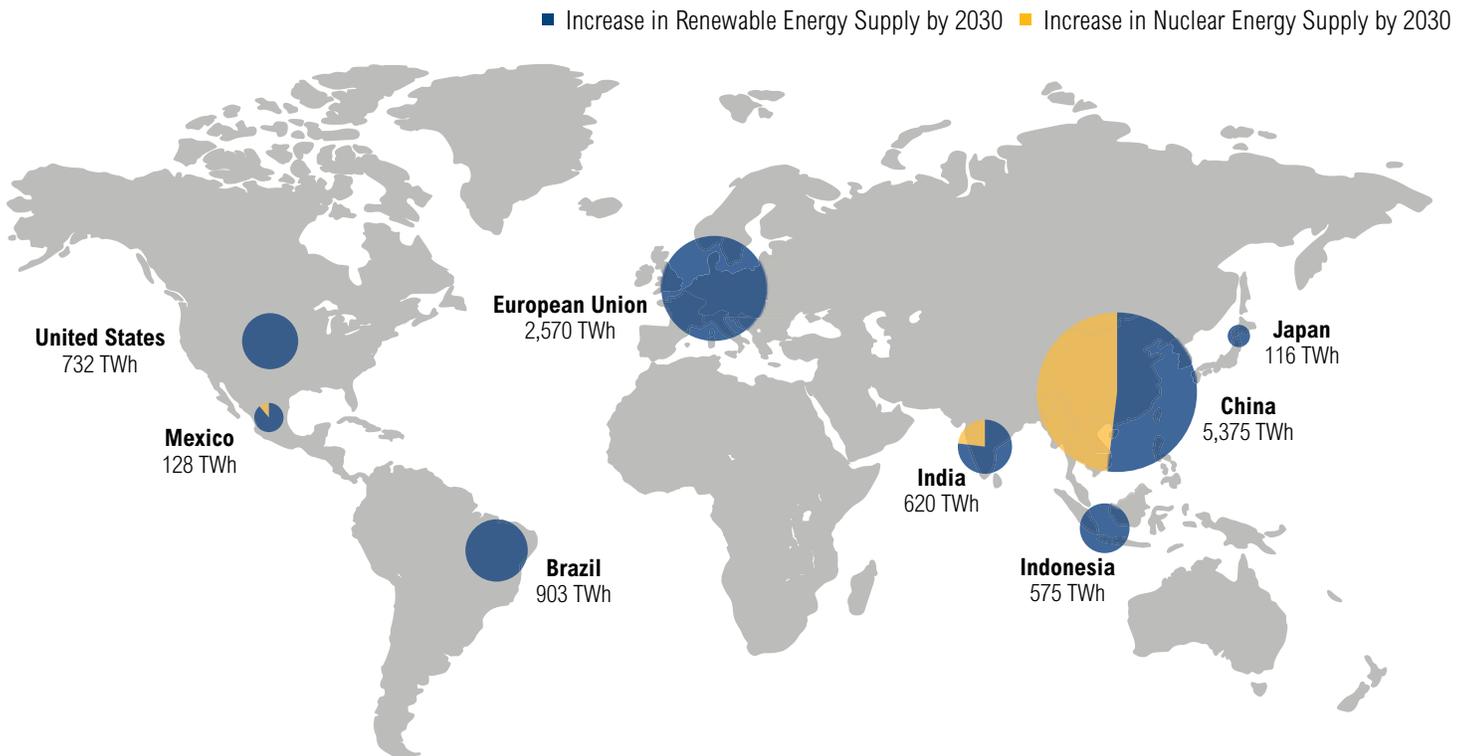
Figure 6 presents the calculated increases in clean energy supply levels (renewables and nuclear) between 2012 and 2030 if the clean energy plans of Brazil,¹³ China, the European Union, India, Indonesia, Japan, Mexico, and the United States are met.

Over the eight countries/regions assessed, total clean energy levels¹⁴ are set to increase from 8,908 TWh/year in 2012 to 19,927 TWh/year in 2030. This is an

11,019 TWh/year increase by 2030, more than double 2012 levels. As an indication of scale, 11,019 TWh/year is more than India's total current primary energy demand.

These clean energy levels are also **2,911 TWh/year (or 17 percent) above Reference Scenario projections.** This demonstrates the relative ambition of countries' post-2020 plans, a factor that is likely to galvanize further action and drive investment in clean energy technologies.

Figure 6 | **Total Amounts of New Clean Energy Assuming Top Emitting Countries' Post-2020 Plans Are Achieved**



APPENDIX I: CLEAN ENERGY INFORMATION CONTAINED IN INDCS

Table 3 | Clean Energy Plans in INDCs

PARTY	PLAN TYPE	INDC TEXT
Afghanistan	Outcomes	“Behavioral change and opportunities for provision and development of alternative and renewable energy sources for 25% of the rural population above existing levels (15%), in order to contribute to a reduction in the unsustainable usage of natural resources and decreasing the strong reliance on fossil fuels by rural communities.”
Albania	—	
Algeria	Outcomes	“By 2030, [Algeria] aspires to the deployment, on a large scale, of photovoltaic and wind power as well as thermal solar energy, and the integration of cogeneration, biomass and geothermal energy. This program ultimately aims to reach the target that 27% of the electricity produced nationally is derived from renewable sources of energy.”
Andorra	—	
Antigua and Barbuda	Outcomes	“Conditional target: By 2030, achieve an energy matrix with 50 MW of electricity from renewable sources both on- and off-grid in the public and private sectors. This target includes distributive renewable energy capacity to be used as backup energy by the commercial sector and some residences. The assumption is that the commercial sector has full backup capacity of approximately 20 MW to continue business when electricity via the grid may be interrupted. Backup electricity generation is currently fossil-fuel-based.”
Argentina	Actions	“Argentina’s goal is to reduce GHG emissions by 15% in 2030 with respect to projected BAU emissions for that year. The goal includes, inter alia, actions linked to: the promotion of sustainable forest management, energy efficiency, biofuels, nuclear power, renewable energy, and transport modal shift.”
Armenia	Actions	“The main sectors included in the mitigation contribution are...energy (including renewable energy and energy efficiency)...”
Australia	Outcomes	“Australia has additional policy measures in place to promote the deployment of renewable energy and improve energy efficiency. Under Australia’s Renewable Energy Target scheme, over 23% of Australia’s electricity will come from renewable sources by 2020.”
Azerbaijan	Actions	Mitigation in the energy sector includes “the use of alternative and renewable energy sources” where Azerbaijan states that the “development and application of technical and normative legal documents on the use of alternative and renewable energy sources based on conducted assessment, acceleration of works to supply renewable energy for the heating system for the population, enhancement of use of innovative technologies, construction of small hydropower plants (HPPs) on small rivers, irrigation canals and water basins, as well as use of biomass, solar power, electric and heat energy, wind power, heat pumps and geothermal energy in all sectors of economy.”
Bangladesh	Outcomes	Bangladesh’s strategy on mitigation is set out in the Bangladesh Climate Change Strategy and Action Plan (BBCSAP). This sets out seven programs on mitigation. One of these programs is renewable energy development with the objective of “maximizing the use of renewable energy sources to lower GHG emission and ensuring energy security.” Bangladesh also sets out “additional mitigation actions” in its INDC in order to meet its conditional contribution. Some of these actions include the development of “400 MW of wind-generating capacity by 2030,” and “1000 MW of utility-scale solar power plant by 2030.”

Table 3 | **Clean Energy Plans in INDCs, continued**

PARTY	PLAN TYPE	INDC TEXT
Barbados	Outcomes	“The following sub-sector contributions have been identified in the energy sector...Renewable energy: contributing 65% of total peak electrical demand by 2030. The country has made huge strides in this regard; for example distributed solar photovoltaic (PV) installation is growing exponentially and this trend is expected to continue. Other planned measures include waste-to-energy and biomass generation plants, wind, distributed and centralized solar PV and capture and use of landfill gas for energy generation.”
Belarus	—	
Belize	Outcomes	“Belize expects to increase its share of its renewable energy (RE) in Belize’s electricity mix by 85% by 2027.”
Benin	Outcomes	[Unofficial translation] Benin communicates the following mitigation measures in the energy sector: To promote the use of renewable energy in electricity production from (i) dual-fired power plants (totaling 400 MW) (ii) four hydropower plants (totaling 396.6 MW installed capacity) and (iii) solar photovoltaic plants (totaling 54.2 MW installed capacity).
Bhutan	Actions	Bhutan commits to “promoting clean renewable energy generation” by “pursuing sustainable and clean hydro-power development with support from CDM or other climate market mechanisms to reduce emissions within Bhutan and the region by exporting surplus electricity.”
Bolivia	Outcomes	Unconditional commitment: “With regard to energy, actions are promoted with a focus on mitigation and adaptation to climate change and holistic development, achieving the following results...increased participation of renewable energy to 79% by 2030 from 39% in 2010...and...develop the export potential of electricity, generated mainly by renewable energies, reaching to export an estimated 8,930 MW by 2030, increasing energy state income.” To achieve results related to energy the following measures and actions will be promoted: “Change and diversification of the energy matrix with renewable energy growth through the construction of hydropower (small and medium hydro power plants, large hydro and multipurpose) and boost alternative energy (wind, biomass, geothermal and solar), and use other sources of energy (steam combined cycle)...and promotion of energy surplus export from renewable sources, positioning Bolivia as a regional powerhouse with clean energy.” Conditional commitment: “Increased participation of renewable energy to 81% by 2030, compared to 39% in 2010.”
Bosnia and Herzegovina	Outcomes	Bosnia and Herzegovina outlines the following mitigation activities in its INDC: “to install mini hydro power plants with the power generation capacity of up to 10 MW and the total generation capacity of 120 MW, by 2030; to install wind farms of the power generation capacity of 175 MW by 2030; to install photovoltaic modules of the total power generation capacity of 4 MW by 2030; and to introduce renewable energy sources in the existing district heating systems and to construct new district heating systems fuel led by renewable energy sources.”
Botswana	—	
Brazil	Outcomes	“Brazil will adopt further measures that are consistent with the 2°C temperature goal, in particular, in the energy sector, achieving 45% of renewables in the energy mix by 2030. This includes expanding the use of renewable energy sources other than hydropower in the total energy mix to between 28% and 33% by 2030, and expanding the use of non-fossil-fuel energy sources domestically, by increasing the share of renewables (other than hydro-power) in the power supply to at least 23% by 2030, including by raising the share of wind, biomass and solar.”
Burkina Faso	Outcomes	[Unofficial translation] The Government of Burkina Faso has joined the initiative Sustainable Energy for All (SE4ALL) which aims to achieve, by 2030...doubling the share of renewable energy in the energy mix. Burkina Faso’s INDC also includes renewable energy technologies to be deployed to achieve this goal.

Table 3 | Clean Energy Plans in INDCs, continued

PARTY	PLAN TYPE	INDC TEXT
Burundi	Actions	[Unofficial translation] To reduce greenhouse gas emissions, Burundi communicates that it will implement programs that include hydropower development and a decentralized rural electrification project using photovoltaic cells.
Cabo Verde	Outcomes	“Cabo Verde makes an unconditional commitment to achieve a 30% renewable energy penetration rate into the electric grid by 2025. With international support, Cabo Verde seeks to increase the renewable energy uptake in electricity to 100% by 2025, with best efforts to achieve this goal already by 2020, in accordance with the following indicative trajectory: 35% RE penetration rate in 2016–2018; 50% RE penetration rate in 2018–2020; and 100% RE penetration rate in 2020–2025.”
Cambodia	Actions	Cambodia communicates mitigation actions in the energy and industrial sectors, which include grid-connected renewable energy generation and off-grid renewable installations such as solar homes and mini-hydro projects.
Cameroon	Actions	[Unofficial translation] Cameroon communicates a target of increasing the share of renewables (excluding large hydropower) in the electricity mix to 25% by 2035.
Canada	—	
Central African Republic	Outcomes	The Central African Republic communicates conditional mitigation measures that include the: “construction of a photovoltaic solar power plant at Bangu; development of 180 MW Dimoli hydroelectric plant; development of 72 MW Lobaye hydroelectric plant; development of 60 KW La Kotto hydroelectric plant; development of Mobaye hydroelectric plant; and a National Biofuels Programme.”
Chad	Outcomes	Chad communicates a summary of the projects to be implemented under the INDC, which include the generation of 500 GWh/year of hydropower, 200 GWh/year of solar energy, and 50 GWh/year of wind energy.
Chile	Outcomes	[Unofficial translation] Implementation... of the mitigation contribution: The National Energy Agenda, led by the Ministry of Energy, includes a target that 20% of the energy mix will be composed of non-conventional renewable energies by 2025.
China	Outcomes	“China has nationally determined its actions by 2030 as follows... to increase the share of non-fossil fuels in primary energy consumption to around 20%.” China has included other goals that include the development of “nuclear power in a safe and efficient manner.”
Colombia	—	
Comoros	Outcomes	[Unofficial translation] During the period 2010–2030, renewable energy will evolve from around 3% to almost 43%.
Congo	Outcomes	[Unofficial translation] Congo has considerable hydroelectric potential, estimated at 14,000 MW, of which only 228 MW is used currently. Congo has developed an ambitious plan for hydropower, with the objective of reaching 85% hydroelectric power in the national electricity mix by 2025. The remaining 15% will be met by gas.
Costa Rica	Outcomes	“The goal of this contribution is to achieve and maintain a 100% renewable energy matrix by 2030.”
Côte d'Ivoire	Outcomes	[Unofficial translation] Côte d'Ivoire communicates its goal of producing 42% of electricity from renewables (including large hydropower) by 2030.

Table 3 | **Clean Energy Plans in INDCs, continued**

PARTY	PLAN TYPE	INDC TEXT
Djibouti	Outcomes	<p>Djibouti communicates the following unconditional mitigation actions:</p> <p>“Installation of 60 MW onshore wind turbines in Goubet. Those power plants are scheduled to be commissioned in 2025.”</p> <p>“Installation of three solar power plants in Petit Bara, Ali Sabieh and Goubet, with an estimated photovoltaic potential of 250 MW. Those power plants are scheduled to be commissioned in 2025.”</p> <p>“Exploitation of geothermal energy, whose potential is estimated at 1200 MW in the region around Lake Assal, Lake Abbé, and North Goubet. The power plants are scheduled to be commissioned in 2030.”</p> <p>Djibouti further communicates the following secondary mitigation measures that are under study and awaiting financing:</p> <p>“Combined production plant for electricity using household waste. Supposed potential of 10 MW.”</p> <p>“Energy production using tidal turbines in Goubet. Supposed potential of 5 MW.”</p> <p>“Djibouti’s total wind power potential is estimated at 390 MW. Installation of 11 onshore wind turbines in Goubet, producing 30 MW.”</p>
Dominica	Actions	<p>“The commercial development and continued harnessing of Dominica’s geothermal resources will, from 2025 onwards, enable the country to export significant amounts of renewable energy...to the nearby French Territories of Martinique and Guadeloupe, thereby contributing to global efforts to reduce GHG emissions.”</p>
Dominican Republic	—	
Democratic Republic of the Congo	—	
Ecuador	Outcomes	<p>[Unofficial translation] Ecuador aims to achieve 90% clean energy from hydropower in total electricity production until 2017 and to increase the share of renewable energy in the energy mix still further by 2025 (National Plan for Good Living 2009–2013).</p>
Equatorial Guinea	Outcomes	<p>[Unofficial translation] Equatorial Guinea communicates that it will strengthen the existing initiatives in the electricity sector, taking advantage of renewable resources, with emphasis on the following: developing the hydroelectric potential of the river Wele, for the electrification of the country’s mainland; reforming the Musola hydroelectric centers (0.4–0.5 MW), Riaba (3.8 MW) for the electrification of the whole island of Bioko; finding options among wind, solar and/or tidal energy sources for remote islands of the country (Annobon, Corisco and others).</p>
Eritrea	Outcomes	<p>“Eritrea intends to raise the share of electricity generation from renewable energy to 70% of the total electricity generation mix (wind, solar, and geothermal) [by 2030].”</p>
Ethiopia	Actions	<p>“[Ethiopia’s] plan to mitigate GHG emissions is built on the following four pillars... (3) Expanding electric power generation from renewable energy.”</p>
European Union (28)	—	
Gabon	Outcomes	<p>[Unofficial translation] Gabon has developed an ambitious plan for the development of hydropower, which aims to ensure that by 2025 the supply of electricity is based on 80% hydropower and 20% gas.</p>
Gambia	Actions	<p>Gambia speaks about increasing renewable energy supply throughout its INDC.</p>
Georgia	—	
Ghana	Outcomes	<p>“The following INDC policy actions will be implemented to achieve the mitigation goals... Scale up renewable energy penetration by 10% by 2030.”</p>

Table 3 | Clean Energy Plans in INDCs, continued

PARTY	PLAN TYPE	INDC TEXT
Grenada	Outcomes	“To achieve [the GHG reduction] goal Grenada needs to produce 20 MW hours of electricity from renewable sources at a conservative 45% portfolio capacity factor. This will emerge in the form of 10 MW from solar, 15 MW from geothermal and 2 MW from wind.”
Guatemala	Outcomes	[Unofficial translation] 80% of the electricity generated in 2030 will be from renewable sources.
Guinea	Outcomes	[Unofficial translation] The Republic of Guinea agrees to produce 30% of its energy (excluding fuel wood) from renewable energy by 2030. Guinea, in accordance with work under the SE4ALL program, will commission 1,650 MW of hydro (127 MW in 2011); installing an additional 47 MW of solar and wind energy (3 MW in 2011); and increase the supply of biofuels and other modern energy (40 kilo tonnes of oil equivalent (ktoe) of butane and biogas, and 3 MW of biofuel).
Guinea Bissau	Actions	“The measures that Guinea-Bissau has appraised so far as contributions are as follows...Conduct studies on the energy potential of the country and set the energy development incorporating the largest possible potential of renewable energies in the energy mix.”
Guyana	Actions	“Guyana will [unconditionally] continue to examine all sources of renewable energy—fossil fuels, wind, solar, bagasse and, of course, hydropower. Guyana will seek to construct and/or promote the construction of small hydro systems at suitable locations across the country. Government also plans to construct and/or promote the construction of small hydro systems in areas such as Moco Moco, Kato and Tumatumari, and will power all of the new townships, starting with Bartica, using alternative energy sources. Independent power producers and suppliers will be encouraged to construct energy farms and sell energy to the national grid.”
Haiti	Outcomes	[Unofficial translation] Haiti will increase the share of renewables in the electricity system to 47% by 2030, which will comprise 24.5% hydro, 9.4% wind, 7.5% solar, and 5.6% biomass.
Honduras	—	
Iceland	—	
India	Outcomes	“Wind energy has been the predominant contributor to the renewable energy growth in India accounting for 23.76 GW (65.2%) of the renewable installed capacity, making India the 5th largest wind power producer in the world. With a potential of more than 100 GW, the aim is to achieve a target of 60 GW of wind power installed capacity by 2022. Solar power in India is poised to grow significantly with Solar Mission as a major initiative of the Government of India. Solar power installed capacity has increased from only 3.7 MW in 2005 to about 4,060 MW in 2015, with a Compound Annual Growth Rate [CAGR] of more than 100% over the decade. The ambitious solar expansion programme seeks to enhance the capacity to 100 GW by 2022, which is expected to be scaled up further thereafter. A scheme for development of 25 Solar Parks, Ultra Mega Solar Power Projects, canal top solar projects and one hundred thousand solar pumps for farmers is at different stages of implementation. Government of India is also promoting solarization of all the 55,000 petrol pumps across the country out of which about 3,135 petrol pumps have already been solarized. Biomass energy constitutes about 18% of total primary energy use in the country and more than 70% of the country’s population depends on it. However, it is currently used in an inefficient manner with high levels of indoor pollution. A number of programmes have been initiated for promotion of cleaner and more efficient use, including biomass-based electricity generation. It is envisaged to increase biomass installed capacity to 10 GW by 2022 from current capacity of 4.4 GW.” India also lists the mitigation technologies that the country plans to implement which include “accelerated-driven systems in advanced nuclear fuel cycles” and “renewable energy.”
Indonesia	Outcomes	“Indonesia has embarked on a mixed energy use policy, with at least 23% coming from new and renewable energy by 2025.”
Israel	Outcomes	“17% of the electricity generated in 2030 will be from renewable sources.”

Table 3 | **Clean Energy Plans in INDCs, continued**

PARTY	PLAN TYPE	INDC TEXT
Japan	Outcomes	Renewables will comprise approximately 22%–24% of Japan's total power generation in 2030. Japan further states that it plans to expand renewable energy introduction to the maximum extent possible and to utilize nuclear power generations whose safety is confirmed.
Jordan	Outcomes	Jordan has set a KPI-style “target” of 11% of renewable energy share in the total energy mix in 2025. This KPI is articulated in “Jordan 2025: A National Vision and Strategy” (launched June 2015). Additionally, the main goals of Jordan’s strategy are “to secure reliable energy supply through increasing the share of local energy resources such as oil shale and natural gas in the energy mix, expanding the development of renewable energy projects, promoting energy conservation and energy efficiency and awareness, and generating electricity from nuclear energy.”
Kazakhstan	Actions	“Following a path of low-carbon economy growth Kazakhstan adopted the law ‘On Energy Saving and Energy Efficiency’ and ‘On Supporting the Use of Renewable Energy Sources’ aiming at greater use of renewable energy sources.”
Kenya	Actions	“Kenya will continue to implement the NCCAP (2013–2017), and subsequent action plans beyond this period to achieve this target. This will include the promotion and implementation of the following mitigation activities... Expansion in geothermal, solar, and wind energy production, other renewables and clean energy options.”
Kiribati	Outcomes	“Reflecting the ambition of the ‘Majuro Declaration,’ Kiribati has identified targets focused on reductions in fossil-fuel use by 2025 through increases in renewable energy and energy efficiency (RE and EE) in the following sectors and geographical areas: South Tarawa by 45% (23% RE and 22% EE); Kiritimati Island by 60% (40% RE and 20% EE); rural public infrastructure, including Southern Kiribati Hospital and Ice plants by 60% (40% RE and 20% EE); and rural public and private institutions such as boarding schools, Island Council, private amenities and households by 100% (100% RE).”
Kyrgyzstan	—	
Lao People's Democratic Republic	Outcomes	“Implementation of Renewable Energy Development Strategy: To increase the share of renewable energy to 30% of energy consumption by 2025. (Note that large-scale technologies with installed capacity equal to or greater than 15 MW are not included in this policy’s target.) For transport fuels the objective is to increase the share of biofuels to meet 10% of the demand for transport fuels by 2025.” “Expansion of the use of large-scale hydroelectricity: The objective of this activity is to build large-scale (>15 MW) hydropower plants to provide clean electricity to neighboring countries. Approximate total installed capacity of the hydropower plants will be 5,500 MW by 2020. In addition, 20,000 MW of additional hydroelectric capacity is planned for construction after 2020.”
Lebanon	Outcomes	Lebanon’s unconditional target: “15% of the power and heat demand in 2030 is generated by renewable energy sources.” Lebanon’s conditional target: “20% of the power and heat demand in 2030 is generated by renewable energy sources.”
Lesotho	Outcomes	“Increase renewable energy sources by 200 MW by 2020: 40 MW from solar (2017/2018); 35 MW from wind (2017); 125 MW from hydropower (2025).”
Liberia	Outcomes	“Raising share of renewable energy to at least 30% of electricity production and 10% of overall energy consumption by 2030.”
Liechtenstein	—	
Macedonia	Actions	Macedonia refers generally to the introduction of low-carbon and renewable energy supply technologies throughout its INDC.

Table 3 | Clean Energy Plans in INDCs, continued

PARTY	PLAN TYPE	INDC TEXT
Madagascar	Outcomes	"The Republic of Madagascar has identified the following actions to contribute to the reduction of GHG emissions... Reinforce renewable energy (hydraulic and solar) from the current level of 35% to 79%."
Malawi	Outcomes	"With external support, Government of Malawi will be able to make significant investments in energy generation from cleaner sources." Malawi outlines the following policy-based mitigation actions: "Produce 2000 solar water heaters (SWH); increase SWH from 2,000 to 20,000 by 2030; install 20,000 solar PV systems; increase Solar PV from 20,000 to 50,000 by 2030; produce 2 million litres of bio-diesel/year; increase biodiesel from 2 to 20 million/year; produce 18 million litres of ethanol/year; increase ethanol production from 18 to 40 million litres per year; and produce 351 MW of hydroelectricity."
Maldives	Actions	"Maldives' high level of fuel imports poses a number of challenges. The country's energy demand is completely met by imported fossil fuel. Therefore it is imperative that the Maldives explore, develop and deploy indigenous, clean and renewable sources to meet energy demand and ensure energy security."
Mali	Actions	[Unofficial translation] Mali communicates that its main mitigation actions in the energy sector will be, amongst others, scaling up the renewable energy program, electrifying villages with renewable energy sources, and commissioning the Kénié hydroelectric plant.
Marshall Islands	Outcomes	"These targets progress beyond the Republic of the Marshall Islands' (RMI's) Copenhagen pledge, and...Put RMI on a trajectory to nearly halve GHG emissions between 2010 and 2030, with a view to achieving net zero GHG emissions by 2050 or earlier if possible. This will require a significant improvement in energy efficiency and uptake of renewables, in particular solar and biofuels." "Reducing fossil-fuel imports is the major goal, with the uptake of renewable energy and further energy efficiency improvements on both the demand and supply sides expected to replace more than one third of fossil fuels for electricity and transport by 2030."
Mauritania	Actions	[Unofficial translation] Mauritania communicates that the country will need external funding to support its 2030 mitigation goal and NAMA platform, especially in the field of energy efficiency and renewable energy.
Mauritius	Actions	"Mauritius will promote and implement the following mitigation activities...the expansion in solar, wind and biomass energy production and other renewable energy sources."
Mexico	—	
Moldova	—	
Monaco	—	
Mongolia	Outcomes	Mongolia's policies and measures for implementation up to 2030 include: "increase renewable electricity capacity from 7.62% in 2014 to 20% by 2020 and to 30% by 2030 as a share of total electricity generation capacity."
Montenegro	Actions	Montenegro's emissions reduction "is to be achieved by general increase of energy efficiency, improvement of industrial technologies, increase of the share of renewables and modernization in the power sector."
Morocco	Outcomes	"Morocco has set a target to limit greenhouse gas (GHG) growth that will be reached through its own means, a target that could be enhanced substantially with support from the international community. This ambition rests, to a large extent; on a major transformation of the energy sector...The main objectives behind this transformation are...Reaching over 50% of installed electricity production capacity from renewable sources by 2025."
Mozambique	Actions	Actions-based contribution covering, among others, the "Energy Strategy (being updated and to be approved by 2016); Biofuel Policy and Strategy; New and Renewable Energy Development Strategy (2011 to 2025); Conservation and Sustainable Use of the Energy from Biomass Energy Strategy (2014 to 2025)."

Table 3 | **Clean Energy Plans in INDCs, continued**

PARTY	PLAN TYPE	INDC TEXT
Myanmar	Outcomes	Myanmar’s INDC includes the following mitigation actions: “Increase the share of hydroelectric generation within limits of technical Hydroelectric potential. Indicative goal: 9.4 GW by 2030.” “To increase access to clean sources of electricity among communities and households currently without access to an electric power grid system. Indicative goal: Rural electrification through the use of at least 30% renewable sources to generate electricity supplies.”
Namibia	Outcomes	“The measures contributing to mitigation in the energy sector will be to increase the share of renewables in electricity production from 33% to 70% by 2030.”
New Zealand	Outcomes	“We are making progress towards reaching our target of 90 percent of electricity coming from renewable sources by 2025.”
Niger	Outcomes	[Unofficial translation] To reduce GHG emissions by 2030, Niger will, among other actions, increase the renewable energy generation capacity from 4 MW in 2010 to 250 MW in 2030, partly achieved through the installation of a 130 MW hydroelectric plant at Kandadji and a 20 MW wind power plant. Niger will also double the share of renewables in the energy mix to 30% by 2030.
Norway	Actions	“[Norway’s] priority areas for enhanced national climate policy efforts are... renewable energy.”
Oman	Actions	Oman communicates that it plans to “increase the share of renewable energy” as a mitigation contribution.
Papua New Guinea	Outcomes	“PNG’s current economic development is seeing a growth in fuel use. Therefore a big effort will be to reduce fossil-fuel emissions in the electricity generation sector by transitioning as far as possible to using renewable energy. The target in this respect will be 100% renewable energy by 2030, contingent on funding being made available.”
Paraguay	Outcomes	[Unofficial translation] 60% increase in renewable energy in the energy mix between 2014 and 2030.
Peru	—	
Philippines	—	
Republic of Korea	Actions	“Korea obligated the power generators to supply a portion of electricity from renewable sources and is increasing the production of renewable energy in order to reduce greenhouse gas emissions from fossil fuel. The Korean government also supports the installation of facilities for the generation of renewable energy.”
Russia	Actions	With regards to fairness and ambition, Russia states its intention of “increasing [the] share of renewables in the Russian energy balance.”
Rwanda	Actions	Rwanda communicates “programmes of action” in the energy sector that include: “the development of a strategy to phase out fossil fuels,” “the establishment of renewable energy feed-in tariffs and public-private partnerships to encourage investments,” and “the implementation of renewable energy guidelines and codes of practice.”
Samoa	Outcomes	“Samoa is committed to reducing its GHG emissions from the electricity sub-sector through the adoption of a 100% renewable energy target for electricity generation through to the year 2025.”
San Marino	—	
São Tome and Principe	Outcomes	“The implementation of four mitigation measures means an introduction of about 47% renewable energy in the national electricity system compared to the projected BAU electricity production, of which 34% is hydro and 13% solar (PV).”

Table 3 | Clean Energy Plans in INDCs, continued

PARTY	PLAN TYPE	INDC TEXT
Senegal	Outcomes	[Unofficial translation] Senegal communicates unconditional renewable energy programmes that will be implemented: <ul style="list-style-type: none"> ■ Solar PV: power plants with a total cumulative capacity of 160 MW ■ Wind Turbine: power plants with a total cumulative power of 150 MW ■ Hydraulics: power plants with a total cumulative capacity of 144 MW/522 GWh; 392 villages electrified mini-grid solar electrified or hybrid (diesel/solar); and Installation of 27,500 domestic biodigesters.
Serbia	—	
Seychelles	Outcomes	“The Energy Policy that was proposed in 2010 has set a target for 15% of energy supply to be met from renewable energy sources by 2030. The expected target in 2020 is 5%. In the long term, the Policy envisages that 100% of energy supply will be from renewable energy sources.”
Sierra Leone	Actions	“Priority climate change response strategies have been identified and included in the INDC. These strategies include: Promotion of energy efficiency, enhanced management and expansion of the energy mix through uptake of renewable energy sources (Solar, Wind, Hydro, and Biomass) particularly in the rural areas of Sierra Leone.”
Singapore	Outcomes	“By 2030, it is estimated that renewable energy could potentially contribute up to 8% of Singapore’s peak electricity demand.”
Solomon Islands	Outcomes	The Solomon Islands communicate mitigation actions that involve the commissioning of hydropower, solar, and geothermal plants. Anticipated installed capacities are as follows: hydropower 3.77 MW, solar 3.2 MW, and geothermal 20–40 MW.
South Africa	—	
Sri Lanka	Actions	Sri Lanka communicates an unconditional and conditional emissions reduction in the energy sector. Both conditional and unconditional contributions involve reductions accruing from non-conventional renewable energy installations and new hydropower plants.
Swaziland	Outcomes	In the energy sector, Swaziland’s contribution “is to double the share of renewable energy in the national energy mix by 2030 relative to 2010 levels.”
Switzerland	—	
Tajikistan	Actions	“At the time of preparation of the INDC, the main efforts of the Pilot Programme for Climate Resilience (PRCR) in the Republic of Tajikistan are focused on hydraulic power industry, development of other renewable sources of energy...”
Tanzania	Actions	“Tanzania will meet its contribution by implementing the following mitigation actions. ...promotion of clean technologies for power generation; and diverse renewable sources such as geothermal wind, solar and renewable biomass.”
Thailand	Outcomes	“Ambitious targets are defined in the Power Development Plan (PDP), the Alternative Energy Development Plan (AEDP) and the Energy Efficiency Plan (EEP). For example, the PDP sets a target to achieve a 20% share of power generation from renewable sources in 2036. The AEDP aims to achieve a 30% share of renewable energy in the total final energy consumption in 2036.”
Togo	Outcomes	[Unofficial translation] Development of renewable energy up to 4% of the energy mix.

Table 3 | **Clean Energy Plans in INDCs, continued**

PARTY	PLAN TYPE	INDC TEXT
Trinidad and Tobago	Actions	“Trinidad and Tobago already produces all of its electricity from natural gas and is working towards achieving greater efficiency through combined cycle generation at all its power plants. This sector would therefore be at the edge of low-carbon emissions with renewable energy being the next stage for reducing emissions even further. The objective therefore is to achieve the optimal energy mix with the lowest greenhouse gas emissions in order to achieve sustainable development, including the decoupling of emissions and economic growth.”
Tunisia	Outcomes	“This transition agenda aims for... a penetration rate of 30% for renewable energies in electricity production.”
Turkey	Outcomes	“Plans and policies to be implemented for this INDC: Increasing capacity of production of electricity from solar power to 10 GW until 2030; increasing capacity of production of electricity from wind power to 16 GW until 2030; commissioning a new nuclear plant, and tapping the full hydroelectric potential.”
Turkmenistan	Actions	The “stabilization of emissions by 2030 is not an obstacle for the economic and social development of the country and it is consistent with the overall objectives of economic development, increasing energy efficiency, reducing energy intensity and increasing the share of renewables in the energy balance of Turkmenistan.”
Uganda	Outcomes	Uganda communicates policies and measures for the mitigation contribution, including “achieving a total of at least 3,200 MW renewable electricity generation capacity by 2030, up from 729 MW in 2013.”
Ukraine	—	
United Arab Emirates	Outcomes	The UAE has set a target of increasing clean energy contribution to the total energy mix from 0.2% in 2014, to 24% by 2021. This will be achieved through renewable and nuclear energy, and is underpinned by detailed emirate level targets and policies.
United States of America	—	
Uruguay	Outcomes	“Thanks to the ongoing structural transformation of the power generation mix, by 2017, Uruguay will achieve an absolute emissions reduction of 88% within this subsector compared to the annual average for the period 2005–2009, with a higher consumption... This will be achieved with 40% of non-conventional renewable energy sources (mainly wind, but also photovoltaic and biomass waste), in addition to 55% hydropower (estimating an average annual rainfall). Although this figure would increase in the following decades after reaching the hydro-wind complementation threshold, it could remain close to 2017 value, if storage systems were to be incorporated through additional means of implementation...”
Vanuatu	Outcomes	“The mitigation contribution for the Vanuatu INDC submission is a sector-specific target of transitioning to close to 100% renewable energy in the electricity sector by 2030. This target would replace nearly all fossil-fuel requirements for electricity generation in the country and be consistent with the National Energy Road Map (NERM) target of 65% renewable energy by 2020.”

Table 3 | **Clean Energy Plans in INDCs, continued**

PARTY	PLAN TYPE	INDC TEXT
Viet Nam	Actions	“In order to achieve the above-mentioned mitigation targets, Viet Nam will exert efforts in implementing the following measures...Promote effective exploitation and increase the proportion of new and renewable energy sources in energy production and consumption” by “developing and implement financial and technical mechanisms and policies to support research and the application of appropriate advanced technologies; exploit and optimize the use of renewable energy sources, both on-grid as well as off grid” and “develop a renewable energy technology market, domestic industries and local service providers.”
Zambia	Actions	One of Zambia’s programs that contribute towards its national mitigation goal is to “promote the switching from conventional and traditional energy sources to sustainable and renewable energy sources and practices, and use of off-grid renewable energy technologies for rural electrification as decentralized systems.”
Zimbabwe	Actions	Zimbabwe’s mitigation goal is to be achieved through the implementation of (among others) solar water heaters, increasing hydro in the energy mix, and solar powered off-grids. Zimbabwe is also considering expanding the Kariba hydropower plant from 666 MW to 750 MW and then to 1,050 MW, and developing new solar plants.

APPENDIX II: CLEAN ENERGY PLAN CALCULATIONS

Table 4 | Data and Calculated Estimates for Quantifying the Renewable Energy Components of Clean Energy Plans

	PLAN TYPE	PLAN TARGET DATE	2012		2030 REFERENCE SCENARIO LEVELS		2030 LEVELS IF CLEAN ENERGY PLANS ARE FULLY ACHIEVED		INCREASE RELATIVE TO 2012 LEVELS IF CLEAN ENERGY PLANS ARE FULLY ACHIEVED		INCREASE RELATIVE TO REFERENCE SCENARIO LEVELS IF CLEAN ENERGY PLANS ARE FULLY ACHIEVED	
			RENEWABLE ENERGY/ ELECTRICITY GENERATION, DEPENDING ON PLAN TYPE	RENEWABLE ELECTRICAL CAPACITY	RENEWABLE ENERGY/ ELECTRICITY GENERATION, DEPENDING ON PLAN TYPE	RENEWABLE ELECTRICAL CAPACITY	RENEWABLE ENERGY/ ELECTRICITY GENERATION, DEPENDING ON PLAN TYPE	RENEWABLE ELECTRICAL CAPACITY	RENEWABLE ENERGY/ ELECTRICITY GENERATION, DEPENDING ON PLAN TYPE	RENEWABLE ELECTRICAL CAPACITY	RENEWABLE ENERGY/ ELECTRICITY GENERATION, DEPENDING ON PLAN TYPE	RENEWABLE ELECTRICAL CAPACITY
			TWH/YEAR	GW	TWH/YEAR	GW	TWH/YEAR	GW	TWH/YEAR	GW	TWH/YEAR	GW
Brazil	Energy supply	2030	1,334*	N/A	2,113*	N/A	2,237	N/A	903	N/A	124	N/A
	Electricity generation	2030	40*	13*	151*	43*	216	61	176	48	65	18
China	Energy supply	2030	3,677*	N/A	5,803*	N/A	6,477	N/A	2,800	N/A	674	N/A
European Union	Energy supply	2030	2,304*	N/A	3,841*	N/A	4,874	N/A	2,570	N/A	1,032	N/A
India	Electrical capacity	2030	177*	68*	620*	251*	655	265	478	197	35	14
Indonesia	Energy supply	2025	664 [#]	N/A	779 [#]	N/A	1,239	N/A	575	N/A	460	N/A
Japan	Electricity generation	2030	128*	65*	288*	144*	245	123	116	58	–	–
Mexico	Electricity generation	2024	38 [#]	13 [#]	61 [#]	22	152	55	114	42	92	33
United States	Electricity generation	2030	249*	87*	766*	275*	981	352	732	265	215	77

* International Energy Agency data

[#] Government data

Table 5 | **Data and Calculated Estimates for Quantifying the Nuclear Energy Components of Clean Energy Plans**

	PLAN TYPE	PLAN TARGET DATE	2012	2030 REFERENCE SCENARIO LEVELS	2030 LEVELS IF CLEAN ENERGY PLANS ARE FULLY ACHIEVED	INCREASE RELATIVE TO 2012 LEVELS IF CLEAN ENERGY PLANS ARE FULLY ACHIEVED	INCREASE RELATIVE TO REFERENCE SCENARIO LEVELS IF CLEAN ENERGY PLANS ARE FULLY ACHIEVED
			NUCLEAR ELECTRICITY GENERATION	NUCLEAR ELECTRICITY GENERATION	NUCLEAR ELECTRICITY GENERATION	NUCLEAR ELECTRICITY GENERATION	NUCLEAR ELECTRICITY GENERATION
			TWH/YEAR	TWH/YEAR	TWH/YEAR	TWH/YEAR	TWH/YEAR
China	Energy supply	2030	295*	2,572*	2,871	2,575	299
India	Electrical capacity	2030	33*	165*	174	141	9
Mexico	Electricity generation	2024	9 [#]	9 [#]	22	14	14
Total			337	2,745	3,067	2,730	322

* International Energy Agency data

[#] Government data

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ENDNOTES

1. In the context of this technical note, “clean energy” refers to non-fossil-fuel based energy, which covers nuclear and renewables. Renewables include bioenergy, geothermal, hydropower, solar photovoltaic (PV), concentrating solar power (CSP), wind, and marine (tide and wave) energy.
2. For more information, see: <http://www.wri.org/indc-definition>.
3. Myanmar, for example, plans to increase access to clean sources of electricity among communities and households currently without access to an electric power grid system.
4. “Energy” refers to total primary energy supply and includes coal, oil, gas, nuclear, hydro, bioenergy, and other renewables.
5. 127 INDCs represent 154 countries (the European Union submits a single, joint INDC on behalf of 28 member states). See CAIT/OCN Paris Contributions Map. Accessible at: <http://cait.wri.org/indc>.
6. The 28 European Union Member States form a single Party under the UNFCCC, and have submitted a joint INDC. The EU also has developed a joint 2030 Energy Strategy, which is one of the focus areas of this analysis.
7. For the purposes of quantifying India’s clean energy plan, it is assumed that the country’s technology and financing requirements are met in full.
8. For the purposes of quantifying Japan’s clean energy plan, a mid-point of 23% renewables in the electricity mix is used for the analysis.
9. For this analysis, the term “clean energy” is understood to mean non-fossil-fuel based energy, including renewables and nuclear. See Box 1 for the full definition.
10. This is particularly relevant to India, whose clean energy plan is reliant on appropriate technological and financial support.
11. The IEA does not report Indonesia’s 2012 electrical capacity levels. These data were, instead, sourced from the country’s national electricity regulator.
12. Where possible, these data were checked against those reported by the U.S. Energy Information Administration. There is a close correlation between both data sets. For example, the IEA reports China’s renewable electricity generation at 1,010 TWh in 2012, and the EIA reports China’s renewable electricity generation at 1,004 TWh in 2012 (a 0.6% difference).
13. Brazil’s INDC contains supporting information that communicates a target for increasing renewable *energy supply* (Figure 2), as well as a sub-point that communicates a renewable *electricity generation* target (Figures 3 and 4). Figure 6 presents the results of Brazil’s *energy supply* target.
14. Clean energy levels refer to energy supply/electricity generation, depending on plan type (see Table 2).

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ABOUT WRI

World Resources Institute is a global research organization that turns big ideas into action at the nexus of environment, economic opportunity and human well-being.

Our Challenge

Natural resources are at the foundation of economic opportunity and human well-being. But today, we are depleting Earth's resources at rates that are not sustainable, endangering economies and people's lives. People depend on clean water, fertile land, healthy forests, and a stable climate. Livable cities and clean energy are essential for a sustainable planet. We must address these urgent, global challenges this decade.

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Our Approach

COUNT IT

We start with data. We conduct independent research and draw on the latest technology to develop new insights and recommendations. Our rigorous analysis identifies risks, unveils opportunities, and informs smart strategies. We focus our efforts on influential and emerging economies where the future of sustainability will be determined.

CHANGE IT

We use our research to influence government policies, business strategies, and civil society action. We test projects with communities, companies, and government agencies to build a strong evidence base. Then, we work with partners to deliver change on the ground that alleviates poverty and strengthens society. We hold ourselves accountable to ensure our outcomes will be bold and enduring.

SCALE IT

We don't think small. Once tested, we work with partners to adopt and expand our efforts regionally and globally. We engage with decision-makers to carry out our ideas and elevate our impact. We measure success through government and business actions that improve people's lives and sustain a healthy environment.

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The Open Climate Network (OCN) brings together independent research institutes and stakeholder groups to monitor countries' progress on climate change. We seek to accelerate the transition to a low-emission, climate-resilient future by providing consistent, credible information that enhances accountability both among and within countries. www.openclimatenetwork.org.

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