A DECADE OF DECARBONIZATION: TARGETS AND TRENDS, TODAY TO 2030

Examining the current and future decarbonization status of 11 countries and their potential pathways to reducing greenhouse gas emissions

EPRI

Overview

World leaders are focused on continued efforts to decarbonize their individual economies, and, in turn, the global economy. These efforts are making the 2020s the "decade of decarbonization" and a critical inflection point for the world's emissions.

The 2015 Paris Agreement on climate change marked a key point in international climate negotiations, with 196 nations agreeing to take ambitious steps to limit climate change and to adapt to it impacts.

Despite fundamental differences in circumstance, nations face many common challenges in reducing their GHG emissions rapidly while simultaneously improving energy affordability, addressing equity issues, and maintaining/improving reliability.

Every five years, the signing nations agreed to revise their goals to reflect current technology, science, and circumstances. After a year of delay due to the COVID-19 pandemic, over 140 nations have enumerated new targets for 2030 at the 2021 United Nations Climate Change Conference (COP26).

This EPRI report, prepared for COP26, looks at 11 countries and examines their respective greenhouse gas (GHG) emission targets in the Paris Agreement, their different GHG starting points, trends in historical and future GHG emissions, emission targets pre- and post-2018, and their sources of electric consumption. The brief closes with a review of key EPRI decarbonization research.

Paris Agreement: 2030 Targets for Selected Countries

Table 1 outlines emission targets, under the Paris Agreement, of some of the largest global emitters.

National commitments vary by:

- base year, ranging from 1990 to 2015
- percent change from that base year, ranging from a 68% reduction to a 181% increase
- how emission limits are defined; while most limit tons of emissions, some rapidly growing nations (China and India in this table) have set limits in terms of carbon intensity (i.e., tons of CO_2 per unit of GDP).

Nine of the eleven countries listed below formally submitted new 2030 targets in advance of COP26. China and India have discussed new targets publicly but have not finalized them. ***(NOTE: This report was compiled prior to the release of South Africa's new NDC, which pledges a 2–18% reduction by 2030 below 2010 levels.)***

Table 1: Goals based on first NDC submission or more recent target announcement. Sources: [1], [2], [3], [4], [5], [6], [7]

Country	Base Year	2030 Target as Change from Base Year Emission Levels
Australia	2005	26 to 28% below
Brazil	2005	43% below
Canada	2005	40 to 45% below
China	2015	1 to 15% above
European Union	1990	55% below
India	2005	164 to 181% above
Japan	2013	46% below
Russia	1990	33% below
South Africa	2010	12 below to 28% above
United Kingdom	1990	68% below
United States	2005	50 to 52% below

Comparing Emission Targets in the Context of Different National Starting Points

Figure 1 illustrates the different circumstances nations face as they set emission targets. Individual nations are committing to differentiated actions to address climate change consistent with their local, regional, and national circumstances.

Key differentiators include the stage of economic development, current energy system, available resources, and technical capacity for each country.

While emissions are stable or declining in many mature economies, emissions have continued to rise rapidly in countries with emerging economies.

Historical and Future Energy-Related GHG Emissions by Country Based on 2030 Targets

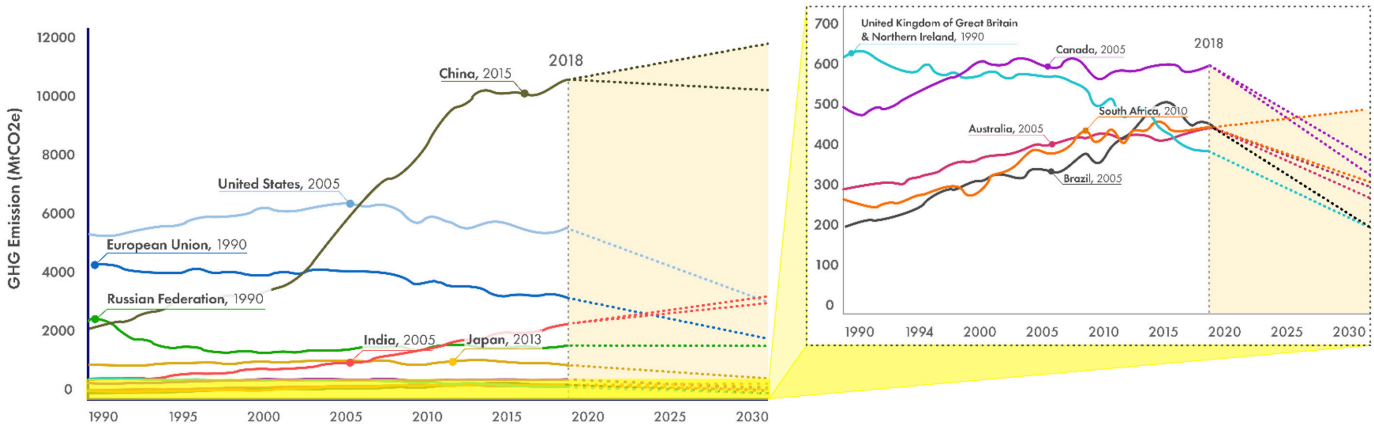

Figure 1: Historical emissions, and trajectories to meet 2030 goals. Emissions reduction targets are derived from a selected percent change in emissions levels from base year levels, which determines the magnitude of the reductions. Base years can vary by country, and are highlighted in this figure. The left panel shows the countries in this analysis with the highest GHG emissions (MtCO2e), while the right panel shows countries with the lowest GHG emissions Sources: [8],[9]

Emission Changes 2005–2018 vs. 2018–2030

Figure 2 depicts the magnitude of emissions reduction necessary to meet 2030 goals compared to the percent change in emissions between 2005 and 2018. The 2020s (the decade of decarbonization) potentially will require most nations to make dramatic changes, by slowing emissions growth or accelerating reductions, to meet their emission commitments.

Different targets can also be characterized by necessary changes in each country's rate of emission reductions. For example: GHG emissions in the United States (U.S.) declined by 1GT from 2005–2020. Achieving the new U.S. target means tripling the rate of decarbonization, accelerating from 1GT over 15 years to 1 GT every five years; Japan's rate of decarbonization will need to double to reach the country's 2030 goal; the United Kingdom's (U.K.) rate of decarbonization is projected to remain constant, as the U.K. appears to be on track to meet its 2030 emissions reduction target. China and South Africa have committed to peaking their emissions in 2030 or earlier, which may require substantial slowing of emissions growth.

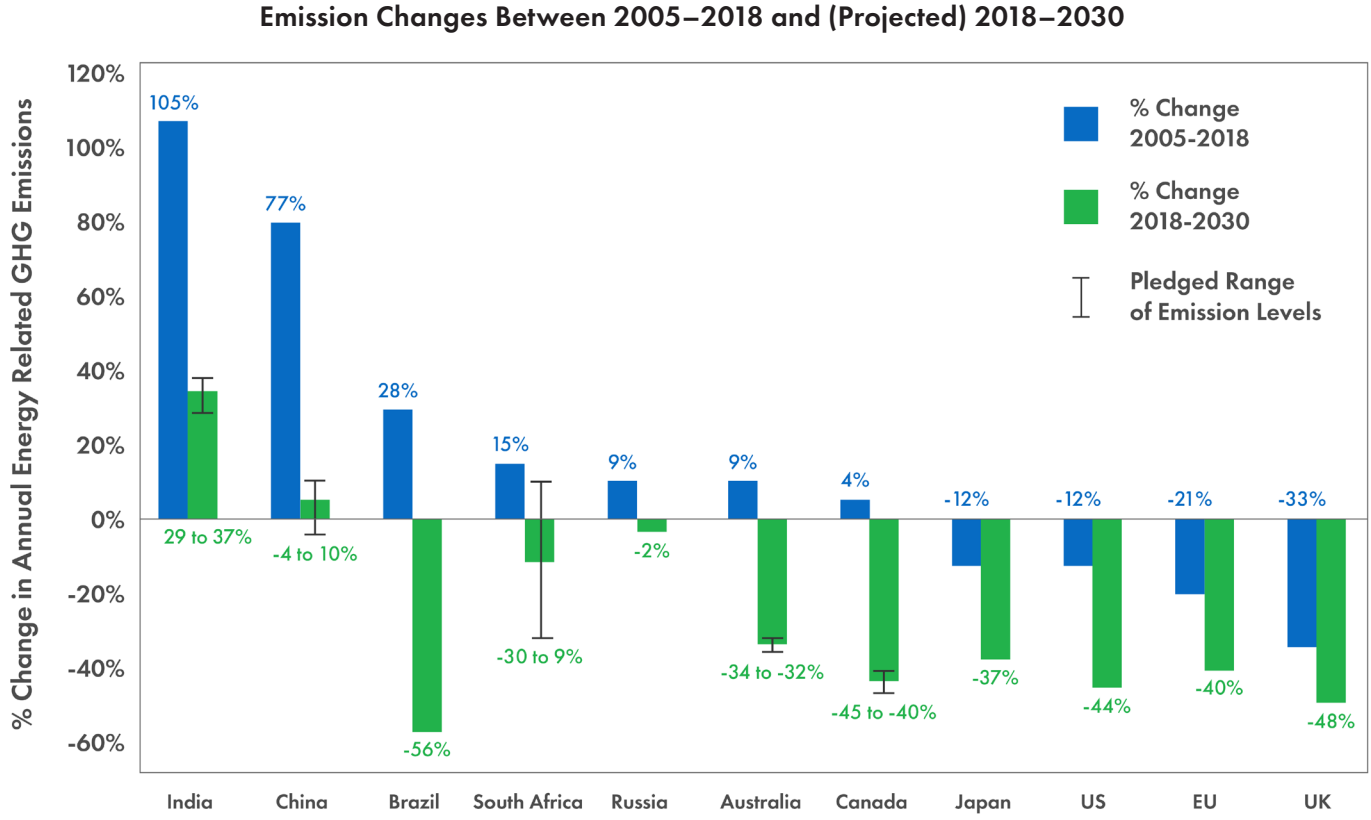

Figure 2: This graphic compares emissions changes pledged by selected nations between 2018–2030 (green) with the change in their annual emissions between 2005–2018 (blue) based on Table 1. For nations that have pledged a range of emissions levels, the bar depicts the average of the range and the whiskers depict the range. Sources: [8][9]

Impact of the Source of Electricity Consumption on Achieving 2030 Targets

The electric sector may play a critical role in cost-effectively reducing emissions in most countries. Potential pathways may include the electric sector controlling its own emissions with economically efficient, low-emission generation options and by enabling other sectors of the economy—e.g., transportation, buildings, and industry—to limit their emissions via electrification.

Figure 3 shows the share of 2018 electricity generation that was non-emitting, and emitting, for each of the eleven nations previously identified. The non-emitting share ranged from a low of 9% in coal-rich South Africa to a high of 85% in hydroelectric-rich Brazil. In Brazil, the primary role of the electric sector could be enabling reductions elsewhere in the economy, while in South Africa, the electric sector may need to reduce its own emissions while enabling electrification in other sectors.

Share of Electricity Consumption by Source, 2018

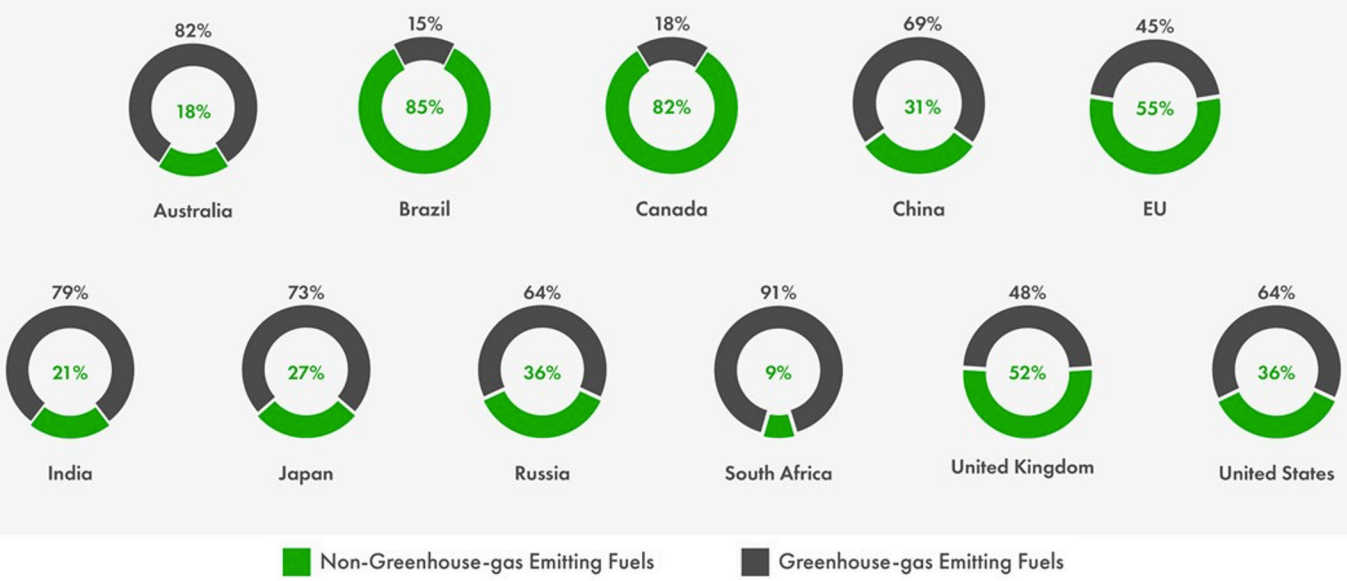

Figure 3: Electricity consumption by country. Depicting the breakdown of energy consumption by emitting versus non-emitting fuels provides another perspective into the challenge of decarbonization, and how it varies by nation. Source: [10]

Key EPRI Decarbonization Research

The cost of reaching net-zero emissions is non-linear, and decarbonization becomes significantly costlier as nations and systems approach 100%. These increased costs, combined with high levels of uncertainty surrounding the performance, availability, and scalability of low-carbon technologies, may create a difficult path forward, even for countries with already largely low-carbon power sectors. [11]

Robust R&D, rapid innovation, and widespread collaboration across R&D institutions, power providers, regulators, policymakers, and the private sector can have a role in driving nations towards net-zero emissions during this decade of decarbonization. EPRI research programs are investigating pathways to decarbonize the energy sector while maintaining a resilient, reliable, and affordable power system. The 2022 Research Portfolio: Driving Toward a Clean Energy Future, can be found here.

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Contact Information

Principal Investigators:

Bill Florence, wflorence@contractor.epri.com, (470) 825-0376.
Diana Grandas, dgrandas@epri.com, (704) 595-2223.
Heidi Scarth, hscarth@epri.com, (202) 440-0693.
Tom Wilson, twilson@epri.com, (650) 855-7928.

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3420 Hillview Avenue, Palo Alto, California 94304-1338 • PO Box 10412, Palo Alto, California 94303-0813 USA • 800.313.3774 • 650.855.2121 • askepri@epri.com • www.epri.com