SCIENCE BASED TARGETS

DRIVING AMBITIOUS CORPORATE CLIMATE ACTION

POWER SECTOR PATHWAYS

Version for public consultation

July 2026

sciencebasedtargets.org /science-based-targets @sciencetargets info@sciencebasedtargets.org

ABOUT SBTi

The Science Based Targets initiative (SBTi) is a corporate climate action organization that enables companies and financial institutions worldwide to play their part in combating the climate crisis.

We develop standards, tools and guidance which allow companies to set greenhouse gas (GHG) emissions reductions targets in line with what is needed to keep global heating below catastrophic levels and reach net-zero by 2050 at latest.

The SBTi is incorporated as a UK charity, with a subsidiary SBTi Services Limited, which hosts our target validation services. Partner organizations who facilitated SBTi's growth and development are CDP, the United Nations Global Compact, the We Mean Business Coalition, the World Resources Institute (WRI), and the World Wide Fund for Nature (WWF).

DISCLAIMER

VERSION HISTORY

Version	Change/update description	Release date	Effective dates
0.1	• Draft for public consultation	July 15, 2025	N/A

ABOUT THIS DOCUMENT

This document includes the specification sheets for the Power sector pathways as summarized in table 1 below.

Table 1: Overview of Power pathways specification sheets

Spec type	Name
Pathway	Low-carbon electricity pathway
Pathway	Electricity emission pathway
Pathway	Power generation asset transition pathway

SCIENCE BASED TARGETS

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SBTi PATHWAY SPECIFICATION

Low-carbon electricity pathway

Version 0.1 - *Draft Public Consultation*

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1. PATHWAY DESCRIPTION

The low-carbon electricity generation pathway describes the evolution of low-carbon electricity generation and sourcing consistent with achieving global net-zero CO_2 emissions by 2050 or earlier.

1.1 Pathway type

The low-carbon electricity pathway is an alignment pathway.

1. APPLICABILITY

This pathway is applicable to companies whose activities involve the purchase of electricity for their own consumption or for sale to end users.

2.1 Geographical applicability

The pathway has global applicability. The pathway provides differentiated values for Advanced Economies and Emerging Markets and Developing Economies (or the rest of the world) (see Section 4 for country classification).

2.2 Method applicability

The pathway shall be used in conjunction with the **Linear Alignment method.**

2. METRIC DEFINITION

This pathway is expressed in terms of share of low-carbon electricity, calculated on a volume basis relative to total electricity purchased and sold within the organisational boundary.

For the purposes of this pathway, low-carbon electricity is defined as electricity with direct CO_2 emissions intensity of 0.048 kg CO_2/kWh or less, until 2035. This threshold reflects the emissions intensity of natural gas combined cycle generation equipped with carbon capture and storage (CCS) operating at a 90% CO_2 capture rate.

From 2035 onwards, the threshold is tightened to 0.024 kg CO_2/kWh, reflecting an increase in capture rates to approximately 95%, consistent with anticipated technological improvements.

3. PATHWAY VALUES

The pathway is expressed as a time-bound trajectory for the share of low-carbon electricity, calculated as the ratio of low-carbon purchased and sold to total electricity generation. The interim benchmarks in Table 1a and 1b are based on the IEA World Energy Outlook NZE (IEA WEO NZE 2024) trajectory (see section 6).

Table 1a. *Regional gross low-carbon power generation pathway for advanced economies*

Metric	2025	2030	2035	2040
Share of low-carbon electricity (%)	75%	80%	99%	**100%** net-zero benchmark

Applicable geography: Advanced Economies. These countries are Australia, Austria, Belgium, Canada, Chile, Colombia, Costa Rica, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States, Bulgaria, Croatia, Cyprus, Malta, Romania.

Table 1b. *Regional low-carbon power generation pathway for Emerging Markets and Developing Economies*

Metric	2025	2030	2035	2040	2045
Share of low-carbon electricity (%)	50%	65%	87%	97%	**100%** net-zero benchmark

Applicable geography: Emerging markets and Developing Economies. These countries include all other countries not included in the Advanced Economies regional grouping.

4. PATHWAY SCOPE

This pathway covers electricity generated by assets whose primary function is the generation of electricity or combined heat and power (CHP).

5. SCENARIO SOURCE

The low-carbon electricity pathway is informed by an assessment of scenarios from the Sixth Assessment Report (AR6) of the Intergovernmental Panel on Climate Change (IPCC) and the IEA WEO NZE 2024 scenario. Scenarios were evaluated against defined thresholds across the following criteria (SBTi, 2025).

- Primary energy from bioenergy does not exceed the sustainability limit of 100 EJ in any year, consistent with the IPCC thresholds for medium sustainability risks (Frank et al., 2021).
- Bioenergy with carbon capture and storage (BECCS) deployment does not exceed 3 $GtCO_2$ per year in any year between 2020 and 2050 to reflect risks to land use, biodiversity, and livelihoods (Warszawski et al., 2021).
- Carbon dioxide removal from afforestation is limited to 3.6 $GtCO_2$ per year in 2050, consistent with estimates of sustainable sequestration potential (Fuss et al., 2018).

- Novel carbon dioxide removal (CDR) technologies do not exceed observed deployment levels of 2.3 $MtCO_2$ in 2020 to reflect current feasibility constraints.
- Carbon capture and storage (CCS) deployment over 2010-2050 does not exceed the feasible limit of 214 $GtCO_2$, reflecting biophysical, infrastructural, and market constraints (van de Ven et al., 2023). The constraint is applied to scenario data from 2020-2050, reflecting near-zero historical CCS deployment across all scenarios.
- Primary energy from fossil fuels follows a sustained decline beyond 2050 (Spangenberg et al., 2021).
- Cumulative emissions from Agriculture, Forestry, and Land-use (AFOLU) over 2020-2050 remain within 99 $GtCO_2$, consistent with the SBTi FLAG pathway (SBTi, 2022).

In addition, scenario selection is constrained to reflect more recent trends in global electricity decarbonization. This results in retaining only the IEA WEO NZE 2024 scenario to define the trajectory for the share of low-carbon electricity generation. The pathway applies regional differentiation based on the IEA WEO NZE 2024 classification of advanced economies, emerging markets and developing economies. Table 2 summarizes the key characteristics of the IEA WEO NZE 2024 scenario.

***Table 2**. Characteristics of scenarios to derive the low-carbon power generation pathway*

Model	Version	Modelling approach	Scenario	Global Carbon budget (2020-2050)	Timeframe	Climate category	Sector Coverage	Ref.
IEA Global Energy and Climate (GEC) model	2024	Hybrid	World Energy Outlook	~ 500 $GtCO_2$	2020 - 2050	1.5°C with low or no overshoot	Energy and Industry	IEA WEO, 2024

6. KEY ASSUMPTIONS

This section describes the pace of regionally differentiated power sector transformation across Advanced Economies, and Emerging Markets and Developing Economies. In Advanced Economies, moderate demand growth allows the transition to be driven primarily by displacing unabated fossil generation with renewables, supported by nuclear power generation and bioenergy. In Emerging Markets and Developing Economies, rising demand from economic growth and expanding electricity access drives a larger expansion of total system output, met with immense renewable growth. While some fossil generation capacity remains on the grid in both geographies, these assets have very low running rates by 2050, limiting their use to grid stability and peak management purposes. Tables 3a and 3b provide an overview of the key assumptions across the most relevant transition indicators over the near term (2020-2030) and the long term (2030-2050).

Table 3a. *Regional assumptions characterizing sector decarbonization in Advanced Economies.*

Assumption category	2020-2030	2030-2050
Total electricity output	Increases by ~35%	Increases by ~175%
Total installed generation capacity	Increases by ~60%	Increases by ~85%
Renewable capacity[1]	Increases by ~155%	Increases by ~115%
Nuclear capacity	Increases by ~10%	Increases by ~50%
Unabated FF generation capacity	Decreases by ~15%	Decreases by ~65%
Bioenergy capacity	Increases by ~60%	Increases by ~70%

Table 3b. *Regional assumptions characterizing sector decarbonization in Emerging Markets and Developing Economies.*

Assumption category	2020-2030	2030-2050
Total electricity output	Increases by ~60%	Increases by ~115%
Total installed generation capacity	Increases by ~170%	Increases by ~170%
Renewable capacity[1]	Increases by ~415%	Increases by ~225%
Nuclear capacity	Increases by ~70%	Increases by ~125%
Unabated FF generation capacity	Decreases by ~20%	Decreases by ~80%
Bioenergy capacity	Increases by ~120%	Increases by ~245%

[1] Includes geothermal, hydropower, solar, and wind

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SBTi PATHWAY SPECIFICATION

Electricity emission pathway

Version 0.1 - *Draft for Public Consultation*

July 2026

1. PATHWAY DESCRIPTION

The power generation emission pathway describes the evolution in emission intensity associated with power generation consistent with achieving global net-zero CO_2 emissions by 2050 or earlier.

1.1 Pathway type

The pathway is an emission intensity pathway.

2. APPLICABILITY

The pathway is applicable to companies with power-generating activities within their organisational boundary.

2.1 Geographical applicability

The pathway has global applicability. The pathway provides absolute emission values differentiated between Advanced Economies and Emerging and Developing Economies (see Section 4 for country classification).

2.2 Method applicability

The pathway shall be used in conjunction with the **Sectoral Decarbonization Approach** or the **Asset Decarbonization Plan method (carbon budget approach)**.

3. METRIC DEFINITION

The pathway is expressed as a **gross** emissions intensity trajectory, measured in grams of CO_2 per kilowatt-hour of electricity generation.

4. PATHWAY VALUES

The pathway is expressed as a time-bound trajectory for reduction in gross CO_2 emissions intensity of electricity generated, calculated by dividing total gross emissions from power and heat generation by total power generation activity. Because the underlying scenario only reports values for 2030-2050, values for 2020 and 2023 represent historical data, and the value for 2025 is interpolated (Ember, 2025).

Table 1a. *Regional power generation emissions intensity for Advanced Economies.*

Metric	2020	2025	2030	2035	2040	2045	2050
Gross emissions intensity (gCO_2/kWh)	367	274	90	3	1	1	1

* The 2020 value represents historical data from Ember, 2025, as the World Energy Outlook does not provide historical benchmark values for this period.

Applicable geography: Advanced Economies. These countries are Australia, Austria, Belgium, Canada, Chile, Colombia, Costa Rica, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States, Bulgaria, Croatia, Cyprus, Malta, Romania.

Table 1b. *Regional power generation intensity for Emerging Markets and Developing Economies.*

Metric	2020	2025	2030	2035	2040	2045	2050
Gross emissions intensity (gCO_2/kWh)	997	821	510	170	29	6	2

* The 2020 value represents historical data from Ember, 2025, as the World Energy Outlook does not provide historical benchmark values for this period.

Applicable geography: Emerging Markets and Developing Economies. These countries include all other countries not included in the Advanced Economies regional grouping.

5. PATHWAY SCOPE

This pathway covers emissions from assets whose primary function is the generation of electricity or combined heat and power (CHP).

6. SCENARIO SOURCE

The power generation emissions pathway is informed by an assessment of scenarios from the Sixth Assessment Report (AR6) of the Intergovernmental Panel on Climate Change (IPCC) and the IEA NZE WEO scenario. Scenarios were evaluated against defined thresholds across the following criteria (SBTi, 2025):

- Primary energy from bioenergy does not exceed the sustainability limit of 100 EJ in any year, consistent with the IPCC thresholds for medium sustainability risks (Frank et al., 2021).
- Bioenergy with carbon capture and storage (BECCS) deployment does not exceed 3 $GtCO_2$ per year in any year between 2020 and 2050 to reflect risks to land use, biodiversity, and livelihoods (Warszawski et al., 2021)
- Carbon dioxide removal from afforestation is limited to 3.6 $GtCO_2$ per year in 2050, consistent with estimates of sustainable sequestration potential (Fuss et al., 2018)
- Novel carbon dioxide removal (CDR) technologies do not exceed observed deployment levels of 2.3 $MtCO_2$ in 2020 to reflect current feasibility constraints.
- Carbon capture and storage (CCS) deployment over 2010-2050 does not exceed the feasible limit of 214 $GtCO_2$, reflecting biophysical, infrastructural, and market constraints (van de Ven et al., 2023). The constraint is applied to scenario data from 2020-2050, reflecting near-zero historical CCS deployment across all scenarios.

- Primary energy from fossil fuels follows a sustained decline beyond 2050 (Spangenberg et al., 2021).
- Cumulative emissions from Agriculture, Forestry, and Land-use (AFOLU) over 2020-2050 remain within 99 $GtCO_2$, consistent with the SBTi FLAG pathway (SBTi, 2022).

In addition, scenario selection is constrained to ensure alignment among SBTi Power sector pathways, require full structural transformation of global power generation, and reflect more recent trends in global power decarbonization across the 2020-2023 period. This results in retaining only the IEA World Energy Outlook's Net Zero Emissions 2050 scenario (WEO NZE 2024) to define the trajectory for the emissions intensity of power generation. The pathway applies regional differentiation based on the IEA WEO classification of advanced economies, emerging markets, and developing economies. Table 3 summarizes the key characteristics of the WEO 2024 NZE scenario.

Table 2. *Characteristics of scenarios to derive the purchased electricity emission pathway*

Model	Version	Modelling approach	Scenario	Climate outcome	Sector Coverage	Ref.
IEA Global Energy and Climate (GEC) model	2024	Hybrid	World Energy Outlook	Global Net Zero by 2050, 1.5°C by 2100 with low or no overshoot	Energy and Industry	IEA, 2024

7. KEY ASSUMPTIONS

This section describes the pace and characteristics of regionally differentiated power sector transformation. In Advanced Economies, electricity demand growth is met primarily through the expansion of renewable generation capacity, alongside more moderate growth in nuclear and bioenergy, while unabated fossil fuel generation capacity declines progressively over time. In Emerging Market and Developing Economies, stronger growth in electricity demand driven by economic development, industrialization, and expanding electricity access requires a substantially larger expansion of total generation and system capacity, supported predominantly by rapid renewable energy deployment.

Across both geographies, the pathway assumes a significant decline in unabated fossil fuel generation capacity alongside a rapid increase in low-carbon generation sources. While some fossil generation assets remain in the system by 2050, their utilization rates are assumed to be very low, limiting their role primarily to system flexibility, reserve capacity, and peak demand management. Tables 3a and 3b summarize the quantitative changes across key transition indicators over the periods 2020–2030 and 2030–2050.

__Table 3a:__ Regional assumptions characterizing sector decarbonization in advanced economies.

Assumption category	2020-2030	2030-2050
Total electricity output	Increases by ~35%	Increases by ~75%
Total installed generation capacity	Increases by ~60%	Increases by ~85%
Renewable capacity[2]	Increases by ~155%	Increases by ~115%
Nuclear capacity	Increases by ~10%	Increases by ~50%
Unabated FF generation capacity	Decreases by ~15%	Decreases by ~65%
Bioenergy capacity	Increases by ~60%	Increases by ~70%

__Table 3b:__ Regional assumptions characterizing sector decarbonization in Emerging Markets and Developing Economies.

Assumption category	2020-2030	2030-2050
Total electricity output	Increases by ~60%	Increases by ~115%
Total installed generation capacity	Increases by ~170%	Increases by ~170%
Renewable capacity[1]	Increases by ~415%	Increases by ~225%
Nuclear capacity	Increases by ~70%	Increases by ~125%
Unabated FF generation capacity	Decreases by ~20%	Decreases by ~80%
Bioenergy capacity	Increases by ~120%	Increases by ~245%

[2] Includes geothermal, hydropower, solar, and wind

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SBTi PATHWAY SPECIFICATION

Power Generation Asset Transition Pathway

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1. PATHWAY DESCRIPTION

The power generation asset transition pathway provides a framework for assessing how power generation assets must be transformed over time, through the abatement, retrofit, retirement, or replacement of existing fossil fuel assets, to be consistent with achieving global net-zero CO_2 emissions by 2050.

1.1 Pathway type

The power generation asset transition pathway is a transition pathway.

2. APPLICABILITY

This pathway applies to companies that own or operate fossil-fuel power generation assets, including electric power producers and entities with onsite or captive generation for internal electricity use or export to the grid.

2.1 Geographical applicability

The pathway has global applicability and reflects differentiated transition dynamics for Advanced Economies, and Emerging Markets and Developing Economies, consistent with the regional categorization used in the International Energy Agency World Energy Outlook 2024 Net Zero Emissions by 2050 scenario (IEA WEO NZE (2024)). (See Section 4 for country classification).

2.2 Method applicability

The pathway shall be used in conjunction with the **Asset Decarbonization Plan (ADP), Milestones approach**.

3. METRIC DEFINITION

The pathway is expressed in Megawatt (MW) and Megawatt-hour (MWh).

4. PATHWAY VALUES

The pathway is expressed through time-bound milestones indicating the year by which installation of new capacity for unabated fossil fuel power generation must be halted and unabated generation must be phased out. Phase-out refers to the cessation of unabated power generation, excluding non-baseload power generation (e.g., generation dedicated to peak- or emergency-load management[3]).

[3] See forthcoming SBTi Power Sector Net Zero Standard.

Table 1a. *Regional power generation asset transition pathway for advanced economies*

Power generation type	No new unabated capacity (0 MW)	Phase-out of unabated generation (0 MWh)
Unabated coal	2025	2030
Unabated oil	2025	2035
Unabated natural gas	2025	2040

Applicable geography: Advanced economies. These countries are Australia, Austria, Belgium, Canada, Chile, Colombia, Costa Rica, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States, Bulgaria, Croatia, Cyprus, Malta, Romania.

Table 1b*. Regional power generation asset transition pathway for Emerging Markets and Developing Economies*

Power generation type	No new unabated capacity (0 MW)	Phase-out of unabated generation (0 MWh)
Unabated coal	2025	2040
Unabated oil	2025	2040
Unabated natural gas	2030	2045

Applicable geography: Emerging Markets and Developing Economies. These countries include all other countries not included in the Advanced Economies regional grouping.

5. PATHWAY SCOPE

This pathway covers activities and assets whose primary function is the generation of power or combined heat and power (CHP).

6. SCENARIO SOURCE

The power generation asset transition pathway is informed by an assessment of scenarios from the Sixth Assessment Report (AR6) of the Intergovernmental Panel on Climate Change (IPCC) and the IEA WEO NZE (2024) scenario. Scenarios were evaluated against defined thresholds across the following criteria (SBTi, 2025):

- Primary energy from bioenergy does not exceed the sustainability limit of 100 EJ in any year, consistent with the IPCC thresholds for medium sustainability risks (Frank et al., 2021).

- Bioenergy with carbon capture and storage (BECCS) deployment does not exceed 3 $GtCO_2$ per year in any year between 2020 and 2050 to reflect risks to land use, biodiversity, and livelihoods (Warszawski et al., 2021).
- Carbon dioxide removal (CDR) from afforestation is limited to 3.6 $GtCO_2$ per year in 2050, consistent with estimates of sustainable sequestration potential (Fuss et al., 2018).
- Novel CDR technologies do not exceed observed deployment levels of 2.3 $MtCO_2$ in 2020 to reflect current feasibility constraints.
- Carbon capture and storage (CCS) deployment over 2010-2050 does not exceed the feasible limit of 214 $GtCO_2$, reflecting biophysical, infrastructural, and market constraints (van de Ven et al., 2023).
- Primary energy from fossil fuels follows a sustained decline beyond 2050 (Spangenberg et al., 2021).
- Cumulative emissions from Agriculture, Forestry and Land-use (AFOLU) over 2020-2050 remain within 99 $GtCO_2$, consistent with the SBTi FLAG pathway (SBTi, 2022).

In addition, only scenarios that provide technology-specific asset transition milestones, including regionally differentiated timelines, are selected to construct the pathway. This results in retaining only the IEA WEO NZE 2024 scenario as the credible pathway source. Table 2 summarizes the key characteristics of the IEA WEO NZE 2024 scenario used to derive the power generation intensity pathway.

Table 2. *Characteristics of scenarios to derive the power generation asset transition pathway*

Model	Version	Modelling approach	Scenario	Global carbon budget (2020 onwards)
IEA Global Energy and Climate (GEC) model	2024	Hybrid	World Energy Outlook Net Zero Emissions scenario by 2050	~500 $GtCO_2$

7. KEY ASSUMPTIONS

This section describes the pace of regionally differentiated power sector transformation across Advanced Economies and Emerging Markets and Developing Economies. In Advanced Economies, moderate demand growth allows the transition to be driven primarily by displacing unabated fossil fuel generation with renewables, supported by nuclear and bioenergy. In Emerging Markets and Developing Economies, rising demand from economic growth and expanding electricity access drives a larger expansion of total system output, met with immense renewable growth. While some fossil fuel generation capacity remains on the grid in both geographies, these assets have very low running rates by 2050, limiting their use to grid stability and peak management purposes. Tables 3a and 3b provide an overview of the key assumptions across the most relevant transition indicators over the near term (2020-2030) and the long term (2030-2050).

Table 3a. *Regional assumptions characterizing sector decarbonization in advanced economies.*

Assumption category	2020-2030	2030-2050
Total electricity output	Increases by ~35%	Increases by ~75%
Total installed generation capacity	Increases by ~60%	Increases by ~85%
Renewable capacity[4]	Increases by ~155%	Increases by ~115%
Nuclear capacity	Increases by ~10%	Increases by ~50%
Unabated FF generation capacity	Decreases by ~15%	Decreases by ~65%
Bioenergy capacity	Increases by ~60%	Increases by ~70%

Table 3b. *Regional assumptions characterizing sector decarbonization in Emerging Markets and Developing Economies.*

Assumption category	2020-2030	2030-2050
Total electricity output	Increases by ~60%	Increases by ~115%
Total installed generation capacity	Increases by ~170%	Increases by ~170%
Renewable capacity[1]	Increases by ~415%	Increases by ~225%
Nuclear capacity	Increases by ~70%	Increases by ~125%
Unabated FF generation capacity	Decreases by ~20%	Decreases by ~80%
Bioenergy capacity	Increases by ~120%	Increases by ~245%

[4] Includes geothermal, hydropower, solar, and wind

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DRIVING AMBITIOUS CORPORATE CLIMATE ACTION