SCIENCE BASED TARGETS

DRIVING AMBITIOUS CORPORATE CLIMATE ACTION

Technical Report: The SBTi Interim 1.5°C Sector Pathway for Aviation

February 2023

1 THE NEED FOR AN INTERIM 1.5°C PATHWAY FOR AVIATION

The Science Based Target initiative (SBTi) completed and delivered a target setting guidance and tool for commercial aviation in August 2021, less than a year before SBTi's updated ambition criteria came into effect. These resources, developed with support from the International Council for Clean Transportation (ICCT) and Boston Consulting Group (BCG), were based on a well-below 2°C (WB-2°C) pathway derived from the Sustainable Development Scenario (SDS) included in the Energy Technology Perspectives 2020 publication by the International Energy Agency.

Under the current SBTi general criteria (v5.0), which requires companies to set targets aligned with a 1.5°C ambition, version 1.0 of the aviation resources have become ineligible for target-setting of emissions resulting from owned or controlled aviation activities. In pursuit of the goal of attaining technical completeness, and to support companies in the aviation sector that are ready to set 1.5°C-aligned targets now, we are releasing an interim 1.5°C sector pathway. This pathway meets SBTi's criteria for scenarios approved for science-based target setting: it is plausible, consistent, and responsible (SBTi 2019). Adopting this pathway also provides a short-term, accessible option for aviation companies that are ready to submit Net Zero targets now. Moreover, the SBTi will review and update the aviation sector target-setting guidance through a formal sector development process, which involves advice of an Expert Advisory Group and public stakeholder consultation. The interim 1.5°C pathway will also be reviewed and, if necessary, superseded upon the completion of the sector guidance update process. For more information about future plans for development of the updated 1.5°C aviation guidance, see section 4 below.

2 SCENARIO DESCRIPTION

The SBTi interim 1.5°C sector pathway for aviation is derived from the Breakthrough scenario described in the Aviation Vision 2050 report from the International Council on Clean Transportation (ICCT; Graver *et al*. 2022). The scenario projects widespread investments in zero-carbon aircraft and fuels, leading to a peak in fossil jet fuel use in 2025 and elimination of fossil jet fuel use by 2050. The Breakthrough scenario incorporates projected demand and technology changes that are sufficient to align a 2050 net-zero carbon dioxide (CO_2) goal with limited removals, but are plausible according to industry trends[1]. For example, activity growth for the sector under the Breakthrough scenario is consistent with aviation traffic projections developed by the industry (ATAG, 2021; Boeing, 2021; ICAO, 2021).

The sector pathways of the IEA Net Zero Emissions (NZE) scenario (IEA 2021)[2] define the upper bound of sector carbon emissions for all sectors for which SBTi has developed guidance (Chang *et al.* 2021). To ensure that the overall emissions budget for a 1.5°C temperature goal, including all sectors, is not exceeded, it is important to confirm that sector pathways derived from alternative sources fall below the corresponding NZE budget assigned to that sector. The cumulative emissions of the Breakthrough scenario over the time period 2019-2050 are lower than those of the IEA NZE scenario, which is consistent with limiting global temperature increase to 1.5°C without overshoot[3].

Table 1 compares the primary assumptions of the ICCT Breakthrough scenario to the IEA NZE scenario (IEA 2022). Note that while emissions targets calculated from the interim 1.5°C pathway are calculated on a Well-to-Wake basis, the IEA NZE scenario reports emissions on a Tank-to-Wake basis only (i.e., direct emissions from fossil fuel combusted during the operation of vehicles[4]). Table 1 compares the Breakthrough scenario to the IEA NZE scenario on the same basis.

[1] The Breakthrough scenario supported the establishment of a 2050 net-zero CO_2 goal for international aviation at ICAO's 41st Assembly (ICAO 2022). Graver *et al.* (2022) classified the Breakthrough scenario as 1.75°C aligned with 67% probability, assuming that aviation doesn't increase its share of a global carbon budget above 2019 emissions (2.9% of anthropogenic CO_2). Aviation is treated as a hard to abate sector under IEA NZE, therefore qualifying it for a larger share of future emissions under that framework (see main text).

[2] IEA NZE sector emissions taken from World Energy Outlook update 2022 (IEA 2022).

[3] Graver *et al.* (2022) classified the Breakthrough scenario as 1.75°C aligned with 67% probability, assuming a constant proportion of global emissions from aviation (2.9%).

[4] IEA NZE emissions include direct emissions from fossil fuels and life-cycle emissions of alternative fuels.

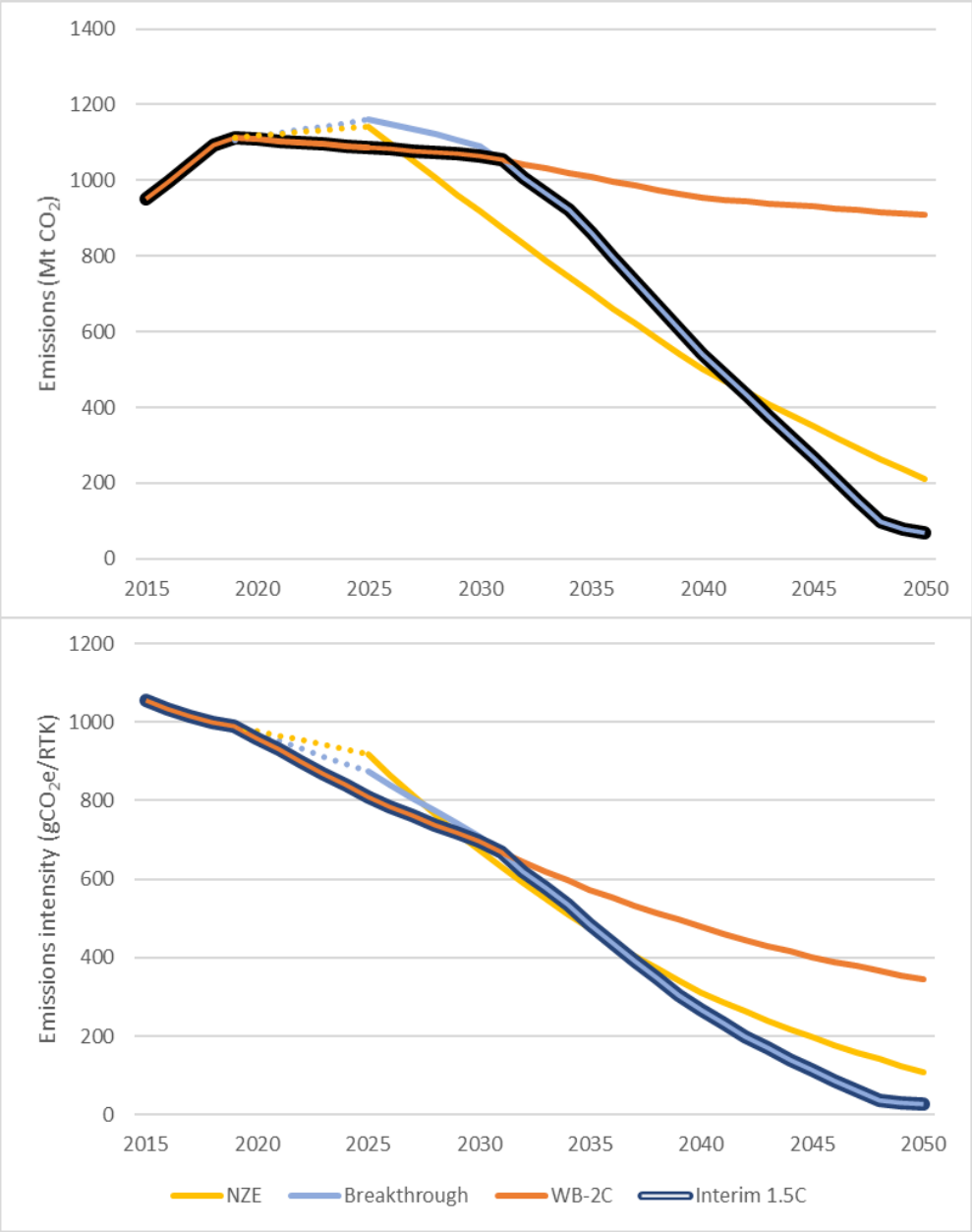
Table 1: Comparison of assumptions in IEA Net Zero Emissions scenario and the ICCT Breakthrough scenario.

Topic	IEA Net-Zero Emissions Scenario	ICCT Breakthrough Scenario
Model time frame	Up to 2050	Up to 2050
Cumulative emissions from aviation, 2019-2050 time period (Tank to Wake basis)	20.5 Gt CO_2	19.6 Gt CO_2
Assumed annual activity growth, revenue passenger kilometers (RPK) (2019-2050)	2.5%	2.9%
Assumed annual efficiency improvement (2019-2050)	1.7%	2%
Alternative fuel share by 2050 (SAF + hydrogen)	70%	100%

While the Breakthrough scenario has cumulative emissions below the IEA NZE scenario, the shape of the pathway differs in both the near and long term. The Breakthrough scenario shows a more gradual decrease in emissions than the NZE scenario in the 2025-2030 time period, and a steeper decline from 2030 to 2050[5]. To ensure that near-term targets using the interim 1.5°C pathway exhibit equal or greater ambition than Well-Below 2°C targets set for the same time period, the interim 1.5°C pathway follows the WB-2°C pathway derived from the Sustainable Development Scenario (SDS) for the time period 2023-2031, and the Breakthrough scenario for 2032-2050[6]. Figure 1 shows the absolute emissions and emissions intensity of the interim 1.5°C pathway, the Breakthrough scenario, the IEA NZE scenario, and the WB-2°C pathway.

[5] The magnitude of both absolute aviation CO_2 and carbon intensity during the recovery period of the COVID-19 pandemic are highly uncertain; many models show diverging expectations during this time period.
[6] Models vary significantly in their system boundaries, data inputs, and assumptions. While the interim 1.5°C pathway leverages both the SDS and Breakthrough scenarios to maintain ambition relative to targets set with the WB-2°C pathway, this choice should not be interpreted to mean that the underlying models are comparable, or that a particular model is more accurate in the selected timeframe.

Figure 1: Absolute emissions and emissions intensity trajectories from the IEA Net Zero Emissions scenario (NZE), the ICCT Breakthrough scenario (Breakthrough), the WB-2°C pathway derived from the IEA SDS (WB-2°C), and the SBTi interim 1.5°C scenario (Interim 1.5C).[7][8]*



[7] Historic emissions and intensity data for the years 2015-2019 taken from the WB-2°C scenario.

[8] Emissions and emissions intensity shown on a Well-to-Wake (WTW) basis; WTW emissions for the NZE scenario were estimated from Tank-to-Wake (TTW) emissions reported by IEA using the ratio of Tank-to-Wake and Well-to-Wake emissions in the Breakthrough scenario.

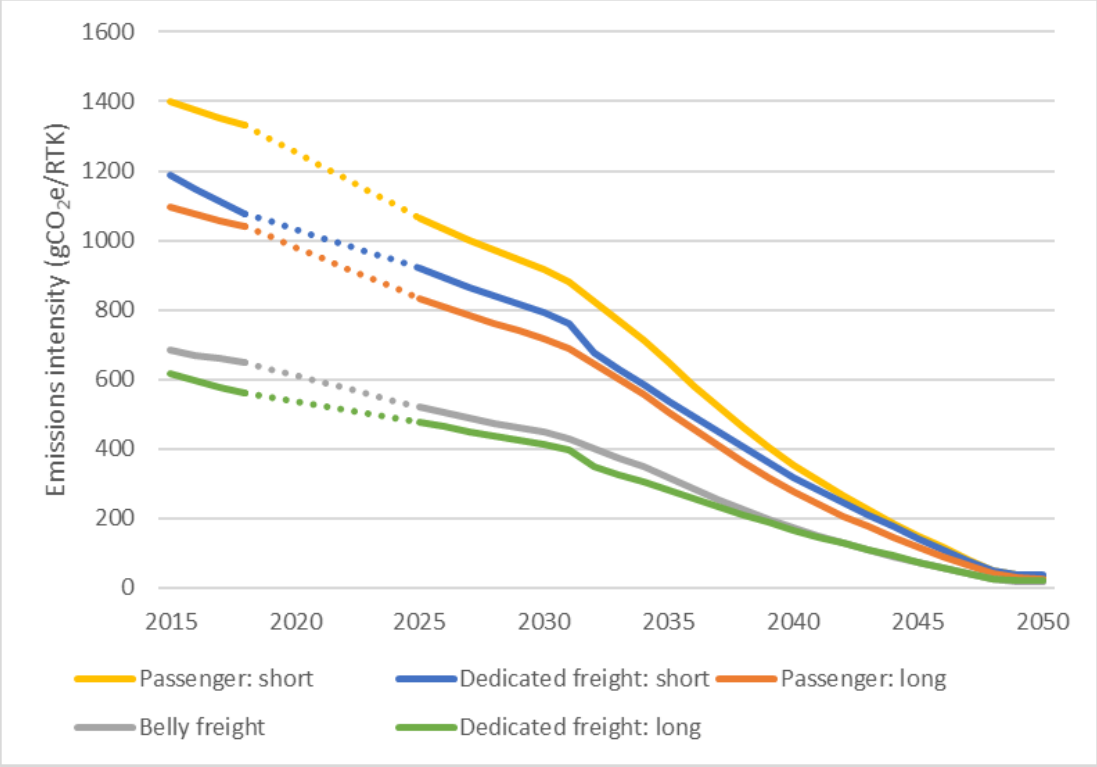
**Dotted lines for the years between 2020 and 2025 indicate the COVID-19 pandemic; these years are anomalous for the industry.*

Table 2: Required reductions in CO_2 emissions intensity relative to the year 2019, according to the interim 1.5°C scenario, the IEA Sustainable Development Scenario (WB-2°C), and the IEA Net Zero Emissions scenario (NZE).

Source	2030	2035	2040	2050
Interim 1.5°C	-29.6%	-50.9%	-73.2%	-97.4%
SDS (WB-2°C)	-29.6%	-42.1%	-51.6%	-65.2%
NZE	-38.5%	-57.0%	-71.7%	-90.1%

The interim SBTi 1.5°C sector carbon intensity pathway derived from the Breakthrough scenario described in the Aviation Vision 2050 report is shown in figure 2.

Figure 2: Sector average carbon intensity pathways from the 1.5°C interim pathway (on a Well-to-Wake basis), 2019 to 2050. Dotted lines for the years between 2020 and 2025 indicate the COVID-19 pandemic; these years are anomalous for the industry.



3 INTERIM SECTOR-SPECIFIC CRITERIA FOR AVIATION

The large degree of uncertainty associated with modeled recovery from the COVID-19 pandemic necessitates the following interim sector-specific criteria for aviation (table 3). These criteria apply in addition to the SBTi general and Net-Zero criteria.

Table 3: Interim sector-specific criteria.

Topics	Criteria	Description
Base year eligibility	Aviation-C1	All companies using the aviation tool version 2.0 may not choose 2020, 2021 or 2022 as the base year. The years 2020-2022 are anomalous for the industry due to the COVID-19 pandemic.

4 LOOKING FORWARD: OFFICIAL SBTI 1.5°C SECTOR GUIDANCE FOR AVIATION

The interim 1.5°C scenario offers a robust and credible path for the aviation sector to set Science-Based targets that are aligned with 1.5 degrees of warming, in line with industry expectations for technology deployment and airline traffic. However, this pathway may be superseded as part of the sector guidance update developed through SBTi's customary sector development process. Updated sector guidance will be developed in consultation with an Expert Advisory Group and will include opportunity for public feedback during an open public consultation period. If the interim 1.5°C pathway is superseded by an updated pathway released alongside the updated sector guidance, targets set using the interim 1.5°C scenario before the release of the updated 1.5°C pathway will remain valid. After a 6-month grace period following the release of the updated pathway, new target submissions will be required to use the updated pathway.

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