2023

Carbon Compass℠ Methodology

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Introduction

A key aspect of JPMorgan Chase's environmental sustainability strategy is helping our clients navigate the challenges and realize the economic opportunities associated with the transition to a low-carbon economy. For us, recognizing the balance needed to achieve long-term sustainability informs our approach to climate initiatives and is rooted in how we do business. We believe that by helping our clients finance and accelerate their transition objectives, we can contribute to efforts to strengthen the broader economy in response to climate change while also generating long-term returns for our shareholders.

In support of this strategy, we are addressing our financed emissions through setting a series of portfolio-level net zero-aligned targets for key carbon-intensive sectors in our financing portfolio. Collectively, our methodological approach is known as Carbon Compass℠. It is designed to provide sector-specific and decision-useful insight into how we are tracking toward our portfolio-level decarbonization targets . Carbon Compass℠ informs not only how we engage with individual clients in support of their transition strategies, but also how we can continue efforts to align our financing activities with limiting global average temperature rise to 1.5 degrees Celsius, above pre-industrial levels - more simply known as the global goal of achieving net zero emissions by 2050.

Since 2021, we have continued to expand Carbon Compass℠ with the goal of addressing additional carbon-intensive sectors and reflecting evolving market practices for the financial sector. With this update to our methodology, we are introducing new emissions intensity reduction targets for two sectors, Shipping and Aluminum, as well as making updates to select sectors — Oil & Gas, Electric Power, and Auto Manufacturing — to bring all our targets into alignment with a net zero by 2050 scenario. In updating our Oil & Gas End Use (Scope 3) target — now referred to as Energy Mix — we have expanded the in-scope activities boundary to adopt a more comprehensive view of the global energy system and reflect the trends we have seen in the Oil & Gas industry's decarbonization goals. This report also outlines our approach to measuring and reporting absolute financed emissions for the included sectors. The timeline below summarizes the evolution of Carbon Compass℠ to date.

OCTOBER 2020

- Announced plan to set **portfolio-level emissions intensity reduction targets** for key carbon-intensive sectors in our financing portfolio, and to align those targets with the goals of the Paris Agreement

MAY 2021

- Became the first large U.S. bank to set 2030 portfolio-level emissions intensity reduction targets, which we set for the **Oil & Gas, Electric Power** and **Auto Manufacturing** sectors using the International Energy Agency's Sustainable Development Scenario (IEA SDS)

DECEMBER 2022

- Set emissions intensity reduction targets for **Iron & Steel, Cement** and **Aviation**, aligned with the IEA Net Zero Emissions by 2050 Scenario (IEA NZE)

NOVEMBER 2023

- Set emissions intensity reduction targets for **Shipping** and **Aluminum**, aligned with IEA NZE
- Updated our **Oil & Gas End Use** target — now called **Energy Mix** — to encompass a broader view of energy supply that better captures the system wide substitution from oil and natural gas to low carbon fuels and zero carbon electricity generation under the IEA NZE scenario
- Updated **Oil & Gas Operational, Electric Power**, and **Auto Manufacturing** targets to align with IEA NZE
- Outlined approach to measuring and reporting **absolute financed emission** for sectors covered in Carbon Compass℠

In establishing our own methodology, we have continued to enlist the support of ERM, a global sustainability consultancy with deep sectoral, technical and business expertise in the low-carbon transition of different sectors. We believe the approach we have developed is robust, practical, and reflects leading thinking on decarbonization of the included sectors.

The sections that follow provide a comprehensive summary of our Carbon Compass℠ methodology as of November 2023. Section Two provides a detailed overview of our approach to setting sector-specific intensity targets, while Section Three provides specifics on the in-scope activities, metric and data sources used for each target. Section Four outlines our approach to calculating absolute financed emissions for the sectors included in Carbon Compass℠. As this document incorporates both new and existing elements of our methodology as of November 2023, it supersedes and replaces versions published prior to that date.

Moving forward, we intend to continue to update and evolve our methodology to address additional sectors and to reflect other changes in our approach as necessary. We will also continue to make the details of our methodology public to help inform efforts across our industry and to support our clients' and our journey in contributing to the global achievement of net zero emissions by 2050. For the latest updates on our approach and targets, visit the Carbon Compass℠ page on our website. For additional information on JPMorgan Chase's climate strategy, our performance against our targets and how we are supporting our clients, see our most recent firmwide Climate Report, available in the Reports and Disclosures section on our Sustainability webpage.

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Methodology Overview

Our Carbon Compass℠ methodology incorporates and expands upon several related approaches both within and beyond our industry to define robust, decision-useful metrics and science-based targets on a sector-by-sector basis. This section provides details on our overall approach, our choice of metrics and how we have tailored our methodology for individual targets. It also includes a summary of our current targets and more detail on how carbon credits factor into our metrics.

2.1 Key Elements of Our Approach

The following key choices and considerations have informed our approach:

Science-based: Our targets build on the transition pathways outlined by the International Energy Agency's Net Zero by 2050 Scenario (IEA NZE). We also reference a wide range of public resources, including additional climate scenarios, decarbonization research and other frameworks for assessing alignment with global emissions reduction goals.

Sector-specific: Within each sector, we focus on specific activities with material emissions and credible pathways toward decarbonization, enabling us to gain more useful insight and better support our clients in developing and implementing their transition strategies.

Decision-useful: For each sector, we define one or more core metrics that provide insight into companies' performance and progress toward decarbonization, and that are compatible with the benchmark trajectories we use to evaluate alignment with global emissions goals.

Robust and consistent data: Each metric is designed to make use of consistent, well-reported and standardized data. Where data availability is limited, we continue to support improvements while defining processes for use of appropriate alternatives.

2.2 Portfolio Definition

To evaluate net zero alignment of JPMorgan Chase's global financing portfolio in each of the included sectors, we compute a portfolio-weighted average of emissions performance for all our clients in the sector portfolio. Weights are determined based on our cumulative financing to each client as a share of our total financing to the sector.

$$\text{JPMC Sector Portfolio Emissions Metric} = \sum \left(\text{Client Weight in JPMC Sector Portfolio (\%)} \times \text{Client Emissions Metric} \right)$$

For purposes of this calculation, our financing portfolio is defined to include all lending, tax equity and capital markets activity. We believe that including all these types of financing activities gives us a better understanding of how our financing is helping our clients make progress toward their decarbonization goals.

For lending and tax equity, we use the 12-month monthly average balance of committed financing to each client. We use committed financing because we believe it better reflects the scope of our relationship with a given client – i.e., based on the total amount that we have agreed to finance – as opposed to outstanding balance, which may obscure differences between smaller and larger clients based on the degree to which they have drawn on available credit from us. We use a 12-month monthly average balance rather than a year-end balance in order to better capture the impact of short-term obligations, such as bridge loans, which frequently have terms of less than one year.

For capital markets activity, we use 100% attribution of our share of the transaction size on a three year rolling average basis. The choice of a three year versus one year rolling average helps minimize the significant volatility often observed with capital markets transaction volumes, driven in part by companies typically only going to the market for additional financing every few years.

2.3 Intensity-Based Metrics

Our independent net zero-aligned targets for 2030 are defined on the basis of emissions intensity, which measures emissions relative to given unit of activity or output (e.g., kilograms CO_2 per megawatt hour of electricity generation), rather than absolute emissions. This is because we believe intensity-based metrics provide the most effective way for us to evaluate and compare performance at the sector and company level, and thus better inform how we engage with clients and make capital allocation decisions. Intensity-based metrics also provide a clearer view of changing performance relative to production, which is crucial in an economy that needs to reduce emissions while still meeting the world's growing economic and development needs.

More specifically, intensity-based metrics are decision-useful and impact-oriented because they enable us to:

- Set informative targets that are aligned with science-based scenarios, without necessarily curbing activity growth;
- Meaningfully engage with new and existing clients and provide the capital necessary to help finance their transition, while reducing the carbon intensity of our portfolio;
- Evaluate both individual companies' and whole sectors' performance against decarbonization trajectories that align with the global goal of net zero emissions;
- Better reflect the progress that high-emitting companies and sectors are making in transitioning to lower-carbon production and products;
- Easily compare performance across a portfolio of companies within a sector and between companies of different sizes; and,
- Analyze performance in a manner that is less affected than absolute emissions by factors that cause year-to-year emissions volatility, such as changes in companies' production and/or valuation.

Although we have chosen intensity-based metrics for the reasons highlighted above, we have also begun measuring and reporting our financed emissions on an absolute-basis (i.e., absolute financed emissions) for the sectors included in Carbon Compass℠. For details on our approach, see Section 4.

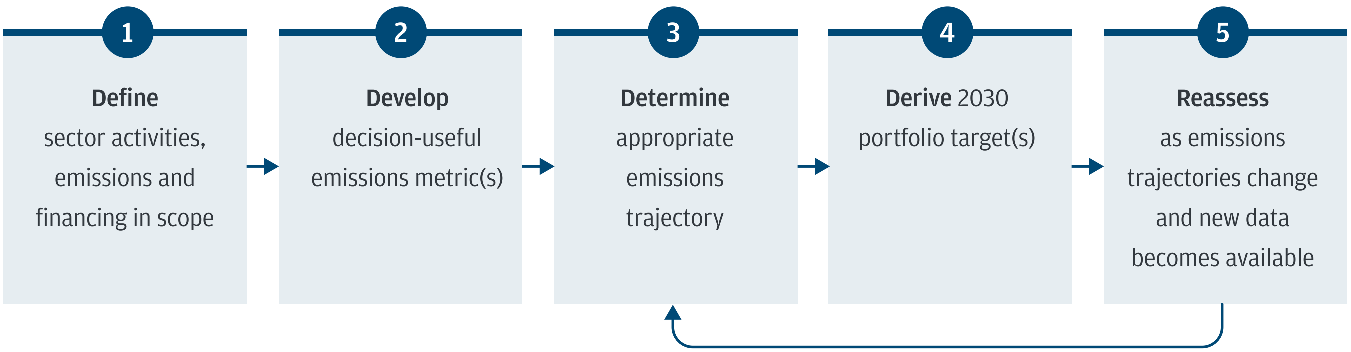
2.4 Sector Selection

To date, we have set emissions intensity reduction targets for eight sectors: Oil & Gas, Electric Power, Auto Manufacturing, Iron & Steel, Cement, Aviation, and — new with this update — Shipping and Aluminum. With each prior update, we have added sectors based on several factors, including their relative contribution to global emissions, the availability of viable decarbonization pathways and technologies, the role that our financing and advice can play in helping advance the transition strategies of companies in the sector, and the availability of data. As we move forward, we anticipate that we will continue to incorporate additional sectors on this basis, with the goal of eventually addressing the substantial majority of emissions associated with heavy emissions sectors in our financing portfolio.

2.5 Tailoring Our Methodology for Each Target

Carbon Compass℠ incorporates what we believe are the most relevant, impactful, credible and decision-useful data and metrics to help support decarbonization within our portfolios. As noted above, one of the essential features of our approach is the use of a tailored methodology for each included sector. The figure below summarizes the process we use and outlines the general framework for the sector-specific methodologies described in Section 3.

How We Design Our Methodology for Each Sector



Define sector activities, emissions and financing in scope. Our approach to each sector begins with careful consideration of key business activities and emissions drivers, available transition pathways, industry trends, regulatory context, key dependencies and our portfolio. This approach results in an initial definition of the activities and emissions we want to track, which are key inputs for developing metrics and determining how to align them to our emissions goals.

Develop decision-useful emissions metric(s). Next, we develop one or more metrics for measuring and tracking emissions performance of our client companies and our portfolio as a whole. This involves assessing available tools and approaches, including commonly-used metrics and available data sources. While our goal is to use standardized data and metrics where possible, in some cases we have chosen to combine multiple approaches or datasets in order to create a more robust, decision-useful metric.

Determine appropriate emissions trajectory. After metrics are chosen, we then determine how to align them with what we believe is a suitable net zero emissions reduction trajectory. This process involves selecting a scenario for which appropriate, sector-specific projections are provided or can be reasonably extrapolated. In some cases, it is necessary to make strategic choices or adjustments to align with our chosen metric. Once this process is complete, the output is a net zero-aligned benchmark emissions trajectory for the chosen sector and performance metric. In select hard to abate sectors, scenarios such as the IEA NZE assume that the use of fossil fuels does not fall to zero in 2050 and therefore design pathways that rely on negative emissions technologies to achieve net zero emissions by 2050.

Derive 2030 portfolio target(s). Using the chosen benchmark emissions trajectory for each sector, we then derive portfolio-level 2030 convergence or rate-of-change targets that are credibly net zero-aligned. Depending on the granularity of available scenario projections, the target may be expressed as a specific carbon intensity value or a percentage reduction from a specified baseline.

Reassess as scenarios are updated and/or new data becomes available. The scenarios in IEA's World Energy Outlook are usually updated annually, to reflect both relevant changes in the energy picture (e.g., available technologies, anticipated costs, new public policies) and current global energy and emissions trends. This may lead to changes in the trajectories required to maintain net zero alignment, which could also create the need to update our targets. Also, changes in industry dynamics and new or better data becoming available for some sectors may create opportunities to incorporate additional emissions or otherwise improve our metrics. Therefore, a key step for each sector methodology is to periodically reassess key inputs and assumptions and recalibrate our targets as needed.

2.6 Current Targets

The table below summarizes the portfolio-weighted baselines and 2030 net zero-aligned targets we have defined for each sector. For more information on each target, including activity and emission boundaries, the scenario and methods used, and other details, see the descriptions of individual sector methodologies in the next section.

SECTOR	DETAILS			BASELINE		2030 TARGET
	Scope(s) Included	Scenario Used	Metric (Unit of Measurement)	Baseline Year	Portfolio Baseline	
Energy Mix	3 (end use)	IEA NZE	g CO_2 / MJ	2019	45.9	29.5 -36% from baseline
Oil & Gas Operational	1 and 2	IEA NZE	g CO_2e / MJ	2019	4.9	-45% from baseline
Electric Power	1	IEA NZE	kg CO_2 / MWh	2019	342.6	105.3 -69% from baseline
Auto Manufacturing	1, 2 and 3 (tank-to-wheel)	IEA NZE	g CO_2e / km	2019	164.8	86.1 -48% from baseline
Iron & Steel	1 and 2	IEA NZE	t CO_2e / t crude steel	2020	1.412	0.981 -30% from baseline
Cement	1 and 2	IEA NZE	kg CO_2e / t cementitious product	2020	639.9	460.0 -28% from baseline
Aviation	1 (tank-to-wake)	IEA NZE	g CO_2 / RTK	2021	972.6	625.0 -36% from baseline
Shipping	1 (tank-to-wake)	IEA NZE	g CO_2 / t-nm	2021	12.5	8.4 -33% from baseline
Aluminum	1 and 2	IAI 1.5DS (based on IEA NZE)	t CO_2e / t aluminum	2021	8.7	6.5 -25% from baseline

2.7 Carbon Credits

To halt the accumulation of greenhouse gases in the atmosphere and slow the resulting climate impacts, the world must reduce emissions to as close to zero as possible and deploy carbon removal solutions to address the remainder.

In addition to our focus on helping reduce emissions in line with science-based pathways, we recognize the importance of supporting the development of carbon removal technologies in the near term. To this effect, under our methodology, individual client emissions may be offset by company-implemented carbon removal projects – including carbon capture, use and storage (CCS/CCUS), direct air capture and nature-based solutions – provided they are properly attributed according to standard GHG accounting protocols.

Reductions associated with retirement of credits from third-party carbon removal projects that have been validated and registered on an eligible platform will also be considered. Renewable energy credits (RECs) are permitted for use in offsetting emissions but may only be counted against Scope 2 emissions from purchased electricity, wherever applicable.

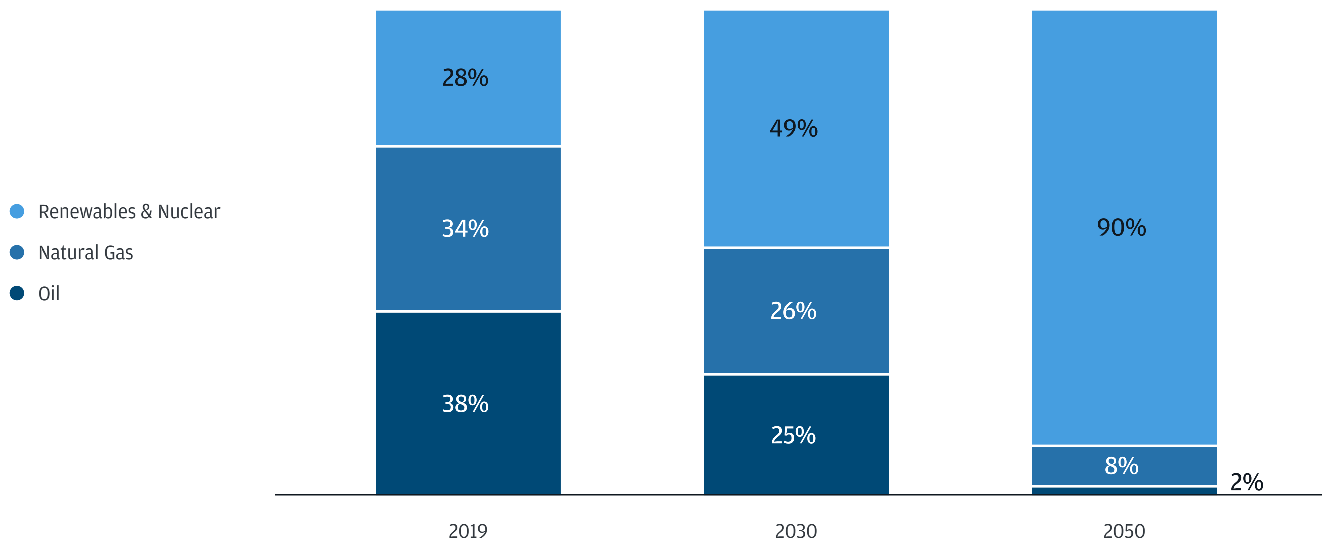
We recognize that carbon markets are rapidly evolving with a focus on improving both the quality and quantity of available credits. We will continue to monitor developments and consider the feasibility of recognizing additional types of credits in the future. To that end, we published JPMorgan Chase's Carbon Market Principles earlier this year, which outlines our approach to strengthening the voluntary carbon market to scale decarbonization solutions.

3 Sector-Specific Methodologies

3.1 Energy Mix

With this year's Carbon Compass℠, we have updated our previous Oil & Gas End Use target to focus on the decarbonization of energy supply – specifically, the transition from fossil fuels including oil and natural gas to low- or zero-carbon alternatives such as wind, solar, hydrogen and nuclear. Key to this approach is the understanding that energy remains vital to the functioning of society and the economy, and that most of the energy currently supplied by fossil fuels must eventually be abated or replaced by energy from low- or zero-carbon alternatives.

Global Energy Supply by Source in the IEA NZE Scenario (Excluding Coal)



Source: IEA World Energy Outlook

Note: 2019 data sourced from World Energy Outlook 2021 published in October 2021. 2030 and 2050 projections represent the IEA NZE Scenario and is sourced from World Energy Outlook 2022 published in October 2022. Excludes Coal and non-energy use Oil

The substitution of oil and natural gas with low-carbon alternatives is beginning to take shape globally as most demand-side sectors seek to increase electrification and/or shift to bio- and synthetic-based alternatives. While the Oil & Gas sector is taking the lead in biofuels and CCS/CCUS investments, the build-out of zero-carbon power – solar, wind, hydro, bioenergy, nuclear and other renewables – is taking place primarily in the Electric power sector. Therefore, it is important that we orient our financing toward enabling both the transition of electric grids from fossil fuels to renewables and the substitution of oil and natural gas with low- or zero-carbon alternatives, including zero-carbon power, while helping maintain energy security and affordability.

This updated target enables us to continue our focus on supporting our Oil & Gas clients in reducing their Scope 3 carbon intensity, such as by increasing production of energy with low- or zero-carbon content (e.g., renewables, biofuels, hydrogen) and/or relying less on energy products with higher carbon content. In addition, we will increase our focus on expanding our financing of companies involved in production of zero-carbon power, as well as supporting efforts to transition key drivers of demand for energy. In this way, our updated target is closely integrated with our targets for individual sectors on both the supply and demand sides of the energy equation, including those for Electric Power, Auto Manufacturing, Aviation and more. We will continue to maintain our Electric Power target that focuses specifically on the decarbonization of electric grids. Due to the integrated nature of our Energy Mix metric, and its partial overlap with our existing Electric Power target, we will include our financing of zero-carbon power generation activities in our calculations for both targets, which we believe is consistent with the IEA NZE scenario's treatment of global power generation.

3.1.1 Key Decisions

Our Energy Mix target has been expanded to focus on the carbon intensity of energy supplied for end use consumption. As such, it encompasses Scope 3 CO_2 emissions associated with the combustion of oil and natural gas, as well as the comparative lack of emissions associated with solar, wind, hydro, bioenergy, nuclear, hydrogen, and other renewables. With this expansion of in-scope activities we have created a linkage between the decarbonization of our Electric Power portfolio and progress toward our Energy Mix target. Due to this partial overlap between both targets, we will include our financing of companies involved in the production of zero-carbon electricity in both targets' calculations. By tracking both fossil fuels and zero- or low-carbon energy sources, we gain a clearer view of how our financing relates to the emissions of the global energy system, which enables us to make better informed financing decisions.

We obtained a net zero-aligned carbon intensity pathway for the combined energy system using the IEA NZE scenario, adjusted to exclude coal and non-energy uses of oil. From this we derived a 2030 target of 29.5 g CO_2 / MJ, representing a 36% reduction from our 2019 portfolio baseline of 45.9 g CO_2 / MJ.

Sector Portfolio Target Summary – Energy Mix

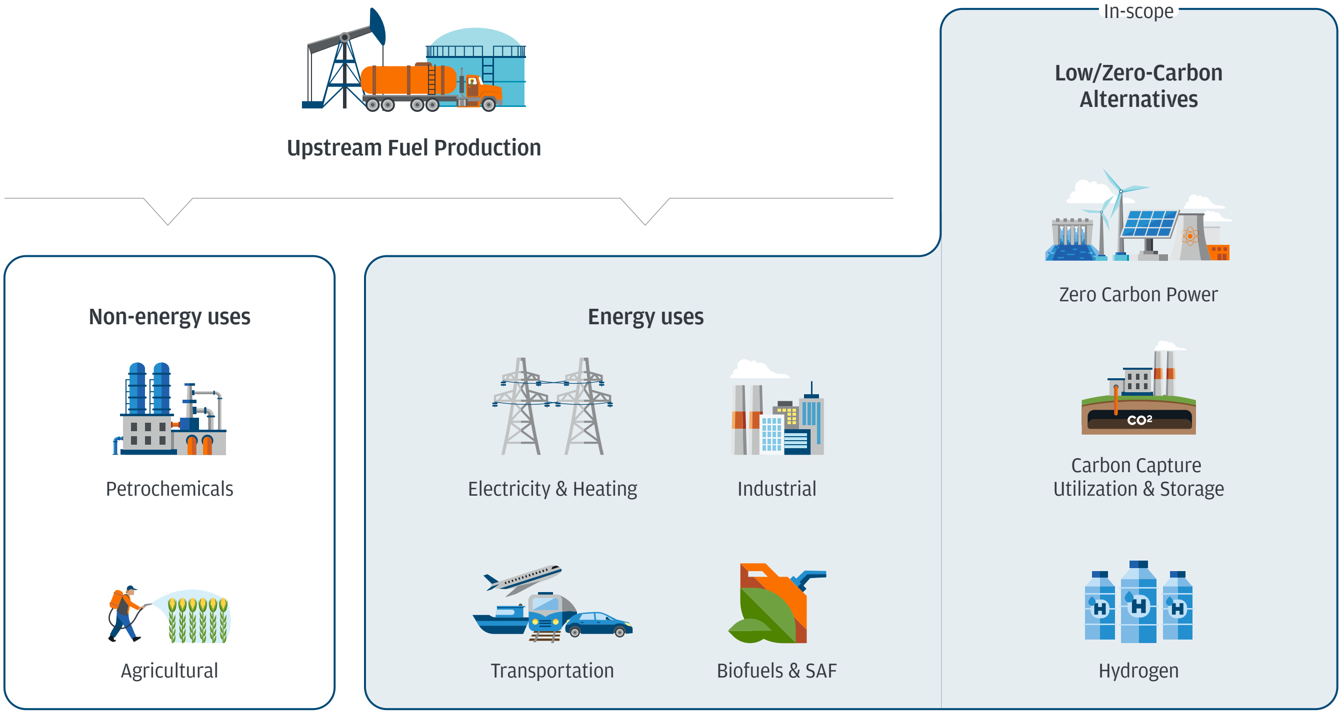
Activity Focus	Supply of oil, natural gas and low-carbon fuels for end use combustion, and zero-carbon power generation by Oil & Gas and Electric Power companies
Scope	Scope 3 CO_2 emissions from end use of energy products
Metric	g CO_2 / MJ
Scenario	IEA NZE with adjustments to exclude coal and non-energy uses of oil
2030 Target	29.5 g CO_2 / MJ
Data Sources	Wood Mackenzie, Enverus, S&P Global Trucost, S&P Global SNL Financial, company disclosures

3.1.2 Methodology Detail

3.1.2.1 BOUNDARIES

Our methodology for Energy Mix includes Scope 3 CO_2 emissions associated with energy products. Depending on a company's operations, energy products may include natural gas, unrefined liquids products (e.g., crude oil), refined liquids (e.g., gasoline, diesel), low-carbon fuels (e.g., biofuels), and/or zero-carbon power generation. The methodology assumes no end use emissions from bioenergy, as any such emissions are generally offset by carbon storage benefits gained during the growing of feedstock. We also currently assume zero end use emissions for hydrogen and zero-carbon electricity. Scope 3 supply chain emissions are not included as the target focuses on end use emissions.

Energy Mix Value Chain



Expanding the activity boundary to include both fossil fuels and low- and zero-carbon alternatives allows us to capture the decarbonization of global energy supply – specifically, the transition from oil and natural gas to low- or zero-carbon alternatives. Our approach is grounded in acknowledging that in order to meet temperature goals, the world needs to transition to low- or zero-emissions energy sources, while also recognizing the essential role of energy security and affordability in sustaining society and the economy. It also underscores our intention to continue helping finance and facilitate the low-carbon transition by supporting the development and scale of alternative energy sources, while also engaging with our Oil & Gas clients to help them develop strategies that set them up for success in a low-carbon future.

CCS/CCUS is a significant area of focus for Oil & Gas companies, who are currently involved in 90% of CO_2 capture and storage capacity in operation around the world.[1] This is primarily because various points along the oil and gas supply chain result in highly concentrated sources of CO_2 emissions suitable for CCUS. Additionally, once the CO_2 is captured and compressed, geological storage resources are often found close to existing oil and gas activities, and sometimes within their operational footprint. There are several applications of captured carbon, such as in the production of hydrogen, fertilizers, and building products, that make investing in CCS/CCUS an economically attractive proposition for the Oil & Gas sector – especially when using depleted wells to store carbon – while also driving down their Scope 3 emissions.

Given the role CCS/CCUS will play in helping the Oil & Gas and other sectors to achieve net zero emissions by 2050, our methodology aims to account for it in individual client emissions, provided the associated emissions impacts are properly attributed according to standard GHG accounting protocols. We believe this inclusion will, over time, drive down our clients' Scope 3 emissions intensity and in turn have a positive impact on our Energy Mix metric. Although data disclosure is currently limited due to the relatively small scale of operations, we will continue to monitor developments and consider enhancing our methodology to better account for CCS/CCUS activity in the future.

[1] IEA (2023), Emissions from Oil and Gas Operations in Net Zero Transitions, IEA, Paris

3.1.2.2 METRIC

JPMorgan Chase's Energy Mix target is evaluated using the metric grams CO_2 per megajoule of energy, which includes energy embedded in oil, natural gas, refined products and low-carbon fuels, and generated energy from zero-carbon power sources. To compute our portfolio-level Energy Mix metric, we apply separate calculations for in-scope Oil & Gas and Electric Power companies.

For Oil & Gas companies, engaged in upstream and refining activities, carbon intensity is calculated as the emissions resulting from combustion of natural gas, oil and refined products, net of CCS/CCUS activity, divided by the energy embedded in these products, any low-carbon fuels produced (e.g., biofuels, hydrogen) and the energy generated from renewable electricity sources by Oil & Gas companies.

Oil & Gas End Use carbon intensity

$$\frac{\text{Scope 3 Emissions from Oil and Natural Gas Combustion - CCS / CCUS (g } CO_2\text{)}}{\text{Embedded Energy in Oil, Natural Gas, Refined Products and Low-Carbon Fuels and Energy from Zero-Carbon Power Generation (MJ)}}$$

For Electric Power companies (public and investor-owned utility companies, independent power producers and electric cooperatives, as well as diversified companies with power generation activities) engaged in zero-carbon power generation, carbon intensity is calculated as the emissions resulting specifically from the generation of zero-carbon power divided by the energy generated from these sources.

Zero-Carbon Power Generation carbon intensity

$$\frac{\text{Zero-Carbon Power Generation Emissions (g } CO_2\text{)}}{\text{Energy from Zero-Carbon Power Generation (MJ)}}$$

The portfolio weight applied to each client is determined based on the amount of in-scope exposure being considered for this target. For Oil & Gas clients we include all in-scope financing provided. For Electric Power clients, we isolate exposure to zero-carbon power generation activities by taking a pro-rated share of in-scope financing based on the zero-carbon proportion of the client's total generation activity.

Changes in the resulting portfolio-weighted average Energy Mix carbon intensity is therefore dependent on three factors: (i) the Scope 3 combustion emissions intensity of Oil & Gas clients; (ii) the share of financing provided to Oil & Gas companies; and (iii) the share of financing provided to Electric Power companies (utilities and independent power producers) engaged in zero-carbon power generation.

We believe this metric better captures the shift in fuel mix of the global energy complex as the world aims to move from fossil fuels to low- and zero-carbon sources of energy to achieve net zero emissions by 2050. It supports continued engagement with Oil & Gas companies on their Scope 3 decarbonization plans while also supporting our efforts to accelerate financing of zero-carbon power generation.

3.1.2.3 SCENARIO AND TARGET

The benchmark trajectory for our Energy Mix target is based on IEA's projections of CO_2 emissions and energy supply under the NZE scenario. We aggregate energy supply pathways for oil, natural gas, solar, wind, hydro, bioenergy, nuclear, and other renewables to construct an aggregate energy supply pathway capturing the substitution of fossil fuels with low- and zero-carbon energy. Coal and non-energy use of oil are excluded from the aggregation of energy supply.

Using the resulting trajectory, we have calculated a net zero-aligned, carbon intensity target for 2030 of 29.5 g CO_2 / MJ, representing a 36% reduction from our 2019 baseline of 45.9 g CO_2 / MJ.

3.1.2.4 DATA SOURCES AND CONSIDERATIONS

To calculate the carbon intensity of companies covered by JPMorgan Chase's Energy End Mix target, we use a combination of data sources that we believe best capture production activity of the various fuels and power generation sources included in our metric.

For upstream oil and natural gas and refining activity, we rely on data collected and maintained by Wood Mackenzie and Enverus. Production and refining data from both data providers uses the net working interest method of aggregating asset-level (field- or refinery-level) data up to the parent company. For companies not adequately covered by these sources, we use proxy values equivalent to the 75th percentile of the available data for other portfolio companies, based on the type of operations.

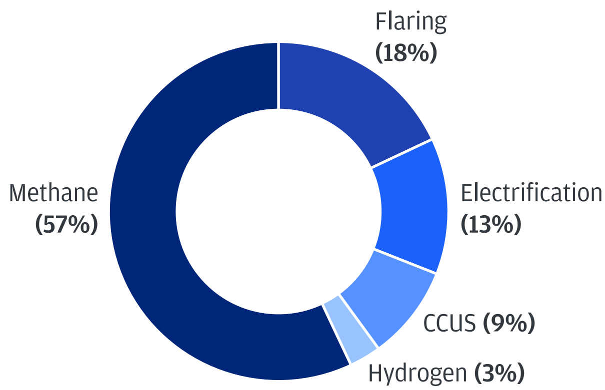
For zero-carbon power generation activity, we source data from S&P Global Trucost. If generation data is unavailable, we use installed capacity from S&P Global's SNL tool and apply average utilization rates derived from the IEA World Energy Outlook data, based on fuel type and region.

Moving forward, we will continue to monitor developments in the availability of data — especially those relevant to the evolving composition of our portfolio and the further development of sector decarbonization strategies — and consider updates to our methodology as appropriate.

3.2 Oil & Gas Operational

Despite the larger share of the Oil & Gas sector value chain emissions being driven by end use, the need to address its operational emissions is also important to the energy transition. The Oil & Gas sector's operational emissions include those associated with extraction, refining and transport and, in particular, the release of methane. While the scope and scale of these emissions vary by source and production method, they are significant. IEA's analysis shows that Scope 1 & 2 (Operational) emissions represent between 10% and 30% of total lifecycle carbon intensity for oil and between 15% and 40% for natural gas.[2] In total, the operational footprint of oil and gas production currently accounts for 15% of total energy-related emissions globally.[3]

Global Contribution of Each Lever to the Reduction of Total Emissions from Oil and Gas Operations in the IEA NZE Scenario, 2022-2030



Source: Emissions from Oil and Gas Operations in Net Zero Transitions - A World Energy Outlook Special Report on the Oil and Gas Industry and COP28, IEA, Paris, May 2023

To reduce operational emissions, companies involved in upstream production and processing segments can invest to reduce venting and flaring of methane and switch to lower-carbon energy sources for production equipment. Companies with refining operations can work to reduce process-related CO_2 emissions. Companies can also reduce operational emissions by investing in carbon removal strategies such as direct air capture or nature-based solutions and retaining ownership of or retiring the resulting carbon credits.

Significant progress, especially in areas such as methane emissions, is achievable this decade, which will help the industry in reducing the emissions generated from oil and natural gas value chains for as long as it remains part of the overall energy mix. To this effect, we have published *'The Methane Emissions Opportunity: Our perspective on leveraging technology in continuous improvement in the Oil and Gas sector'*. This report describes energy security, climate, and business benefits of immediate action to reduce methane emissions and flaring in the Oil & Gas sector, and identifies best-in-class and positive actions companies can consider implementing.

3.2.1 Key Decisions

JPMorgan Chase's Oil & Gas Operational target focuses on the intensity of Scope 1 and 2 emissions from production and/or refining activities, which account for the majority of the sector's operational emissions. Emissions performance is measured on an intensity basis and benchmarked to targets derived from the energy pathways published as part of the IEA NZE.

A key element of our approach to operational emissions is recognition of the need for a rapid decline in fugitive and vented methane emissions, including the release of unburnt natural gas from flare stacks, and CO_2 from flaring. IEA analysis consistent with NZE suggests the need for a 79% reduction in methane emissions, a 93% reduction in CO_2 emissions from flaring and a 29% reduction in CO_2 emissions from all other activities and processes between 2019 and 2030. This framework is applied to our portfolio to derive our 2030 reduction target of 45% for Operational carbon intensity from a 2019 baseline.

[2] IEA (2020), IEA Methane Tracker 2020, IEA, Paris

[3] IEA (2023), Emissions from Oil & Gas Operations in Net Zero Transitions, IEA, Paris

Sector Portfolio Target Summary – Oil & Gas

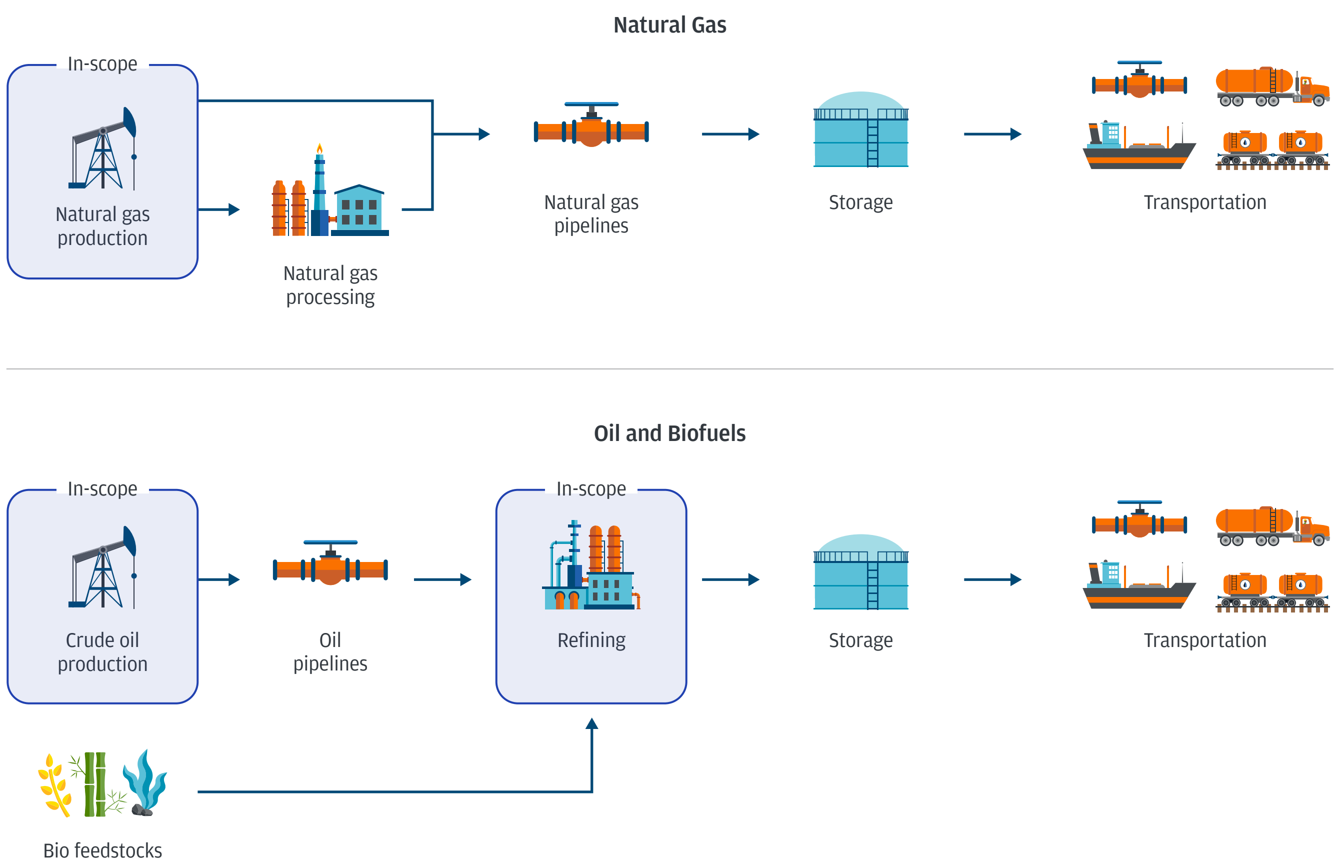
Activity Focus	Production and refining of oil, natural gas, bioenergy and other energy products
Scope	Scope 1 and 2 CO_2 and methane emissions
Metric	g CO_2e / MJ
Scenario	IEA NZE with methane added based on supplemental IEA data consistent with NZE
2030 Target	45% intensity reduction from 2019 baseline
Data Sources	Wood Mackenzie, company disclosures

3.2.2 Methodology Detail

3.2.2.1 BOUNDARIES

Our Oil & Gas Operational target is focused on all portfolio companies that are involved in production and/or refining activities. This includes both pure-play exploration and production (E&P) and refining companies, integrated majors and nationally owned oil companies, as well as diversified companies with oil and gas activities. Emissions from the production of low-carbon fuels, such as biofuels or hydrogen, by Oil & Gas companies are also included. The methodology does not currently include transportation of oil and natural gas products.

Oil & Gas Operational Value Chain



For upstream production activities, Scope 1 includes emissions from fugitive and vented methane emissions, including the release of unburnt natural gas from flare stacks, and CO_2 emissions from flaring and any on-site use of fossil fuels. Scope 2 emissions include those from grid electricity used for operational activities. Although these are generally a small proportion of overall emissions, they reflect a notable decarbonization lever as more upstream facilities and refineries are electrified.

For refining, Scope 1 and 2 emissions primarily result from the use of fossil fuels for heat and reliance on fossil-based electricity grids. Decarbonization efforts include expanding the use of low-emissions electrolysis hydrogen and electrifying processes so they can rely more on zero-carbon power.

Addressing methane emissions is one of the most important levers that contributes to the overall reduction in emissions from the sector's operations, followed by eliminating routine flaring and increased electrification. Scaling up CCS/CCUS and expanding the use of low-emissions hydrogen also play complementary roles in reducing the operational emissions, while having the potential to contribute to low-carbon transition efforts of other sectors, such as Cement and Iron & Steel.

3.2.2.2 METRIC

We measure the emissions intensity of Oil & Gas Operational activity using the metric grams CO_2 equivalent per megajoule of embedded energy.

$$\frac{\text{Scope 1 + 2 Emissions - Credits (g } CO_2e\text{)}}{\text{Embedded Energy in Oil + Natural Gas + Bioenergy (MJ)}}$$

The Operational carbon intensity metric is calculated as CO_2 and methane emissions divided by energy embedded in natural gas, oil and bioenergy that is produced. For oil refineries, refinery throughput is used in the denominator.

The use of an intensity-based metric is effective for capturing variations in the strategic and operational characteristics of different clients and providing insight into the full range of decarbonization strategies being deployed in the sector. It also allows for more consistent tracking and comparison to support taking emissions into account as part of our financing decisions.

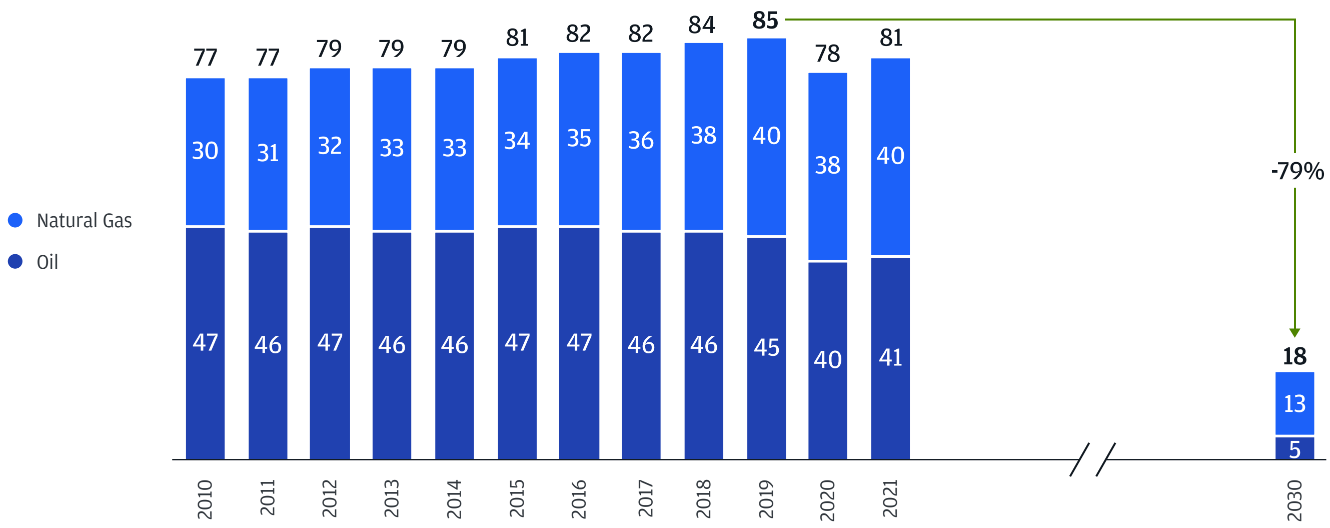
3.2.2.3 SCENARIO AND TARGET

The benchmark trajectory for our Oil & Gas Operational target is based on the IEA NZE scenario, which we use to calculate net zero-aligned rates of change and a resulting g CO_2e/MJ. The benchmark is calculated by applying the following framework to our portfolio baseline in 2019:

- 79% reduction in methane emissions, as indicated by IEA's Methane Tracker 2023[4]
- 93% reduction in CO_2 emissions from flaring, as referenced in IEA's 2023 report on emissions from Oil & Gas operations[5]
- 29% reduction in CO_2 emissions associated with other energy use (e.g., engines used to power compressors, drilling rigs and other equipment)

4 IEA (2023), Global Methane Tracker 2023, IEA, Paris
5 IEA (2023), Emissions from Oil & Gas Operations in Net Zero Transitions, IEA, Paris

Global Oil & Gas Sector Methane Emissions in the IEA NZE Scenario (in $MtCH_4$)



Source: Global Methane Tracker 2023, IEA, Paris, February 2023

Applying this framework results in a 2030 portfolio rate of change target of 45%, which is a slightly lower percentage than the overall carbon intensity reduction published by the IEA. The difference is driven by our analysis that the companies in our portfolio have lower average operating emissions relative to the global average. However, we recognize the importance of a focused effort to reduce methane emissions and reduce flaring and venting in the Oil & Gas industry, which is why we have set a target that is appropriately challenging for our portfolio. This rate of reduction target will be applied to JPMorgan Chase's 2019 global portfolio Operational carbon intensity of 4.9 g CO_2e/MJ.

3.2.2.4 DATA SOURCES AND CONSIDERATIONS

To calculate Operational carbon intensity for Oil & Gas clients, we currently use upstream oil and natural gas and refining data collected and maintained by Wood Mackenzie. Production and refining data from Wood Mackenzie uses the net working interest method of aggregating asset-level (field- or refinery-level) data up to the parent company. Additional sources including direct company disclosures and syndicated databases are also used to collect and verify specific data points for our model. For companies not adequately covered by these sources, we use proxy values equivalent to the 75th percentile of the available data for other portfolio companies, based on the type of operations.

Data quality and reliability is a well-known challenge for the Oil & Gas sector. This arises from inconsistencies in measurement, management and reporting of data across the industry, as well as the lack of reliable and standardized techniques for measurement in areas such as methane. Although the situation is gradually improving, it remains a key concern of industry groups, NGOs and other stakeholders engaged in efforts to decarbonize the sector, and it was an important consideration in how our Oil & Gas sector methodology was formulated.

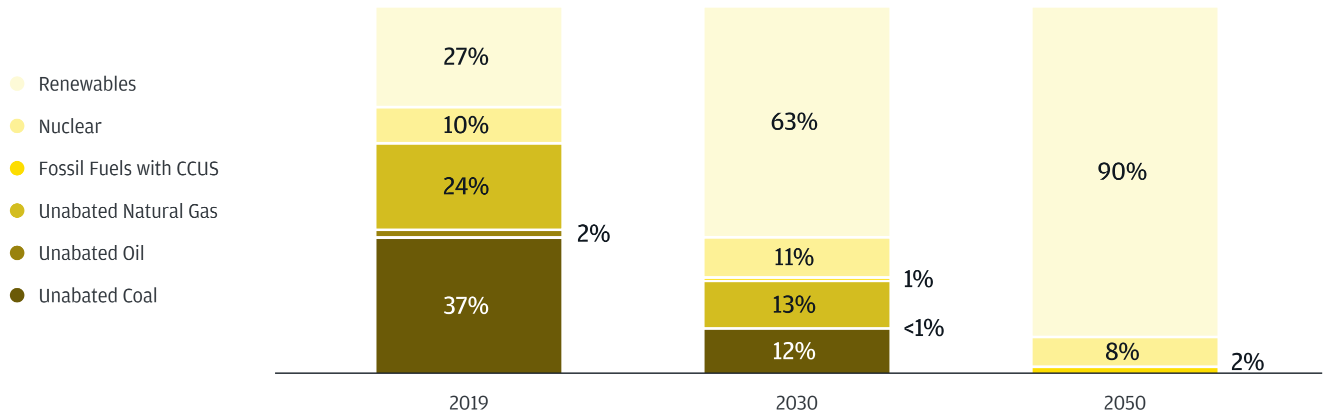
Currently, reported methane emissions data primarily relies on inference methods. JPMorgan Chase will continue working with industry partners and NGOs to help make direct measurement technologies the preferred method of tracking methane emissions, which should materially improve the quality of methane data in the future.

We will continue to engage with our Oil & Gas portfolio companies and work with other industry stakeholders to improve data availability and reliability. Future refinements and improvements in data may necessitate changes to our baseline emissions calculations. Over time, we expect that increased consistency in approaches to measure and report emissions will lead to advances that we can incorporate into our Carbon Compass℠ methodology.

3.3 Electric Power

Globally, power generation is the single largest use for fossil fuels and thus a major source of climate-altering emissions. At the same time, electrification offers a key pathway for decarbonizing other sectors responsible for significant emissions, including transportation, industry and buildings. As a result, the sector faces the double challenge of accelerating decarbonization while continuing to meet growing demand for electricity worldwide.

Global Electricity Generation Fuel Mix in the IEA NZE Scenario



Source: IEA World Energy Outlook

Note: 2019 data sourced from World Energy Outlook 2021 published in October 2021. 2030 and 2050 projections represent the IEA NZE Scenario and is sourced from World Energy Outlook 2022 published in October 2022

Today, the Electric Power sector produces significant emissions due to continued reliance on fossil fuels, especially coal. Decarbonization of the sector therefore hinges on accelerating deployment of renewable and other low- or zero-carbon generating capacity, both to meet new demand and ultimately displace legacy fossil-fired sources. Technologies such as energy storage, smart grids and carbon capture are also expected to play an increasingly important role in improving the sector's emissions performance. Navigating this transition will require significant investment and innovative financing solutions to build new infrastructure, develop and commercialize new technologies, manage risk and improve cost-effectiveness.

With the expansion of in-scope activities included in our updated Energy Mix intensity target, we have created a linkage between the decarbonization of our Electric Power portfolio and progress toward our Energy Mix target. Due to this partial overlap between both targets, we will include our financing of companies involved in the production of zero-carbon electricity in our calculations for both targets. A pro-rated share of exposure from our Electric Power portfolio, based on the zero-carbon proportion of clients' total generation activity, is combined with our Oil & Gas portfolio. This approach underscores our goal of accelerating our financing of zero-carbon power generation activities.

3.3.1 Key Decisions

Our target for the Electric Power sector focuses on the intensity of Scope 1 CO_2 emissions from electricity generation, which enables us to focus directly on the sector's core business activity and the primary driver of its GHG emissions.

We have obtained a net zero-aligned carbon intensity trajectory for sector activity using the IEA NZE scenario, adjusted for our portfolio's split of Organization for Economic Co-operation and Development (OECD)- and non-OECD clients. From this, we derived a 2030 target of 105.3 kg CO_2 / MWh, representing a 69% reduction from our 2019 baseline of 342.6 kg CO_2 / MWh.

Sector Portfolio Target Summary – Electric Power

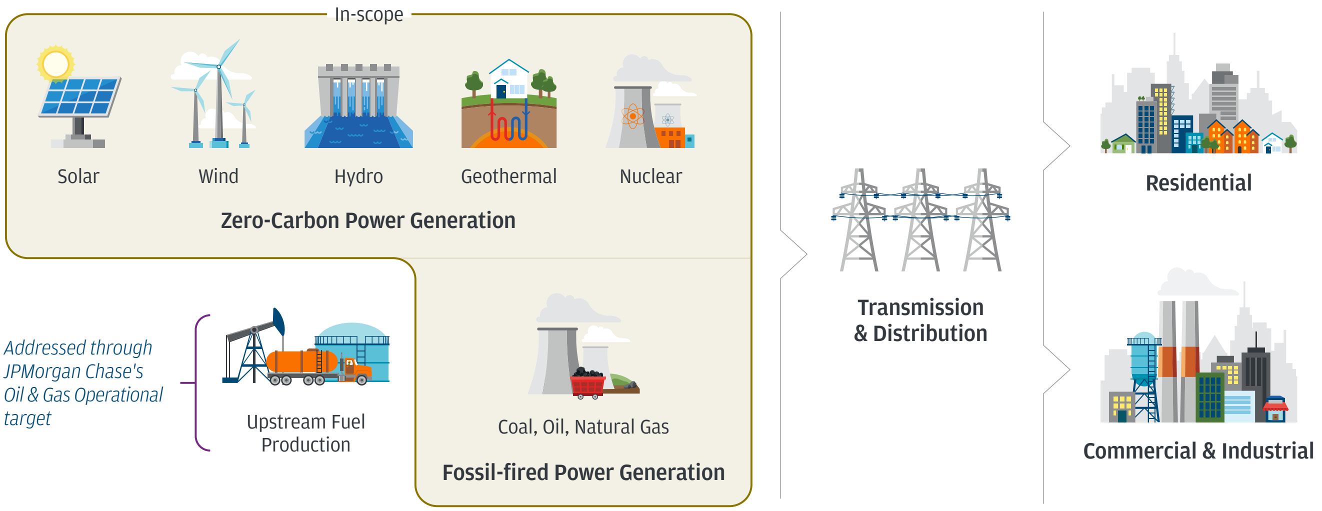
Activity Focus	Power generation
Scope	Scope 1 CO_2 emissions from fuel combustion for power generation
Metric	kg CO_2 / MWh
Scenario	IEA NZE, adjusted for JPMC's portfolio OECD/non-OECD split
2030 Target	105.3 kg CO_2 / MWh
Data Sources	S&P Global Trucost, S&P Global SNL Financial, company disclosures

3.3.2 Methodology Detail

3.3.2.1 BOUNDARIES

For the purposes of our Carbon Compass℠ methodology, the Electric Power sector consists of all portfolio companies that are engaged in electricity generation. This includes both public and investor-owned utility companies, independent power producers and electric cooperatives, as well as diversified companies with power generation activities.

Electric Power Sector Value Chain



To evaluate the sector's performance, we measure companies' direct Scope 1 carbon emissions from power generation. This allows us to concentrate on the part of the value chain responsible for the majority of the sector's emissions and thus where the greatest amount of strategic focus and investment are required. We do not include Scope 2 and 3 emissions for the sector as the focus is on direct emissions from power generation. Focusing on Scope 1 emissions is also consistent with the modeling approach in IEA's World Energy Outlook projections, which allows for direct comparison of our portfolio with IEA benchmark scenario data.

3.3.2.2 METRIC

The emissions intensity of JPMorgan Chase's Electric Power sector portfolio is evaluated using the metric kilograms CO_2 per megawatt-hour of electricity generated.

$$\frac{\sum_{\text{Generation type}} \text{Power generated by generation type (MWh)} \times \text{Emission factor} \left(\frac{\text{kg } CO_2}{\text{MWh}}\right)}{\sum_{\text{Generation type}} \text{(Generation type) Power generated by generation type (MWh)}}$$

An intensity-based metric is particularly well suited to the Electric Power sector because it captures a wide range of fuel mixes and technology solutions and their impact on emissions performance over time. It also allows for more consistent tracking and comparison between companies without the need for complex methods to allocate shares of absolute emissions or adjust for market volatility or other changes unrelated to emissions performance.

3.3.2.3 SCENARIO AND TARGET

The benchmark trajectory for the sector is based on sector-specific projections of CO_2 emissions associated with the generation of power from the IEA NZE scenario. The IEA provides distinct trajectories for the OECD and non-OECD regions, in order to reflect the difference in the rate of decarbonization between their respective member countries.

When we first set our IEA SDS-aligned emissions intensity reduction target for the sector, we chose to align our target exclusively to the OECD scenario. In updating our Electric Power target to align with the IEA NZE, we have also revised our target to take into account our financing activities to companies in countries outside of the OECD. Projections for the OECD region assume more stringent (i.e., lower) carbon intensities than those for non-OECD countries, reflecting the expectation that OECD countries will transition more aggressively in the near term.

Considering that the current distribution of companies in our Electric Power portfolio has a smaller share of non-OECD representation than the world overall, we have calibrated our target to take into account the split of clients in our portfolio between OECD and non-OECD member countries. As the IEA does not currently provide OECD/Non-OECD breakdowns under the IEA NZE scenario, we have extrapolated using available data to derive projections.

As a result, we have derived a net zero-aligned, carbon intensity target for 2030 of 105.3 kg CO_2 / MWh, representing a 69% reduction from our 2019 baseline of 342.6 kg CO_2 / MWh.

3.3.2.4 DATA SOURCES AND CONSIDERATIONS

To calculate the carbon intensity of companies in JPMorgan Chase's Electric Power portfolio, we use generation data sourced from S&P Trucost and apply emissions factors based on fuel type and region that are derived from IEA World Energy Outlook data. If generation data is unavailable, we use installed capacity from S&P Global SNL Financial and estimate carbon intensity by applying average utilization rates, based on fuel type and region, and the aforementioned emissions factors.

For a small proportion of companies in our portfolio for which no data is available, a default carbon intensity based on a relatively conservative fuel mix that is equal parts coal and natural gas is assigned, unless the company's NAICS codes indicate it to be a zero-emitting power producer, in which case it is assigned a carbon intensity of zero.

Moving forward, we will continue to monitor developments in the availability of data — especially those relevant to the evolving composition of our portfolio and the further development of sector decarbonization strategies — and consider updates to our methodology as appropriate.

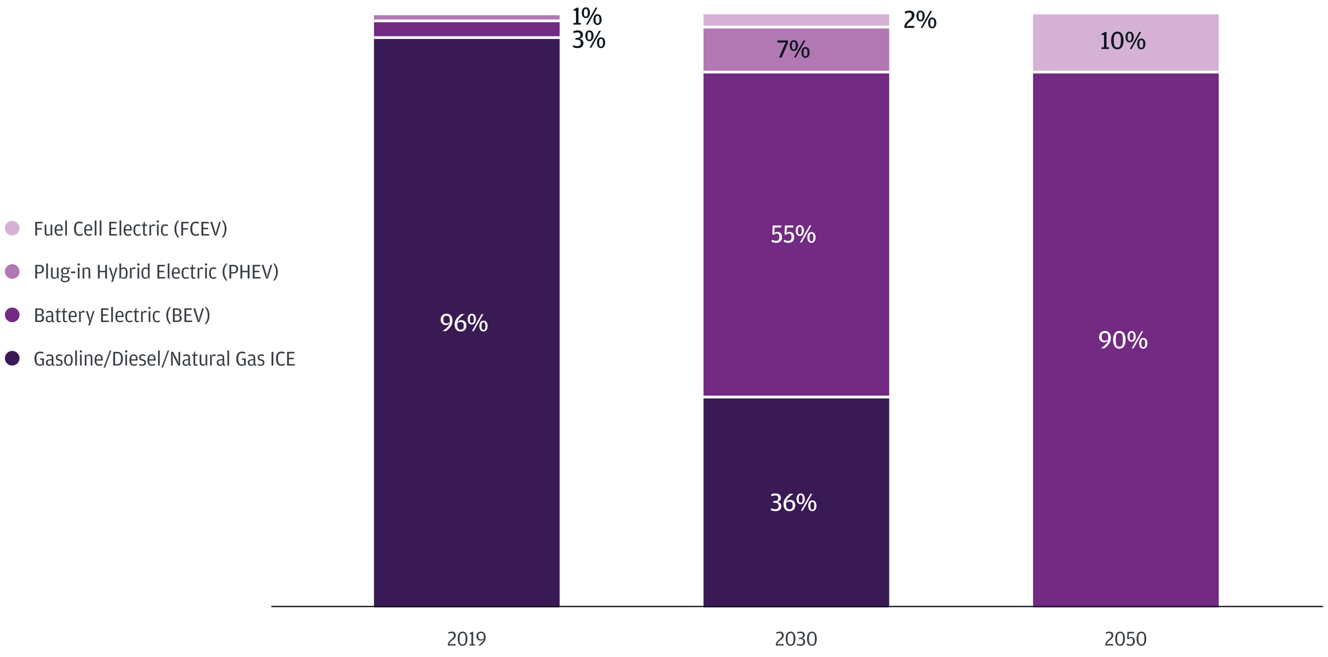
3.4 Auto Manufacturing

According to the IEA, transportation accounts for more than a third of CO_2 emissions from end use sectors, with a majority contributed by road vehicles. Although automotive efficiency continues to improve, both global sales and driving activity have rebounded following the COVID-19 pandemic, while buyers in many markets have continued to shift toward larger, heavier vehicles such as SUVs — trends that have helped contribute to increased emissions in recent years. Despite rising sales of electric vehicles (EVs) globally, the IEA notes the need for transport-related emissions to fall at an accelerated rate in order for the world to align with the NZE scenario pathway.[6]

Transition strategies for the automotive sector generally call for: (i) increased efficiency of internal combustion engine (ICE) vehicles; (ii) conversion of a significant portion of the fleet to EVs; (iii) further decarbonization of the electric grids that power EVs; and (iv) increased utilization and/or reduced per capita vehicle miles traveled through strategies including demand management and modal shift (e.g., from private to public transport).

Auto manufacturers contribute most directly to the first two strategies above. Namely, as sales of more efficient ICE vehicles and EVs increase, the average carbon intensity of the global fleet declines, indicating progress toward net zero emissions in terms of technology deployment. As illustrated by the figure below, the IEA NZE scenario projects a near-total replacement of ICE vehicle sales with EV sales by 2050.

Global Share of Total Passenger Vehicle Sales by Vehicle Type in the IEA NZE Scenario



Source: IEA Net Zero by 2050, IEA, Paris, May 2021

Note: Values for 2019 are estimates based on CAGR between 2010 and 2020

The transition to EVs has been spurred by numerous factors including regulation, tax incentives, technological advances and competition — all of which have contributed to increasing consumer interest and acceptance. Yet, even as these forces strengthen, shifting the course of the entire global auto industry remains a significant undertaking. New and further investments in technology, manufacturing, infrastructure and services are required and must coincide with equally massive transitions in other parts of the

6 IEA (2023), Tracking Clean Energy Progress 2023, IEA, Paris

economy — including in the Electric Power and Oil & Gas sectors — to achieve net zero emissions by 2050. This is a key reason why Auto Manufacturing was among the first sectors we set targets for, and why we are supporting in-scope clients as they continue to develop and implement their transition strategies.

3.4.1 Key Decisions

To assess net zero alignment of JPMorgan Chase's Auto Manufacturing portfolio, we evaluate the carbon intensity of global sales of new passenger cars and U.S. sales of light trucks (e.g., SUVs, vans, pickups). Both manufacturing emissions (Scope 1 and 2) and emissions from the end use of vehicles (Scope 3) are included.

The benchmark emissions trajectory for the sector was obtained using the sector-specific emissions and activity pathways in the IEA NZE scenario. Although the scenario focuses on fleet emissions, we can reasonably extrapolate the rate of change to apply to tailpipe emissions from new vehicle sales and manufacturing, enabling us to determine an emissions trajectory that is compatible with our chosen metric.

With this update, we are switching the basis for deriving Scope 3 emissions from the New European Driving Cycle (NEDC) to the Worldwide Harmonized Light Vehicle Test Procedure (WLTP), in an effort to better reflect real-world emissions of passenger vehicles. From this, we derived a 2030 a target of 86.1 g CO_2e / km, representing a 48% reduction from our revised 2019 baseline of 164.8 g CO_2e / km.

Sector Portfolio Target Summary – Auto Manufacturing

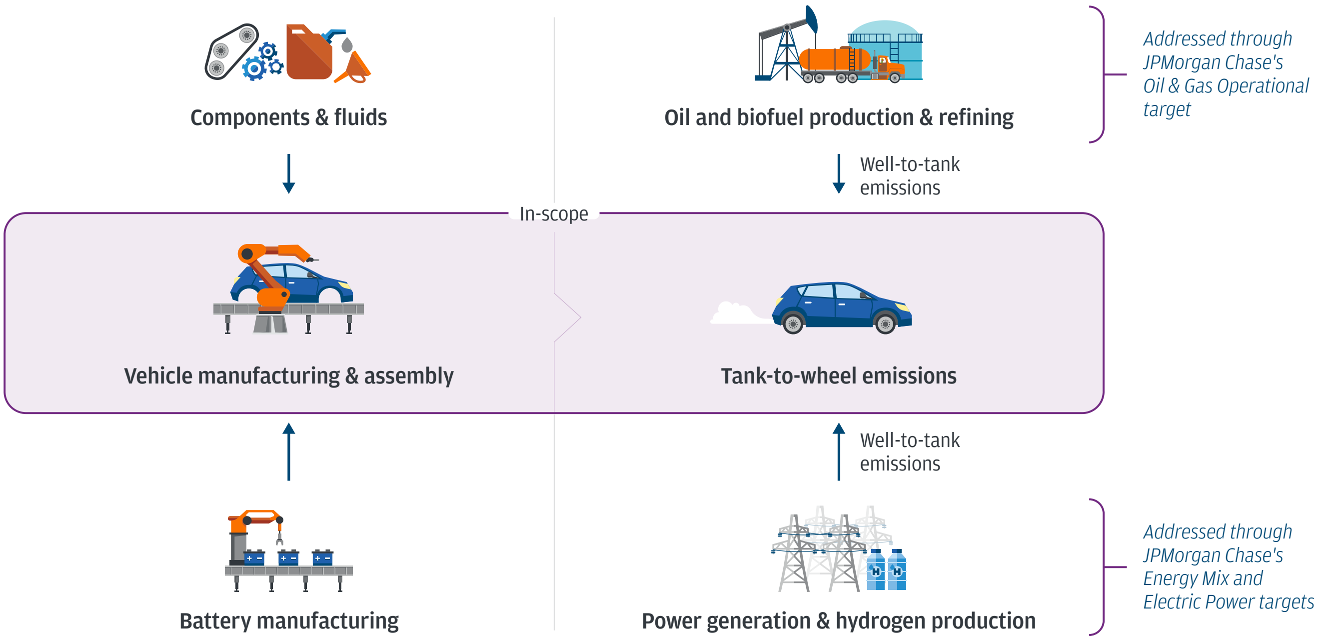
Activity Focus	Manufacturing of global passenger cars and U.S. light trucks
Scope	Scope 1 and 2 GHG emissions from manufacturing Scope 3 end use "tank-to-wheel" emissions from fuel combustion, based on the Worldwide Harmonized Light Vehicle Test Procedure (WLTP)
Metric	g CO_2e / km
Scenario	IEA NZE
2030 Target	86.1 g CO_2e / km
Data Sources	Transition Pathway Initiative (TPI), National Highway Transportation Safety Administration (NHTSA), S&P Global Market Intelligence, S&P Global Trucost

3.4.2 Methodology Detail

3.4.2.1 BOUNDARIES

The Auto Manufacturing sector methodology includes "tank-to-wheel" (i.e., tailpipe) emissions from vehicle use (Scope 3 — end use) and emissions from manufacturing (Scope 1 and 2). To evaluate companies' performance, we focus on emissions associated with global sales of new passenger cars and U.S. sales of light trucks (SUVs, vans, pickups). We include U.S. light trucks because they account for the majority of total U.S. passenger vehicle sales, and because of differences in how they are regulated in the U.S. versus other global markets (i.e., as passenger versus commercial vehicles).

Auto Manufacturing Sector Boundary



The focus on end use emissions from companies' new passenger vehicle sales reflects that these represent the largest share of the sector's overall emissions. We do not currently include emissions from the production and delivery of the energy used by vehicles (Scope 3 – fuel production). This omission keeps our methodology focused on the vehicles that client companies are producing, while also reflecting that Carbon Compass℠ separately covers the Oil & Gas and Electric Power sectors, which provide fuel for ICEs and EVs, respectively.

We also do not currently include emissions "embedded" in parts and materials that manufacturers purchase from third parties (Scope 3 – supply chain). However, we recognize that embedded manufacturing emissions are material to comprehensive assessment of the Auto Manufacturing sector's net zero alignment, especially as EVs – whose supply chain emissions are materially higher than those for ICEs, primarily due to battery production – make up a growing share of total sales. To address this gap, when evaluating individual auto companies, we will collect and qualitatively analyze manufacturer data on supply chain plans and goals, particularly as they relate to efforts toward reducing emissions from battery manufacturing. We will also continue to evaluate how we might include supply chain emissions in the future, as the required data becomes available.

3.4.2.2 METRIC

The emissions intensity of JPMorgan Chase's Auto Manufacturing sector portfolio is evaluated using the metric grams of CO_2 equivalent emissions per kilometer for new cars sold, assuming 150,000 km of vehicle life – equivalent to approximately 11 years of driving, measured on a global average basis.

$$\frac{\text{Scope 1 \& 2 Emissions from Manufacturing - Credits (g } CO_2e)}{\text{Lifetime Kilometers of New Global Cars and U.S. Light Trucks (km)}} + \text{TTW Emissions of Global Cars and U.S. Light Trucks (g } CO_2/\text{km)}$$

The use of an intensity-based metric is effective for capturing variations in the strategic and operational characteristics of different clients and provides the most flexible means of tracking progress on the sector's two key strategies for decarbonization: rising efficiency of ICE vehicles and increasing adoption of EVs. It also allows for more consistent tracking and comparison to support taking emissions into account as part of our financing decisions.

3.4.2.3 SCENARIO AND TARGET

The benchmark trajectory for JPMorgan Chase's Auto Manufacturing sector methodology is based on the sector-specific projections of tailpipe CO_2 emissions and passenger vehicle activity from the IEA NZE scenario.

Although the scenario focuses on fleet emissions, we can reasonably extrapolate the rate of change to apply to tailpipe emissions from new vehicle sales and manufacturing to derive our 2030 target.

Using this approach, we have established a 2030 Auto Manufacturing sector portfolio intensity target of 86.1 g CO_2e / km, representing a 48% reduction from our 2019 baseline of 164.8 g CO_2e / km.

3.4.2.4 DATA SOURCES AND CONSIDERATIONS

To calculate the carbon intensity of companies in JPMorgan Chase's Auto Manufacturing sector portfolio, we use the approach developed by the Transition Pathway Initiative (TPI) for deriving g CO_2 / km from reported average miles per gallon (MPG) aligned to the WLTP, with minor modifications to include U.S. light truck sales and Scope 1 and 2 manufacturing emissions.

We estimate the carbon intensity for U.S. light trucks using TPI's methodology and the company's average fuel economy for light trucks reported by the National Highway Transportation Safety Administration (NHTSA). This is combined with the company's TPI-reported value for global cars on a sales-weighted basis. Finally, Scope 1 and 2 emissions, amortized over the expected life of manufactured vehicles, are added to Scope 3 intensity to derive the company's combined g CO_2e / km value. If certain data required for the metric calculation are unavailable, we use a conservative proxy value equivalent to the 75th percentile of the available data for other portfolio companies.

Finally, it should be noted that calculations for clients in our Auto Manufacturing sector portfolio will generally be subject to a two- to three-year data lag. This is due to a significant lag in reporting of certified model year fuel economy and sales values due to typically long sales cycles (i.e., up to 22 months spanning three calendar years) for individual model years in the U.S. To account for this delay, in select instances, we make extrapolations based on past performance that will be restated when verified data is published.

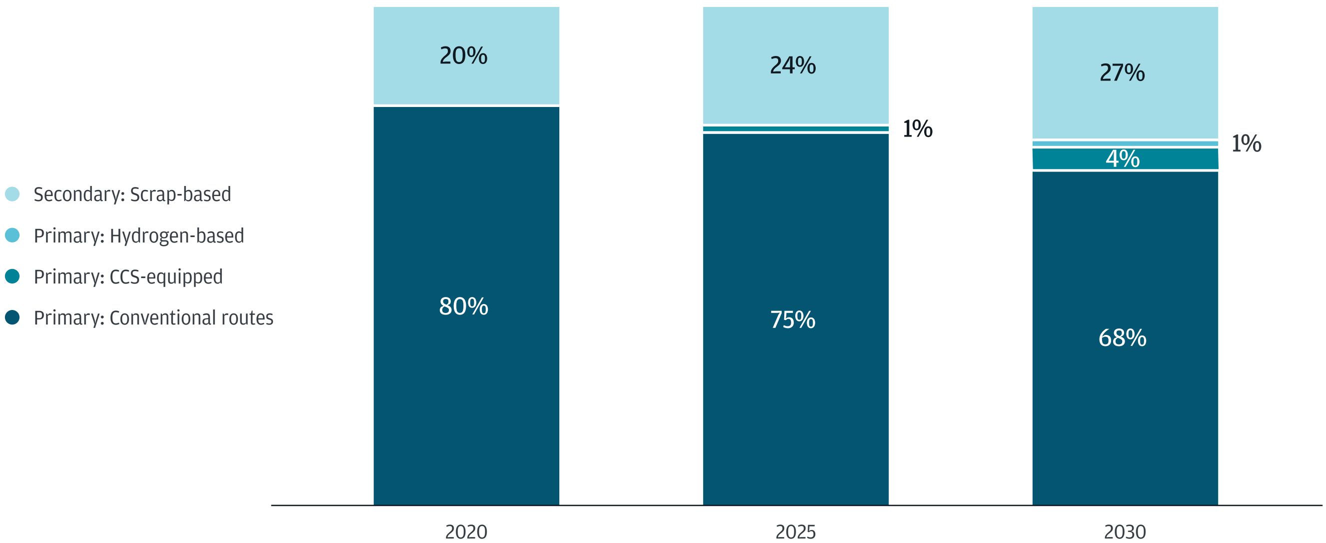
3.5 Iron & Steel

The Iron & Steel sector's direct and indirect CO_2 emissions account for approximately 10% of global emissions, making it the highest emitting of the heavy industrial sectors.[7] This is mostly due to its heavy reliance on metallurgical coal, which is converted into coke and used to generate heat and strip oxygen from the iron ore. The industry is considered hard-to-abate given the climate challenge associated with the likelihood of continued growth in global steel demand – driven in part by infrastructure needs related to the wider low-carbon transition – and the overall capital intensity and long useful life of its existing production assets.

Decarbonization pathways for the sector include electrification, increasing scrap recycling, using lower-carbon energy inputs such as biomass or hydrogen, and deploying CCS/CCUS technologies to reduce direct CO_2 emissions. In particular, modifying or replacing the traditional blast furnace/basic oxygen furnace (BF-BOF) production route is necessary to reduce dependence on coal and enable the use of other sources of energy. Lower-carbon alternatives that are currently available include biomass-based BF-BOF, electric arc furnace (EAF) and/or natural gas-based direct-reduced iron (NG DRI) processes, while longer-term options such as blue or green hydrogen-based DRI may help drive much deeper decarbonization in the future.

Although several promising technologies are on the horizon, more will need to be done to drive the scale necessary for the sector to fully align with a path to net zero emissions by 2050.

Steel Production by Share of Process Routes in the IEA NZE Scenario



Source: IEA Net Zero by 2050, IEA, Paris, May 2021

Note: Values for 2020 are IEA estimates

3.5.1 Key Decisions

Our target for the Iron & Steel sector focuses on the intensity of Scope 1 and 2 GHG emissions associated with crude steel production, in order to capture emissions and activity from both primary and secondary steelmaking processes.

We obtained a net zero-aligned carbon intensity trajectory for the sector using the IEA NZE scenario, adjusted to include Scope 2 emissions from electricity consumption. From this we derived a 2030 target of 0.981 t CO_2e / t crude steel, representing a 30% reduction from our 2020 portfolio baseline of 1.412 t CO_2e / t crude steel.

[7] IEA (2020), Iron and Steel Technology Roadmap, IEA, Paris

Sector Portfolio Target Summary – Iron & Steel

Activity Focus	Iron and steel manufacturing
Scope	Scope 1 and 2 CO_2e — including both energy-related and process emissions — from production of primary and secondary crude steel
Metric	t CO_2e / t crude steel
Scenario	IEA NZE, adjusted to include Scope 2 emissions
2030 Target	0.981 t CO_2e / t crude steel
Data Sources	CDP, S&P Global Trucost, World Steel Association (WSA), Wood Mackenzie, Global Energy Monitor Global Steel Plant Tracker, company disclosures

3.5.2 Methodology Detail

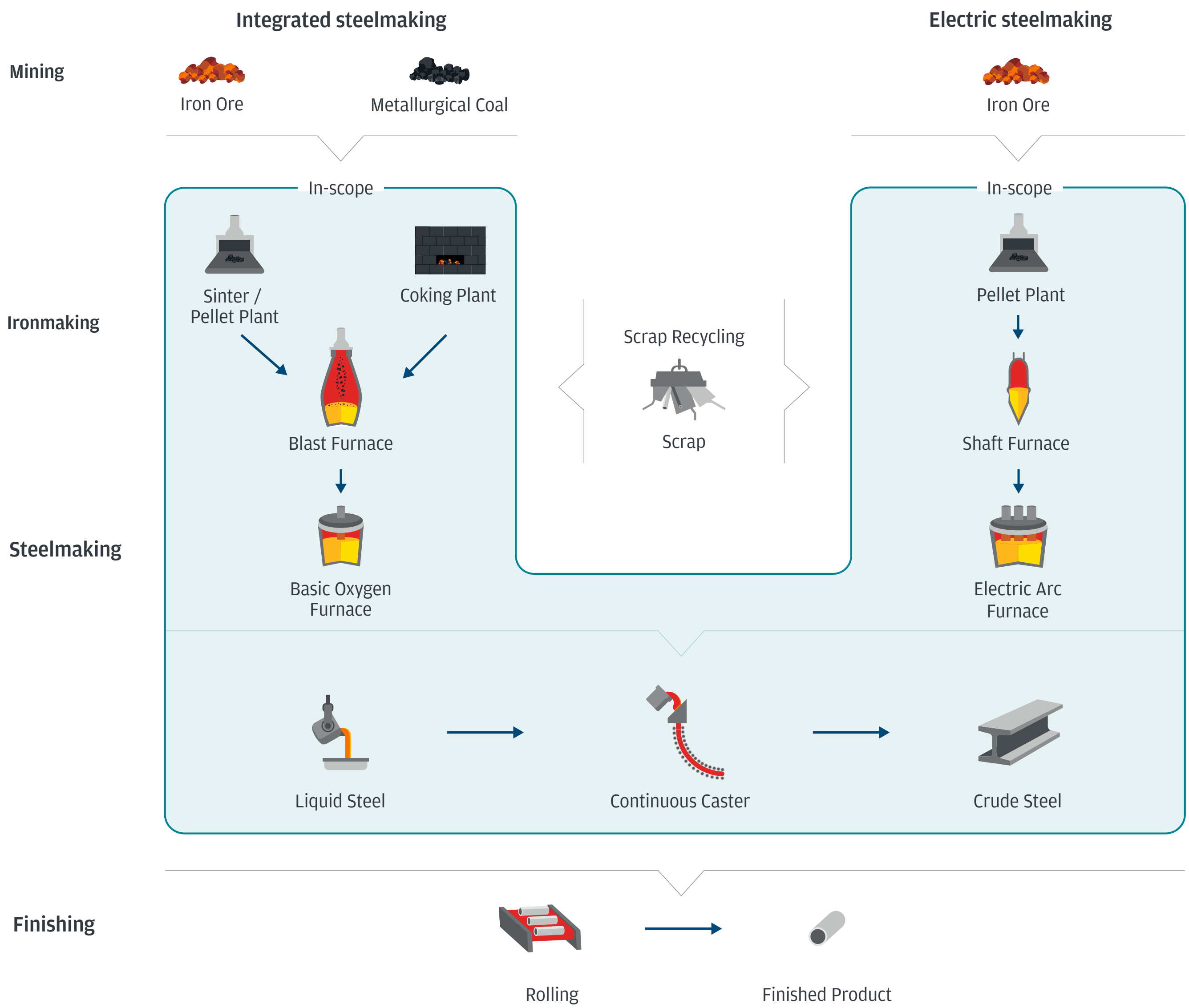
3.5.2.1 BOUNDARIES

Our methodology for the Iron & Steel sector includes Scope 1 and 2 GHG emissions associated with the production of crude steel, which refers to steel in its first solid state, when it is cast after leaving the final furnace. Scope 1 includes direct energy-related emissions from fuel combustion (including any on-site electricity generation) and process emissions from iron ore reduction, the use of lime fluxes, ferroalloy production, carbon-containing electrodes, calcination of carbonates and consumption of graphite anodes in EAFs. Scope 2 includes indirect emissions from grid-purchased electricity. While electricity-related emissions have not historically been very significant, they are included in recognition of the importance of EAFs to the sector's decarbonization pathway.

The activities we focus on include both primary and secondary steelmaking. This is consistent with the boundary used for the sector-specific modeling underlying IEA's NZE scenario. It is also estimated to account for the majority of total value chain emissions for the sector.

Scope 3 emissions, which are primarily driven by iron ore extraction and transport, account for a negligible portion of total emissions and are therefore excluded.

Iron & Steel Sector Boundary



3.5.2.2 METRIC

The emissions intensity of JPMorgan Chase's Iron & Steel sector portfolio is evaluated using the metric tons CO_2e per metric ton of crude steel produced.

$$\frac{\text{Scope 1 + 2 Emissions from Primary and Secondary Production - Credits (t } CO_2e\text{)}}{\text{Crude Steel Production (t)}}$$

An intensity-based metric is effective for its ability to capture wide variation in the emissions profiles of different steelmaking processes, and because reduction in carbon intensity of such processes – rather than a material reduction in steel demand – is expected to be the primary driver of decarbonization for the sector. It also allows for more consistent tracking and comparison to support taking emissions into account as part of our financing decisions.

3.5.2.3 SCENARIO AND TARGET

The benchmark trajectory for the sector is based on sector-specific projections of CO_2 emissions and production from the IEA NZE scenario. Because IEA NZE only projects Scope 1 emissions for the sector, we use the scenario's energy demand inputs to allow for Scope 2 emissions inclusion.

Although our metric includes non-CO_2 emissions — because they are commonly included in reporting for this sector — IEA's scenario projections are for CO_2 emissions only. However, since the sector's non-CO_2 emissions are relatively insignificant, further adjustments to the IEA trajectory are not necessary.

We have derived a net zero-aligned target by converging to the scenario's 2050 emissions projection for the sector and interpolating the corresponding carbon intensity in 2030, similar to the criteria in the Science Based Targets initiative's (SBTi) Sectoral Decarbonization Approach (SDA). This results in a target of 0.981 t CO_2e / t crude steel, representing a 30% reduction from our 2020 portfolio baseline of 1.412 t CO_2e / t crude steel.

3.5.2.4 DATA SOURCES AND CONSIDERATIONS

To calculate the carbon intensity of companies in JPMorgan Chase's Iron & Steel sector portfolio, we use Scope 1 and 2 emissions data from CDP and S&P Trucost and production data from CDP, the World Steel Association (WSA) and Wood Mackenzie. Where production data is unavailable, we use capacity data sourced from the Global Energy Monitor Global Steel Plant Tracker to derive an estimate of annual production. If emissions data is unavailable, we calculate estimates using average utilization and emissions factors for the company's capacity of each of the major production routes (BF-BOF, scrap-EAF, and NG DRI-EAF). If none of these methods are available, we use a conservative proxy value equivalent to the 75th percentile of the available data for other portfolio companies.

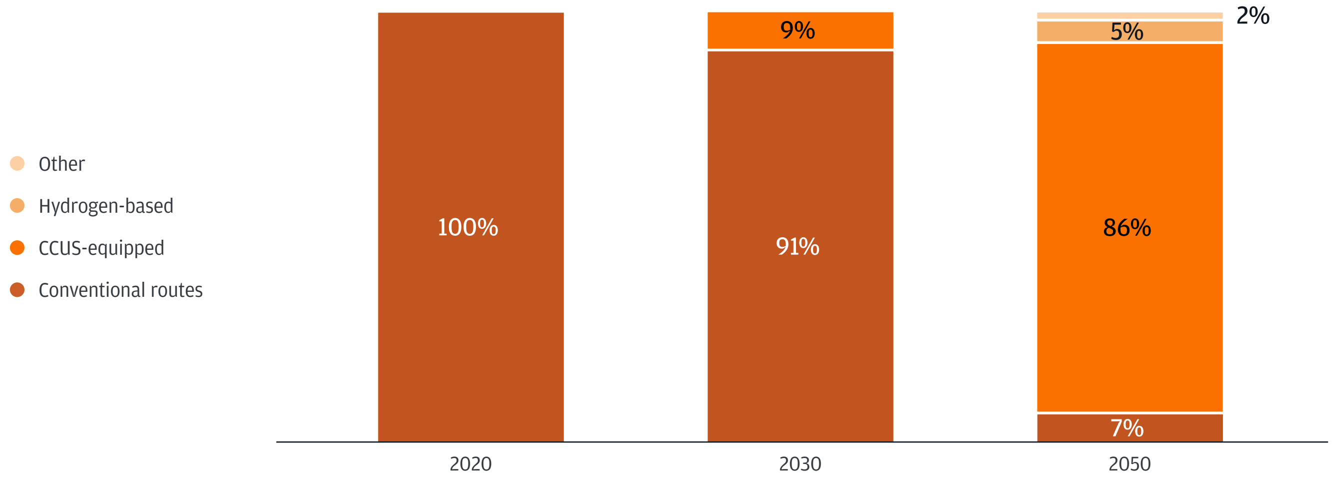
Moving forward, we will continue to monitor developments in the availability of data — especially those relevant to the evolving composition of our portfolio and the further development of sector decarbonization strategies — and consider updates to our methodology as appropriate.

3.6 Cement

The Cement sector is responsible for approximately 7% of global CO_2 emissions and a quarter of all industrial emissions.[8] Cement production is generally considered hard-to-abate due to its emissions resulting not just from energy consumption but also from the chemical process of calcination, an essential step in cement production that directly releases substantial quantities of CO_2.

Abatement strategies for the sector therefore include efforts to reduce reliance on clinker (the processed material that results from calcination) by using supplementary cementitious materials (SCMs) and other cement substitutes that partially replace cement to reduce its concentration in finished cement products. Replacing the use of fossil fuels to generate process heat is also a key lever for reducing emissions, with possibilities including the use of alternative fuels or electrification at different stages of the production process. However, these strategies alone will not be sufficient to align the sector with a path to achieving net zero emissions by 2050, so experts also see a long-term role for CCS/CCUS technologies, as well as efforts to reduce future demand, such as prolonging the life of buildings and infrastructure and scaling the use of alternative building materials and techniques.

Cement Production by Share of Process Routes in the IEA NZE Scenario



Source: IEA Net Zero by 2050, IEA, Paris, May 2021

The complexity and scale of many of these changes will necessitate work across the industry, supportive policy, and long-term capital investments, particularly in emerging economies where the majority of future demand and production are expected to be concentrated.

3.6.1 Key Decisions

To assess net zero alignment of JPMorgan Chase's Cement sector portfolio, we evaluate the intensity of Scope 1 and 2 GHG emissions from cement manufacturing. We calculate intensity using the production metric of cementitious product, as this captures both the primary driver of emissions (clinker production) and potential levers for reducing them, including the use of SCMs and other cement substitutes.

The benchmark trajectory was obtained from the sector-specific emissions and activity pathways in the IEA NZE scenario. From this we derived a 2030 target of 460.0 kg CO_2e / t cementitious product, representing a 28% reduction from our 2020 portfolio baseline of 639.9 kg CO_2e / t cementitious product.

[8] IEA (2020), Energy Technology Perspectives 2020, IEA, Paris

Sector Portfolio Target Summary – Cement

Activity Focus	Cement manufacturing
Scope	Scope 1 and 2 CO_2e – including both process and energy-related emissions – from production of cement
Metric	kg CO_2e / t cementitious product
Scenario	IEA NZE, adjusted to include Scope 2 emissions and align with use of cementitious product metric
2030 Target	460.0 kg CO_2e / t cementitious product
Data Sources	CDP, S&P Global Trucost, Global Cement and Concrete Association (GCCA), company disclosures

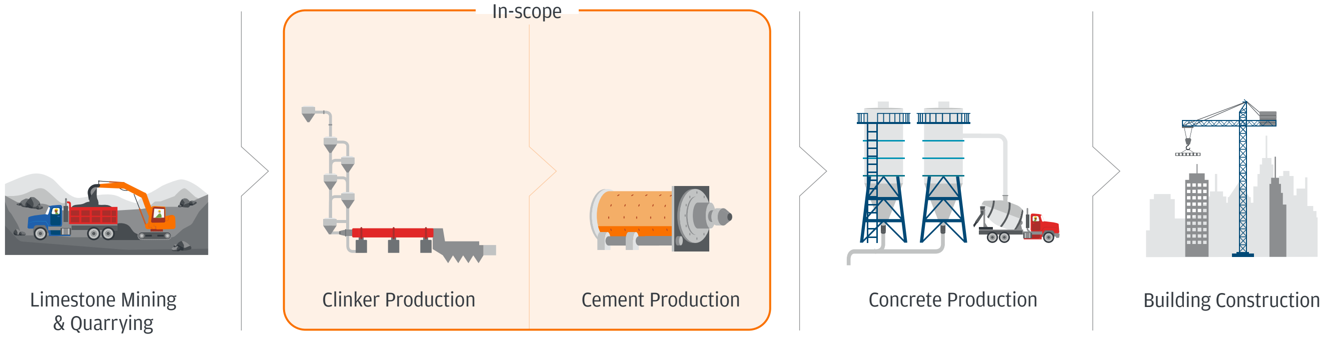
3.6.2 Methodology Detail

3.6.2.1 BOUNDARIES

The Cement sector methodology includes Scope 1 and 2 CO_2 emissions associated with manufacturing of cementitious product. Cementitious product refers to all clinker produced by the client company for the purposes of making cement or direct clinker sale, plus gypsum, limestone, cement kiln dust, all clinker substitutes consumed for blending and all cement substitutes, and excluding clinker bought from third parties.

Scope 1 includes emissions from both the combustion of fuels and the decomposition of limestone in the clinker production process. Scope 2 includes emissions associated with electricity purchased for production uses, such as for cement grinders or other equipment. Together, these account for approximately 96% of total lifecycle emissions for the sector. While Scope 2 emissions are relatively small in comparison to Scope 1, we include them for several reasons: (i) they are well represented in the available data and projections for the sector; (ii) many cement companies include them in their decarbonization strategies and targets; and (iii) excluding them would require complex adjustments to company emissions data, since some generate power on-site (resulting in Scope 1 emissions) while others purchase it from utilities (resulting in Scope 2 emissions).

Cement Sector Boundary



Scope 3 emissions from mining and quarrying, processing, transport, and logistics are estimated to account for just 4% of total emissions and are therefore excluded.[9] Some companies have integrated operations, meaning that certain upstream or downstream

9 McKinsey & Company (2020), Laying the foundation for zero-carbon cement

activities may also contribute to their Scope 1 and 2 emissions. However, since these activities are not a significant driver of overall emissions, no adjustments to company emissions totals are made. Scope 3 emissions from purchased cement and clinker can be significant for some companies but are excluded due to lack of consistent reporting, and because they are already included in Scope 1 and 2 emissions of clinker producers when taking a global perspective.

3.6.2.2 METRIC

The emissions intensity of JPMorgan Chase's Cement sector portfolio is evaluated using kilograms of CO_2 per metric ton of cementitious product produced.

$$\frac{\text{Scope 1 + 2 Emissions - Credits (kg } CO_2e)}{\text{Cementitious Product (t)}}$$

Similar to our approach for other sectors, the use of an intensity-based metric is effective for capturing variations in the strategic and operational characteristics of different clients and providing insight into the full range of decarbonization strategies being deployed in the sector. It also allows for more consistent tracking and comparison to support taking emissions into account as part of our financing decisions.

The production metric — cementitious product — refers to all clinker produced by the client company for the purposes of making cement or direct clinker sale, plus gypsum, limestone, cement kiln dust, all clinker substitutes consumed for blending and all cement substitutes, and excluding clinker bought from third parties. Use of cementitious product is specified by GHG Protocol's CO_2 Accounting and Reporting Standard for the Cement Industry and Global Cement and Concrete Association's (GCCA) Sustainability Guidelines for the monitoring and reporting of CO_2 emissions from cement manufacturing, which guides how companies report their data and is also recommended by TPI and SBTi.

3.6.2.3 SCENARIO AND TARGET

The benchmark trajectory for our Cement sector methodology is based on the sector-specific projections of CO_2 emissions, energy use and production volumes from the IEA NZE scenario. Since production data in the scenario is expressed as metric tons of cement rather than cementitious product, we perform a conversion using a factor derived by TPI from data compiled by GCCA.[10]

Although our metric includes non-CO_2 emissions — because they are commonly included in reporting for this sector — IEA's scenario projections are for CO_2 emissions only. However, since the sector's non-CO_2 emissions are relatively insignificant, further adjustments to the IEA trajectory are not necessary. Using the resulting trajectory, we have calculated a net zero-aligned, carbon intensity target for 2030 of 460.0 kg CO_2e / t cementitious product, representing a 28% reduction from our 2020 baseline of 639.9 kg CO_2e / t cementitious product.

3.6.2.4 DATA SOURCES AND CONSIDERATIONS

To calculate the carbon intensity of companies in JPMorgan Chase's Cement sector portfolio, we use Scope 1 and 2 emissions data sourced from CDP and S&P Trucost and production data reported by companies. If neither cementitious nor cement production data are available, we may use as an alternative company-reported input, such as clinker production, cement capacity or clinker capacity, to derive cementitious product. If none of these methods are available, we use a conservative proxy value equivalent to the 75th percentile of the available data for other portfolio companies.

Moving forward, we will continue to monitor developments in the availability of data — especially those relevant to the evolving composition of our portfolio and the further development of sector decarbonization strategies — and consider updates to our methodology as appropriate.

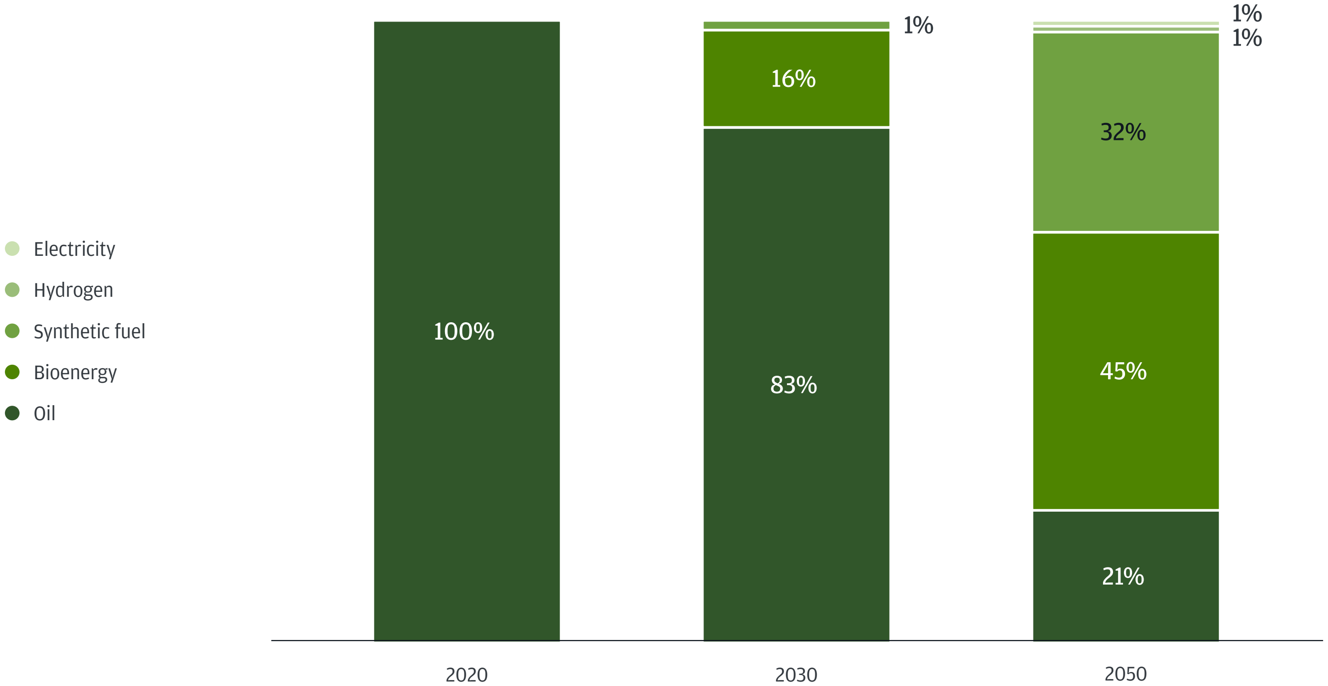
[10] GCCA (2019), Cement Industry Energy and CO_2 Performance: Getting the Numbers Right (GNR)

3.7 Aviation

The Aviation sector currently accounts for over 2% of global CO_2 emissions, mainly from commercial airline operations.[11] It is considered a hard-to-abate sector because of the significant technical barriers to replacing fossil fuels in its operations and the high cost of solutions such as sustainable aviation fuels (SAF) and fleet replacement. Options for decarbonization are also constrained by challenging industry economics, which have been amplified by recent events including the COVID-19 pandemic and energy market disruptions resulting from the war in Ukraine.

To date, the industry has made progress primarily through fleet modernization, with newer engine technologies, lighter materials, improved aerodynamics and other factors contributing to a more than 50% reduction in emissions per passenger kilometer since 1990.[12] Higher passenger load factors (i.e., increasing the utilization of aircraft space, especially relative to fuel consumption) and operational improvements have also contributed to a reduction in emissions intensity. Looking forward, though, deeper decarbonization of the sector will require significantly scaling the adoption of SAF and other low-carbon technologies, such as electric and hydrogen-fueled propulsion systems.

Aviation Energy Consumption by Fuel in the IEA NZE Scenario



Source: IEA Net Zero by 2050, IEA, Paris, May 2021

Bringing each of these options to scale will require significant investment and collaboration both within and beyond the airline industry. In particular, rapidly reducing costs and scaling both production and distribution of SAF are key priorities requiring action by multiple stakeholders, including airlines, aircraft and engine manufacturers, lessors, governments, energy companies, the agricultural sector and others.

[11] IEA (2022), Aviation Tracking Report, IEA, Paris
[12] IATA (2019), Fuel Fact Sheet

3.7.1 Key Decisions

To assess net zero alignment of JPMorgan Chase's Aviation sector portfolio, we evaluate the intensity of direct (Scope 1) CO_2 emissions for revenue-generating passenger service and belly freight operations of airline companies, specifically from the combustion of fuels during flight — also referred to as tank-to-wake (TTW) emissions.

We determined a net zero-aligned carbon intensity trajectory for the sector using emissions data from the IEA NZE scenario, adjusted to exclude emissions from dedicated air freight, along with detailed global flight activity data from the International Air Transport Association (IATA). From this we derived a 2030 target of 625.0 g CO_2 / RTK, representing a 36% reduction from our 2021 baseline of 972.6 g CO_2 / RTK.

Sector Portfolio Target Summary – Aviation

Activity Focus	Scheduled passenger service and belly freight by airline companies
Scope	Scope 1 tank-to-wake (TTW) CO_2 emissions from flights
Metric	g CO_2 / revenue tonne kilometer (RTK)
Scenario	IEA NZE with an adjustment to exclude emissions for dedicated air freight
2030 Target	625.0 g CO_2 / RTK
Data Sources	Platform for Analyzing Carbon Emissions (PACE), International Civil Aviation Organization (ICAO), company disclosures

3.7.2 Methodology Detail

3.7.2.1 BOUNDARIES

Our Aviation sector methodology focuses on Scope 1 CO_2 emissions from revenue-generating passenger service and belly freight operations of airline companies. We chose this focus because Scope 1 emissions from flights currently represent more than 98% of airlines' operational emissions, on average, and passengers and belly freight account for the bulk of the sector's activity.[13]

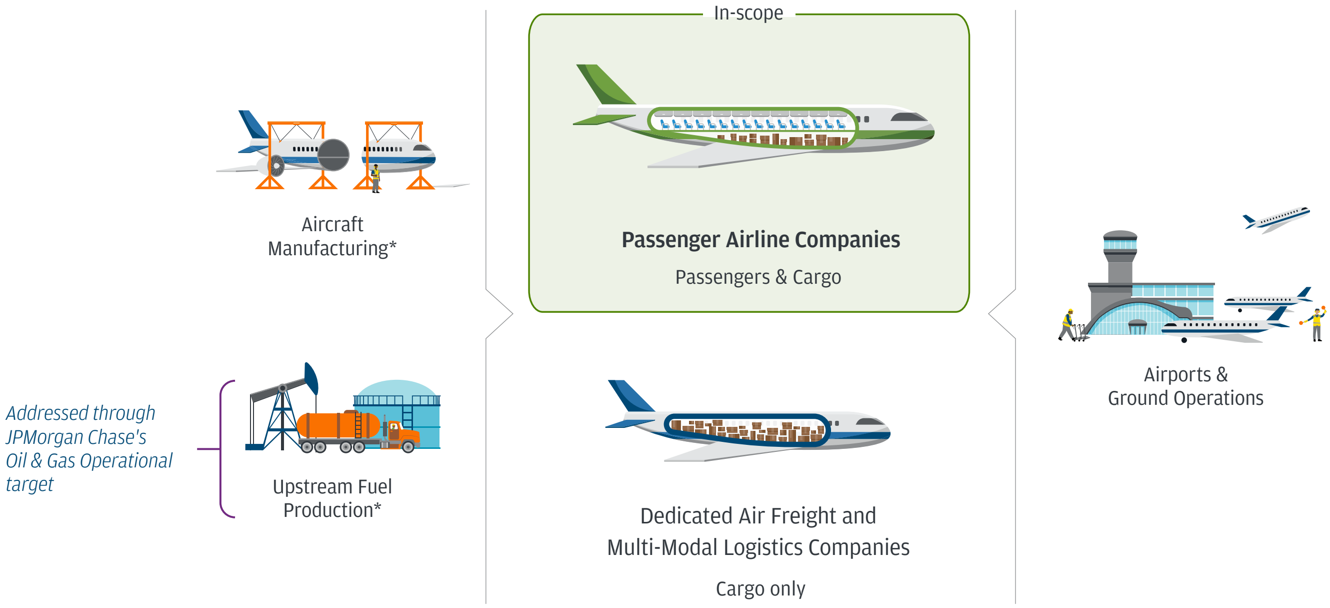
Dedicated air freight and multi-modal logistics companies also play an important role in the sector but are currently not in scope for our target. This is because they represent only a marginal share of total emissions, and also due to challenges with data availability, most notably for distinguishing the share of activity and emissions attributable to aviation compared to other forms of transport used by multi-modal logistics companies.

For our Aviation sector target, we currently focus on Scope 1 emissions from flights, or tank-to-wake (TTW) emissions, resulting primarily from the combustion of jet fuel. A potential well-to-wake (WTW) scope was also considered, in order to capture upstream (Scope 3) emissions associated with fuel production, which are especially important to understanding the impact of SAF. However, upstream emissions for fossil-based jet fuel are already covered by our Oil & Gas Operational target, and SAF volumes are currently too low to have a significant impact on the overall emissions picture, so these emissions are currently not included as in-scope for our target. Moving forward, we will continue to monitor market practices and data availability for assessing the SAF value chain with the intention of incorporating relevant emissions in our target in the future.

[13] U.S. Federal Aviation Administration (FAA)(2021), 2021 Aviation Climate Action Plan, FAA, Washington, D.C.

Although our sector boundary only includes direct emissions from flights, it is important to note that airlines' ability to reduce them is dependent on the actions of other stakeholders, both within and beyond the broader Aviation sector. Key future actions include further improvements in engine efficiency, new types of aircraft and propulsion systems, innovative financing structures, and new policies and incentives to support industry-wide action. Efforts are also needed to help further scale the production, deployment and accessibility of SAF, which is expected to be the most important lever for decarbonizing the sector in the near-to-medium term. While we aim to work closely with airlines to advance all of the above, it is equally important for us to engage with other relevant clients – such as engine and aircraft manufacturers, lessors, agricultural producers and others – on their role in enabling transition for this sector.

Aviation Sector Boundary



* Out-of-scope but included in JPMC's engagement efforts with relevant clients

In addition to CO_2 emissions from flights, we also recognize the importance of non-CO_2 effects, specifically emissions of other aerosol particles which may increase the sector's overall climate impact. However, these effects are not currently included in our approach, as there is not yet a clear consensus on how they should be accounted for. This is also consistent with IEA's current methodology for projecting Aviation sector emissions, which includes only end use CO_2 emissions from jet fuel combustion, as well as with the SBTi's Aviation tool. We intend to reevaluate this approach as more information and guidance become available.

3.7.2.2 METRIC

We measure the emissions intensity of Aviation sector clients using the metric g CO_2 / revenue tonne kilometer (RTK), with RTK reflecting the combination of revenue passenger kilometers (RPK) and freight tonne kilometers (FTK).

$$\frac{\text{Scope 1 TTW Emissions - Credits (g } CO_2\text{)}}{\text{Revenue Passenger Kilometers (RPK) + Freight Tonne Kilometers (FTK)}}$$

Similar to our approach in other sectors, an intensity-based metric is appropriate for capturing variations in clients' strategies and operations, and for gaining insight into a broad range of decarbonization options being pursued. While airlines commonly use the activity metric RPK, we have chosen RTK to capture both passenger and belly freight activity, recognizing that the latter accounted for a larger share of the industry's activity during the COVID-19 pandemic. We convert RPK to RTK using a conversion factor of 100 kg per passenger, which is consistent with guidance from SBTi and IATA, and is also used by several airlines in their own reporting.

3.7.2.3 SCENARIO AND TARGET

The benchmark trajectory for our Aviation portfolio is based on the IEA NZE scenario, which includes detailed projections of emissions and passenger activity through 2050. To improve alignment of our approach with the IEA methodology, emissions attributable to dedicated air freight activity are removed from IEA's total emissions projection.

Using the adjusted scenario projections, combined with detailed data on passenger and belly freight activity from IATA, we derived a 2030 target of 625.0 g CO_2 / RTK, which represents a 36% reduction from our 2021 baseline of 972.6 g CO_2 / RTK.

3.7.2.4 DATA SOURCES AND CONSIDERATIONS

To calculate the carbon intensity of companies in JPMorgan Chase's Aviation sector portfolio, we use detailed Scope 1 emissions data modeled by the Platform for Analyzing Carbon Emissions (PACE), powered by Fexco and Avocet, and historical passenger and belly freight activity data from the International Civil Aviation Organization (ICAO), supplemented by company-reported data where necessary.

We have chosen to use PACE's modeled flight emissions data to isolate emissions from flight activity. This enables us to exclude other Scope 1 emissions from ground operations and other ancillary non-aviation services (such as complementary road transport, bus operations, etc.), which most closely aligns to our choice of boundary. Furthermore, the use of modeled data by PACE standardizes the emissions calculation methodology for all our clients, improving comparability. Modeled aircraft-level data also provides greater client coverage and data transparency, which are central to effective engagement with our clients. Similarly, ICAO's detailed data on global flight activity provides a consistent and comprehensive reference for comparison of individual airlines' passenger and belly freight activities. In the event that data is unavailable or incomplete for a given company, we use a proxy value equivalent to the 75th percentile of the available data for other portfolio companies.

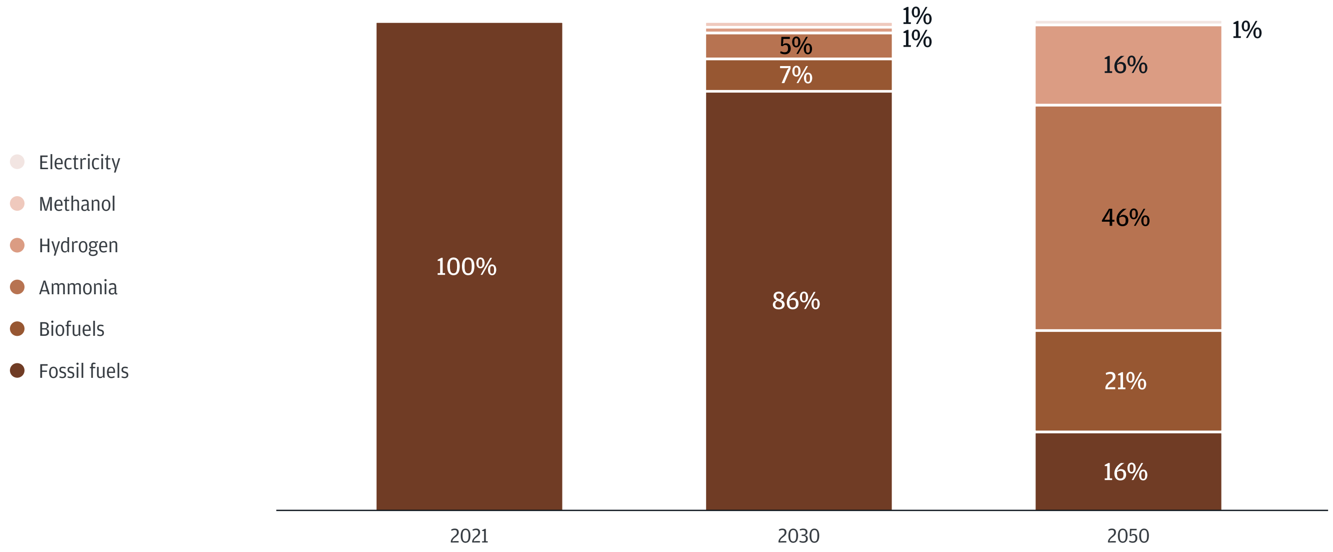
Moving forward, we will continue to monitor developments in the availability of data — especially those relevant to the evolving composition of our portfolio and the further development of sector decarbonization strategies — and consider updates to our methodology as appropriate. For the Aviation sector specifically, this will include monitoring available data and analytic techniques relating to the global warming impact of aircraft contrails, along with developments in the visibility of emissions originating in the SAF value chain.

3.8 Shipping

Maritime shipping plays a central role in global commerce, carrying an estimated 80% of trade by volume[14], including many of the products produced and/or relied upon by other sectors included in Carbon Compass[SM]. As a result of this scale, the Shipping sector is responsible for approximately 2% of global energy-related CO_2 emissions, driven primarily by fuel combustion in international shipping vessels used for freight transportation.[15] Although the sector's emissions declined considerably during the COVID-19 pandemic, they have since rebounded along with overall trade and could rise further as shipping volumes resume their long-term growth trajectory.

In the short term, meaningful reduction in CO_2 emissions from shipping can be made through efficiency measures, such as optimizing sailing speed optimization and improving logistics communication to enhance arrivals and departures through just-in-time sailing. Long-term decarbonization of the sector depends on transitioning from its current reliance on oil-based fuels to alternatives such as biofuels, hydrogen, ammonia and electricity. However, progress to date has been slow due to challenges with the availability, price and scalability of these technologies, as well as the substantial costs and complexities of replacing or retrofitting existing ships. In addition, the global nature of the industry and fragmentation of applicable policy and regulatory frameworks have made it difficult to coordinate and scale efforts across jurisdictions. The sector faces increasing pressure to accelerate its progress to align with net zero goals, beginning with stabilizing emissions before driving much deeper reductions over the medium to long term.

Global Energy Consumption for International Shipping in the IEA NZE Scenario



Source: IEA Net Zero by 2050, IEA, Paris, May 2021

Continued technological development, capital investment, international cooperation and harmonization with other sectoral decarbonization efforts are all seen as critical in the near term in order to achieve this goal.

3.8.1 Key Decisions

Our target for the Shipping sector focuses on the intensity of Scope 1 tank-to-wake (TTW) CO_2 emissions from the combustion of fuels by international maritime freight transportation vessels. We calculate intensity using the Energy Efficiency Operating Indicator (EEOI) developed by the International Maritime Organization (IMO), which captures both vessel design and operational levers for reducing emissions in the sector.

14 UNCTAD (2022), Review of Maritime Transport 2022, UNCTAD, Geneva
15 IEA (2023), Tracking Clean Energy Progress 2023, IEA, Paris

The benchmark emissions trajectory for the sector was obtained from the sector-specific emission and activity pathways in the IEA NZE scenario. This results in a 2030 target of 8.4 g CO_2 / tonne-nautical mile (nm), representing a 33% reduction from our 2021 portfolio baseline of 12.5 g CO_2 / t-nm.

Sector Portfolio Target Summary – Shipping

Activity Focus	International maritime freight transportation
Scope	Scope 1 tank-to-wake (TTW) CO_2 emissions from vessels
Metric	g CO_2 / tonne-nautical mile (nm)
Scenario	IEA NZE
2030 Target	8.4 g CO_2 / t-nm
Data Sources	Transition Pathway Initiative (TPI), CDP, S&P Global Trucost, company disclosures

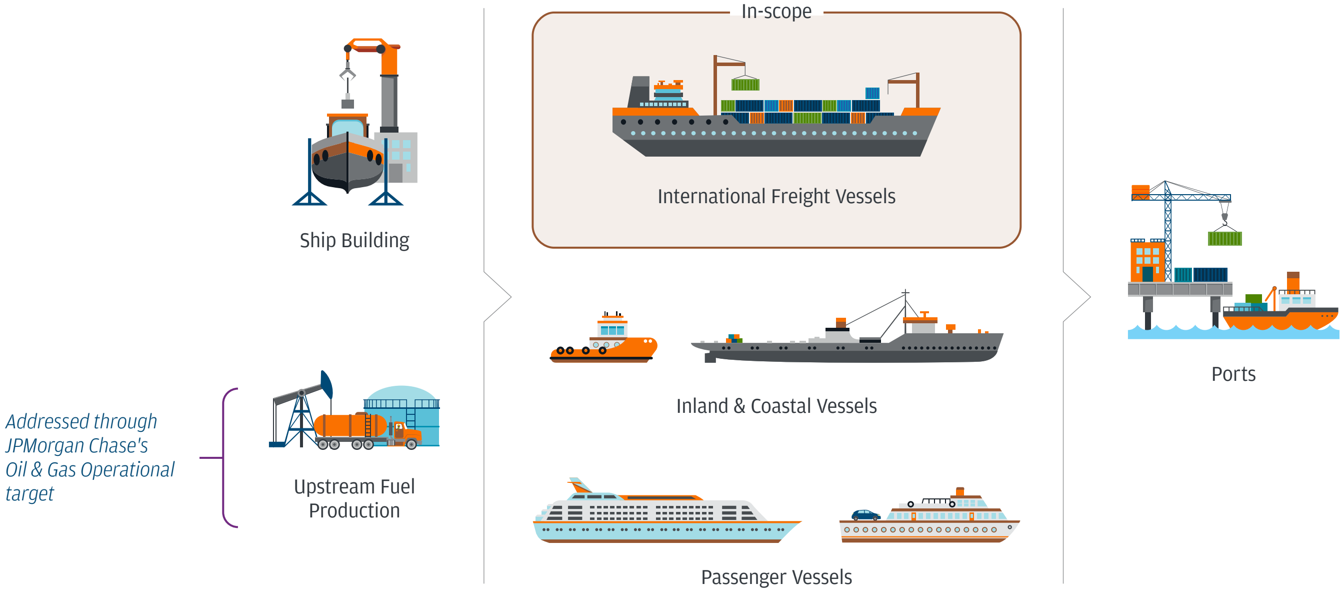
3.8.2 Methodology Detail

3.8.2.1 BOUNDARIES

Our Shipping sector methodology focuses on Scope 1 TTW CO_2 emissions from international shipping of freight. We chose this focus because Scope 1 emissions from international vessel operations currently represent more than 90% of the sector's emissions, on average, and freight shipping accounts for the bulk of its activity.[16]

We currently do not include passenger transport (for example, cruise ships) and domestic shipping activity (for example, coastal shipping between ports in the same country or inland waterway transport), due to their negligible contribution to the sector's emissions.

Shipping Sector Value Chain



[16] ICCT (2017), Greenhouse Gas Emissions from Global Shipping 2013-2015, ICCT, United States

We currently focus on Scope 1 TTW emissions, as this captures the industry's long-term need to transition from reliance on fossil fuels to low- or zero-carbon alternatives. We do not currently include emissions from the production and delivery of the energy used by vessels (Scope 3 — fuel production). This omission keeps the Shipping sector methodology focused on the direct fuel use of vessels, efficiency characteristics and operations of the vessels that clients own, while also reflecting that Carbon Compass[SM] already separately covers the Oil & Gas sector, which provides fuel for the global shipping industry. The methodology currently assumes no end use emissions from the use of biofuels, as any such emissions are generally offset by carbon storage benefits gained during the growing of feedstock.

In addition to CO_2 emissions from vessel operations, we also recognize the importance of non-CO_2 emissions such as black carbon, which may increase the sector's overall climate impact. However, these emissions are not currently included in our approach, as there is not yet a clear consensus on how they should be accounted for. This is also consistent with IEA's current methodology for projecting Shipping sector emissions, which includes only end use CO_2 emissions from fuel combustion, as well as with the SBTi's Maritime tool. We intend to reevaluate this approach as more information and guidance become available.

3.8.2.2 METRIC

The emissions intensity of JPMorgan Chase's Shipping sector portfolio is evaluated using the EEOI metric, which is represented in grams of CO_2 emissions per tonne-nautical mile traveled by international shipping vessels.

$$\frac{\text{Scope 1 TTW Emissions - Credits (g } CO_2\text{)}}{\text{Volume of freight transported (tonnes)} \times \text{Distance traveled (nautical miles)}}$$

Consistent with our approach in other sectors, an intensity-based metric is appropriate for capturing variations in clients' strategies and operations, and for gaining insight into the full range of decarbonization options being pursued. This includes tracking progress of the sector's two key levers for decarbonization: improving efficiency of new and existing vessels and substituting consumption of fossil fuels with low- or zero-carbon alternatives. It also allows for consistent tracking and comparison to support taking emissions into account as part of our financing decisions.

We considered alternative metrics such as: (i) Annual Efficiency Ratio (AER), which measures the ratio of a ship's carbon emissions per actual capacity distance; and (ii) Energy Efficiency Existing Index (EEXI) and Energy Efficiency Design Index (EEDI), which measure the energy efficiency based on technical design specifications of in-service and new vessels, respectively. We concluded that, compared to EEOI, these alternatives do not fully capture the various levers that clients are focused on, which limits our ability to fully engage with them on their decarbonization goals.

3.8.2.3 SCENARIO AND TARGET

The benchmark trajectory for our Shipping portfolio is based on the IEA NZE scenario, which includes detailed projections of emissions and maritime activity through 2050. Despite the exclusion of passenger and domestic freight activity from our boundary, we have not made any adjustments to the scenario's emissions and activity projections as they are assessed to have non-material impact.

Using the scenario projections, we derived a 2030 target of 8.4 g CO_2 / t-nm, which represents a 33% reduction from our 2021 baseline of 12.5 g CO_2 / t-nm.

3.8.2.4 DATA SOURCES AND CONSIDERATIONS

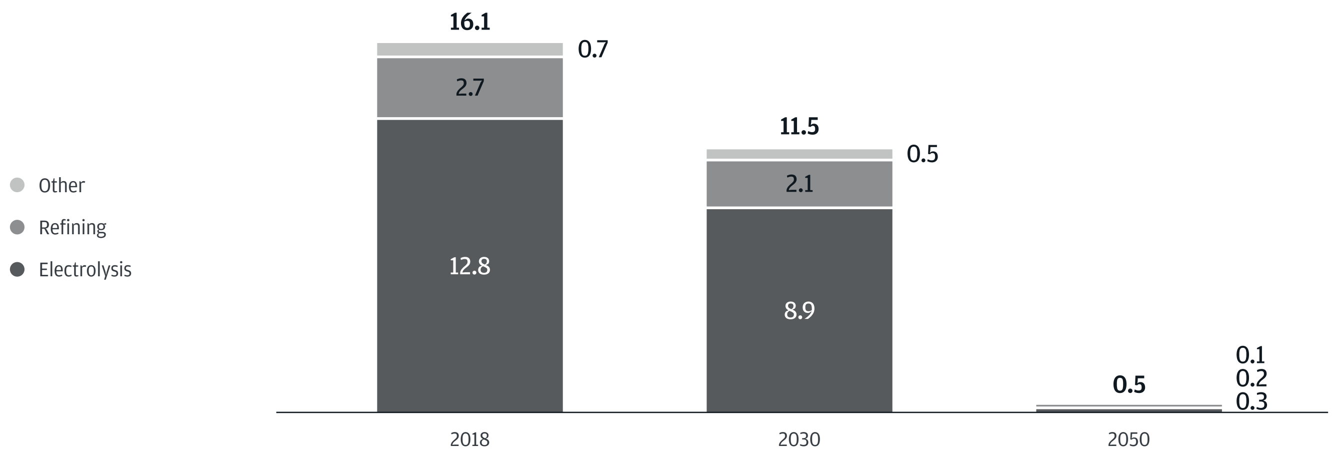
To calculate the carbon intensity of companies in JPMorgan Chase's Shipping sector portfolio, we use a combination of company-reported EEOI data and IMO's approach for converting g CO_2 / t-nm from company reported data when reported in Twenty-foot Equivalent Units (TEU) or Annual Efficiency Ratio (AER).

For companies that do not publicly disclose one of the above metrics and/or are not covered by TPI, we source emissions data from CDP, S&P Global Trucost, or company disclosures and activity data from company disclosures to estimate their carbon intensity. If certain data required for the metric calculation are unavailable, we use a conservative proxy value equivalent to the 75th percentile of the available data for other portfolio companies.

3.9 Aluminum

The Aluminum sector is responsible for approximately 3% of global direct industrial CO_2 emissions, driven primarily by energy used for the aluminum smelting process.[17] Although industry-wide carbon intensity has been declining moderately in recent years, increasing production has meant that overall emissions have continued to grow. Moreover, global demand for aluminum is expected to continue growing in light of rising population and GDP, as well as its importance to the overall low-carbon transition – for example, for lightweighting of motor vehicles or as an input to some renewable energy technologies – which further underscores the need for accelerated progress toward decarbonization.

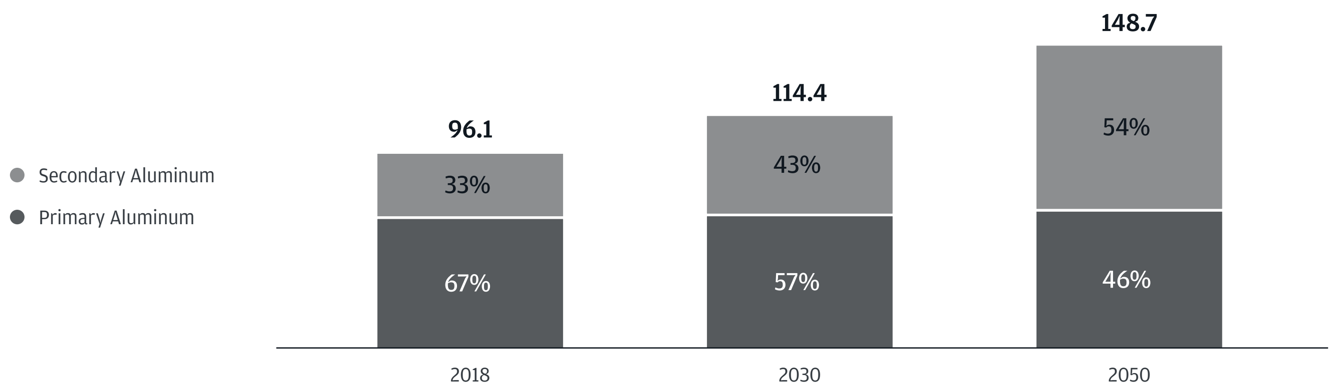
Global Emissions Intensity of Primary Aluminum Production in the IEA NZE Scenario (t CO_2e / t Aluminum)



Source: International Aluminum Institute 1.5 Degrees Scenario (based on IEA Net Zero by 2050 Scenario), October 2021

The most important and promising pathways for decarbonization of the sector include increasing the proportion of secondary (or recycled) versus primary aluminum production, reducing process emissions through the use of inert anodes in primary aluminum smelting, shifting to low- or zero-carbon electricity, improving material efficiency and scaling deployment CCS/CCUS technologies. At the same time, processes that currently rely on the direct use of fossil fuels, such as alumina refining and secondary aluminum production, will ideally be transitioned to use alternatives such as bioenergy, hydrogen or electricity.

Global Production of Primary and Secondary Aluminum in the IEA NZE Scenario (Mt)



Source: International Aluminum Institute 1.5 Degrees Scenario (based on IEA Net Zero by 2050 Scenario), October 2021

[17] IEA (2023), Tracking Clean Energy Progress 2023, IEA, Paris

Secondary aluminum production is important both due to aluminum's high degree of recyclability and because it is significantly less emissions-intensive than primary production. A key challenge to increasing secondary production, however, is improving the availability of scrap material for recycling. Therefore, enhancing systems for collection, recycling and sorting is also seen as a key priority for the sector.

Achieving necessary progress will require substantial investment in research and development and commercialization of new technologies, as well as in scaling deployment of proven solutions across the industry. Meanwhile, corresponding developments in other sectors, such as further decarbonization of the electric grid and scaling of clean hydrogen production, as well as supportive policies, will be needed to keep the Aluminum sector on track with the global goal of net zero by 2050.

3.9.1 Key Decisions

Our target for the Aluminum sector focuses on the intensity of Scope 1 and 2 GHG emissions from key emissions-intensive activities associated with both primary and secondary aluminum production. The benchmark emissions trajectory for the sector is supplied by the International Aluminum Institute 1.5 Degrees Scenario (IAI 1.5DS), which is in turn based upon IEA NZE.

To reflect our focus on primary and secondary aluminum production activities, we exclude several processes — such as bauxite mining, production of anodes, and aluminum ingot casting — that the IAI has included in their boundary as these generally have minimal contribution to the sector's overall emissions. Our exclusion of emissions from fabrication scrap remelting, as well as semis and final product production, is aligned with the IAI boundary for primary and secondary aluminum.

From this we derived a 2030 target of 6.5 t CO_2e / t aluminum, representing a 25% reduction from our 2021 portfolio baseline of 8.7 t CO_2e / t aluminum.

Sector Portfolio Target Summary – Aluminum

Activity Focus	Refining and smelting of primary aluminum and production of secondary aluminum
Scope	Scope 1 and 2 CO_2e — including both CO_2 and PFC emissions — from production of primary and secondary aluminum
Metric	t CO_2e / t aluminum
Scenario	IAI 1.5DS (based on IEA NZE)
2030 Target	6.5 t CO_2e / t aluminum
Data Sources	CRU Aluminum Emissions Analysis Tool, company disclosures

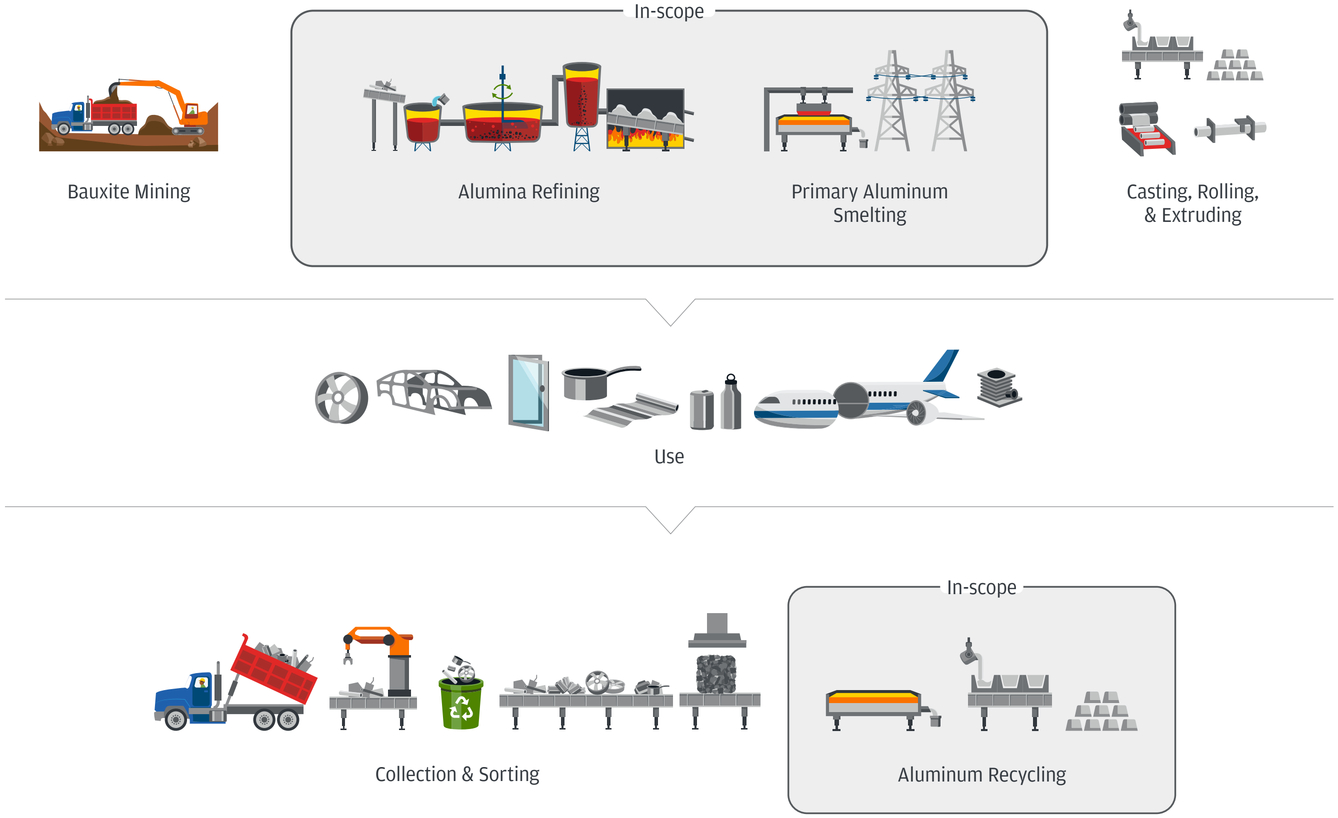
3.9.2 Methodology Detail

3.9.2.1 BOUNDARIES

Our methodology for the Aluminum sector includes Scope 1 and 2 GHG emissions associated with the production of aluminum, which refers to both primary production from refining and smelting processes and secondary production from recycled input. Scope 1 includes direct energy-related emissions from fuel combustion (including any on-site electricity generation) and process emissions from the use of carbon-containing anodes in the smelting process. Scope 2 includes indirect emissions from grid-purchased electricity. Addressing electricity-related emissions – by sourcing renewable-based power – will be a significant contributor to the sector's decarbonization efforts.

The activities we focus on include both primary and secondary aluminum production. Refining of alumina, smelting of primary aluminum and recycled production of secondary aluminum are estimated to account for the majority of total value chain emissions for the sector. We exclude bauxite mining, production of anodes, and aluminum ingot casting as these generally have minimal contribution to the sector's overall emissions. Our exclusion of emissions from fabrication scrap remelting as well as semis and final product production is aligned with the IAI boundary for primary and secondary aluminum.

Aluminum Sector Value Chain



Scope 3 emissions, which are primarily driven by emissions from the production of purchased anodes and extraction and transport of bauxite, account for a negligible portion of total emissions and are therefore excluded.

3.9.2.2 METRIC

The emissions intensity of JPMorgan Chase's Aluminum sector portfolio is evaluated using the metric tonnes CO_2e per metric tonne of aluminum produced.

$$\left(\begin{array}{c}\text{Primary}\\\text{Production}\\\text{\% of total}\end{array}\right) \times \left(\frac{\text{Scope 1 \& 2 Emissions from Refining (t } CO_2\text{e)}}{\text{Aluminum-equivalent Production (t)}} + \frac{\text{Scope 1 \& 2 Emissions from Smelting (t } CO_2\text{e)}}{\text{Primary Aluminum Production (t)}}\right) + \left(\begin{array}{c}\text{Secondary}\\\text{Production}\\\text{\% of total}\end{array}\right) \times \frac{\text{Scope 1 \& 2 Emissions from Secondary Production (t } CO_2\text{e)}}{\text{Secondary Aluminum Production (t)}}$$

An intensity-based metric is effective for its ability to capture wide variation in the emissions profiles of primary vs. secondary aluminum, sources of energy used for alumina refining and smelting, and because reduction in carbon intensity of such processes — rather than a material reduction in aluminum demand — is expected to be the primary driver of decarbonization for the sector. It also allows for more consistent tracking and comparison to support taking emissions into account as part of our financing decisions.

3.9.2.3 SCENARIO AND TARGET

The benchmark trajectory for the sector is based on sector-specific projections of CO_2 and perfluorocarbons (PFCs) emissions and production from the International Aluminum Institute's (IAI) 1.5 Degree Scenario (1.5DS), which has been derived from the IEA NZE scenario.

Our metric also includes perfluorocarbons (PFCs) emissions, which can be produced in the primary aluminum reduction process, due to their long atmospheric lifetimes and having one of the highest global warming potentials, as well as the sector's focus on curbing them in the near- to medium-term. This is consistent with the IAI 1.5DS scenario.

Using IAI's projections, we have calculated a net zero-aligned carbon intensity target for 2030 of 6.5 t CO_2e / t aluminum, representing a 25% reduction from our 2021 baseline of 8.7 t CO_2e / t aluminum.

3.9.2.4 DATA SOURCES AND CONSIDERATIONS

To calculate the carbon intensity of companies in JPMorgan Chase's Aluminum sector portfolio, we use Scope 1 and 2 emissions from refining and smelting coupled with alumina and primary aluminum production data from CRU's Aluminum Emissions Analysis Tool. For recycled production we rely on company disclosures of secondary aluminum production and the emissions generated from doing so, wherever available. If only secondary aluminum production is available but emissions are not disclosed, we assume that the carbon intensity of secondary aluminum is equivalent to 5% of the company's primary aluminum production carbon intensity. Where all necessary data is unavailable, we use a conservative proxy value equivalent to the 75th percentile of the available data for other portfolio companies.

Moving forward, we will continue to monitor developments in the availability of data — especially those relevant to the evolving composition of our portfolio and the further development of sector decarbonization strategies, such as secondary aluminum production — and consider updates to our methodology as appropriate.

4

Absolute Financed Emissions

As a complement to the emissions intensity targets we have set for key sectors in our financing portfolio, we have begun measuring and disclosing our financed emissions on an absolute-basis (i.e., absolute financed emissions) for these same sectors. Our methodology for calculating absolute financed emissions builds on international standards and guidance while also aligning with the principles and parameters set out in Carbon Compass℠ for our sector-specific intensity targets. In particular, our approach is tailored to focus on what we consider to be the most important sources of emissions for each sector to account for our exposure to a given client and to minimize distortion that may result from the effect of short-term market volatility on client valuations. We consider this approach to be the most suitable for our calculated absolute financed emission figures to correlate with real-world emissions performance of clients in our applicable sector portfolios.

We calculate absolute financed emissions for a given sector portfolio as follows:

$$\text{Absolute Financed Emissions} = \sum \left(\frac{\text{Financing}}{\text{Company Value}} \times \text{Client Absolute Emissions} \right)$$

The table below summarizes the specific information we use for the three elements required for the calculation – financing, company value, and client absolute emissions – including how these vary based on sector, form of financing and whether the client company is a public or private company. Following this are sections with additional detail on each of these elements, as well as our approach to data quality scoring.

Financing	Lending & Tax Equity	12-mo monthly average committed financing
	Capital Markets	100% of Capital Markets activity on a 3-year rolling average basis
Company Value	Public companies	3-year average enterprise value including cash (EVIC)
	Private companies	3-year average year-end (YE) Debt + Equity
Client Absolute Emissions	Energy Mix	Scope 3 CO_2 from end use of energy products
	Oil & Gas Operational	Scope 1 and 2 CO_2e from production and refining of oil, natural gas, bioenergy and other energy products
	Electric Power	Scope 1 CO_2 from fuel combustion for power generation
	Auto Manufacturing	Scope 1 and 2 CO_2e from manufacturing Scope 3 end use tank-to-wheel CO_2e from fuel combustion
	Iron & Steel	Scope 1 and 2 CO_2e – including energy-related and process emissions – from production of primary and secondary crude steel
	Cement	Scope 1 and 2 CO_2e from cement manufacturing
	Aviation	Scope 1 tank-to-wake CO_2 from flights
	Aluminum	Scope 1 and 2 CO_2e from smelting (primary production) and recycling (secondary production)
	Shipping	Scope 1 tank-to-wake CO_2 from international shipping vessel operations

4.1 Financing

For purposes of calculating financed emissions, the amount of financing we have provided to a client includes lending, tax equity and capital markets activity, which matches our approach for our sector-specific intensity targets.

For lending and tax equity, we use the 12-month monthly average balance of committed financing. We have chosen committed financing because we believe this better reflects the scope of our relationship with a given client — i.e., based on the total amount that we have agreed to finance — as opposed to outstanding balance, which may obscure differences between smaller and larger clients based on the degree to which they've drawn on available credit from us. We use a 12-month monthly average balance rather than a year-end balance in order to better capture the impact of short-term obligations, such as bridge loans, which frequently have terms of less than one year.

For capital markets activity, also known as facilitated emissions, we use 100% attribution of our share of the transaction size — i.e., the full value of transactions facilitated in the debt and equity capital markets for in-scope clients — and include our share of transactions on a 3-year rolling average basis. The choice of a 3-year versus 1-year rolling average helps compensate for the significant volatility often observed with capital markets transactions, driven in part by companies typically only going to the market for additional financing every few years.

4.2 Company Value

For the value of public companies, we use enterprise value including cash (EVIC) sourced from financial information providers such as FactSet or S&P Global. We use a three-year rolling average of EVIC in order to control for potential distortion due to the effect of market volatility on company valuations.

For the value of private companies, we use the sum of total company equity and debt as found on the company's balance sheet. In the event that equity value is negative, we treat it as zero. We use a 3-year rolling average of year-end equity and debt in order to control for potential short-term variation that could otherwise distort our calculation of absolute financed emissions.

For a small number of companies in our portfolio, EVIC or equity and debt may be unavailable. In these cases, we estimate absolute financed emissions using an asset-based emissions factor. For more information, see section 4.4 below.

4.3 Client Emissions

For consistency, we include client absolute emissions within the same scopes and boundaries as we have defined for each of our sector portfolio targets, as summarized in the table below. For additional detail, see the relevant portion of the methodologies for our sector-specific emissions intensity reduction targets in Section 3.

SECTOR	ACTIVITY FOCUS	SCOPE(S)	DATA SOURCES
Energy Mix	Supply of oil, natural gas and low-carbon fuels for end use combustion, and zero-carbon power generation by Oil & Gas and Electric Power companies	Scope 3 CO_2 emissions from end use of energy products	Wood Mackenzie, Enverus, S&P Global Trucost, S&P Global SNL Financial, company disclosures
Oil & Gas Operational	Production and refining of oil, natural gas, bioenergy, and other energy products	Scope 1 and 2 CO_2e – including both CO_2 and methane emissions	Wood Mackenzie, company disclosures
Electric Power	Power generation	Scope 1 CO_2 emissions from fuel combustion for power generation	S&P Global Trucost, S&P Global SNL Financial, company disclosures
Auto Manufacturing	Manufacturing of global passenger cars and U.S. light trucks	Scope 1 and 2 CO_2e emissions from manufacturing Scope 3 end use "tank-to-wheel" emissions from fuel combustion, based on the World Harmonized Light Vehicles Test Procedure (WLTP)	Transition Pathway Initiative (TPI), National Highway Transportation Safety Administration (NHTSA), S&P Global Market Intelligence, S&P Global Trucost, company disclosures
Iron & Steel	Iron and steel manufacturing	Scope 1 and 2 CO_2e – including both energy-related and process emissions – from production of primary and secondary crude steel	CDP, S&P Global Trucost, company disclosures
Cement	Cement manufacturing	Scope 1 and 2 CO_2e	CDP, S&P Global Trucost, company disclosures
Aviation	Scheduled passenger service and belly freight by airline companies	Scope 1 tank-to-wake (TTW) CO_2 emissions from flights	Platform for Analyzing Carbon Emissions (PACE), company disclosures
Shipping	International maritime freight transportation	Scope 1 tank-to-wake (TTW) CO_2 emissions from vessels	TPI, CDP, S&P Global Trucost, company disclosures
Aluminum	Refining and smelting of primary aluminum and production of secondary aluminum	Scope 1 and 2 CO_2e – including both CO_2 and PFC emissions	CRU Aluminum Emissions Analysis Tool, company disclosures

4.4 Data Waterfall Approach

As noted above, we calculate absolute financed emissions based on total financing we have provided, company value and client absolute emissions, as follows:

$$\text{Absolute Financed Emissions} = \sum \left(\frac{\text{Financing}}{\text{Company Value}} \times \text{Client Absolute Emissions} \right)$$

In the event that suitable emissions data and/or company value are unavailable, we apply a data waterfall approach enabling the reasonable estimation of absolute financed emissions. If company value is known but emissions are not, we estimate emissions using last twelve months (LTM) revenue multiplied by an appropriate environmentally extended input-output (EEIO) emissions factor, as follows:

$$\text{Absolute Financed Emissions} = \sum \left(\frac{\text{Financing}}{\text{Company Value}} \times \text{LTM Revenue} \times \text{Revenue Emissions Factor} \right)$$

For companies for which EVIC or equity and debt are not known, we estimate absolute financed emissions by multiplying our financing to the client by a total assets emissions factor based on the median of other companies in our portfolio.

$$\text{Absolute Financed Emissions} = \sum \left(\text{Financing} \times \text{Total Assets Emissions Factor} \right)$$

4.5 Data Quality Scoring

When calculating absolute financed emissions for a sector portfolio, we assign a data quality score for each client depending on the data and method used to determine absolute emissions for that client. We then calculate and report a weighted average data quality score based on the financing provided to each client relative to our total financing to the sector.

The table below summarizes how scores are assigned depending on the quality of data available for each client, with 1 representing highest quality and 5 representing lowest quality. This is consistent with the data quality scoring methodology recommended by the Partnership for Carbon Accounting Financials (PCAF). We then calculate and report a weighted average data quality score for each sector based on the financing provided to each client relative to our total financing to the sector.

Data Quality Scoring Table

	CLIENT DATA AVAILABILITY		
DATA QUALITY SCORE	Company Value	Client Emissions	APPROACH TO DETERMINE ABSOLUTE FINANCED EMISSIONS
1	✓	✓	Company reported emissions with verification, divided by company value
2	✓	✓	Company reported emissions, divided by company value
3	✓	✗	Emissions modeled or estimated using physical activity or capacity data, multiplied by appropriate emissions factors, divided by company value
4	✓	✗	Emissions estimated using company revenue multiplied by appropriate revenue emissions factor, divided by company value
5	✗	✗	Financing multiplied by total asset emissions factor based on median of other companies in portfolio

Assigning data quality scores helps us to understand the accuracy of the data used to calculate our absolute financed emissions, and to consider strategies for improving data quality over time. Reporting data quality scores helps us increase transparency and accountability. In select sectors, such as Oil & Gas Operational and Aviation, data quality score will have an upper limit of 3 out of 5 as we rely on modeled emissions data for our calculations. Our objective is to use the highest quality data available to achieve as accurate as possible absolute financed emission accounting.

Abbreviations

B2DS	Beyond 2 Degrees Scenario
CCS	carbon capture and storage
CCUS	carbon capture, use and storage
CH_4	methane
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
EAF	electric arc furnace
ETP	Energy Technology Perspectives
EV	electric vehicle
FTK	freight tonne kilometers
g	gram
GCCA	Global Cement and Concrete Association
GEM	Global Energy Monitor
GHG	greenhouse gas
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
ICE	internal combustion engine
IEA	International Energy Agency
JPMC	JPMorgan Chase
kg	kilogram
km	kilometer
MJ	megajoule
MPG	miles per gallon
Mt	megaton
MWh	megawatt hour
N_2O	nitrous oxide
NAICS	North American Industry Classification System
NGO	nongovernmental organization
NHTSA	National Highway Transportation Safety Administration
NZE	Net zero Emissions by 2050 Scenario
OECD	Organization for Economic Co-operation and Development
PACE	Platform for Analyzing Carbon Emissions
PCAF	Partnership for Carbon Accounting Financials
RPK	revenue passenger-kilometers
RTK	revenue tonne-kilometers
SAF	sustainable aviation fuel
SBTi	Science-Based Target initiative
SCMs	supplementary cementitious materials
SDA	Sectoral Decarbonization Approach
SDS	Sustainable Development Scenario
SUV	sport-utility vehicle
S&P	Standard & Poor's
TPI	Transition Pathway Initiative
TTW	tank-to-wheel / tank-to-wake
U.S.	United States
WSA	World Steel Association
WTW	well-to-wheel / well-to-wake

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