INEVITABLE POLICY RESPONSE

- Inevitable Policy Response 2021 Emissions & 1.5°C Required Policy Scenario
- (1.5°C RPS) Policy Summary

Preparing financial markets for climate-related policy and regulatory risks

December 2021

IPR is commissioned by the Principles for Responsible Investment (PRI), supported by world class research partners and joined by leading financial institutions

PRI Principles for Responsible Investment

PRI commissioned the Inevitable Policy Response in 2018 to advance the industry's knowledge of climate transition risk, and to support investors' efforts to incorporate climate risk into their portfolio assessments

:vivideconomics putting economics to good use

Energy Transition Advisors ETA

A research partnership led by Energy Transition Advisors and Vivid Economics conducts the initiative's policy research and scenario modelling and includes 2Dii, Carbon Tracker Initiative, Climate Bonds Initiative, Quinbrook Infrastructure Partners and Planet Tracker

The consortium was given the mandate to bring leading analytic tools and an independent perspective to assess the drivers of likely policy action and their implications on the market

Planet Tracker

quinbrook infrastructure PARTNERS

2° Investing Initiative

Carbon Tracker Initiative

Climate Bonds Initiative

Who supports the Inevitable Policy Response ?

Leading financial institutions joined the IPR as Strategic Partners in 2021 to provide more in-depth industry input, and to further strengthen its relevance to the financial industry

BLACKROCK · FitchRatings · nuveen A TIAA Company · ROBECO The Investment Engineers · BNP PARIBAS ASSET MANAGEMENT · Goldman Sachs Asset Management · NewForests

Core philanthropic support since IPR began in 2018. The IPR is funded in part by the Gordon and Betty Moore Foundation through The Finance Hub, which was created to advance sustainable finance and the ClimateWorks Foundation striving to innovate and accelerate climate solutions at scale

GORDON AND BETTY MOORE FOUNDATION · THE FINANCE HUB · climateworks FOUNDATION

The IPR helps the financial sector navigate the climate transition

Markets inconsistently price transition risk

- Policies will continue interacting with new technologies to deeply disrupt established industries and economies
- Financial institutions need to deepen their understanding of this unfolding environment to manage their assets effectively
- Yet the scenarios currently available provide limited intelligence about the realistic risks and opportunities most critical to the financial sector, and omit the land sector

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The IPR offers a range of applications

IPR Policy Forecast

A **high-conviction policy-based forecast** of forceful policy response to climate change and implications for energy, agriculture and land use

IPR Forecast Policy Scenario (FPS)

A **fully integrated climate scenario** modelling the impact of the forecasted policies on the real economy up to 2050, tracing detailed effects on all emitting sectors

IPR 1.5°C RPS Scenario

A **'1.5°C Required Policy Scenario'**(1.5°C RPS) building on the IEA NZE by deepening analysis on policy, land use, emerging economies, NETs and value drivers. This can be used by those looking to align to 1.5°C

IPR value drivers

A set of publicly available **outputs from the FPS and 1.5°C RPS** that offer significant granularity at the sector and country level allowing investors to assess their own climate risk

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IPR's FPS value add

A high conviction policy-based forecast, anchored in realistic policy and technology expectations rather than hypothetical 'optimal' pathways

Fully integrating land-use to examine the full system impacts of policies, and highlight the critical role of land

Transparent on expectations for policy and deployment of key technologies, such as Negative Emission Technologies

Covers all regions of the world, with specific policy forecasts for key countries and regions

Applicable to TCFD reporting and regulatory stress testing

Complete forecast includes macroeconomic, energy and land use models linking crucial aspects of climate across the entire economy

A '**1.5°C Required Policy Scenario**' (1.5°C RPS) has been developed, building on the IEA NZE, deepening analysis on land use, and deriving polices required to reach a rapid net zero 2050 outcome

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IPR 2021 Reports

A series of new IPR reports have been released in 2021. Please visit the PRI website here for more information

Glossary

- AgTech - Agriculture technology
- BECCS - Bioenergy with carbon capture and storage
- BNEF - Bloomberg New Energy Finance
- CAGR - Compound average growth rate
- CCS - Carbon capture and storage
- CDR - Carbon dioxide removal
- CH_4 - Methane
- CO_2 - Carbon dioxide
- CPS - Current Policies Scenario
- DAC - Direct air capture
- LT-DAC - Low temperature solid sorbent
- EV - Electric vehicle
- FPI - Food Price Index
- FPS - Forecast Policy Scenario
- GHG - Greenhouse gas
- ICE - Internal Combustion Engine
- IEA - International Energy Agency
- IPR - Inevitable Policy Response
- N_2O - Nitrous oxide
- NDC - Nationally determined contributions
- NEO - New Energy Outlook
- NETs - Negative emission technologies
- NPS - New Policies Scenario
- P1 - An IPCC 1.5°C scenario
- P2 - An IPCC 1.5°C scenario
- 1.5°C RPS - 1.5°C Required Policy Scenario
- SDS - Sustainable Development Scenario
- STEPS - Stated Policies Scenario
- TCFD - Task Force on Climate-related Financial Disclosures
- ULEV - Ultra low emission vehicles
- WEO - World Energy Outlook

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Summary IPR Forecast Policy Scenario 2021 (IPR FPS 2021)

As the world prepares for COP26, the IPR FPS 2021 forecast shows rapid policy action is likely by the 2025 Paris Ratchet, which could result in warming being held to well below 2°C

The IPR FPS anticipates that the combination of investor, corporate and civil society pressure around Net Zero, climate impacts, volatile weather patterns and low-carbon technology developments over the coming years will push policymakers to make changes by the 2025 Paris Ratchet that could result in warming at 1.8°C with a 50% probability

- Sweeping policy changes in the next decade lead to a transformation across the energy system, including:
  - Zero emissions vehicles make up around 30% of all vehicles on the road by 2030, accelerating the demise of oil which is already near its all-time peak, and drops after the mid-2020s
  - Wind and solar power will represent over 30% of global electricity generation by 2030, around three times the level of today (10%)
- Rapid changes in the food and land system , often overlooked in climate scenarios, also play a critical role. Huge shifts in food production see land use becoming a carbon sink within 30 years as the world reaches 'peak meat' consumption in 2030, and Nature Based Solutions accelerate

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Summary IPR 1.5°C Required Policy Scenario (IPR 1.5°C RPS)

Despite rapid transformation, these forecasted changes would still not be enough to hold warming to 1.5°C with Net Zero in 2050, which requires greater action, sooner. IPR 2021 now includes a 1.5°C Required Policy Scenario (RPS) to illustrate what further action would be required. Key actions to pursue a 1.5°C outcome include:

- A rapid end to deforestation across the entire globe, ideally by 2025 and before 2030. If not, the energy system has to absorb greater reductions, potentially through bioenergy with CCS (BECCS)
- Crucially, unabated coal fully decommissioned in most advanced economies including China by 2035
- Phase out new fossil cars in almost all markets by 2040 and transition to 100% clean power globally by 2045

Drawing on insights from 200 global policy experts, the 2021 analysis provides for the first time a full regional breakdown which reveals complex and divergent landscape for policymakers and investors

The IPR 1.5°C RPS emissions pathway is closer to that of the IPR FPS 2021 for OECD economies but requires a relatively greater reduction in emissions for non-OECD economies, due to the prevalence of net zero targets in the OECD

In particular China stands out, accounting for around 30% of forecast global emissions (in IPR FPS 2021) by 2050. Emissions are forecast to peak in the mid-2020s as a solid start to the task of reduction

The United States is the largest emitter among OECD economies, accounting for 10% of forecast emissions by 2050. In line with these emissions, the IPR 1.5°C RPS requires the United States to carry out the greatest additional reductions among OECD economies

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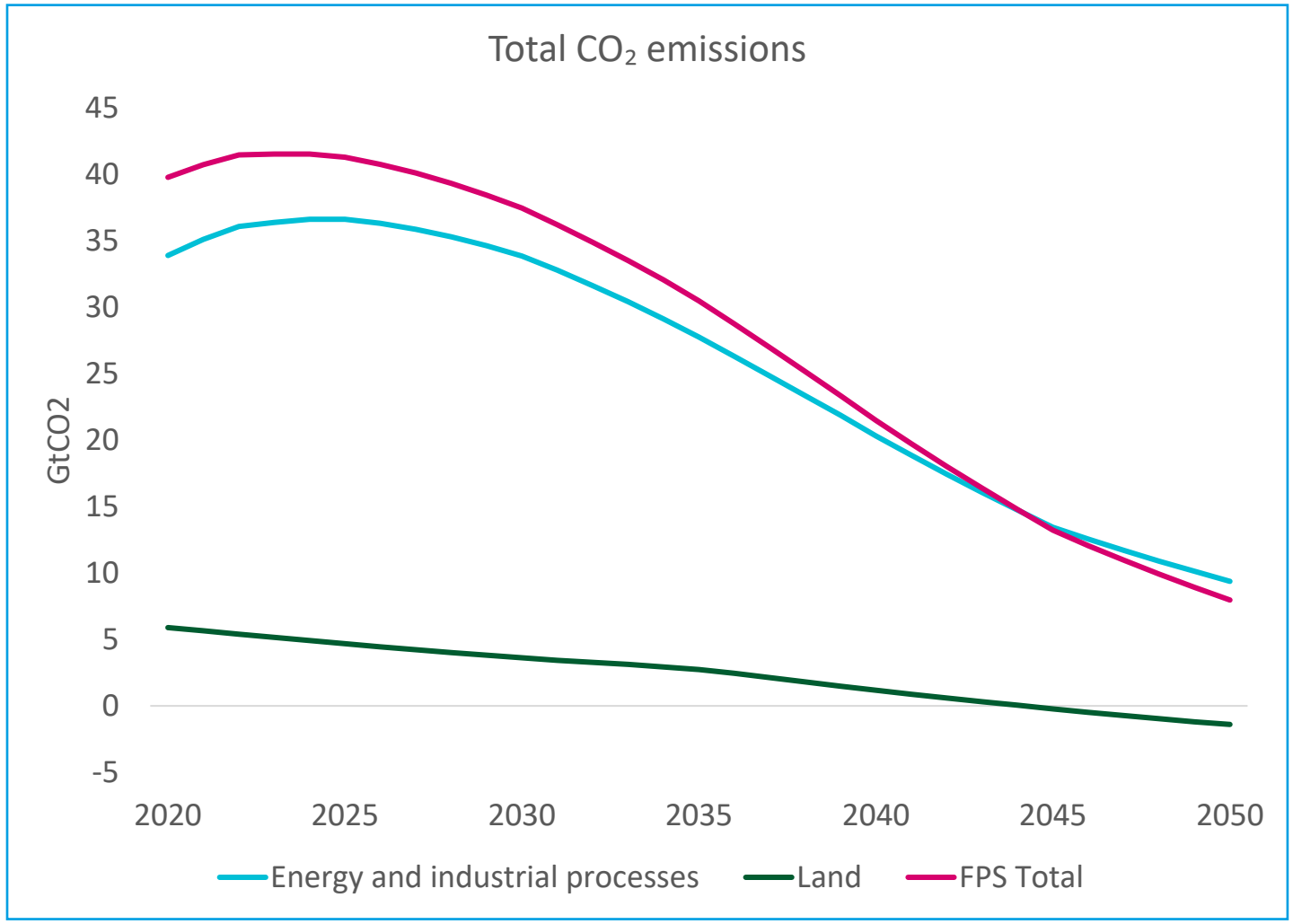
Emission pathways

IPR FPS 2021 total (energy and land) CO_2 emissions fall from around 40 Gt in 2020 to 8 Gt in 2050, with the land sector becoming a net carbon sink before 2050



- Total CO_2 emissions fall from around 40 Gt in 2020 to 8 Gt in 2100
- This fall is driven by reduction in emissions across both energy and land
- Energy sector emissions fall from around 34 $GtCO_2$ in 2020 to 9 $GtCO_2$ in 2100
- Land sector emissions fall from around 6 $GtCO_2$ in 2020 to zero in 2045
- Beyond 2045 the land sector becomes a net carbon sink and removes around 1 $GtCO_2$ per year by 2050

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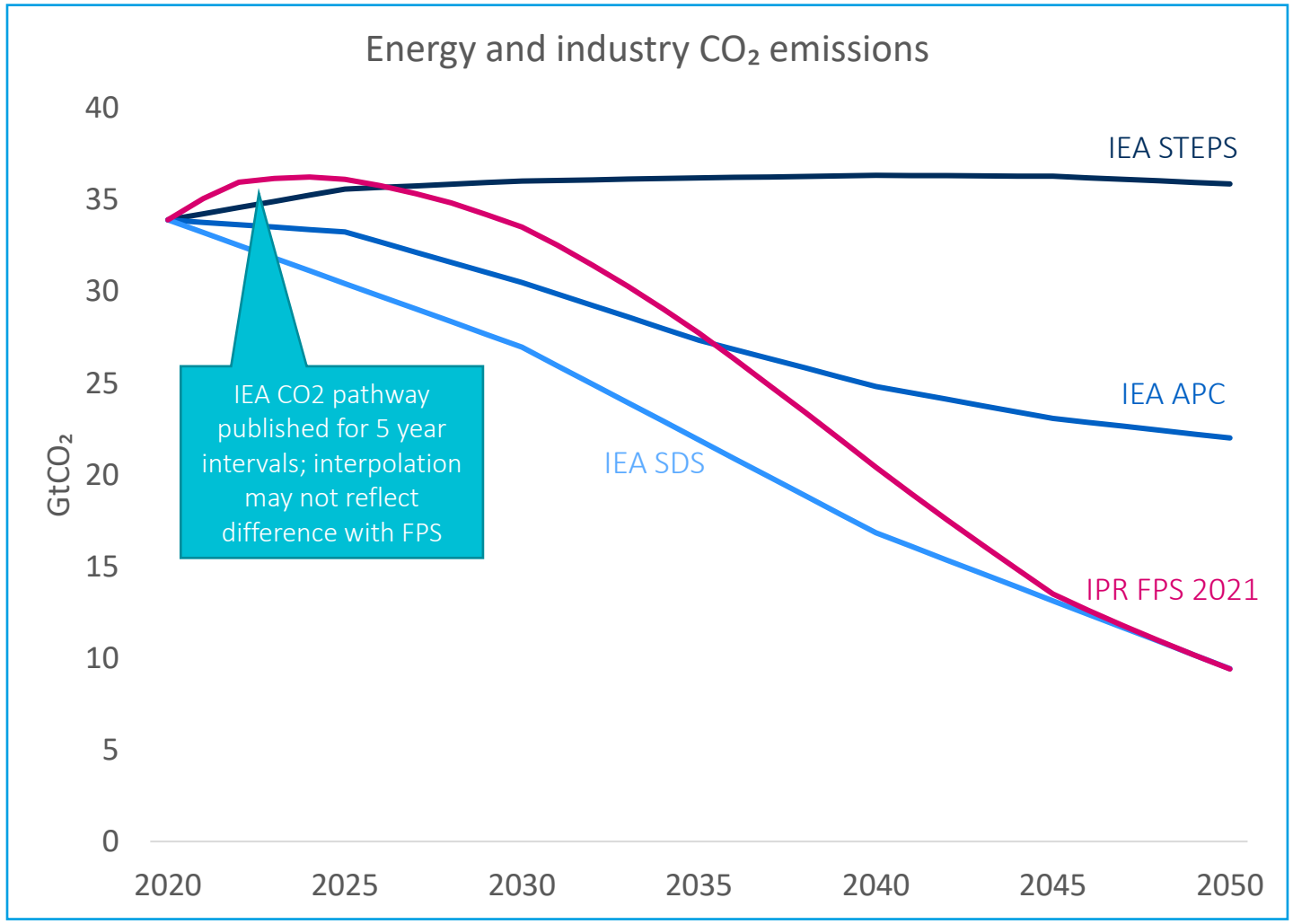
IPR FPS 2021 energy related CO_2 emissions vs IEA APC and IEA SDS



- Between 2020 and 2030, energy-related CO_2 emissions fall only slightly, as new policies begin to take effect
- By 2035 emissions are comparable to the IEA Announced Pledges Case (APC)
- Over this period emissions are well above those in IEA Sustainable Development Scenario (SDS), which represents immediate climate action
- From around 2035, emissions fall well below APC levels as more ambitious IPR 2021 forecast policies take effect
- By around 2045, emissions are line with those in IEA SDS

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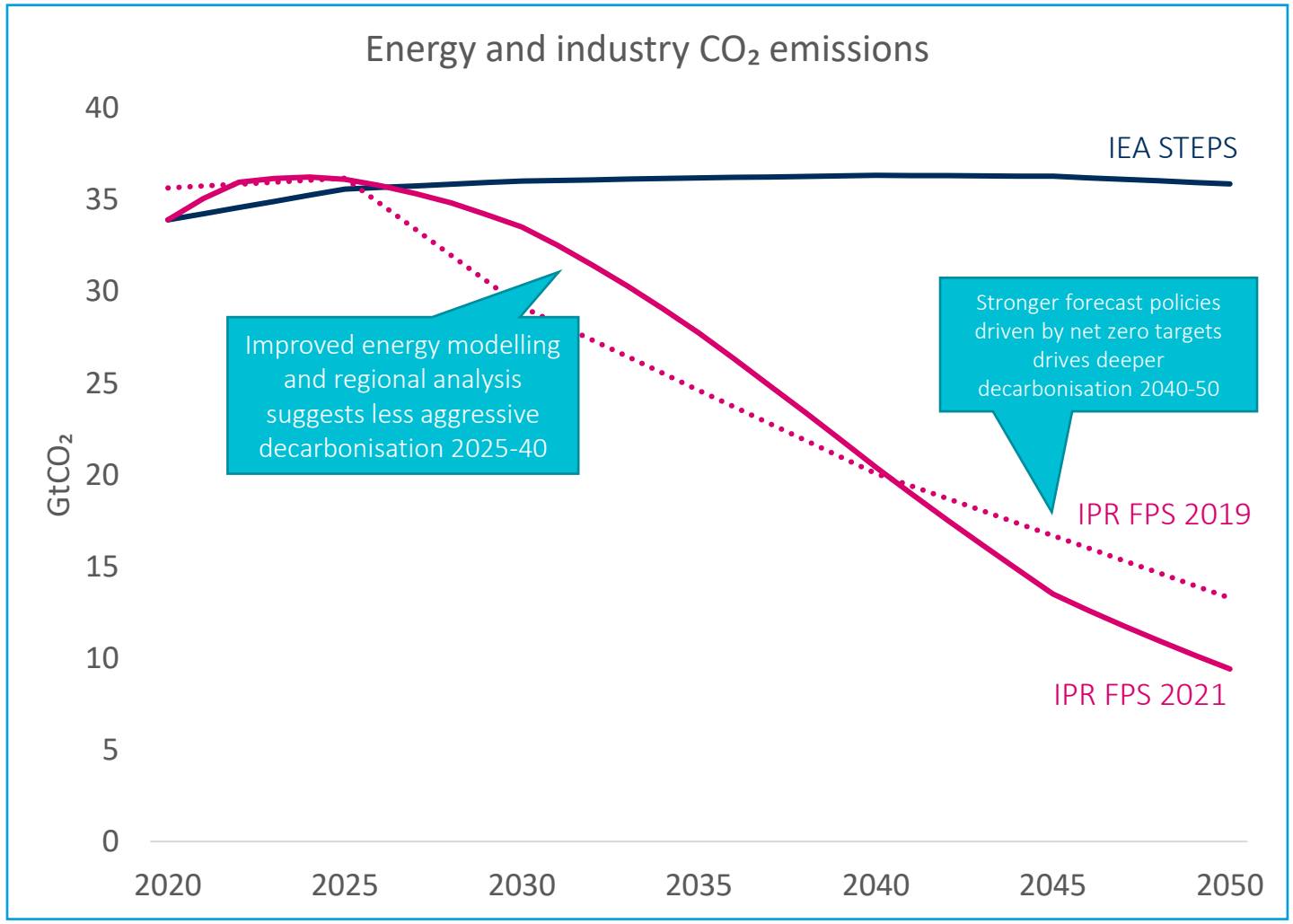
* Data on IEA CO2 pathways are published in 5-year intervals ** IPR FPS 2019 was modelled in 5-year increments
Note: IEA scenario data based on May 2021 Net Zero Emissions report; in WEO2021, IEA APC is renamed Announced Pledges Scenario (APS), with a slightly modified emissions pathway

IPR FPS 2021 energy related CO_2 emissions vs IEA STEPS and IPR FPS 2019

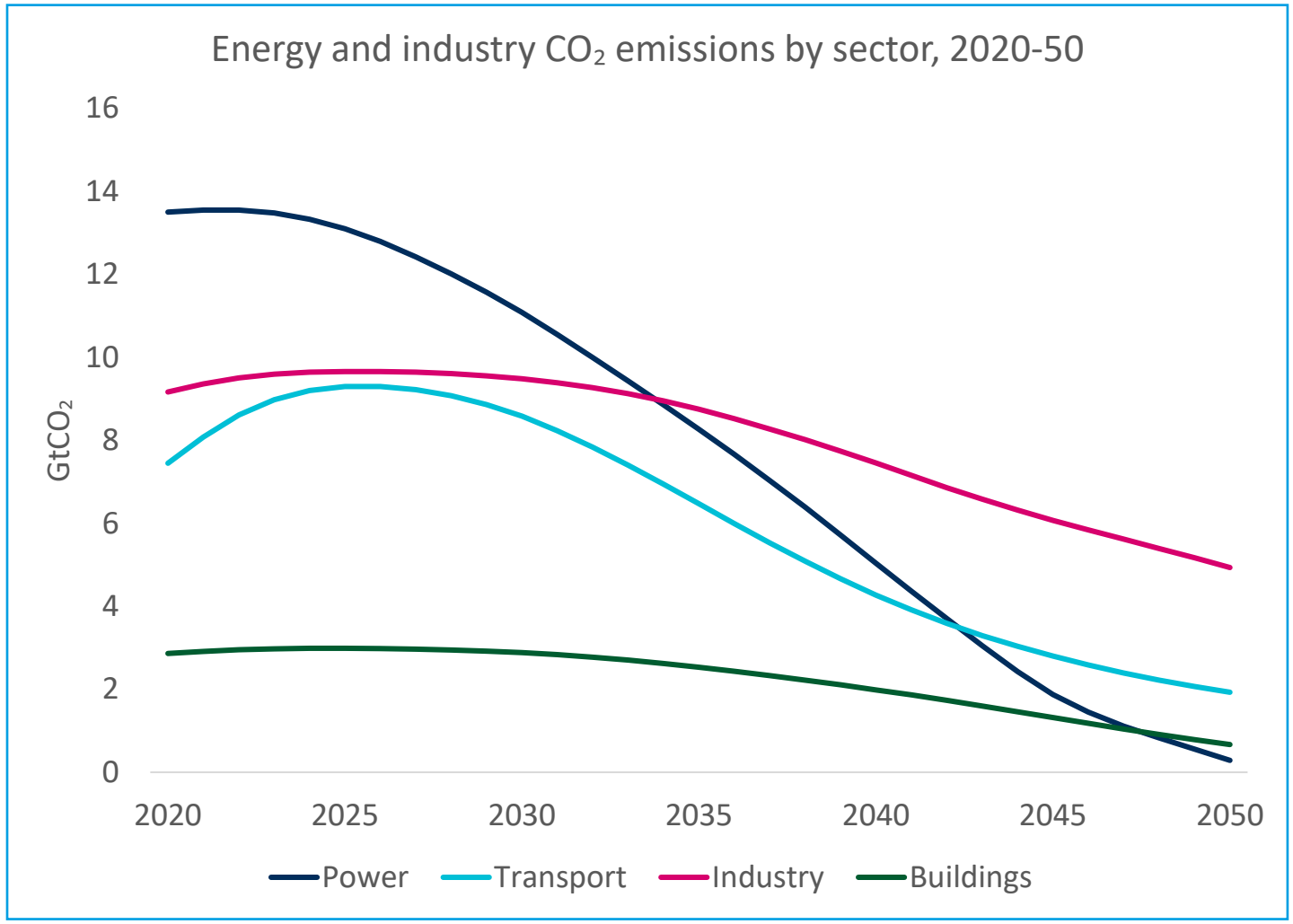


- Energy-related CO_2 emissions follow a similar pathway to IEA STEPS to 2025*, before declining to 2050
- Between 2025 and 2040, energy-related CO2 emissions are above the IPR 2019 forecast**
- Emissions reduction projections have been revised upwards following more detailed modelling at the regional level
- From 2040, energy-related CO_2 emissions fall below the IPR 2019 forecast, as more ambitious IPR 2021 forecast policies take effect

INEVITABLE POLICY RESPONSE

* Data on IEA CO2 pathways are published in 5-year intervals ** IPR FPS 2019 was modelled in 5-year increments
Note: IEA scenario data based on May 2021 Net Zero Emissions report

IPR FPS 2021 emissions reductions are most rapid in the power sector, followed by transport and buildings, while industry is slower to decarbonise



- CO_2 emissions fall most rapidly in the power sector, with a 20% fall to 2030 and near 100% by 2050
- In the transport sector, emissions rise to around 2025 as demand grows, before falling to around a quarter of 2020 levels by 2050
- In buildings, emissions also fall to around a quarter of 2020 levels by 2050
- In industry the fall in emissions is less rapid; by 2050 CO_2 emissions fall around 45% and account for the largest share of remaining emissions

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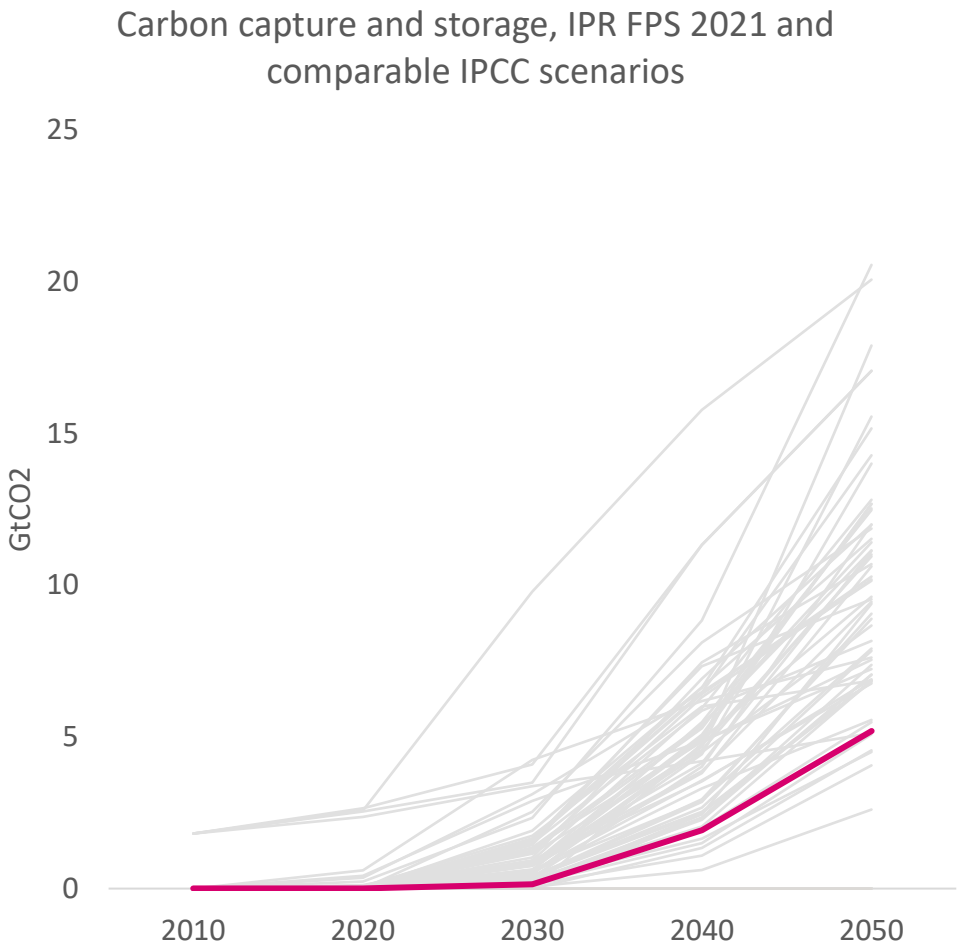
In IPR FPS 2021, by 2050 around 3.5 Gt of CO_2 is captured from fossil fuels; and around 6.5 Gt CO_2 are removed from the atmosphere through NETs

Fossil CO_2 capture and negative emissions ($GtCO_2$)

Emissions Category	Source	2020	2030	2040	2050
Avoided emissions	Power coal	0.0	0.0	0.0	0.9
	Power gas	0.0	0.0	0.2	0.4
	Industry coal	0.0	0.0	0.2	0.4
	Industry gas	0.0	0.0	0.2	0.3
	Industry process	0.0	0.0	0.4	0.8
	Hydrogen gas	0.0	0.1	0.4	0.7
	Total	**0.0**	**0.1**	**1.4**	**3.5**
Negative emissions	Power biomass	0.0	0.0	0.3	1.1
	Industry biomass	0.0	0.0	0.0	0.1
	Direct air capture	0.0	0.0	0.1	0.5
	Nature based solutions	0.0	2.0	3.3	4.7
	Total	**0.0**	**2.0**	**3.8**	**6.4**

Note: Additional Nature Based Solutions (NBS) of up to 4 $GtCO_2$ provided by avoided deforestation, which is not considered a NET

Carbon capture and storage (CCS) & bioenergy with carbon capture and storage (BECCS) – why is it needed in IPR FPS 2021



- Our policy forecast drives many countries to 100% 'clean power' by 2050/60. These are carbon prices, Net Zero and clean power targets
- In industry we compare the potential of CCS against hydrogen to look at what is required from the process. In particular, cement stands out as needing CCS
- Power systems require flexible, low-carbon generation and inertia, requiring gas with CCS or hydrogen generators. We assume both technologies will play a role
- For coal in China, CCS is an asset life, economic and political issue
- Our overall fossil CCS impact is to reduce emissions by 3.5 $GtCO_2$ by 2050. With additional biomass and direct air capture with CCS, this figure rises to around 5 Gt. Levels of CO_2 stored are in line with IEA SDS and significantly below the majority of IPCC scenarios with similar temperature outcomes (1.7-1.9 degrees)
- The economics would suggest more extensive deployment but we believe uncertainty around scale requires caution
- By 2050, around 0.5 Gt of direct air capture is deployed, as the developed world looks at ways to offset the impact of its historical emissions on the carbon budget

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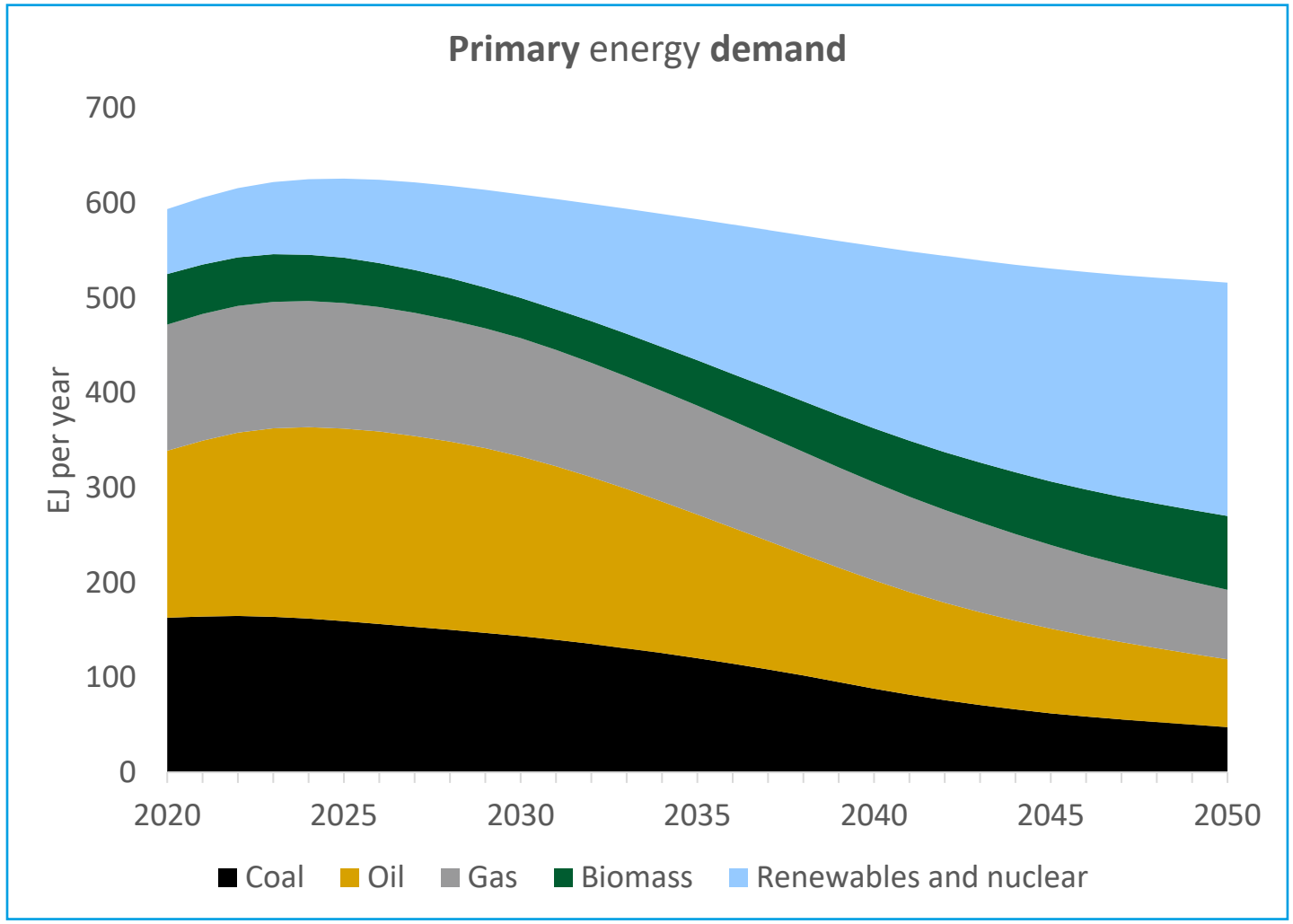
IPR FPS 2021: Biomass, renewables and nuclear grow from around 20% of primary energy in 2020 to around 65% in 2050



- The share of fossil fuels in primary energy falls from around 80% in 2020 to below 40% in 2050
- In contrast, the share of biomass, renewables and nuclear rises substantially
- These low-carbon fuels account for the majority of primary energy by the mid-2040s and for around 65% by 2050
- Overall, around 15% of primary energy demand is used to produce hydrogen

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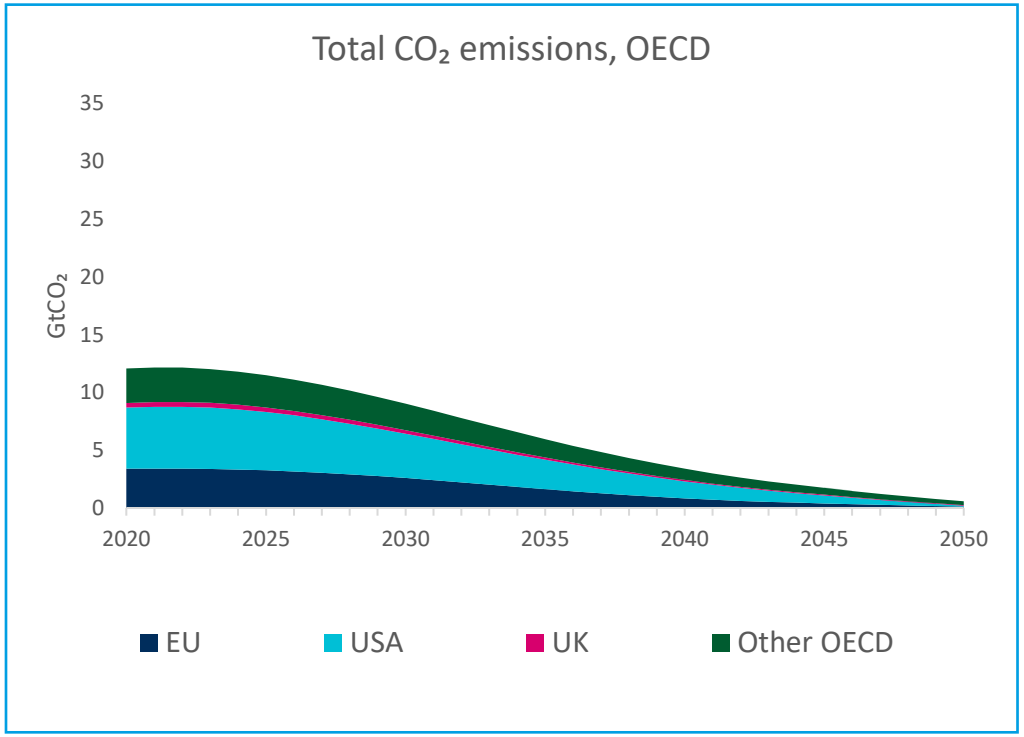
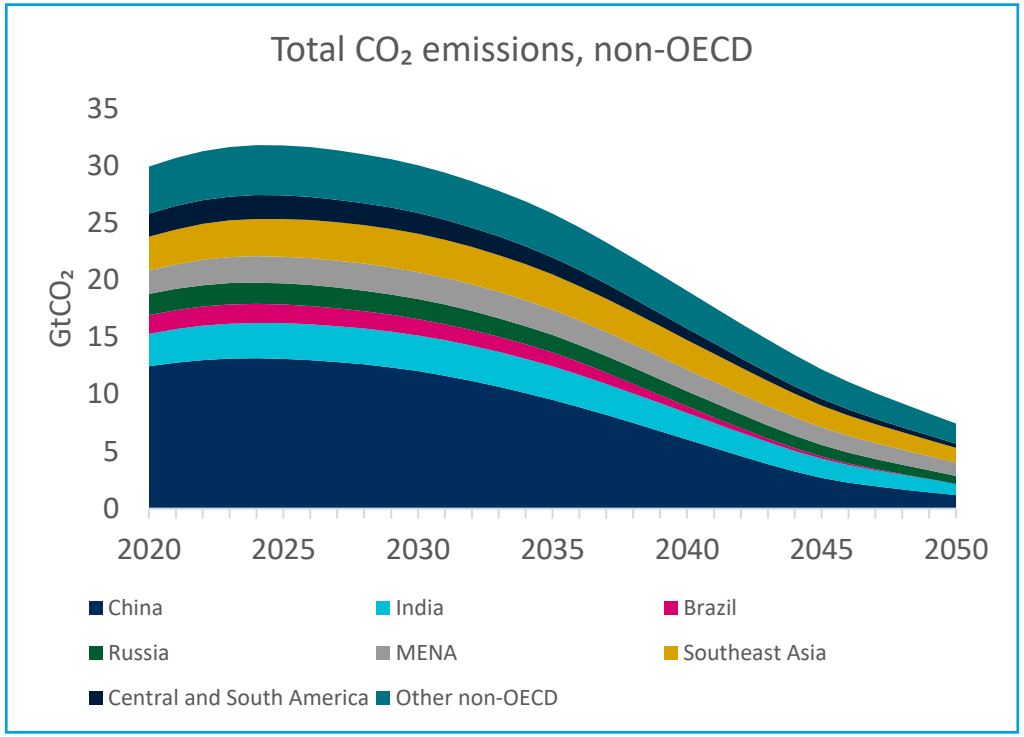
IPR FPS 2021: Total CO_2 emissions (on a production basis) reach near zero in OECD countries, though remain substantial in non-OECD countries





- In OECD countries, emissions reductions are rapid due to 2050 net zero targets.
- Total (energy and land) CO_2 emissions countries fall from around 12 Gt in 2020 to 9 in 2030 and near zero in 2050, with virtually no international offsets required

- In non-OECD countries, emissions reductions are slower due to rapid growth in energy demand, later net zero targets in China, India and Brazil, and lack of net zero targets elsewhere
- Total CO_2 emissions rise in the 2020s and fall back to 2020 levels of 30 Gt by 2030, before declining substantially and falling to 8 Gt in 2050

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OECD countries and many non-OECD countries reduce CO_2 emissions by 2030 in line with NDC commitments

Contribution from each sector to total % change in CO2 emissions, 2020-30

Group	Region	Power	Transport	Buildings	Industry	Land	Total
OECD	United States	-22%	-6%	-1%	-2%	-1%	**-31%**
	EU	-11%	-6%	-4%	-3%	-3%	**-28%**
	UK	-10%	-13%	-5%	0%	-1%	**-30%**
	Japan	-16%	-5%	-2%	-5%	-1%	**-30%**
	Korea	-16%	-4%	-1%	-1%	-1%	**-23%**
	Canada	-9%	-4%	-3%	-1%	-8%	**-26%**
	Australia	-17%	-4%	-1%	-1%	-6%	**-28%**
Non-OECD	China	-4%	3%	1%	-2%	-5%	**-8%**
	India	-5%	6%	1%	8%	-7%	**4%**
	Brazil	-1%	0%	0%	0%	-18%	**-19%**
	Russia	-4%	-1%	2%	-3%	-1%	**-9%**
	Indonesia	17%	1%	0%	6%	-4%	**20%**
	South Africa	-17%	0%	-1%	-1%	-3%	**-22%**
	South East Asia	2%	2%	0%	2%	-3%	**3%**
	MENA	4%	2%	1%	3%	-2%	**8%**
	Central and South America	-1%	-2%	-1%	1%	-14%	**-17%**
	Eurasia	-4%	2%	1%	1%	-6%	**-5%**
	Gulf States (GCC)	-4%	1%	1%	2%	0%	**0%**
	South Asia	9%	10%	1%	4%	-4%	**21%**
	Sub-saharan Africa	3%	6%	0%	3%	-20%	**-7%**

Highlighted values are largest drivers of CO2 reduction (>5% reduction)

Reduction in key regions in line with Nationally Determined Contributions (NDC) commitments e.g.:

- USA: 50% reduction from 2005
- EU: 55% reduction from 1990
- UK: 68% reduction from 1990
- China: emissions peak before 2030

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Some countries achieve net zero CO_2 emissions on a territorial basis, while others will require international carbon offsets to meet commitments

Contribution from each sector to total % change in CO2 emissions, 2020-50 and net zero year (territorial basis)

Group	Region	Power	Transport	Buildings	Industry	Land	Total	Net zero year
OECD	United States	-39%	-31%	-10%	-10%	-7%	**-100%**	2050
	EU	-30%	-27%	-14%	-14%	-10%	**-100%**	2050
	UK	-36%	-21%	-11%	-13%	-12%	**-100%**	2050
	Japan	-38%	-18%	-9%	-18%	-2%	**-89%**	not achieved
	Korea	-40%	-18%	-7%	-17%	-1%	**-87%**	not achieved
	Canada	-10%	-22%	-11%	-10%	-26%	**-89%**	2069
	Australia	-38%	-21%	-3%	-9%	-20%	**-94%**	2058
Non-OECD	China	-41%	-7%	-3%	-24%	-11%	**-91%**	2059
	India	-34%	-7%	-1%	-7%	-14%	**-66%**	2061
	Brazil	-3%	-10%	-1%	-5%	-81%	**-101%**	2050
	Russia	-24%	-10%	-5%	-9%	-7%	**-64%**	2087
	Indonesia	-19%	-14%	-2%	12%	-33%	**-57%**	2081
	South Africa	-42%	-11%	-5%	-9%	-8%	**-90%**	not achieved
	South East Asia	-21%	-15%	-1%	2%	-22%	**-60%**	not achieved
	MENA	-20%	-22%	-6%	8%	-4%	**-47%**	not achieved
	Central and South America	-16%	-19%	-4%	1%	-43%	**-83%**	2078
	Eurasia	-30%	-10%	-8%	-1%	-13%	**-69%**	2068
	Gulf States (GCC)	-26%	-21%	0%	1%	0%	**-50%**	not achieved
	South Asia	-18%	-4%	-3%	14%	-20%	**-29%**	2078
	Sub-saharan Africa	-3%	-3%	0%	8%	-59%	**-58%**	not achieved

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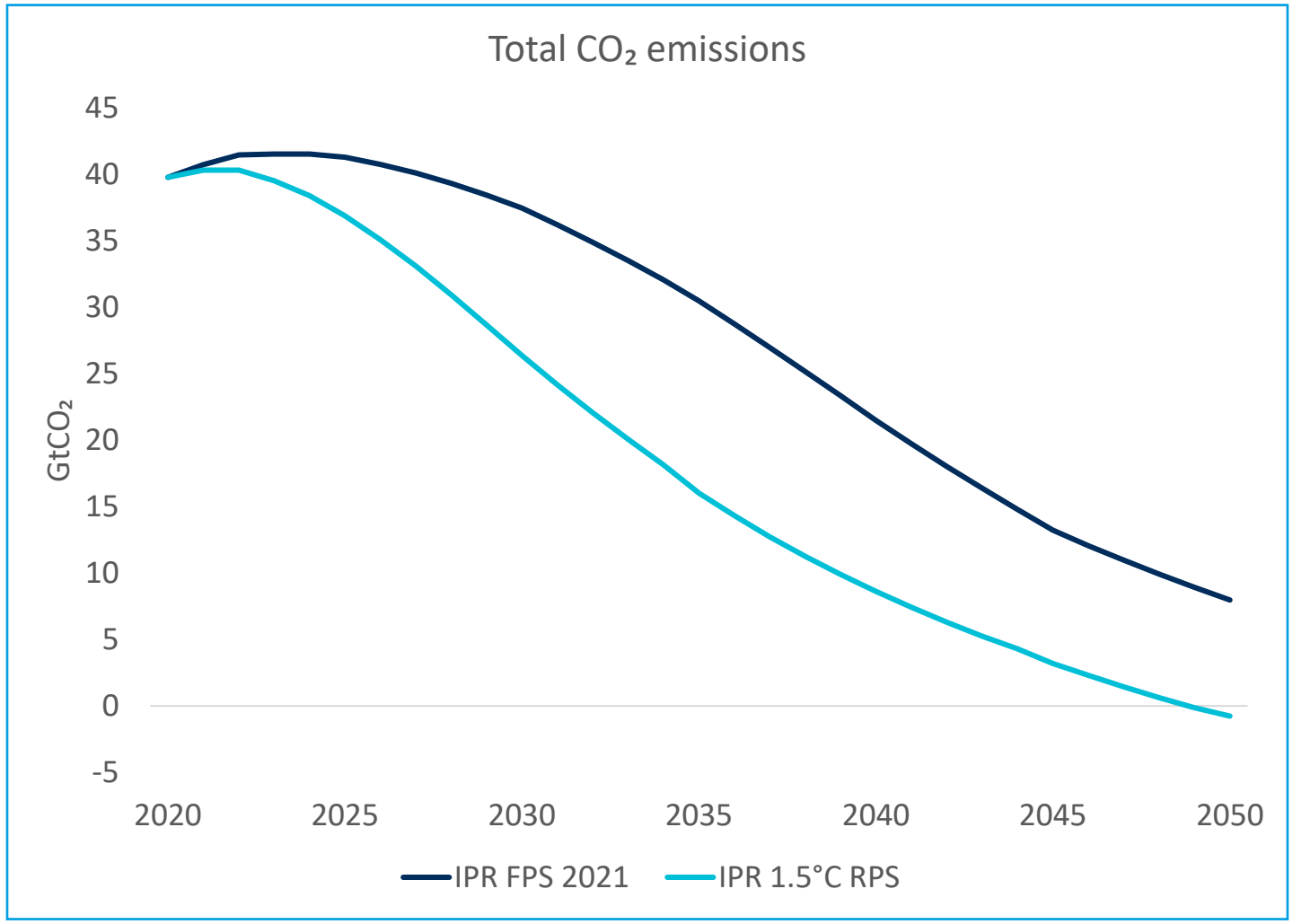
- IPR 1.5°C Required Policy Scenario (RPS): Policy comparisons with Forecast Policy Scenario

Relative to the IPR FPS 2021, total CO_2 emissions (land and energy) in the IPR 1.5°C RPS decline rapidly, and are below zero by 2050



- IPR 1.5°C RPS cumulative CO_2 emissions are around 30% below IPR FPS 2021 levels between 2020 and 50
- IPR 1.5°C RPS emissions fall around 35% between 2020 and 2030, compared to 13% under the IPR FPS 2021
- By 2030 IPR 1.5°C RPS emissions are 8 $GtCO_2$ lower than IPR FPS 2021, and are below zero by 2050

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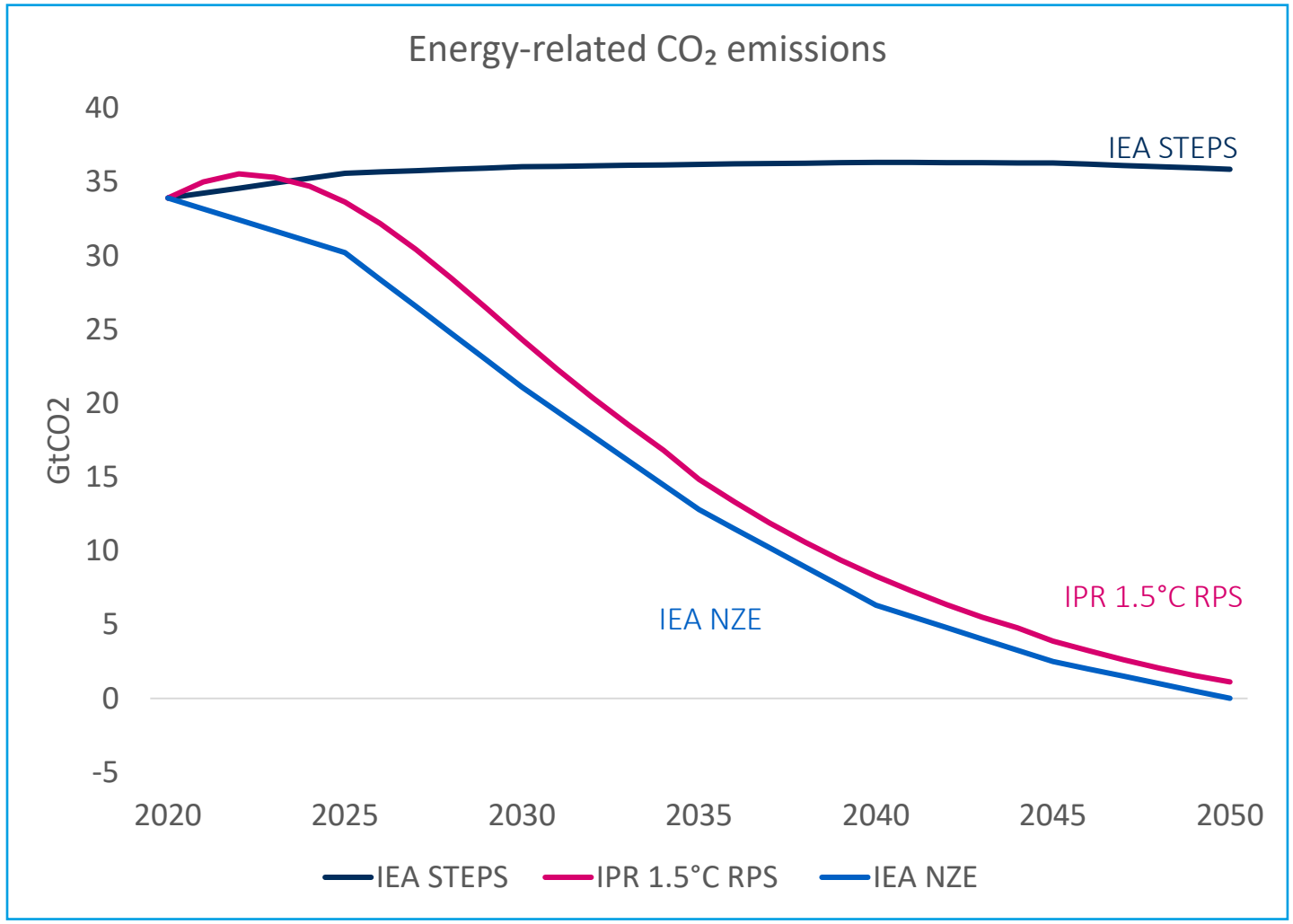
IPR 1.5°C RPS: Energy-related CO_2 emissions follow a comparable path to IEA's NZE scenario, and are just above zero by 2050



- Emissions reductions are comparable to those in the IEA NZE scenario
- Emissions are within around 1 $GtCO_2$ of IEA NZE over the period to 2050
- Energy sector emissions are just above zero in 2050, and are offset by reductions in the land sector

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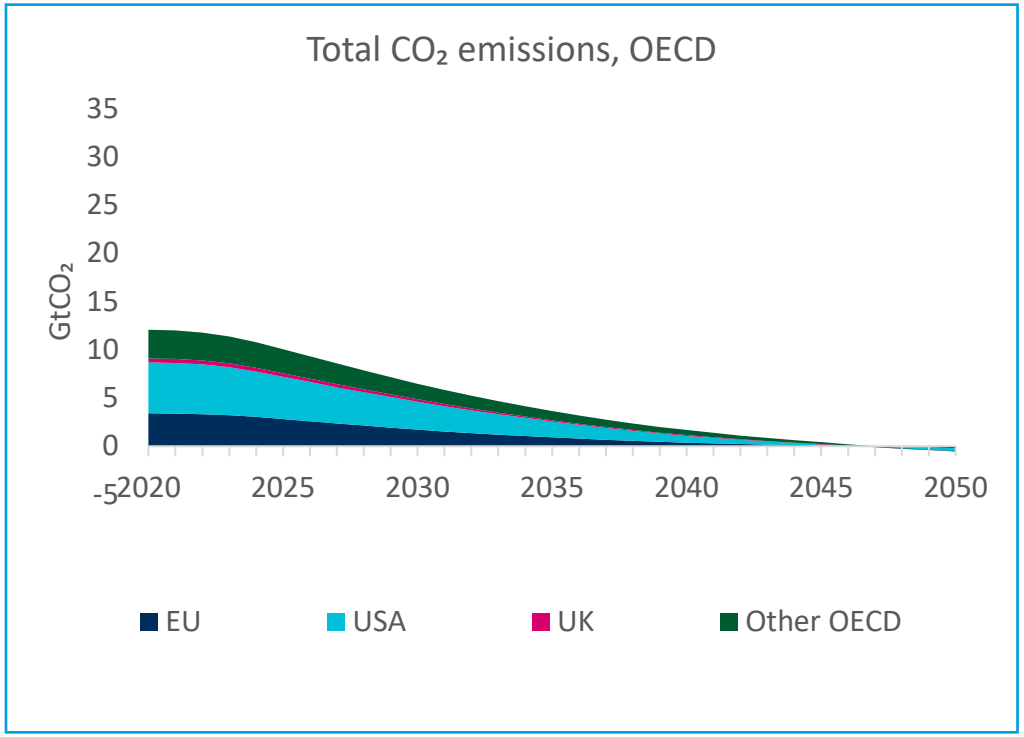
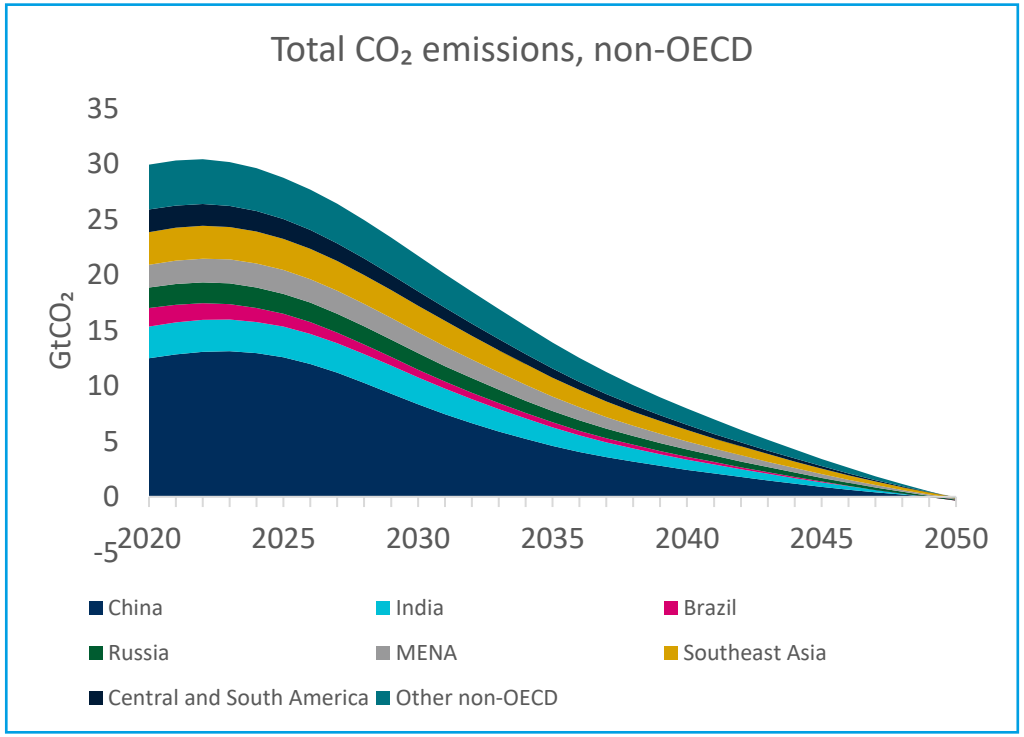
IPR 1.5°C RPS: Total CO_2 emissions are net negative in OECD countries and around zero in non-OECD countries by 2050





- Total (energy and land) CO_2 emissions countries fall from around 12 Gt in 2020 to 6 in 2030 and zero in 2047
- By 2050 CO_2 emissions are net negative

- Emissions reductions are slower due to rapid growth in energy demand
- Total CO_2 emissions fall from around 30 Gt in 2020 to 21 in 2030 and around zero in 2050

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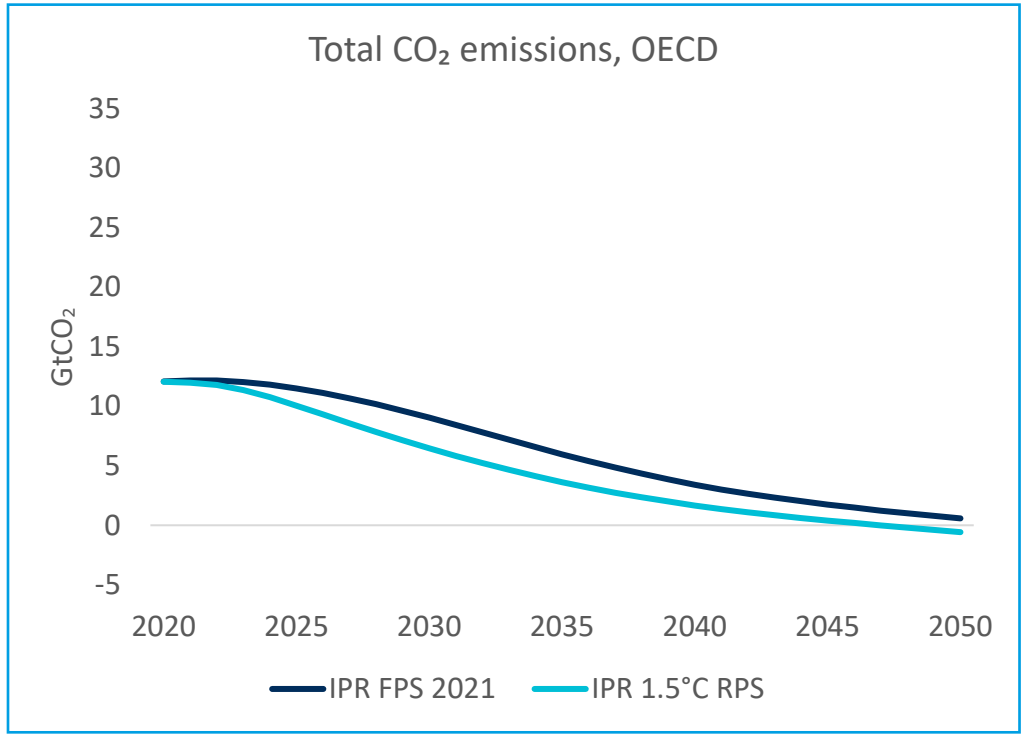
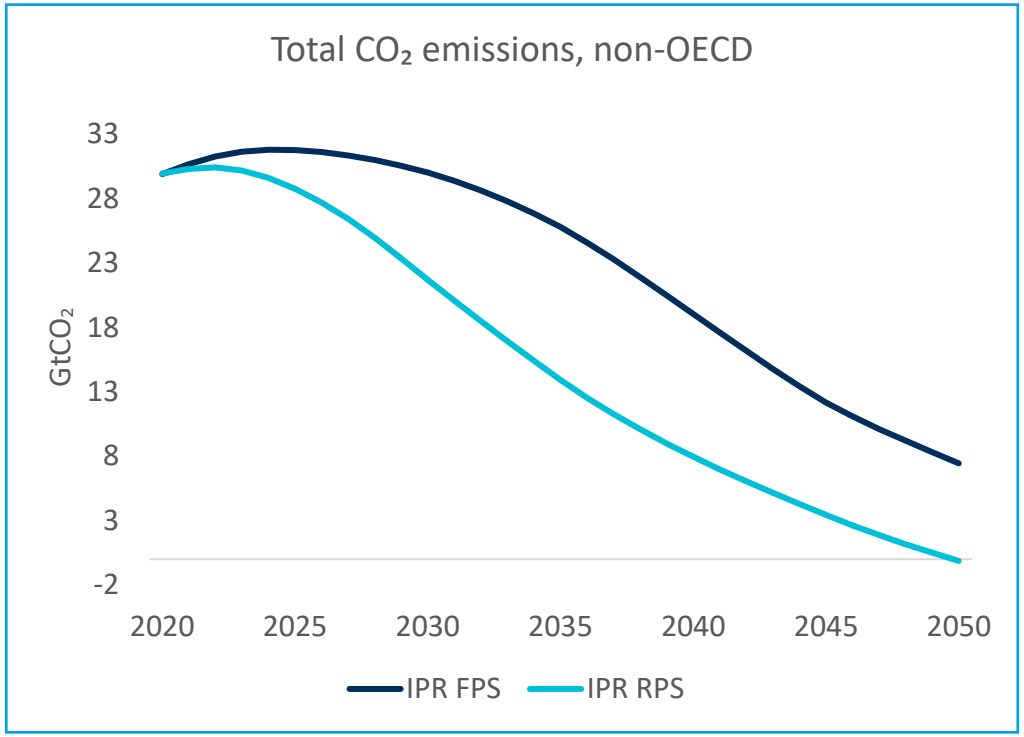
Relative to the IPR FPS 2021, the 1.5°C RPS requires a significant further policy ratchet, particularly in non-OECD countries





- IPR 1.5°C RPS CO_2 emissions 2020-50 are around 25% lower than under IPR FPS 2021
- IPR 1.5°C RPS CO_2 emissions are 2 Gt below IPR FPS 2021 in 2030, and 1 Gt below in 2050

- IPR 1.5°C RPS CO_2 emissions 2020-50 are around 33% lower than under IPR FPS 2021
- IPR 1.5°C RPS CO_2 emissions are 8 Gt below IPR FPS in 2030, and 7 Gt below in 2050

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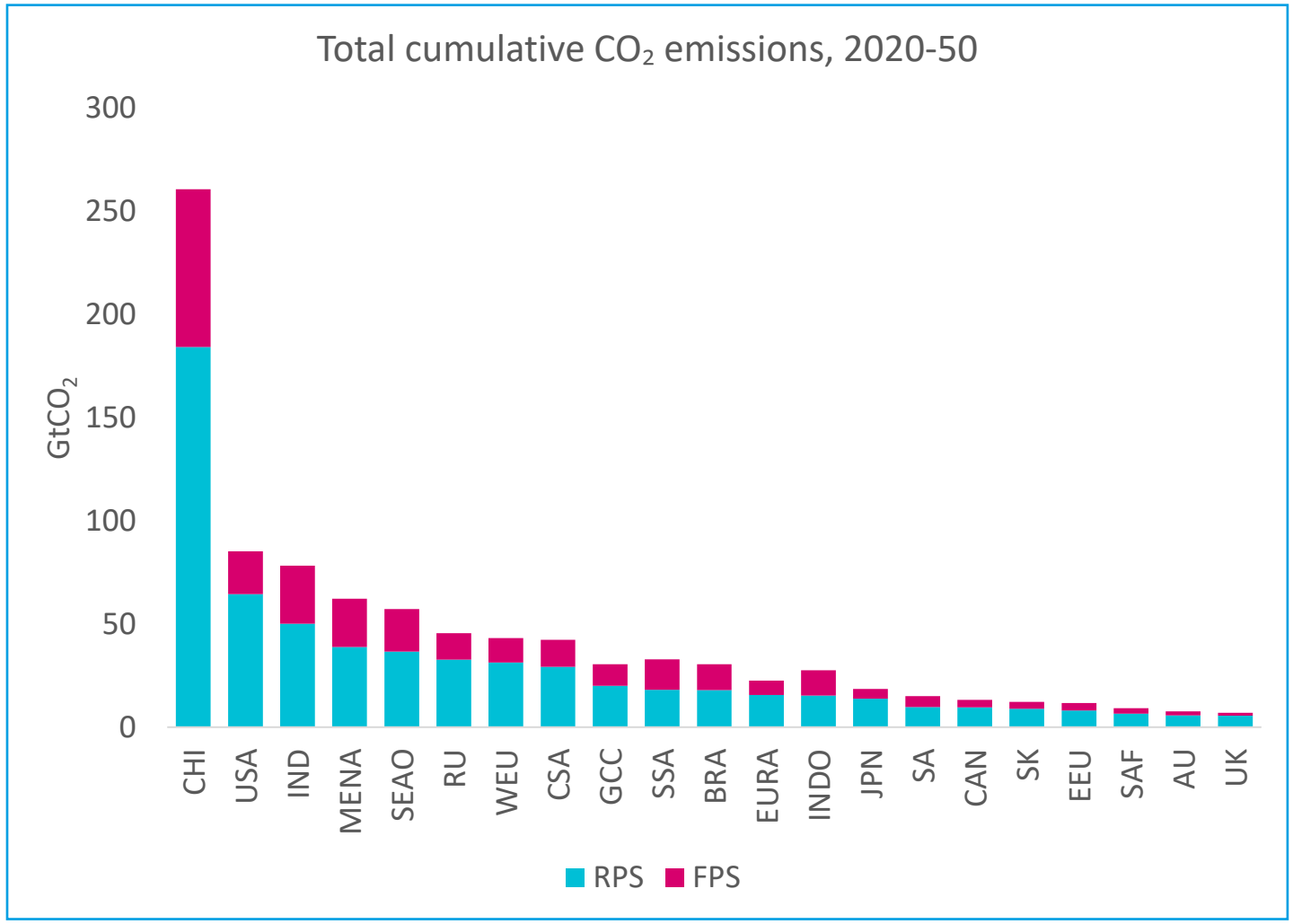
China accounts for around 30% of total world cumulative emissions under the IPR FPS 2021

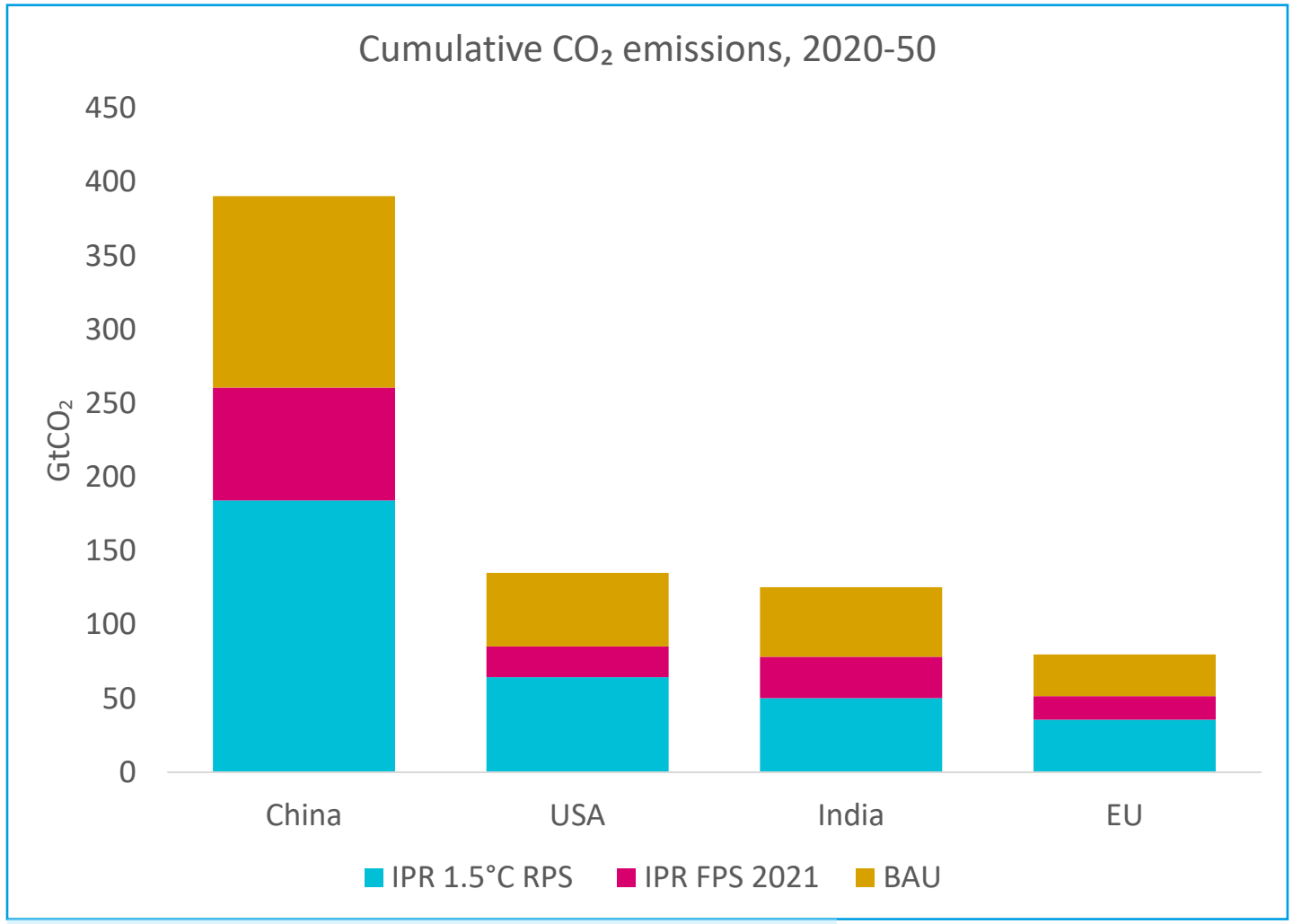


- China alone accounts for 30% of the cumulative emissions emitted in the IPR FPS 2021, and a similar share in the IPR 1.5°C RPS
- The US and India each account for a further 10%
- The IPR 1.5°C RPS requires further emissions reductions of around 30% below IPR FPS 2021 levels for China; 20% for the United States and 35% for India

Key:
CHI (China); IND (India); MENA (Middle East and North Africa); SEAO (South East Asia and Oceania); RU (Russia); WEU (Western Europe); CSA (Central and South America); GCC (Gulf Cooperation Council); SSA (Sub-Saharan Africa); BRA (Brazil); EURA (Eurasia); INDO (Indonesia); JPN (Japan); SA (South Asia); CAN (Canada); SK (South Korea); EEU (Eastern Europe); SAF (South Africa); AU (Australia)

INEVITABLE POLICY RESPONSE

Embedded in the IPR FPS 2021 are substantial emissions reductions, additional reductions to achieve the IPR 1.5°C RPS will be challenging



- The IPR FPS 2021 represents a substantial reduction in emissions relative to a business-as-usual (BAU) scenario
- China's emissions are around 35% lower than under a BAU pathway
- The United States and India's emissions are around 40% lower
- The EU's emissions are around 35% lower
- Smaller additional reductions are needed to achieve the IPR 1.5°C RPS, though these will be more costly and challenging than those delivered under the IPR FPS 2021

Note: BAU based on emissions growth rates from IEA STEPS scenario

China: Coal and NBS are key considerations

The Chinese coal fleet is 12% of world emissions, and China's cumulative emissions at around 250 Gt are around 30% of world emissions up to 2050 in the FPS 2021

- Security and political forces point towards some use of CCS along with Hydrogen
- NBS has massive potential, where we expect the NDC to be implemented
- The Net Zero 2060 target is key to driving further policy beyond the NDC
- China will remain a major supplier to the low carbon world

Under IPR FPS 2021, China achieves its NDC objective of peaking emissions before 2030 due to

- Faster reduction in coal fleet
- Large deployment of NBS

Solutions for remaining coal fleet post-2030

- Renewables with storage
- Coal CCS retrofit
- Hydrogen

Meeting the 1.5°C RPS is a significant challenge for China and will require

- Phase out of unabated coal by 2035
- 100% clean power by 2040
- Fossil vehicle phase out by 2030 for light duty vehicles and 2035 for heavy duty
- 100% clean industry by 2035
- Phase out of new fossil heating systems in buildings by 2040

INEVITABLE POLICY RESPONSE

IPR 1.5°C RPS requires more carbon capture when compared to IPR FPS 2021, and reaches similar levels of CO_2 captured to IEA NZE by 2050

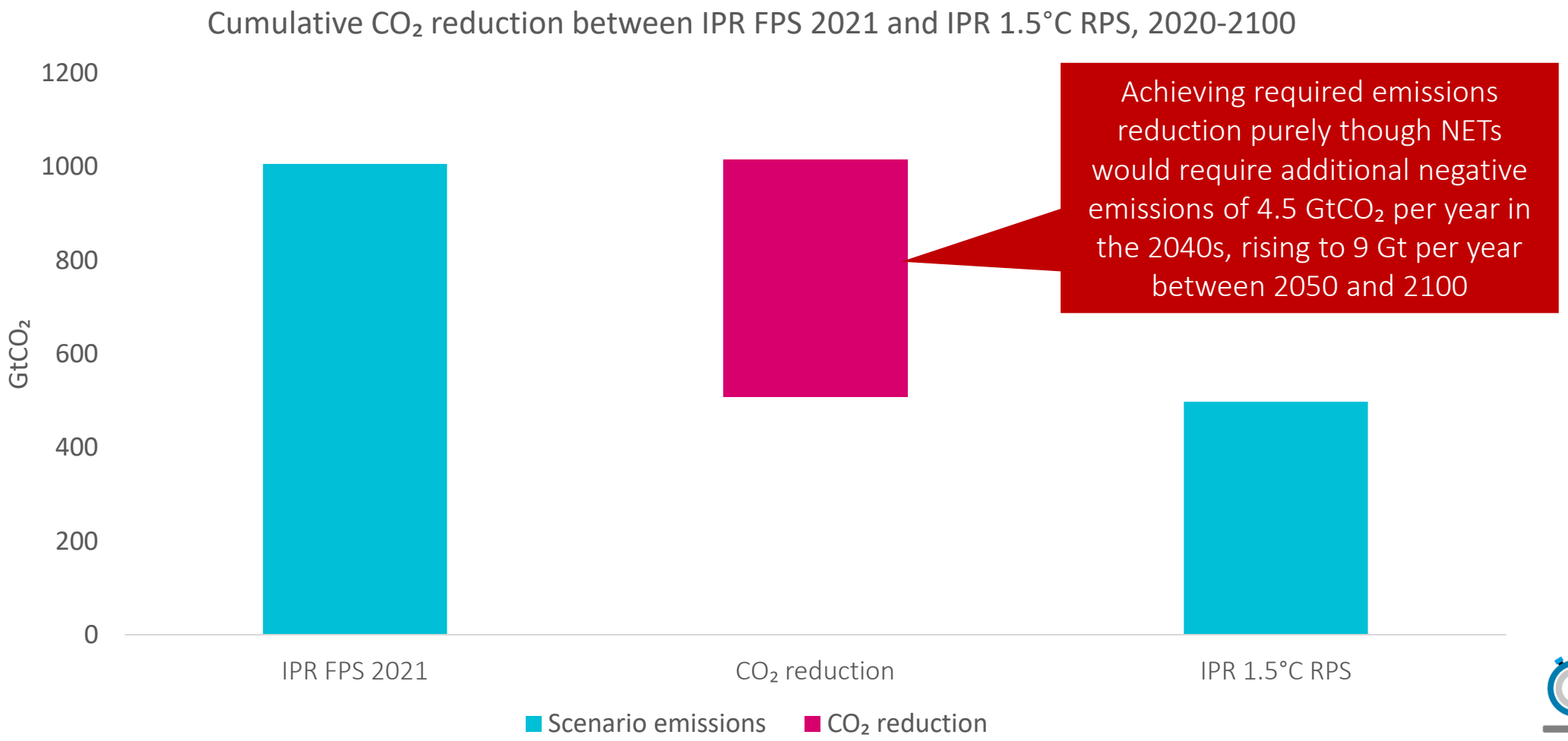
Fossil CO_2 capture and negative emissions ($GtCO_2$) in 2050

Emissions Category	Source	IPR FPS	IPR RPS	IEA NZE
Avoided emissions	Power coal	0.9	0.9	0.6
	Power gas	0.4	0.7	0.2
	Industry coal	0.4	0.5	1.2
	Industry gas	0.3	0.9	
	Industry process	0.8	1.7	1.6
	Hydrogen	0.7	1.3	1.4
	Other			1.0
	Total	**3.5**	**6.0**	**6.0**
Negative emissions	Power biomass	1.1	1.1	0.6
	Industry biomass	0.1	0.2	0.2
	Direct air capture	0.5	0.5	0.6
	Nature based solutions	4.7	4.9	
	Total	**6.4**	**6.7**	**n/a**

Note: Additional NBS of up to 4 $GtCO_2$ provided by avoided deforestation, which is not considered a NET

INEVITABLE POLICY RESPONSE

Achieving 1.5°C with less aggressive action on fossil CO_2 emissions would require substantially more negative emissions technologies (NETs)



INEVITABLE POLICY RESPONSE

- IPR 1.5°C Required Policy Scenario (RPS):
- Energy policies

Policy methodology for the IPR 1.5°C RPS

Our analysis allows us to pinpoint the actions needed in key sectors to achieve an outcome consistent with 1.5°C

- We assume carbon prices to be similar to IPR FPS 2021 levels, as the extremely rapid transition required to achieve IPR 1.5°C RPS will be challenging to achieve through carbon pricing mechanisms beyond what is already expected in the IPR FPS 2021
- Instead, what drives the additional impact of the IPR 1.5°C RPS is performance standards (bans) or more direct subsidies driven by policymakers
- These further policies would need to be announced as quickly as possible, certainly by the 2023 Paris stocktake
- Implementation is required immediately upon announcement
- For the IPR FPS 2021, we forecast announcements are by the 2025 ratchet
- In IPR FPS 2021 we forecast a timeframe for the emergence of carbon prices at different levels

INEVITABLE POLICY RESPONSE

Global coal phase out by 2045 requires immediate policy action

Phase out of existing unabated coal

	Timeline									annual reduction*	
	2020	2025	2030	2035	2040	2045	2050	2055	2060	RPS	FPS
AU			RPS		FPS					10%	5%
BRA				RPS		FPS				7%	4%
CAN		RPS	FPS							20%	10%
CHI				RPS		FPS				7%	4%
CSA				RPS		FPS				7%	4%
EEU			RPS		FPS					10%	5%
EURA						RPS			FPS	4%	3%
GCC						RPS			FPS	4%	3%
IND						RPS			FPS	4%	3%
INDO						RPS			FPS	4%	3%
JAP				RPS		FPS				7%	4%
MENA						RPS			FPS	4%	3%
RU						RPS			FPS	4%	3%
SA						RPS			FPS	4%	3%
SAF				RPS	FPS					7%	5%
SEAO						RPS			FPS	4%	3%
SK				RPS		FPS				7%	4%
SSA						RPS			FPS	4%	3%
UK		Both								20%	20%
USA			RPS	FPS						10%	7%
WEU			RPS		FPS					10%	5%

** reduction in coal generation as a share of 2020 levels*

INEVITABLE POLICY RESPONSE

100% clean power can be achieved with immediate policy action if taken now

100% clean power

	Timeline									annual reduction*	
	2020	2025	2030	2035	2040	2045	2050	2055	2060	RPS	FPS
AU					RPS		FPS			5%	3%
BRA					RPS		FPS			5%	3%
CAN			RPS	FPS						10%	7%
CHI					RPS		FPS			5%	3%
CSA					RPS		FPS			5%	3%
EEU				RPS		FPS				7%	4%
EURA						RPS			FPS	4%	3%
GCC						RPS			FPS	4%	3%
IND						RPS			FPS	4%	3%
INDO						RPS			FPS	4%	3%
JAP				RPS		FPS				7%	4%
MENA						RPS			FPS	4%	3%
RU						RPS			FPS	4%	3%
SA						RPS			FPS	4%	3%
SAF				RPS	FPS					7%	5%
SEAO						RPS			FPS	4%	3%
SK				RPS		FPS				7%	4%
SSA						RPS			FPS	4%	3%
UK				RPS	FPS					7%	5%
USA				RPS	FPS					7%	5%
WEU				RPS		FPS				7%	4%

** reduction in power CO2 emissions as a share of 2020 levels*

INEVITABLE POLICY RESPONSE

Light duty vehicles: new fossil vehicles must be phased out between 2030 and 2045, five years earlier than under IPR FPS 2021 policies

Fossil vehicle phase out (light duty)

	Timeline									annual reduction*	
	2020	2025	2030	2035	2040	2045	2050	2055	2060	RPS	FPS
AU				RPS	FPS					7%	5%
BRA					RPS	FPS				5%	4%
CAN			RPS	FPS						10%	7%
CHI			RPS	FPS						10%	7%
CSA				RPS	FPS					7%	5%
EEU			RPS	FPS						10%	7%
EURA					RPS	FPS				5%	4%
GCC					RPS	FPS				5%	4%
IND				RPS	FPS					7%	5%
INDO				RPS	FPS					7%	5%
JAP				RPS	FPS					7%	5%
MENA				RPS	FPS					7%	5%
RU					RPS	FPS				5%	4%
SA						RPS	FPS			4%	3%
SAF				RPS	FPS					7%	5%
SEAO				RPS	FPS					7%	5%
SK			RPS	FPS						10%	7%
SSA						RPS	FPS			4%	3%
UK			Both							10%	10%
USA				RPS	FPS					7%	5%
WEU			RPS	FPS						10%	7%

** reduction in fossil vehicle sales as a share of 2020 levels*

INEVITABLE POLICY RESPONSE

Heavy duty vehicles: new fossil vehicles must be phased out between 2035 and 2050, five years earlier than under IPR FPS 2021 policies

Fossil vehicle phase out (heavy duty)

	Timeline									annual reduction*	
	2020	2025	2030	2035	2040	2045	2050	2055	2060	RPS	FPS
AU					RPS	FPS				5%	4%
BRA					RPS	FPS				5%	4%
CAN					RPS	FPS				5%	4%
CHI				RPS	FPS					7%	5%
CSA					RPS	FPS				5%	4%
EEU				RPS	FPS					7%	5%
EURA						RPS	FPS			4%	3%
GCC						RPS	FPS			4%	3%
IND					RPS	FPS				5%	4%
INDO					RPS	FPS				5%	4%
JAP				RPS	FPS					7%	5%
MENA					RPS	FPS				5%	4%
RU						RPS	FPS			4%	3%
SA							RPS	FPS		3%	3%
SAF					RPS	FPS				5%	4%
SEAO					RPS	FPS				5%	4%
SK				RPS	FPS					7%	5%
SSA							RPS	FPS		3%	3%
UK				Both						7%	7%
USA					RPS	FPS				5%	4%
WEU				RPS	FPS					7%	5%

** reduction in fossil vehicle sales as a share of 2020 levels*

INEVITABLE POLICY RESPONSE

Industry: the sector has a 30-year transition opportunity to net zero

100% clean industry

	Timeline									annual reduction*	
	2020	2025	2030	2035	2040	2045	2050	2055	>2060	RPS	FPS
AU							RPS		FPS	3%	2%
BRA								RPS	FPS	3%	2%
CAN							RPS		FPS	3%	2%
CHI								RPS	FPS	3%	2%
CSA								RPS	FPS	3%	2%
EEU							RPS		FPS	3%	2%
EURA								RPS	FPS	3%	2%
GCC								RPS	FPS	3%	2%
IND								RPS	FPS	3%	2%
INDO								RPS	FPS	3%	2%
JAP							RPS		FPS	3%	2%
MENA								RPS	FPS	3%	2%
RU								RPS	FPS	3%	2%
SA								RPS	FPS	3%	2%
SAF							RPS		FPS	3%	2%
SEAO								RPS	FPS	3%	2%
SK							RPS		FPS	3%	2%
SSA								RPS	FPS	3%	2%
UK							RPS		FPS	3%	2%
USA							RPS		FPS	3%	2%
WEU							RPS		FPS	3%	2%

** reduction in industry CO2 emissions as a share of 2020 levels*

INEVITABLE POLICY RESPONSE

Buildings: new fossil heating systems must be phased out globally by 2040, and by 2030 in regions with large heating needs

New fossil heating system phase out

	Timeline									annual reduction*	
	2020	2025	2030	2035	2040	2045	2050	2055	2060	RPS	FPS
AU			RPS	FPS						10%	7%
BRA					RPS		FPS			5%	3%
CAN			RPS	FPS						10%	7%
CHI					RPS	FPS				5%	4%
CSA				RPS	FPS					7%	5%
EEU			RPS	FPS						10%	7%
EURA					RPS		FPS			5%	3%
GCC					RPS		FPS			5%	3%
IND					RPS		FPS			5%	3%
INDO					RPS		FPS			5%	3%
JAP				RPS	FPS					7%	5%
MENA					RPS		FPS			5%	3%
RU					RPS		FPS			5%	3%
SA					RPS		FPS			5%	3%
SAF			RPS	FPS						10%	7%
SEAO					RPS		FPS			5%	3%
SK				RPS	FPS					7%	5%
SSA					RPS		FPS			5%	3%
UK			RPS	FPS						10%	7%
USA				RPS	FPS					7%	5%
WEU			RPS	FPS						10%	7%

** reduction in fossil heating system sales as a share of 2020 levels*

INEVITABLE POLICY RESPONSE

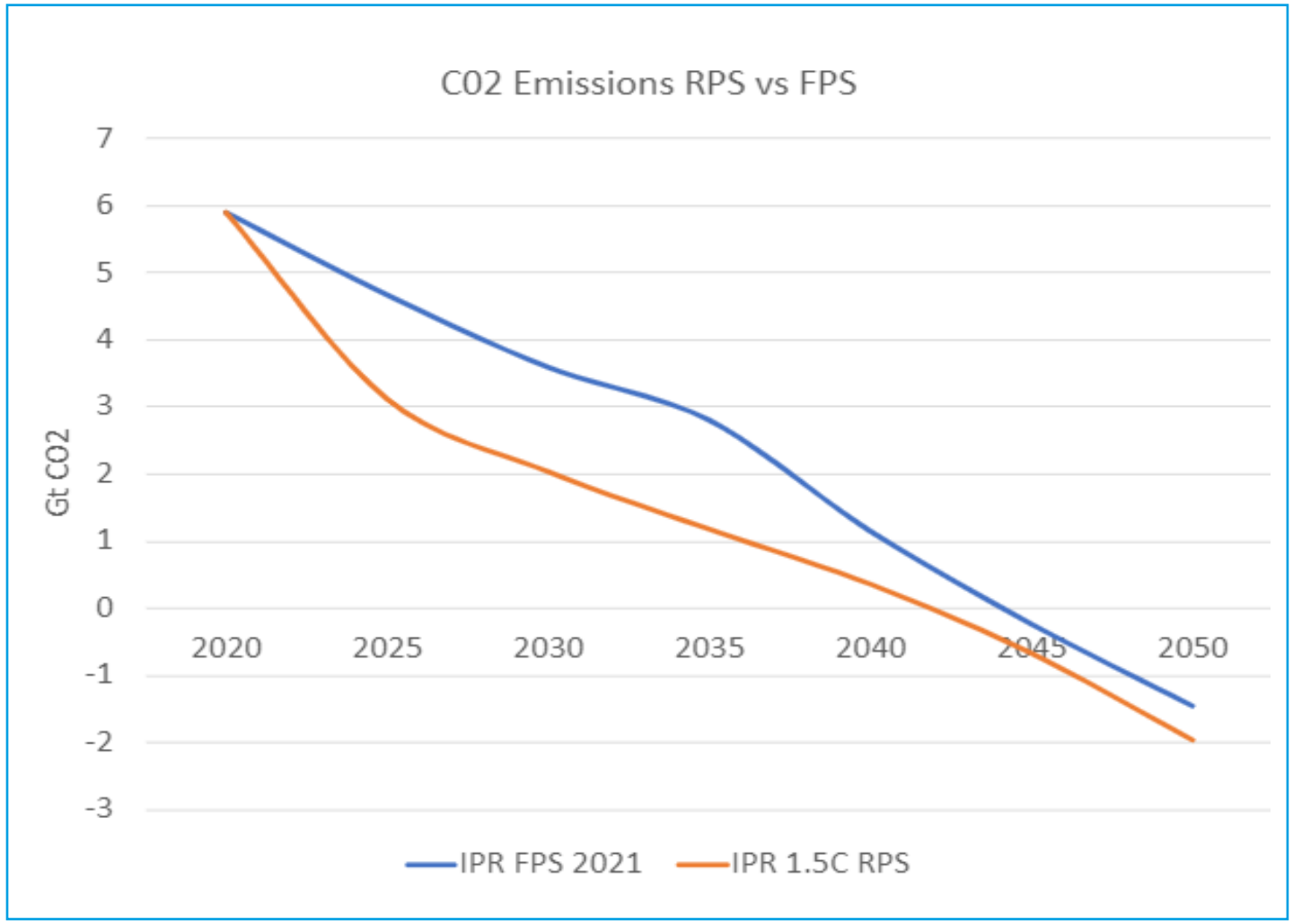
- IPR 1.5°C Required Policy Scenario (RPS):
- Land use policies

IPR 1.5°C RPS 2021 is based on additional regulatory and technological drivers of change than FPS 2021

Policy lever	FPS 2021	IPR 1.5°C RPS
GHG prices	Land use carbon prices gradually rise to align with carbon price in energy and industry, representing the gradual incorporation of the former into the latter.	Greater integration of agriculture in carbon pricing schemes
Food production	Peak meat in 2030; 30% fall to 2050 due to. • Policy-driven increases in the cost of animal meat, encouraging the production of alternative meat • Consumer preferences will shift towards alternative meat for sustainability and health reasons • Technology development will reduce the cost and improve the taste of alternative meat; cell-based meat becomes price/taste competitive 2035-2040	Faster reductions in traditional meat consumption • Strong consumer preference for lower environmental impact influenced by public education and marketing by alternative protein companies. • Technological progress accelerated by government support, with plant-based meat reaching cost and taste-parity with low grade meat in 2025. Cell-based meat becomes price and taste competitive in 2030. • Highly interventionist regulation, approval of cellular agriculture globally
Bioenergy	90 EJ production by 2050	99 EJ production by 2050
Deforestation	End to deforestation in 2030	End to deforestation in 2025

INEVITABLE POLICY RESPONSE

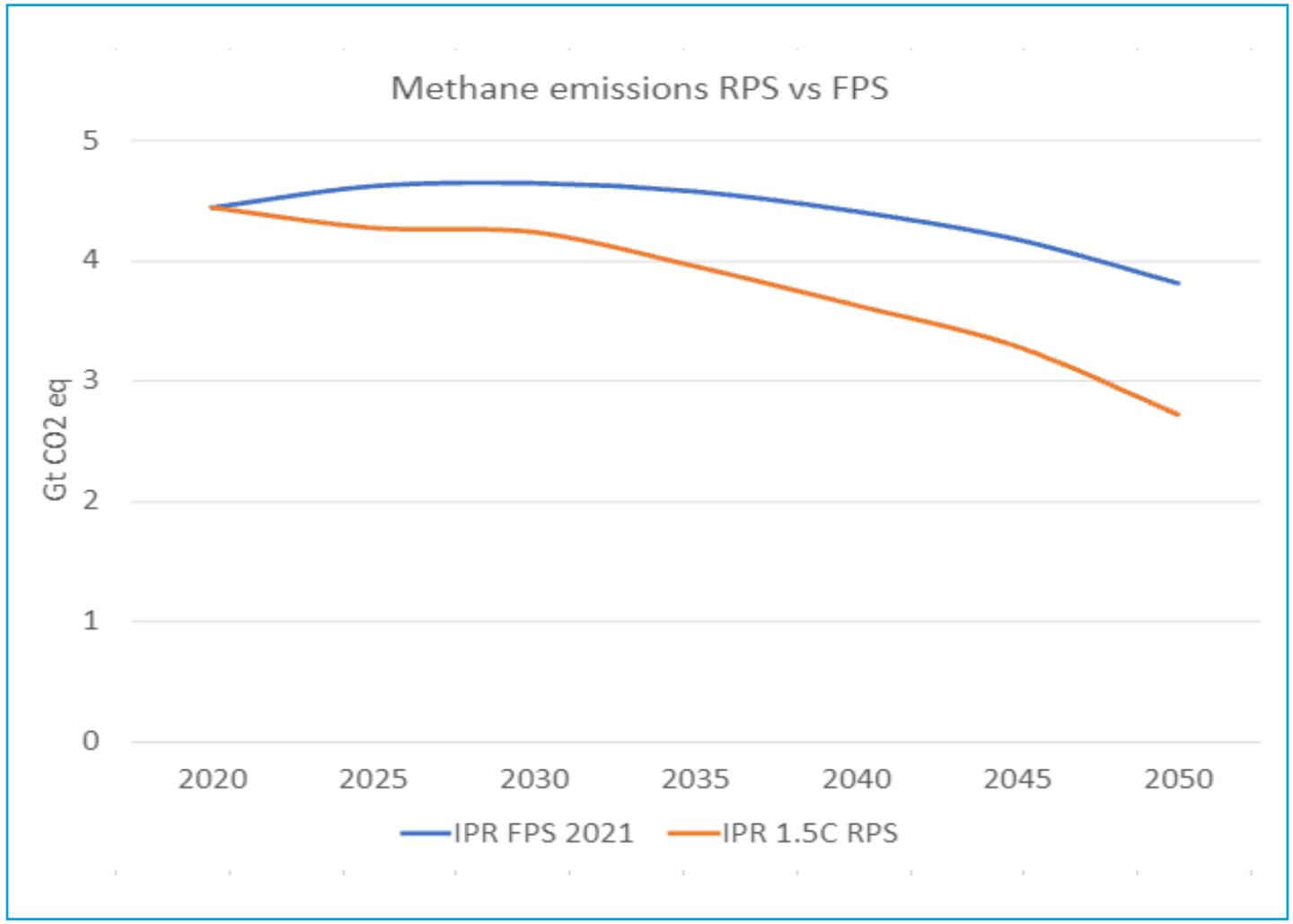
IPR 1.5°C RPS: CO_2 emissions from land use change decline more rapidly, compared to the IPR FPS 2021, in the especially in the 2020-2025 period



- The IPR 1.5°C RPS estimates a more aggressive decline in CO_2 emissions in the 2020-2050 period
- This drop is mostly driven by the end of deforestation in 2025 (as opposed to 2030 for IPR FPS 2021)
- Food production shifts away from animal protein, also opening up space for more NBS to be deployed in RPS

INEVITABLE POLICY RESPONSE

IPR 1.5°C RPS: Methane emissions from agricultural production decline more rapidly compared to the IPR FPS 2021, especially after 2030



- The IPR 1.5°C RPS estimates a more aggressive decline methane emissions in the 2020-2050 period
- This drop is mostly driven more aggressive food production shifts away from animal meat, more specifically ruminant meat
- The shift is accelerates in the 2030's when alternative meats are expected to become cost competitive

INEVITABLE POLICY RESPONSE

IPR designed the 1.5°C RPS to demonstrate how aggressive policies and actions have to be to keep global warming below 1.5°C

Main message

- IPR 1.5°C RPS is driven by stronger interventions than the IPR FPS 2021
- **Strong government intervention anticipated in the meat market,** with substantial support for the cellular agriculture industry (e.g. subsidies) alongside regulation which limits animal protein consumption
- Environmental impact expected to be a primary concern for consumers when making consumption choices, following government education programs

Demand shape	Consumer preferences	Technology availability	Regulation
Peak animal meat 2030, substantial fall by 2050 globally	Strong consumer preference for lower environmental impact influenced by government education leads to shift away from animal meat consumption	High rate of technological progress driven by government intervention, with plant-based meat reaching cost parity with low grade meat in 2025 and cell-based meat becoming price competitive in the 2030s	Highly interventionist regulation, approval of cellular agriculture globally

INEVITABLE POLICY RESPONSE

Ending deforestation by 2025 in 1.5°C RPS, compared to the IPR FPS 2021 assumption of ending it in 2030, will require immediate policy action

Deforestation of natural forest halted through strong and effective command and control policy

Countries/regions like CAN, GCC, JAP, SA, SK, UK have virtually zero net deforestation

End of deforestation				Change in forest cover 2020-2050 (m ha)	
	2020	2025	2030	IPR FPS 2021	IPR 1.5C RPS
AU		FPSRPS		3	3
BRA		RPS	FPS	12	16
CAN	FPSRPS			1	1
CHI		RPS	FPS	92	92
CSA		RPS	FPS	10	14
EEU		FPSRPS		4	4
EURA		RPS	FPS	1	2
GCC	FPSRPS			0	0
IND		RPS	FPS	13	13
INDO		RPS	FPS	2	6
JAP	FPSRPS			0	0
MENA		RPS	FPS	-1	1
RU		RPS	FPS	1	2
SA	FPSRPS			0	0
SAF		RPS	FPS	0	1
SEAO		RPS	FPS	3	11
SK	FPSRPS			0	0
SSA		RPS	FPS	0	15
UK	FPSRPS			1	1
USA		FPSRPS		17	17
WEU		RPS	FPS	11	12

Carbon pricing and NDC commitments combine to stop net deforestation by 2030. Biggest changes need to occur in BRZ, CSA, INDO, SEAO, SSA

INEVITABLE POLICY RESPONSE

Achieving 1.5°C RPS animal meat consumption reductions requires a shift in policy acceleration of five years compared to the IPR FPS 2021

	2020	2025	2030	2035	2040	Reduction in per capita meat consumption* 2020-2050 (%) IPR FPS 2021	IPR 1.5C RPS
AU		RPS	FPS			42	51
BRA		RPS	FPS			38	48
CAN		RPS	FPS			43	52
CHI				FPSRPS		35	45
CSA		RPS	FPS			34	45
EEU		RPS	FPS			40	50
EURA			RPS	FPS		30	42
GCC			RPS	FPS		25	37
IND			RPS	FPS		0	14
INDO			RPS	FPS		18	31
JAP		RPS	FPS			40	50
MENA			RPS	FPS		28	39
RU		RPS	FPS			36	46
SA			RPS	FPS		6	22
SAF			RPS	FPS		-13	6
SEAO			RPS	FPS		20	33
SK		RPS	FPS			40	50
SSA					FPSRPS	-13	6
UK		RPS	FPS			41	50
USA		RPS	FPS			42	51
WEU	RPS	FPS				40	50

*kcal per person

All regions need to reduce and/or reverse the growth of animal meat consumption

Large drop in SSA happens post 2035

INEVITABLE POLICY RESPONSE

Thank you!

Please see PRI website for further details:

https://www.unpri.org/climate-change/what-is-the-inevitable-policy-response/4787.article

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INEVITABLE POLICY RESPONSE

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INEVITABLE POLICY RESPONSE

Annex: IEA Announced Pledges Scenario

Scenario emissions (GtCO2)

Scenario	2020	2030	2040	2050
Announced Pledges Case (APC) May 2021	33.9	30.5	24.8	22.0
Announced Pledges Scenario (APS) October 2021	34.1	33.6	26.7	20.7

- This report has compared emissions in IPR FPS to the IEA Announced Pledges Case (APC) scenario from the May 2021 Net Zero Emissions report
- In WEO 2021, IEA APC is renamed Announced Pledges Scenario (APS), with a slightly modified emissions pathway

INEVITABLE POLICY RESPONSE