Climate Change Advisory Council Secretariat

CB WG Meeting 10

18th January 2024

Agenda

Time	Agenda Item
13:30	1. Opening of Meeting
13:35	2. IEA Net Zero Roadmap 2023 Update
14:30	3. Analysis of warming impact of selected core scenarios (1st iteration)
15:30	4. Additional testing of scenario results
16:00	5. Update on economic & macroeconomic analysis
16:20	6. Carbon Budgets Work Plan
16:20	7. Next Steps and Agenda for next meeting
16:30	8. AOB
16:30	Meeting Close

1. Opening of Meeting

Action Number	Date Raised	Description	Owner	Due	Status
10	19/10/23	Secretariat to share a note on the inputs required for macroeconomic analysis and a template regarding the temperature impact analysis with the core modelling teams for review and feedback	CCAC Secretariat/ CB WG Members	Nov 2023	*Closed* *Feedback on the inputs required for macroeconomic analysis to be discussed at the January 2024 CBWG meeting*
11	15/12/23	Modelling groups to provide projected GHG emission data for temperature analysis	CBWG core modelling groups	Dec 2023	*Propose to Close* *Modelling groups provided data by 18/12/23 and shared with Joe Wheatly for temperature impact analysis*

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16:30	Meeting Close

6. 2024 Meeting Schedule and Proposed Topics for Consideration

CB WG Meeting No.	Proposed Date and Time	Topic(s) for Consideration
10	Thursday 18th January 2024, 13:30 – 16:30	IEA Net Zero Roadmap 2023 Update/ Analysis of warming impact of selected core scenarios (1st iteration)/ Update on economic & macroeconomic analysis
11	Thursday 29th February 2024, 9:30 – 13:30	Quantitative approaches to carbon budgeting for Parties to the Paris Agreement (Victorian Government Report)/ Energy and Power systems modelling (Paul Deane)/ Scientific advice for the determination of an EU-wide 2040 climate target and a greenhouse gas budget for 2030–2050 (ESAB)
12	Friday 22nd March 2024, 13:30 – 16:30	Agree inputs, parameters and assumptions for 2nd Iteration of Modelling/ Teagasc research and implications for Carbon Budgets (Teagasc)/ *Follow on discussion on methane and climate neutrality (TBC)*
13	Friday 19th April 2024, 13:30 – 16:30	Just Transition principles and considerations in the Carbon Budget Process (NESC)/ *Decarbonised Electricity System Study (SEAI)*
14	Thursday 23rd May 2024, 13:30 – 16:30	*2nd Iteration of Core Modelling Results/*
15	Friday 28th June 2024, 13:30 – 16:30	Analysis of warming impact of selected core scenarios (2nd iteration)/ *Macroeconomic and Economic Modelling Results (based on 1st and 2nd iteration)*
16	Thursday 25th July 2024, 13:30 – 16:30	Agree inputs, parameters and assumptions for 3rd Iteration of Modelling/
17	Thursday 29th August 2024, 13:30 – 16:30	3rd *Iteration of Core Modelling Results/*
18	Wed 18th September 2024, 13:30 – 16:30	*Macroeconomic and Economic Modelling Results (based on the 3rd iteration)* Analysis of warming impact of selected core scenarios (3rd iteration)

6. Other Proposed Topics for Consideration in 2024

- Follow on discussion on biodiversity considerations (Yvonne Buckley/ Secretariat)
- Discussion on various aspects of aviation and maritime (Secretariat)
- Greenhouse gas - air pollution interactions and synergies (Andrew Kelly)
- Economic assessment of climate change impacts and adaptation options in Ireland (ESRI)
- Follow on discussion on CDR and Carbon Budgets (Oliver Geden/ Secretariat)

6. Carbon Budgets Workplan

Item	Description	2023									2024											
		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	**Modelling / Analysis Iteration 1**																					
1.1	Agree inputs, parameters and assumptions																					
1.2	Core pathways development and modelling									→												
1.3	Paris Test Assessment									→												
1.4	Additional modelling and testing of results									→												
1.5	Post-hoc analysis																					
2	**Modelling / Analysis Iteration 2**																					
2.1	Agree inputs, parameters and assumptions																					
2.2	Core pathways development and modelling																					
2.3	Paris Test Assessment																					
2.4	Additional modelling and testing of results																					
2.5	Post-hoc analysis																					
3	**Modelling / Analysis Iteration 3**																					
3.1	Agree inputs, parameters and assumptions																					
3.2	Core pathways development and modelling																					
3.3	Paris Test Assessment																					
3.4	Additional modelling and testing of results																					
3.5	Post-hoc analysis																					
D	**Key Deliverables**																					
D.1	Modelling / Analysis Iteration 1 Results																					
D.2	Modelling / Analysis Iteration 2 Results																					
D.3	Modelling / Analysis Iteration 3 Results																					
D.4	Carbon Budgets Technical Report																					
D.5	CCAC Carbon Budget Proposals																					

6. Carbon Budgets Workplan: 2nd Iteration of Modelling & Analysis

Item	Description	2024											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	**Modelling / Analysis Iteration 2**												
2.1	Agree inputs, parameters and assumptions												
2.2	Core pathways development and modelling												
2.3	Paris Test Assessment												
2.4	Additional modelling and testing of results												
2.5	Post-hoc analysis												

- **Friday 22nd March 2024, 13:30 – 16:30:**
  - Agree inputs, parameters and assumptions for 2nd Iteration of Modelling
- **Thursday 23rd May 2024, 13:30 – 16:30:**
  - 2nd Iteration of Core Modelling Results
- **Friday 28th June 2024, 13:30 – 16:30:**
  - Analysis of warming impact of selected core scenarios (2nd iteration),
  - Additional Testing of Scenario Results (SEAI & NTA)
  - Macroeconomic and Economic Modelling Results (based on 1st and 2nd iteration)

7. Next Steps

- Secretariat briefed Council on the Carbon Budgets Core Model Outputs on 11/01/24
- Secretariat due to brief Council on the warming impacts of the first iteration outputs from the core models on 14/02/24
  - *Proposal to invite core modelling teams to join for the final 30mins i.e., 12:30-13:30?*
- Council to discuss feedback for CBWG at the February CCAC meeting on 15/02/24

7. Agenda for Meeting No. 11: 29th February 9:30 – 13:30

1. **Quantitative approaches to carbon budgeting for Parties to the Paris Agreement**
- Malte Meinshausen (University of Melbourne) to present on Victorian emissions budgets

2. Energy and Power systems modelling
- Paul Deane (UCC) to present on energy and power systems modelling

3. ESAB Scientific advice for the determination of an EU-wide 2040 climate target and a greenhouse gas budget for 2030–2050
- ESAB Secretariat to present on the ESAB 2040 Advice

Note: extended meeting timing – meeting invite to be updated

7. Agenda for Meeting No. 12: Friday 22nd March 2024, 13:30 – 16:30

1. **Teagasc research on feed additives and nitrous oxide emissions**
- Teagasc to present latest research on mitigation technologies and their implications for carbon budgets

2. Follow on discussion on methane and climate neutrality
- Updated Secretariat working paper to be presented
- Potential Invited Speakers (TBC): *Substantial reductions in non-CO_2 greenhouse gas emissions reductions implied by IPCC estimates of the remaining carbon budget* (Rogeli and Lamboll, 2024)

3. Agree inputs, parameters and assumptions for 2nd Iteration of Modelling
- CBWG to develop a shared understanding of model inputs and expected outputs for the 2nd iteration of modelling and analysis

8. AOB

International Energy Agency

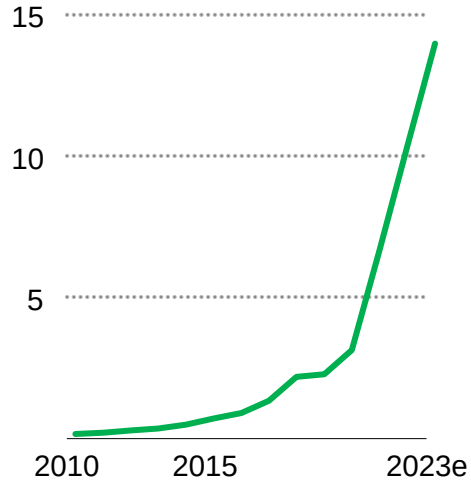
A Global Pathway to Keep the 1.5 °C Goal in Reach

Christophe McGlade, Head of Energy Supply, World Energy Outlook

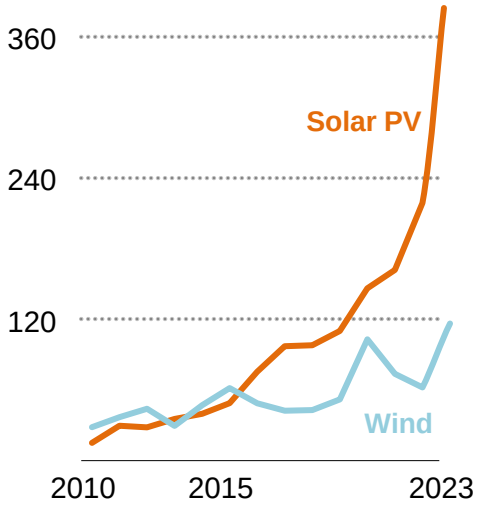
18 January 2024

Clean energy growth is keeping the door to 1.5 ºC open

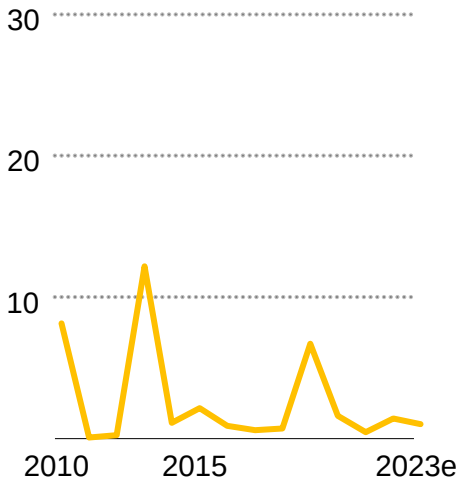
Electric car sales (million)



Solar PV and wind capacity additions (GW)



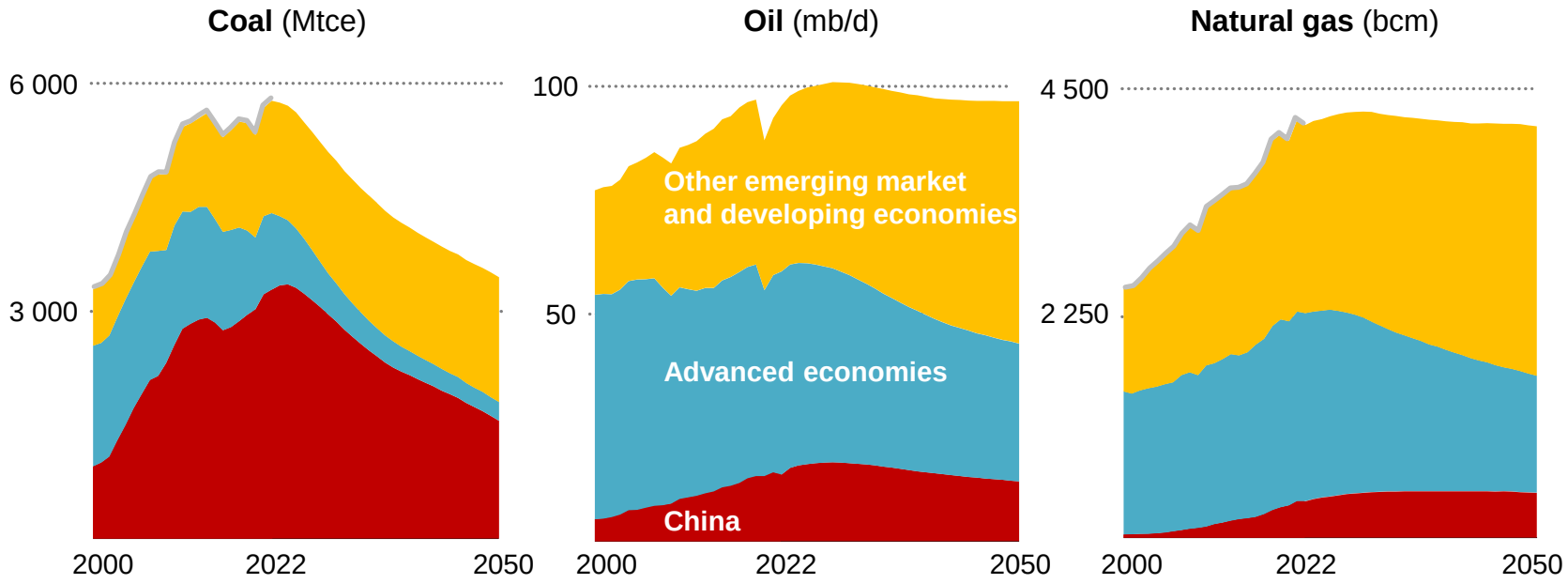
Carbon capture capacity additions (Mt CO_2)



Spurred by policies and market competition, some key technologies have recently seen strong growth in deployment; while other technologies will require much more rapid progress to be aligned with a Net Zero pathway

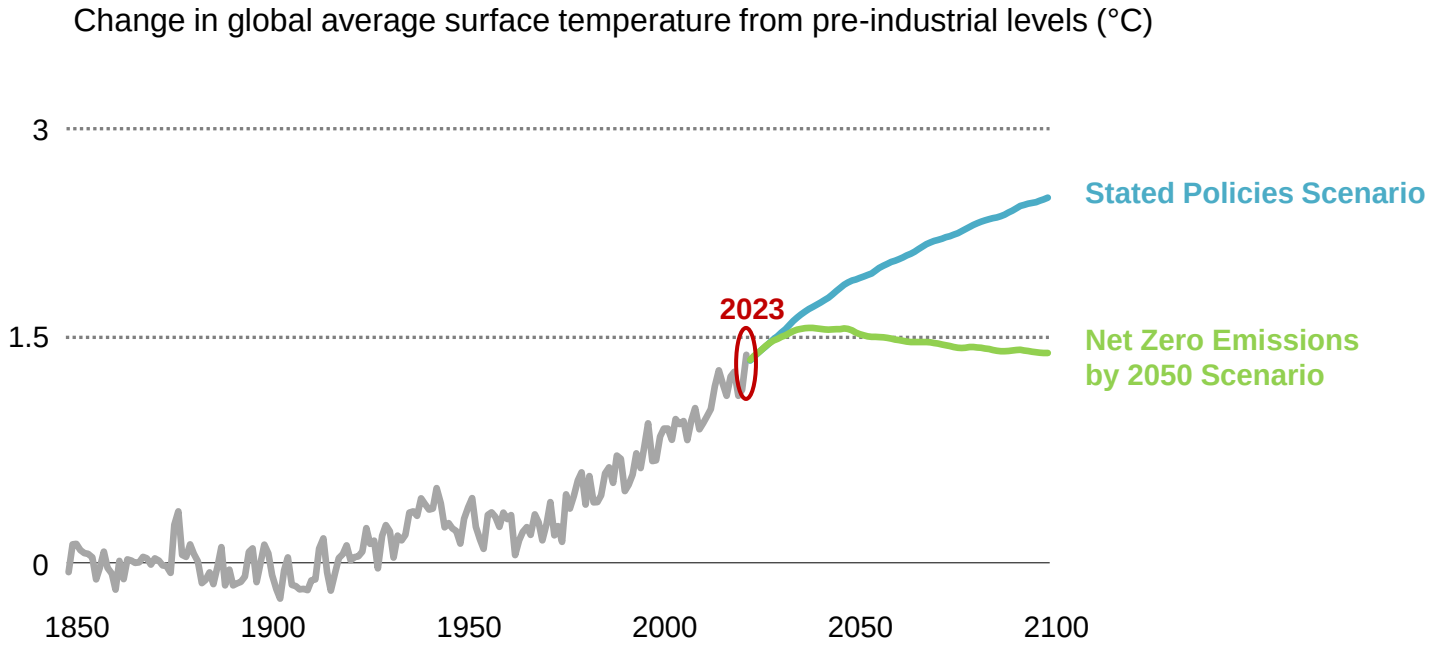
On track for a peak in all fossil fuels before 2030

Fossil fuel demand in the Stated Policies Scenario (STEPS)



For the first time, today's policy settings are strong enough to generate peaks for coal, oil and natural gas this decade; the share of fossil fuels starts to edge downwards from 80% today to 73% in 2030

Today’s choices will determine future warming

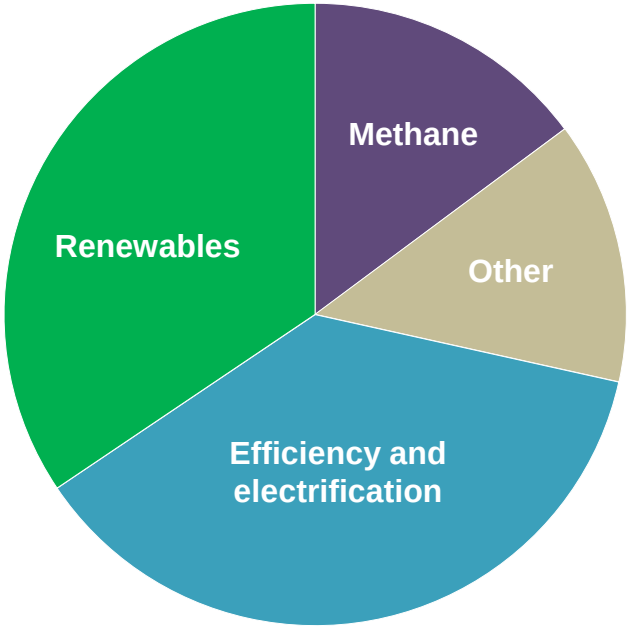


Emissions are set to peak by 2025 under today’s policy settings, but temperatures would continue to rise; proven policies and technologies are available to keep the door to 1.5 °C open

Historical temperature data from HadCRUT.5.0.1.0

We have the tools to go much faster

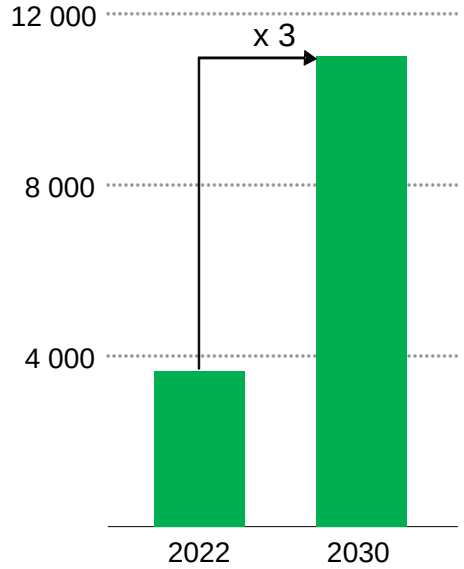
Emissions reductions by measure by 2030 in the NZE Scenario



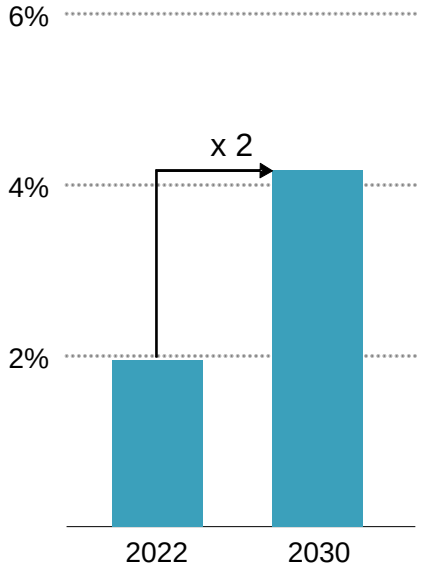
Energy-related greenhouse gas emissions peak by 2025 and decline by nearly 40% from today to 2030. Proven solutions available today deliver over 80% of what is needed this decade.

We have the tools to go much faster

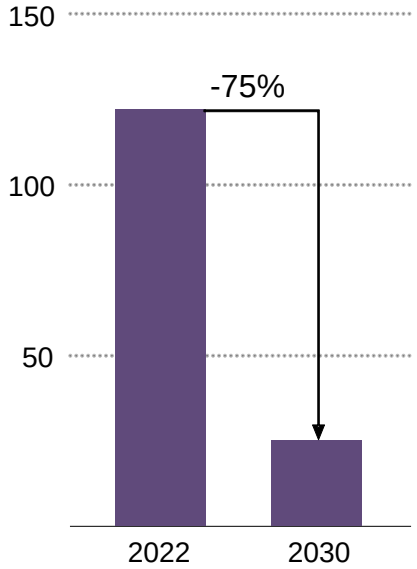
Renewables installed capacity (GW)



Annual energy intensity improvement



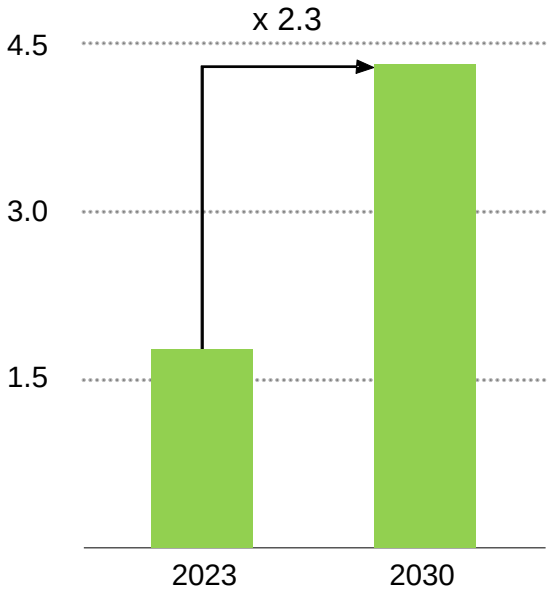
Methane emissions from fossil fuel operations (Mt)



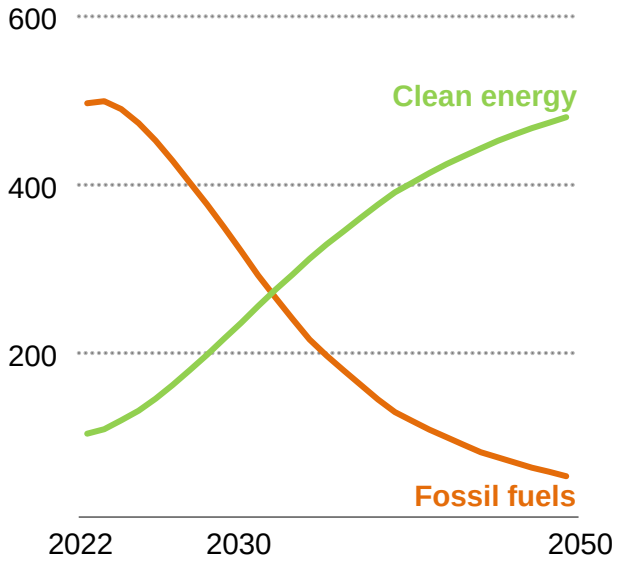
Energy-related greenhouse gas emissions peak by 2025 and decline by nearly 40% from today to 2030. Proven solutions available today deliver over 80% of what is needed this decade.

Strong growth in clean energy drives a decline in fossil fuel demand

Clean energy investment
(trillion USD)



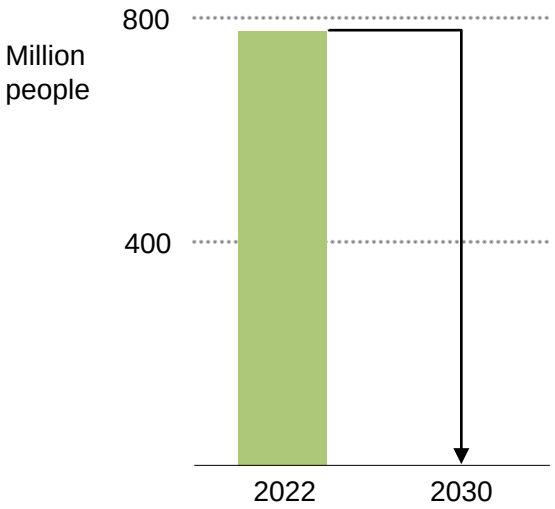
Primary energy demand
(EJ)



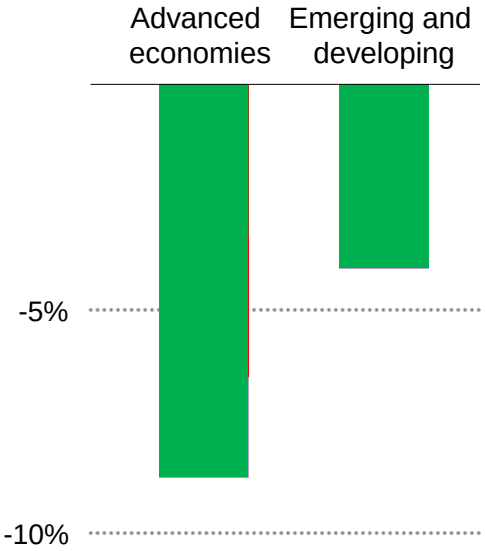
Clean energy investment needs to grow from USD 1.8 trillion today to USD 4.2 trillion in 2030. As clean energy grows and fossil fuel demand declines, there is no need for investment in new coal, oil and natural gas.

The transition to net zero needs to be inclusive and equitable

Population without access to electricity

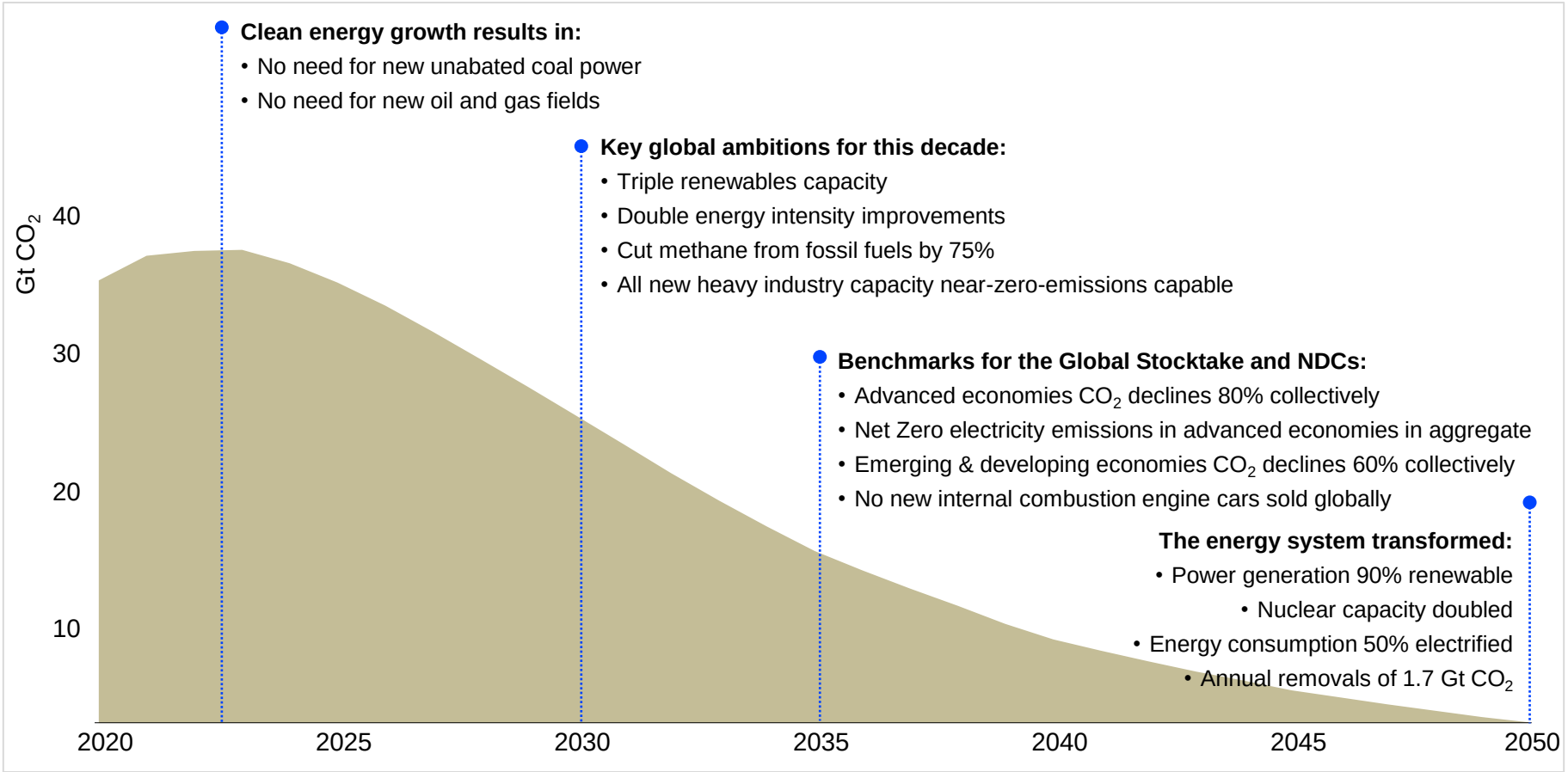


Annual rate of CO_2 emissions reductions, 2022-2030



In the NZE Scenario, universal access to modern energy is achieved by 2030. Advanced economies reach net zero before 2050 and other countries follow.

A roadmap to net zero by 2050



Warming impact of national emissions pathways

Joe Wheatley

18th January 2024 CCAC Carbon Budgets Working Group

Why national warming impacts?

- Paris Agreement expressed in terms of temperature
  - Global 2m surface air temperature (GSAT) vs 1850-1900
- Equity & Liability
  - Some climate damages are f(GSAT,…)
- 2021 Climate Act – Climate Neutrality before 2050
  - Temperature neutrality before 2050

How to calculate?

- CO_2 TCRE
  - $GSAT_t \approx TCRE \times E_t$ E_t cumulative CO_2 emissions at time t
  - AR6 assessed TCRE is 0.45 ± 0.18 °C per $TtCO_2$
  - e.g. 400 $MtCO_2$ is 0.18 m°C
- Ad hoc methods for non-CO_2 climate drivers
  - e.g. warming-equivalents GWP* for CH_4.
- GWPs: not directly useful

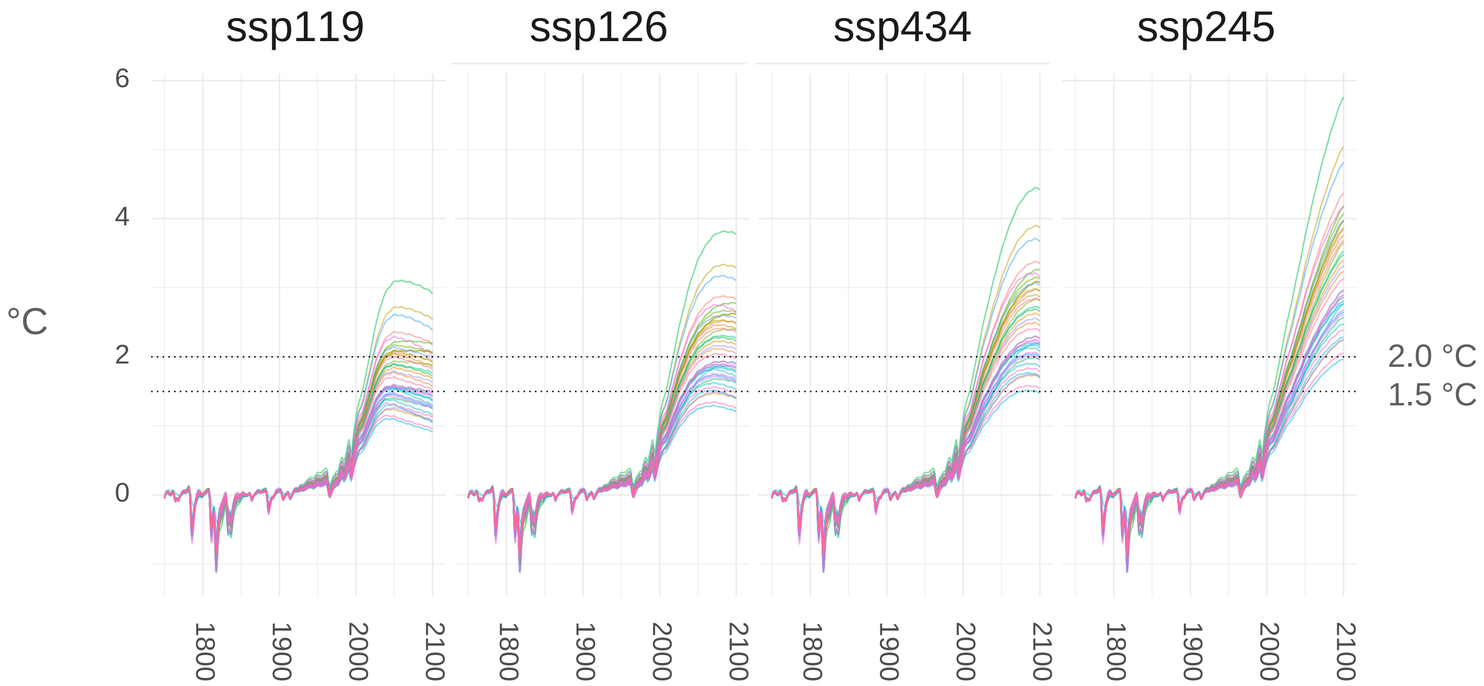
Simple Climate Models

- Long History
  - Early understanding of feedbacks
  - Calibration to Earth System Models (CMIP6)
- Rich inputs
  - Main GHGs CO_2, CH_4, N_2O
  - Halocarbons
  - Aerosols
  - Ozone precursors
- **FaIRv1.6**, Hectorv3.1, MAGICCv7

Mikhail Budyko

Global Warming

FalRv1.6 40-member ESM ensemble

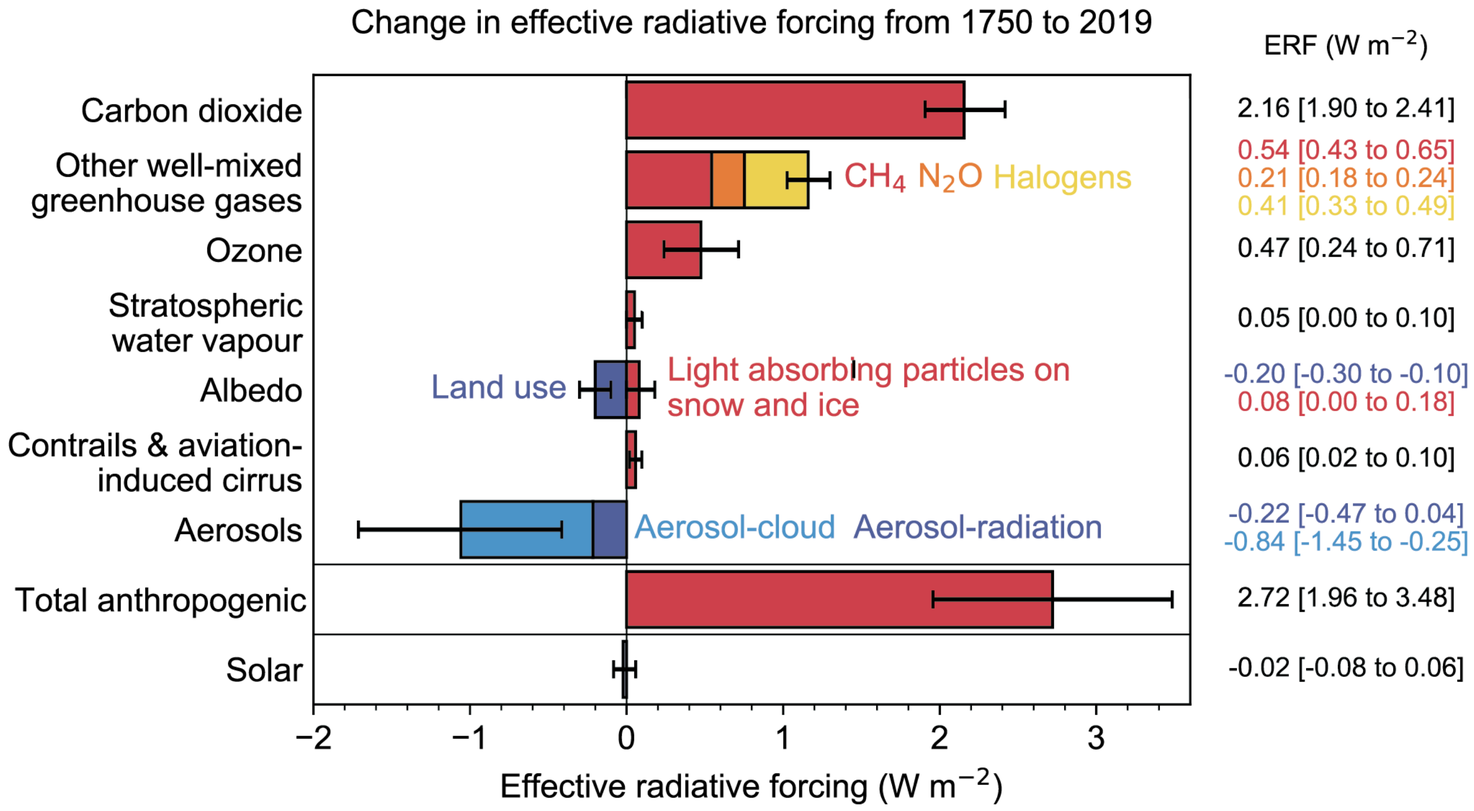


	Neutral	$GSAT_{Peak}$
SSP119	2050	1.74 °C
SSP126	2082	2.08 °C
SSP434	≈2094	2.45 °C
SSP245	>2100	>3.18 °C

medians

Global Climate Forcing 1750-2019

FaIRv1.6 good agreement with IPCC AR6



AR6 Figure 7.6

W/m^2

forcer	AR6	**FaIRv1.6**
CO_2	2.16	**2.18**
Aerosol-cloud	-0.84	**-0.85**
CH_4	0.54	**0.54**[a]
O_3	0.47	**0.43**[a]
Aerosol-radiation	-0.22	**-0.22**
N_2O	0.21	**0.22**

[a] method: Leach et al 2021

Ireland Data

TIM (3) x Goblin (8) scenarios to 2050

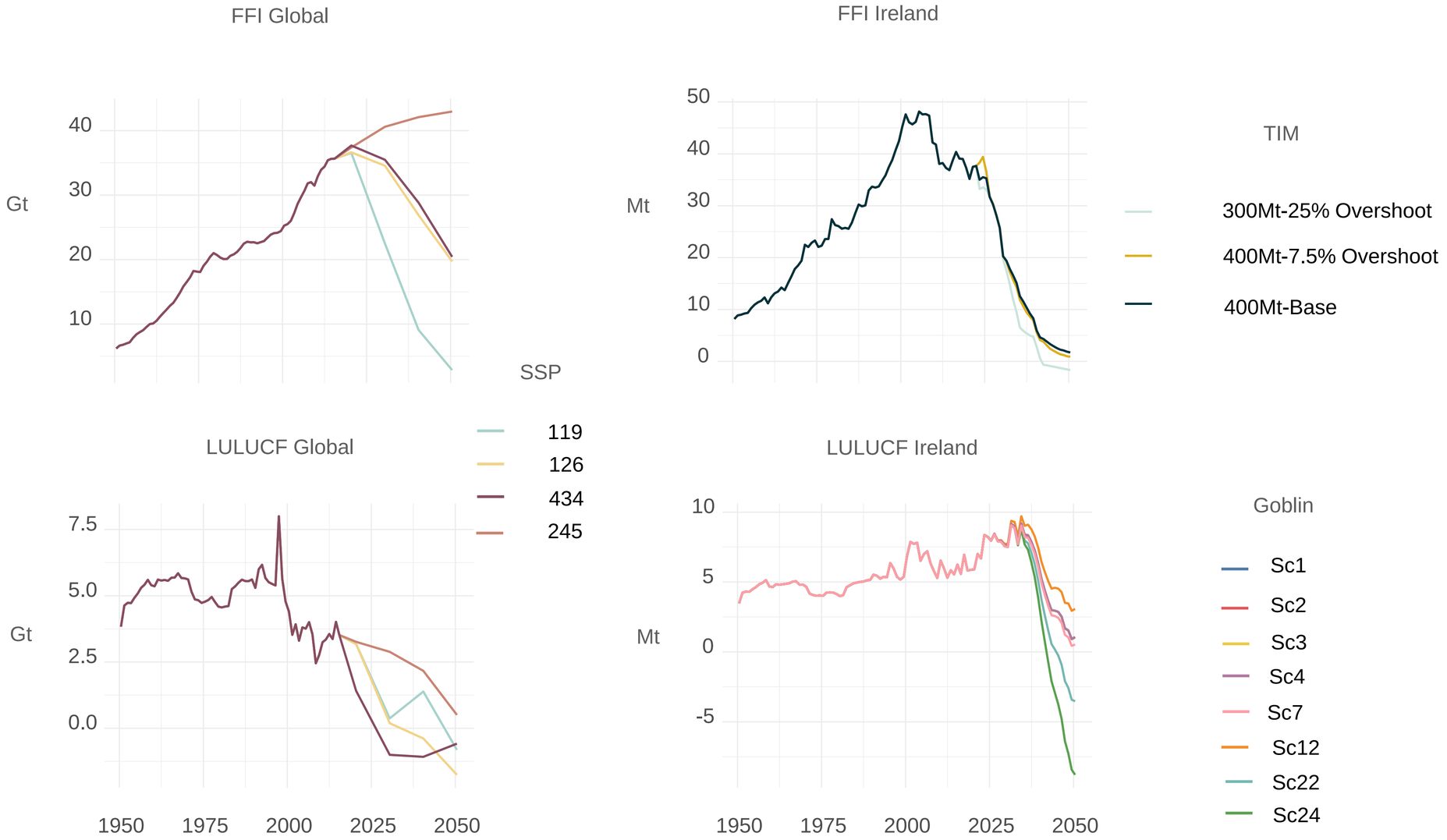
TIM	GOBLIN	2050 Mt CO_2-eq
300Mt-25% Overshoot	Sc24	-1.29
400Mt-7.5% Overshoot	Sc24	1.27
400Mt-Base	Sc24	2.09
300Mt-25% Overshoot	Sc22	5.78
…	…	…
400Mt-7.5% Overshoot	Sc1	15.1
400Mt-Base	Sc12	15.8
400Mt-Base	Sc1	15.9

Historic datasets

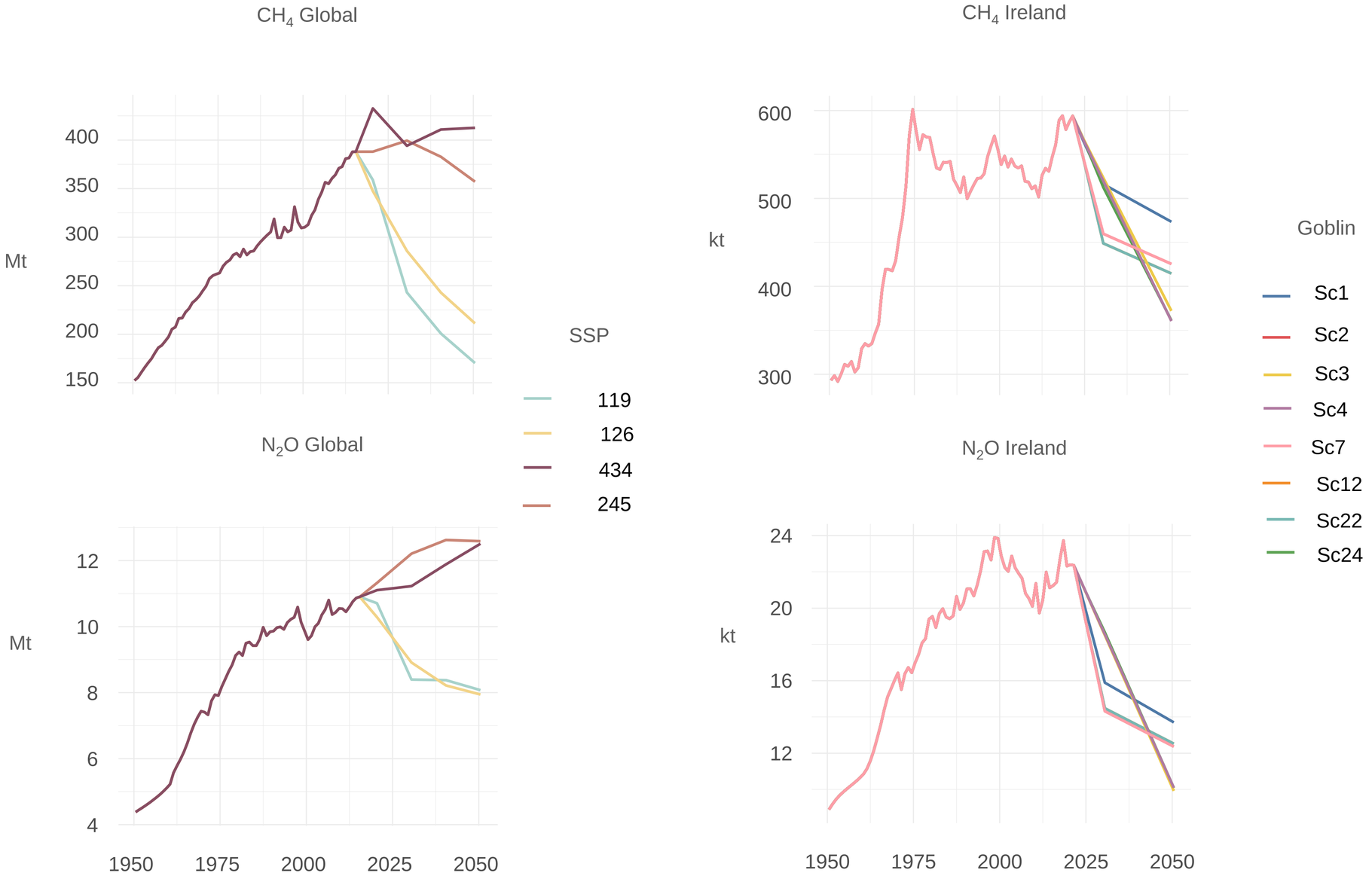
CO_2: 1850-2021 2.9 Gt ≈ 1 m°C

- F-gases
  - EDGAR 1970-2021
  - EU 2030 Target
- Air pollutants
  - CEDS pre-1990
  - EPA historical 1990-2021
  - Emissions Reduction Commitment

CO_2
Global vs Ireland



CH_4, N_2O


CH4 Global
Mt
400
350
300
250
200
150
SSP
119
126
434
245
CH4 Ireland
kt
600
500
400
300
Goblin
Sc1
Sc2
Sc3
Sc4
Sc7
Sc12
Sc22
Sc24
N2O Global
Mt
12
10
8
6
4
1950
1975
2000
2025
2050
N2O Ireland
kt
24
20
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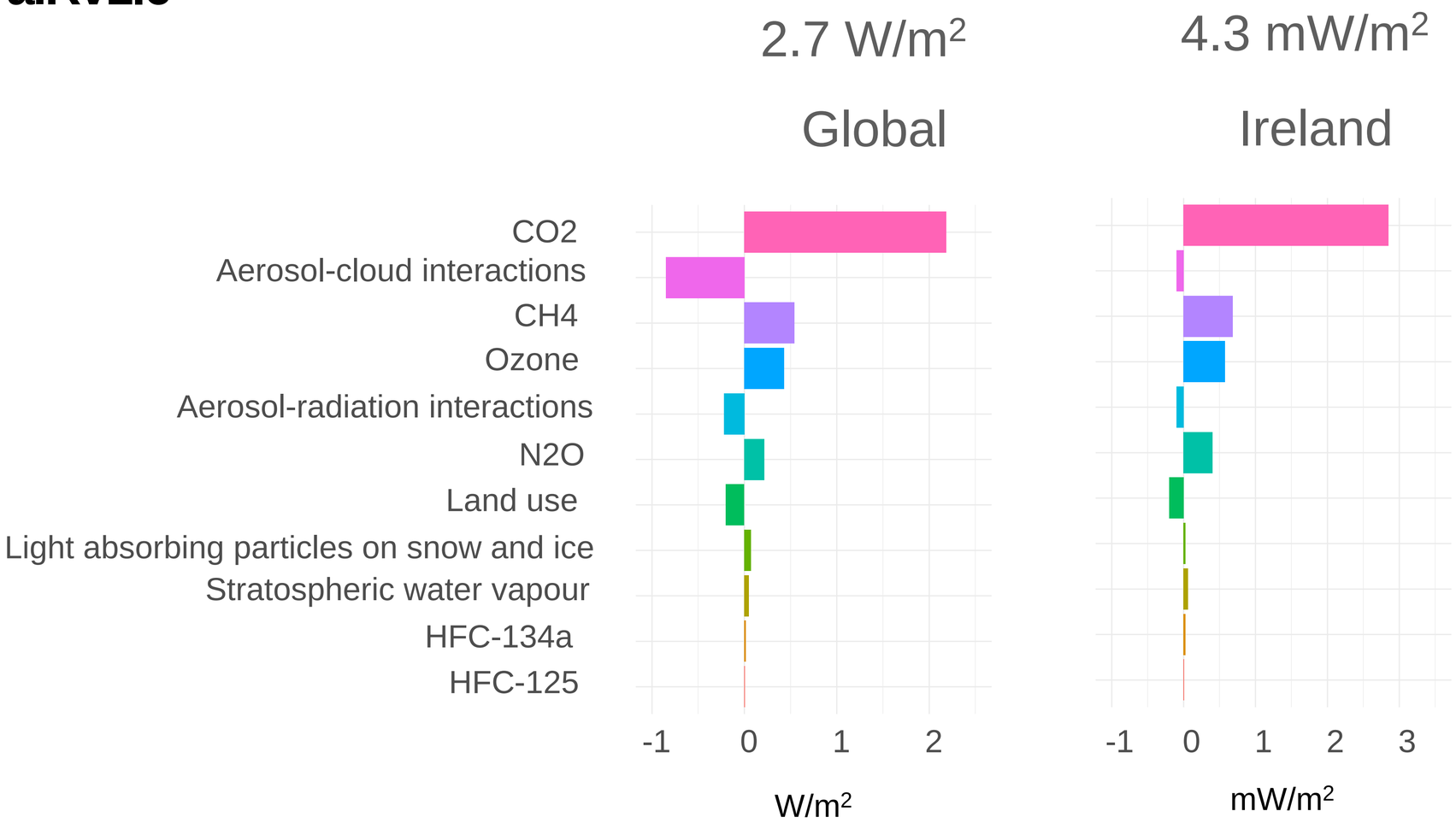
1950
1975
2000
2025
2050

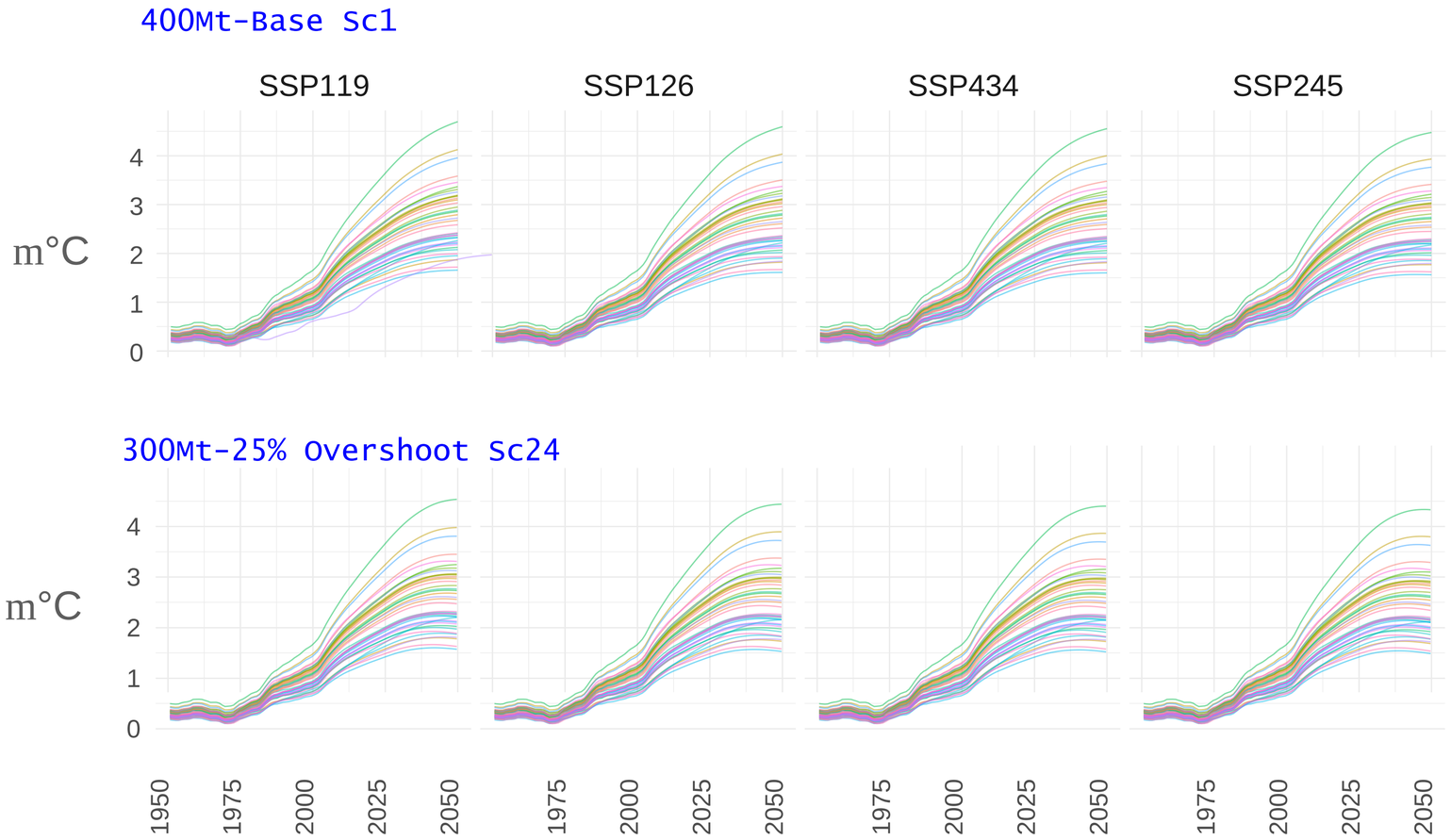
Ireland Marginal Climate Forcing 1750-2019

FalRv1.6



Ireland Marginal Warming Contribution

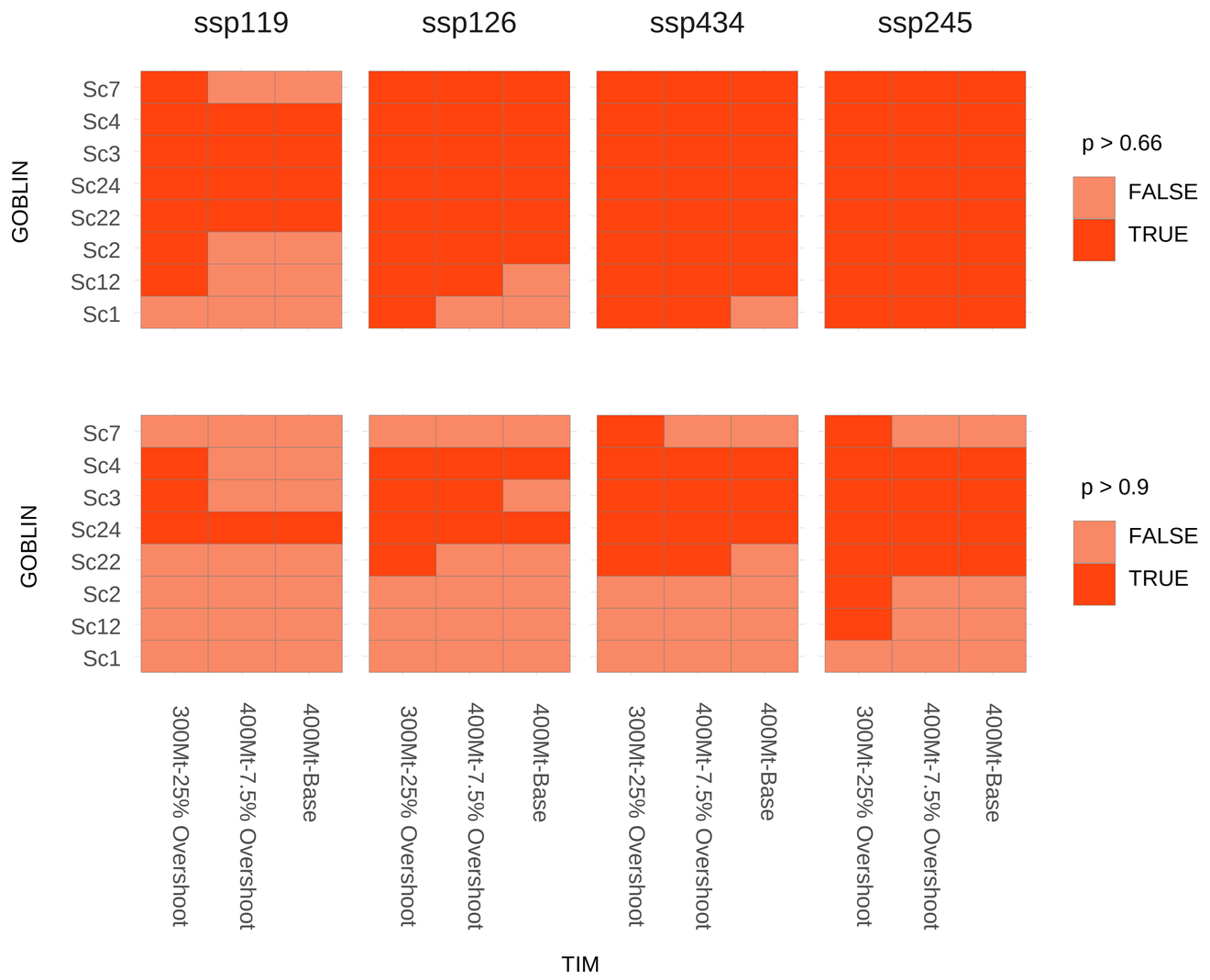
FaIRv1.6 40-member ESM ensemble 1950-2050



δGSAT relative to 1850-1900 average

Neutrality before 2050

66%



scenario	lulucf_drop	ch4_drop	n2o_drop
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Sc1	0.805	0.244	0.402
Sc2	0.806	0.347	0.466
Sc7	0.877	0.347	0.466
Sc12	0.533	0.367	0.459
Sc22	1.43	0.367	0.459
Sc3	0.808	0.434	0.551
Sc24	2.14	0.454	0.544
Sc4	0.807	0.456	0.543

Median peak warming contribution

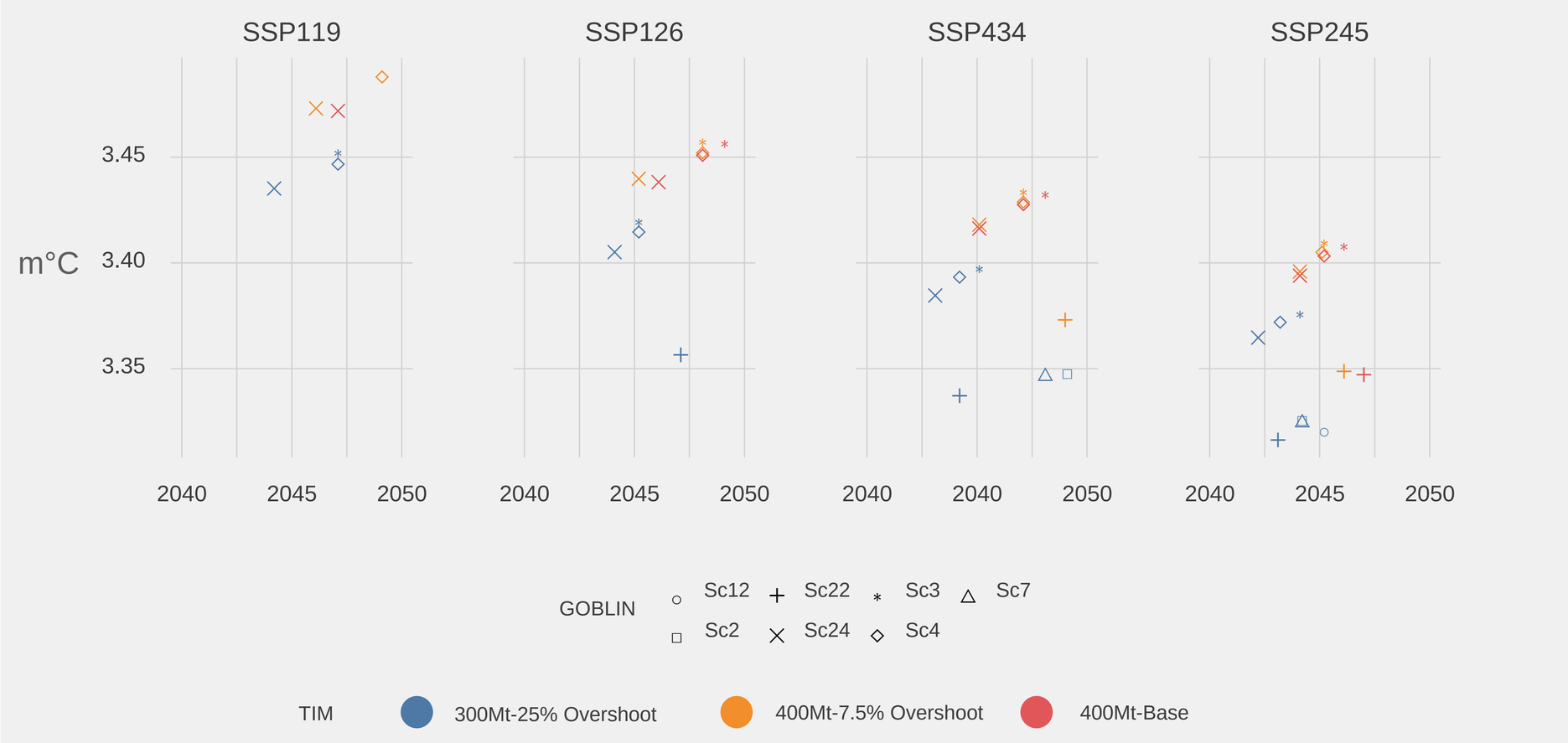
Range in scenarios neutral before 2050

2.6 - 2.8 m°C **vs 1850-1900**

0.4 - 0.6 m°C **vs 2018**

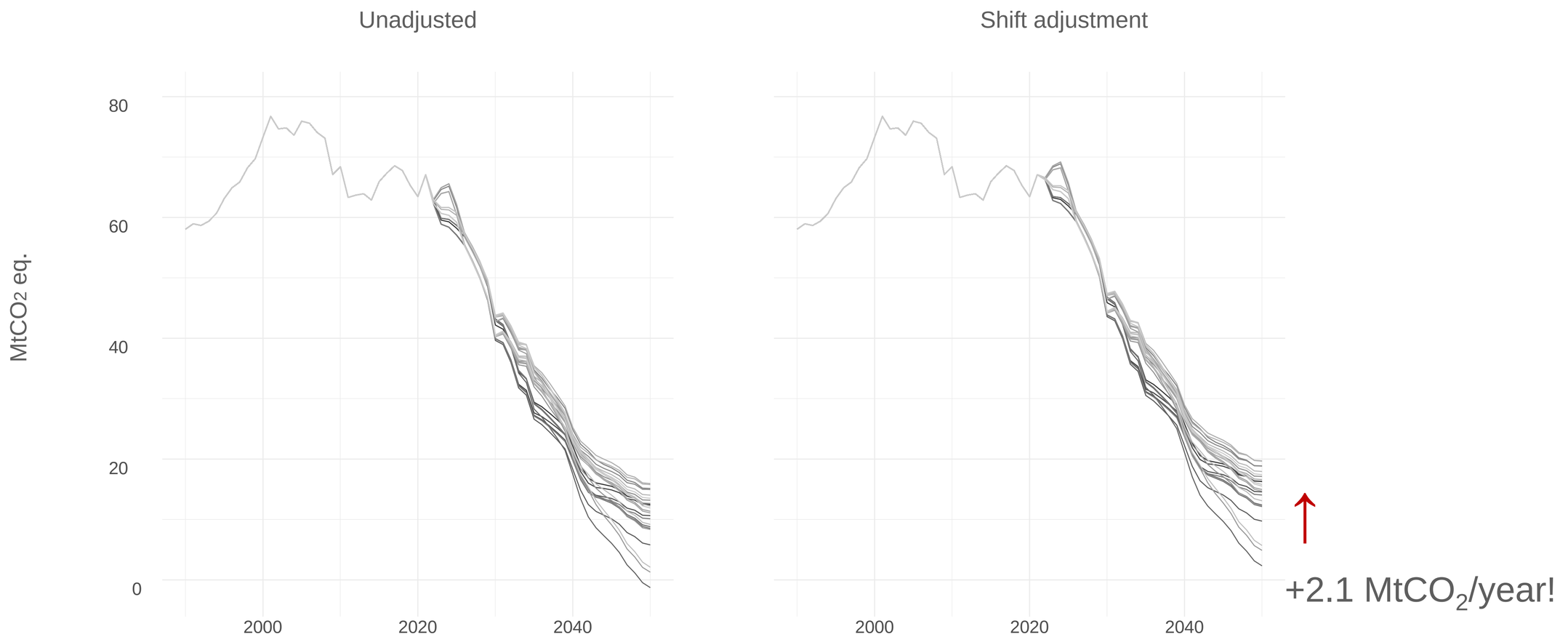
Warming and neutral year 90% confidence

FaIRv1.6 40-member ESM ensemble



Ireland Data

Harmonise pathways to EPA 1990-2021 final emissions CO_2, CH_4, N_2O



To-do list

- Missing non-energy emissions
- CFC-11 & CFC-12
- Increase FaIR ensemble size
- MAGICC7
- Non-marginal warming method
- Extension beyond 2050
- Probability thresholds?
- …

SEAI Review of Carbon Budget Modelling 1st Iteration Outputs

Emma Lynch – Head of Energy Modelling, SEAI

18th January 2024

seai SUSTAINABLE ENERGY AUTHORITY OF IRELAND

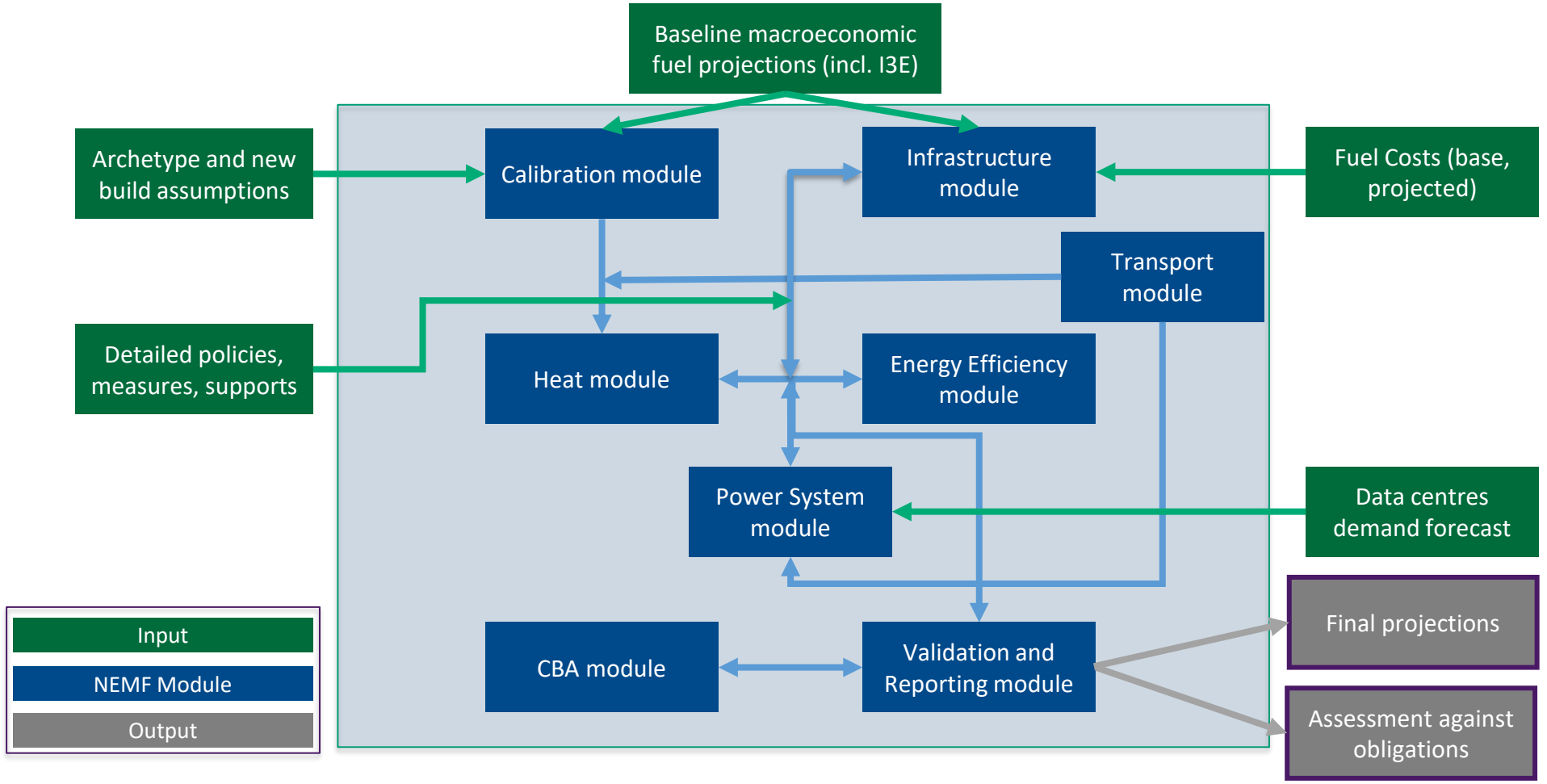
Objective of SEAI Review of Energy Systems Modelling Outputs

- Apply policy lens to output consequences of CB modelling
- Sense check outputs for feasibility e.g. timing, capacity
- Provide recommendations for adjustments to assumptions / constraints in second iteration
- Identify policy gaps and needs for technology acceleration

- Scope reviewed: energy sectors and industrial processes
  - Electricity key area of focus in 1st iteration due to necessity to decarbonise first

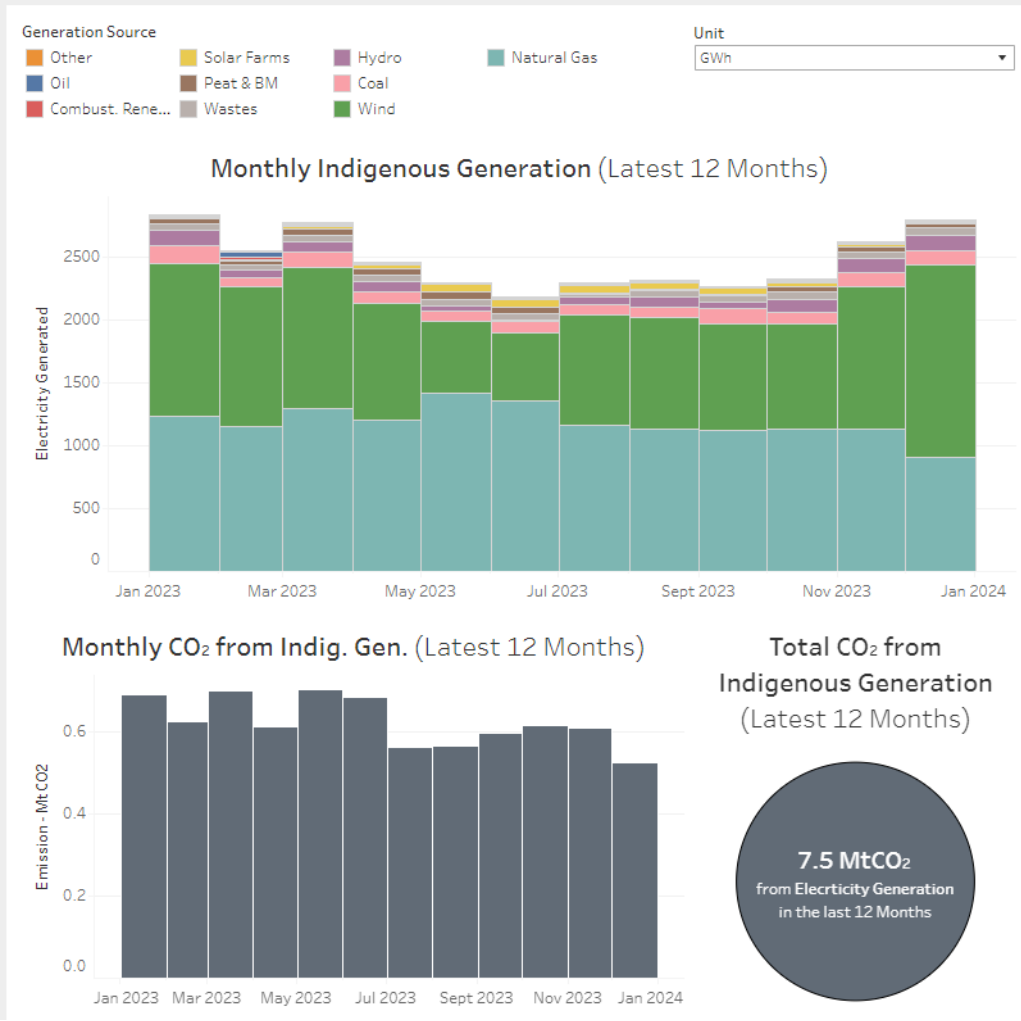
- Sources used: for first iteration, bespoke modelling not applied
  - Findings from previous National Energy Projections: 2023 WEM / WAM
  - Latest insights from current National Energy Projections in progress: 2024 WEM and WAM input assumptions, updated NEMF calibration estimates
  - Previous Electricity scenario modelling supporting CAP – exploration of levers for emissions abatement in electricity

SEAI NEMF Structure with Inputs and Outputs



Observations from TIM Outputs review – Electricity

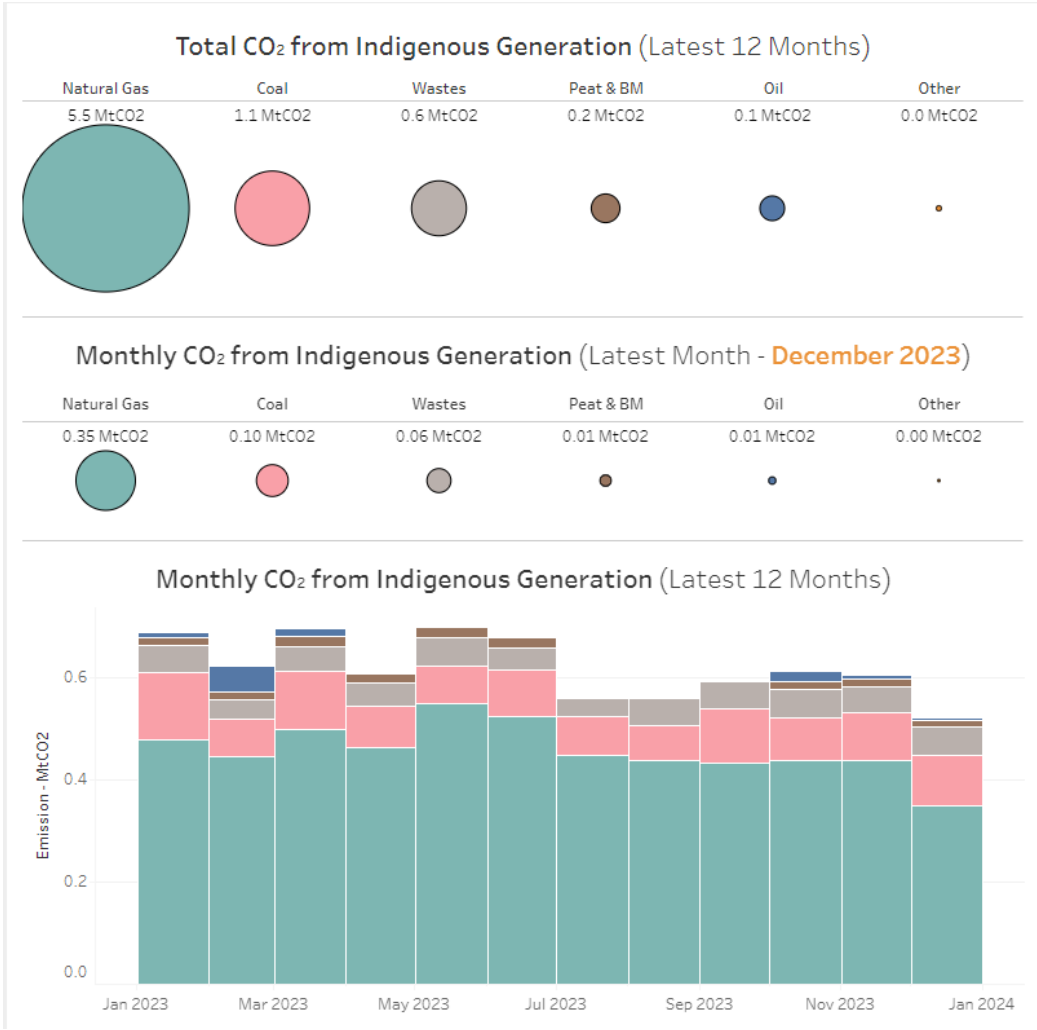
- Emissions / Generation / Fuel Use
  - General
    - Recommend updating 2023 with latest data (SEAI monthly data available) to ensure all known emissions captured in starting point
    - Early indicators available for modelling 2023 to be confirmed with release of EPA emissions inventory
  - Gas: scenarios with very low generation output in 2030 (2-3% of total gen modelled)
    - Recommend reviewing this based on analysis showing that with high shares (>80%) VRE in day-ahead market model gas use expected >10% due to portion of RES-E exported via interconnection



Source: SEAI monthly energy data

Observations from TIM Outputs review – Electricity

- Emissions / Generation / Fuel Use
  - Coal: scenarios without coal-fired generation in 2023 and no coal after 2024
    - Recommend updating 2023 with latest data
    - Review merit order effects in modelling – Moneypoint's announced switch to oil post-2025
  - Waste to Energy / MSW: Negligible emissions due to low generation output modelled
    - Recommend reviewing due to relatively high capacity factor (~80%) of waste-to-energy plants from priority dispatch status (EPA estimate ~0.4-0.5Mt emissions p.a.)
  - Peat: Negligible emissions modelled
    - Recommend updating 2023 with appreciable peat use in power generation (~30% peat share applied to the combined output of peat co-firing)

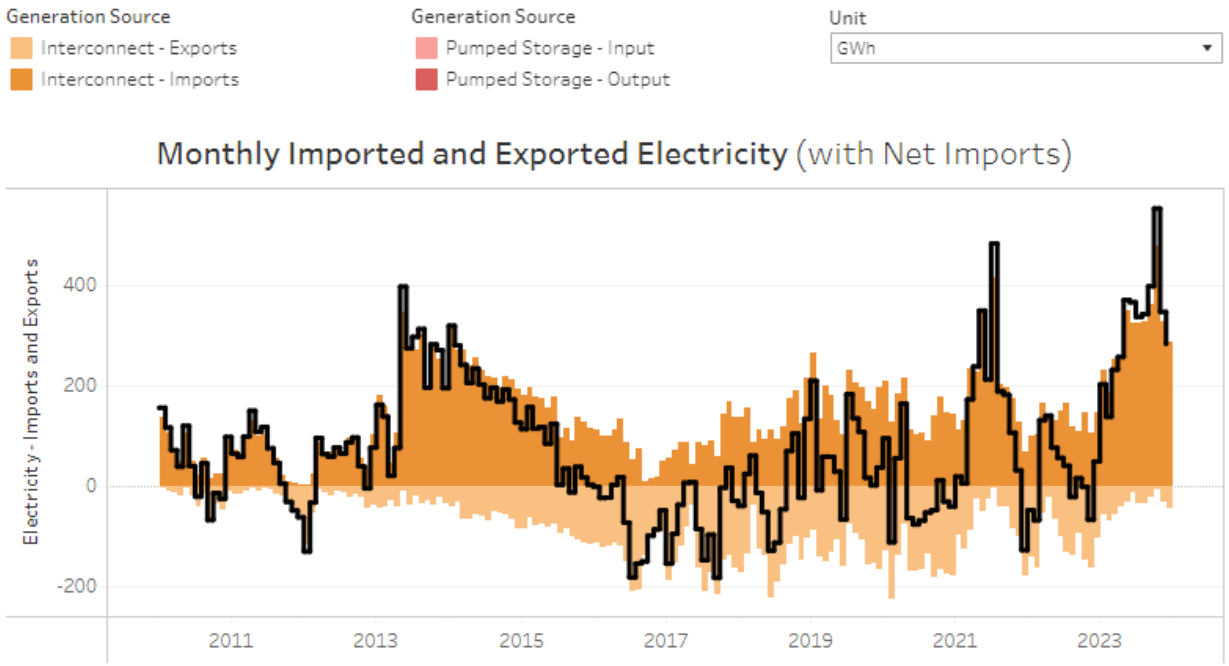


Source: SEAI monthly energy data

SEAI SUSTAINABLE ENERGY AUTHORITY OF IRELAND

Observations from TIM Outputs review – Electricity

- Emissions / Generation / Fuel Use
  - Interconnection: production charts excluding interconnection imports
    - Recommend clarifying modelled interconnection imports and how North-South, EWIC, Greenlink, Celtic treated in model
    - Review of impact of changes in import position and addition of new interconnectors in works – consider sensitivity scenario in future modelling iterations
  - Demand: reductions in total generation 2025-2026 in first iteration LED scenario model results
    - Recommend capping growth without reducing demand over short period if there is a drop in consumption modelled rather than economic shock
  - Hydrogen:
    - Review availability of data on storage volume requirements and usage given uncertainty



Source: SEAI monthly energy data

Observations from TIM Outputs review – Electricity

- Deployment Rates for new capacity
  - New vs Total Installed Capacity:
    - Recommend adding retirements and net change to outputs to distinguish replacement from additions to system
    - Recommend reviewing EirGrid and SONI post-auction risk adjusted views of new capacity which has been successful in the Capacity Auction from Table 5.1 of latest GCS 2023-2032
  - Onshore and Offshore Wind: scenarios projecting 1GW/annum onshore deployment and low offshore post-2030 deployment
    - Recommend reviewing maximum installed capacity for onshore wind
    - Review spatial limits on onshore (and solar pv) uptake - spatial modelling exercises carried out for RESPF and Wind Energy Development Guidelines indicated constrained availability beyond 2030 CAP targets
    - Review economic prioritisation of onshore wind: Higher bid prices for onshore wind in RESS 3 than for offshore wind in ORESS 1
  - Gas Generation: 1-1.5GW new gas-fired plant in 2023-24 not in all scenarios
    - Recommend inclusion in all scenarios to reflect expected market costs, though perhaps delayed in capacity market

Observations from TIM Outputs review – Electricity

- Deployment Rates for new capacity
  - Thermal Generation Capacity: annual additions smaller than expected
    - Recommend reviewing minimum sizes for added thermal generation (e.g. currently 20-50p.a. seems small for multiple consecutive years)
  - Bioenergy with Carbon Capture and Storage (BECCS): uncertainty over adoption in model in BAU Scenario
    - Recommend exploring alternatives to BECCS in modelled scenarios to provide other options in the absence of lower energy demand
    - Given risks and uncertainties associated with both bioenergy for power generation, and carbon capture and storage, would help to see if model could solve with another technology
    - Assess implications of inclusion in carbon budgets modelling for policy system re. land use, technology and operation, need for demand reduction

Insights from NEMF Modelling - Electricity

- Risks in Projections Scenarios
  - WAM scenario has significant risk inherent in final energy projections in 2030+
  - WEM not without risk
    - e.g. VRE capacities based on best estimate of pipeline
    - Underlying demand and macroeconomic factors
    - 300Mt budget energy scenarios for first iteration of model outputs – overshoot scenarios all more optimistic than WEM

Table 6: Targets and assumptions for year-end renewable electricity generation capacity delivery

Parameter / Variable	Year	CAP 2021 target	CAP 2023 target	WEM	WAM-CAP21	WAM-CAP23
RES-E (%)	2025	-	50%	42%	44%	50%
Onshore Wind Capacity (GW)	*2025*	-	*6*	*5*	*5.3*	*5.8*
Offshore Wind Capacity (GW)	*2025*	-	*0*	*0.03*	*0.03*	*0.03*
Solar PV Capacity (GW)	*2025*	-	*5*	*1.5*	*1.7*	*3.0*
RES-E (%)	2030	up to 80%	80%	68%	79%	82%
Onshore Wind Capacity (GW)	*2030*	*up to 8*	*9*	*6.5*	*7.4*	*7.8*
Offshore Wind Capacity (GW)	*2030*	*at least 5*	*5*	*3.7*	*5.0*	*5.0*
Solar PV Capacity (GW)	*2030*	*1.5-2.5*	*8*	*4.3*	*5.2*	*6.0*

Figure 5: Annual greenhouse gas emissions from electricity generation

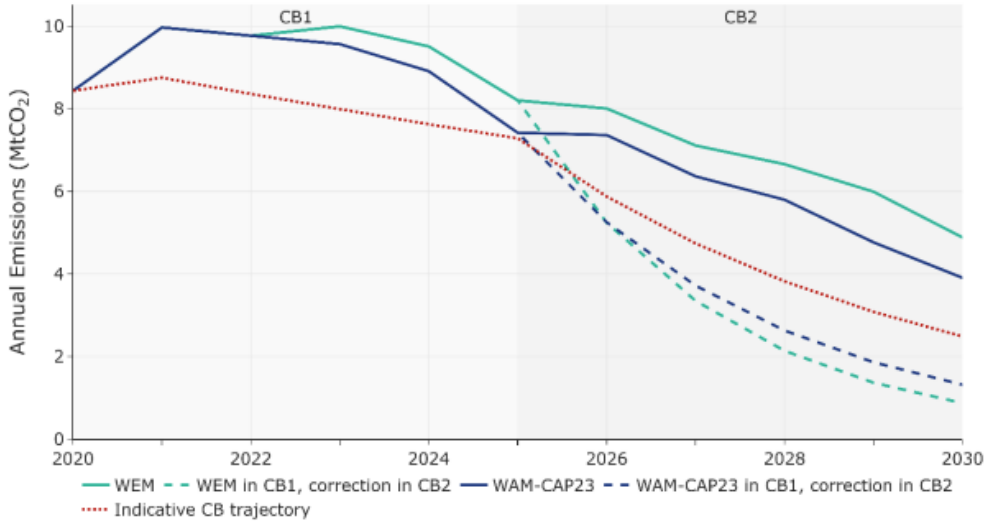
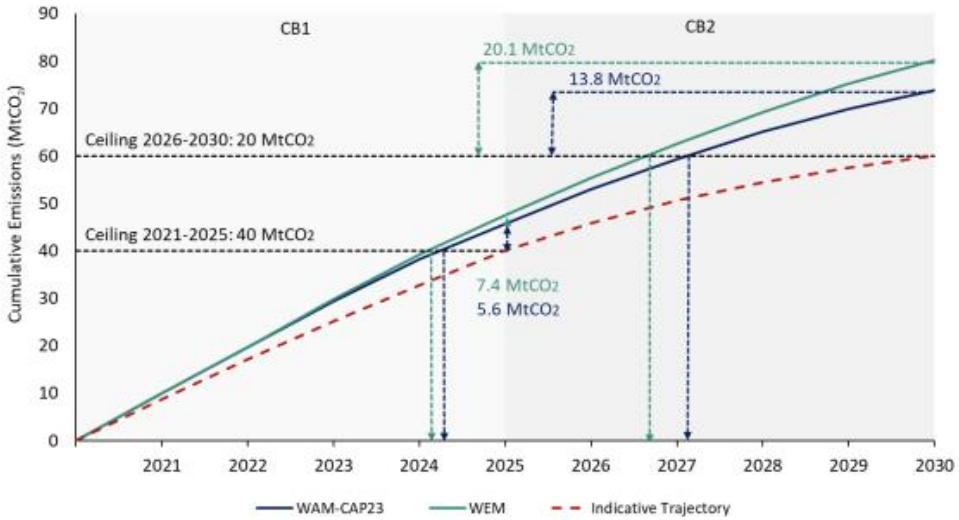


Figure 6: Cumulative greenhouse gas emissions from electricity generation



Source: SEAI National Energy Projections Report

Insights from NEMF Modelling - Electricity

- Mitigation Measures for SECs – Levers Scenario Modelling Findings
  - Mitigation measures reviewed for faster delivery of renewable energy, limiting current emissions
    - E.g. achieving 80% RES-E, further accelerating VRE, minimising coal and oil generation run-hours
  - In VRE levers modelled, ~1.5 GW p.a. (~5x 2008-2020 delivery rates) and 2.3 GW p.a. (~8x inc.) would need to be installed 2024-2030 for 80%_rese and vres_accelerate scenarios
  - Other effects undermining carbon-reduction efforts in electricity
    - Growth in consumption, delays and attrition of VRE projects, gas turbine projects displacing more carbon-intensive firm generation in near term

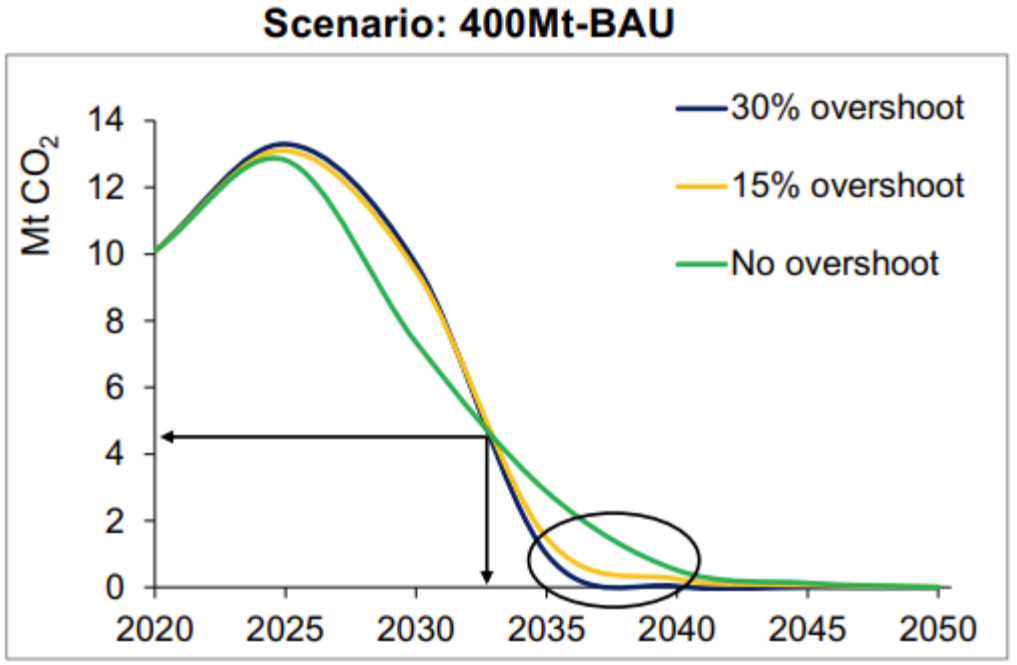
SEAI Report: Mitigation Measures for the 1st and 2nd Electricity Sector Emissions Ceilings

Observations from TIM Outputs review – Residential

- Residential
  - Retrofit ramp up: large jump in 2030 and few additional post-2030
    - Recommend exploring limits here on feasibility basis: annual number of upgrades possible, % increase in single year, absolute limit for available labour and materials
  - Year-on-year increases by dwelling type: more volatile than expected for some dwelling types
    - Recommend reviewing adjustment to reflect annual increases across dwelling types and confirm standard of retrofit assumed
  - Biodiesel consumption: ~5PJ of biodiesel 2021/2022 not in Energy Balance
    - Review assumptions on biodiesel consumption and corresponding emissions considering lag in REDII required support scheme or renewable obligation for bioliquids
  - New dwellings: overstated number in new dwellings and steep reduction in 2040
    - Recommend review of assumptions and calibration to latest CSO figures

Observations from TIM Outputs review – Transport

- Transport
  - New ICE Sales: ICE vehicle sales phased out from 2025
    - Recommend review of timing and feasibility with EU internal market rules of effective ban in advance of EU regulation
  - New EV Sales: High annual sales of EVs in modelled outputs
    - Recommend adjusting constraints for single year sales to avoid 600k/yr (possibly based on margin around historical spikes from CSO historic data e.g. celtic tiger peak 180k/yr, 2000s spike of 225k/yr.)
    - Possibly review same for LGVs and HGVs sales constraints



Source: UCC First Iteration of TIM scenarios – CBWG 9 Presentation

Observations from TIM Outputs review – Other Energy

- Industry: sudden elimination of cement production energy use and related emissions in 2030
  - Recommend review of assumptions to clarify if modelled cessation of cement production or conversion to CCUS
- Commercial: significant drop in oil consumption in 2023 relative to 2022
  - Recommend reviewing latest data and starting point for modelled years
- Agriculture: Electricity consumption varies considerably from year-to-year in the 2020s in most scenarios
  - As above
- Unmitigated CO2 emissions
  - €2000/t backstop technology – explore implications further for CB 3+ in overshoot scenarios
- Social Discount Rate
  - Rate of 2% in outputs 1st iteration vs 4% in real terms from Public Spending Code

Next Steps for 2nd Iteration of Modelling

- Initial meeting held between SEAI and UCC 16th Jan discussing observations and questions provided by SEAI from review of TIM outputs first modelling iteration
- Next steps:
  - UCC reviewing observations and questions from initial review and providing response to SEAI on any adjustments to be made for second iteration
  - SEAI / UCC collaboration on workshop and additional review in advance of second model iteration
  - SEAI to complete National Energy Projections Q1 2024
  - SEAI can provide additional modelling after projections, recommended approach to start from new WEM and WAM and apply select changes to assess impact on energy-related emissions
- Other analysis to note:
  - Decarbonised electricity system study (DESS) expert elicitation in progress

Questions and Discussion

@ seai_ie

Ireland's European Structural and Investment Funds Programmes 2014-2020

Co-funded by the Irish Government and the European Union

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Preparing for macroeconomic assessment: Data requirements

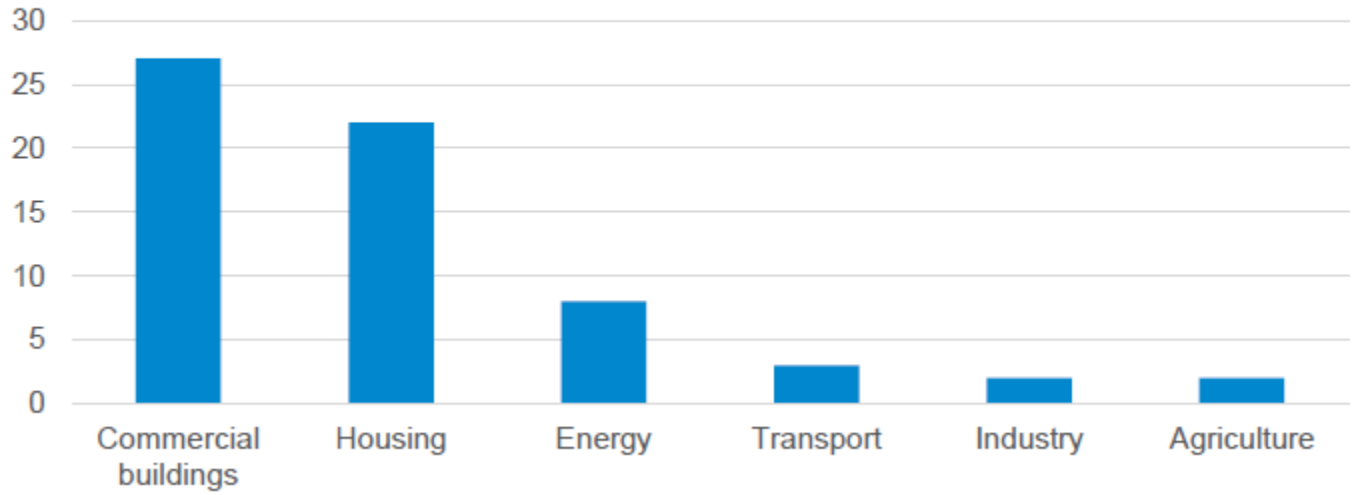
18th January 2024

TIM model crucial information

1. Marginal abatement cost
2. List of measures needed to meet objective each five-year period
3. Estimated capital cost of each measure (annual basis?)
   - Some details of type of investment e.g. CCS, retrofit, EV
   - Any indication of division of cost into construction and equipment?
4. Estimated energy cost savings from investment
5. Net financial cost to society
6. From this may need to estimate labour needs (ESRI, 2024) and levers
7. Very good model, Mahfouz and Pisani-Ferry, 2023, for France

Mahfouz and Pisani-Ferry: Investment summary

Figure 14: Net additional investment required to reach the 2030 target
versus a business-as-usual scenario with no greening of the economy (in billions of 2023 euros)



Mahfouz and Pisani-Ferry: Investment details

Table 2: Additional investments required to reach the 2030 target

Emissions-reduction measures	Change in emissions (in $MtCO_2e$)	Lever	Additional investment (fossil-fuel-intensive and green) compared with a no-transition scenario
in billions of 2023 euros	2030–2021		in 2030
TOTAL (for new measures)	**-138**		**66**
of which green			**101**
of which fossil-fuel-intensive			**-35**
TRANSPORT * (new measures)	**-52**		**3**
of which green			**32**
of which fossil-fuel-intensive			**-29**
Passenger cars	**-23**		**-2**
Electrification of the passenger car fleet, with reduced travel	-11	Sub. K F	-8
[Reminder: Electrification of the fleet, without reduced travel]		*Sub. K F*	*8*
Charging stations		Sub. K F	2
Reduction in the modal share of cars	-6	Sub. K F	4
Cycling infrastructure		Sub. K F	3
Public-transport infrastructure		Sub. K F	1
Increase in passenger car occupancy	-3	Suff.	0
Reduced travel	-3	Suff.	0
Heavy goods vehicles (HGVs)	**-16**		**3**

Agriculture

- List of measures
  - Need to know loss of income
  - Investment needed
  - Change in emissions
- Loss of output for further processing
  - Reduction in inputs into food processing will have an effect
  - Estimated using I3E?

Estimating economic effects

- Model effects in an economy with full employment
  - This could see some reprioritization because of deliverability?
- Estimate implications for public finances
  - Depends on instruments used.
- Assume government borrowing remains unchanged?
  - Government must finance costs through tax or expenditure changes
- Separate issue of loss of revenue on excise taxes
  - Not a concern for carbon budgets
- Implications of climate action internationally

External environment

- Simultaneous action across EU
  - Affects demand for equipment
  - But may also drive innovation
- Inflation impacts – would affect interest rates
  - Could affect domestic cost of investment
- Action internationally?
- Estimates of overall cost in range 2% to 3% of national income
  - Ireland (FitzGerald, 2021), France (Mahfouz and Pisani-Ferry), EU (OECD, 2023)
  - Much higher for other parts of world, especially non-OECD G-20 (OECD)

Relevant Studies

- ESRI, 2024, The National Development Plan in 2023: Priorities and Capacity
- Mahfouz and Pisani-Ferry, 2023, The Economic Implications of Climate Action
- OECD, 2023, Long Term Scenarios: Incorporating the Energy Transition