Climate Change Advisory Council Secretariat

CB WG Meeting 7

19th October 2023

Agenda

Time	Agenda Item
13:30	1. Opening of Meeting
13:35	2. 2024 EPA Projections Process
15:00	3. International approaches to carbon budgets
16:00	4. Carbon Budgets Work Plan
16:15	6. Next Steps and Agenda for next meeting
16:25	7. AOB
16:30	Meeting Close

1. Opening of Meeting

Action Number	Date Raised	Description	Owner	Due	Status
3	20/04/23	Expand discussion of macroeconomic inputs/ drivers	CCAC Secretariat and relevant CB WG Members	Q3 2023	Update provided at CB WG Meetings 4 and 6. Bilateral discussions held with economists in August and October. Further update for the CBWG scheduled for January 2024. *Propose to Close.*

Agenda

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15:00	3. International approaches to carbon budgets
16:00	4. Carbon Budgets Work Plan
16:15	6. Next Steps and Agenda for next meeting
16:25	7. AOB
16:30	Meeting Close

4. Carbon Budgets Work Plan: Topics for Meetings

CB WG Meeting No.	Proposed Date and Time	Topic(s) for Consideration
1	Thursday 9th March 2023 10:00 – 13:00	Carbon Budgets Methodology
2	Thursday 20th April 2023 13:30 – 16:30	Carbon Budgets Methodology / Scoping of modelling work
3	Wednesday 31st May 2023 10:30 – 13:30	Vision for 2050 and Beyond/ Scoping of modelling work/
4	Thursday 29th June 2023 13:30 – 16:30	Climate Justice and 'Paris Test'/ Scoping of modelling work/ Macroeconomic Impacts of carbon budgets/
5	Thursday 27th July 2023 13:30 – 16:30	Focused discussion on methane/ Scoping of modelling work/
6	Friday 8th September 2023 13:30 – 16:30	Populations Projections/ Socioeconomic considerations
CB WG Workshop 1	Wednesday 13th September 2023 13:30 – 16:30	Input model parameters for 2030 starting points, scenario development and assumptions
7	Thursday 19th October 2023 13:30 – 16:30	2024 Projections Process (EPA, SEAI & ESRI)/ International approaches to carbon budgets
8	Thursday 23rd November 2023 10:30 – 13:30	Role of Negative Emissions/ Biodiversity Considerations/ Agriculture and Land Use Review
9	Friday 15th December 2023 13:30 – 16:30	*COP28 – Global Stocktake (TBC)/* *1st Iteration of Core Modelling Results* *ESAB 2040 Target (TBC)*

4. 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 – 12:30	Quantitative approaches to carbon budgeting for Parties to the Paris Agreement (Victorian Government Report)/ Energy and Power systems modelling (Paul Deane)
12	Friday 22nd March 2024, 13:30 – 16:30	Agree inputs, parameters and assumptions for 2nd Iteration of Modelling/
13	Friday 19th April 2024, 13:30 – 16:30	
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	Wednesday 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)

4. Other Proposed Topics for Consideration in 2024

- Follow on discussion on the Just Transition principles and considerations in the Carbon Budget Process (NESC)

- Discussion on various aspects of aviation and maritime (Secretariat)

- Greenhouse gas - air pollution interactions and synergies (Andrew Kelly)

- Follow on discussion on biodiversity considerations (Yvonne Buckley/ Secretariat)

- Economic assessment of climate change impacts and adaptation options in Ireland (ESRI)

- EU 2040 Climate Target and Greenhouse Gas Budget (ESAB)

- Follow on discussion on methane (Secretariat)

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, paramaters 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, paramaters 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, paramaters 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																	▓	▓			

- Scenario results from UCC (TIMES), SEAI (NEMF), Teagasc (FAPRI) and NUIG (GOBLIN) to be presented to CBWG on 15/12/23

- Analysis of warming impact of selected core scenarios from the 1st iteration of modelling to be presented to CBWG on 18/1/24

- Update on macroeconomic and economic analysis to be discussed at the CBWG on 18/1/24

5. Next Steps and Agenda for next meeting

- Note outlining the data requirements for analysing the impact of mitigation actions on employment and the wider economy to be circulated for review and feedback
- Template outlining the inputs for the simple climate models and warming impact analysis to be circulated for review and feedback

5. Agenda for Meeting No. 8: 23rd November 10:30 – 13:30

1. Role of Negative Emissions
- Overview of Carbon Dioxide Removal
  - In the context of the Act requirement to *'(i) determine how the removal of greenhouse gas emissions may betaken into account, (ii) specifying which removals may be used, and (iii) determining the mechanism by which such removals are to be effected'.*

2. Biodiversity Considerations
- Reflections on the outcome of the September workshop in terms of biodiversity considerations
  - In the context of the Act requirement that '*A carbon budget, consistent with furthering the achievement of the national climate objective, shall be proposed by the Advisory Council…'* and, the national climate objective as defined in the Act is a *'climate resilient, biodiversity rich, environmentally sustainable and climate neutral economy'.*

3. Agriculture and Land Use Review
- Thematic paper presented for discussion on various aspects of Agriculture and Land Use

1. COP28 - Global Stocktake
- Overview of the outcome of the global stocktake
  - In the context of European Climate Law, which sets out a binding objective of climate neutrality in the European Union by 2050 in pursuit of the long-term temperature goal set out in the Paris Agreement to hold "the increase in the global average temperature to well below 2°C above pre-industrial levels" and pursue efforts "to limit the temperature increase to 1.5°C above pre-industrial levels".

2. Presentation of the 1st Iteration of Core Modelling Results
- Presentation and discussion of the 1st iteration of core modelling results by Teagasc (FAPRI), NUIG (GOBLIN), UCC (TIM) and SEAI (NEMF)

6. AOB

- Change in venue for meetings going forward: McCumiskey House, Richview, Clonskeagh Road (Details to follow in email)

- However, McCumiskey House unavailable for our meeting on Thursday the 23rd of November. Alternate options include;

  - Small meeting room available in Block 1 (12)

  - Hosted in an alternate venue, potentially SEAI, ESRI or TCD
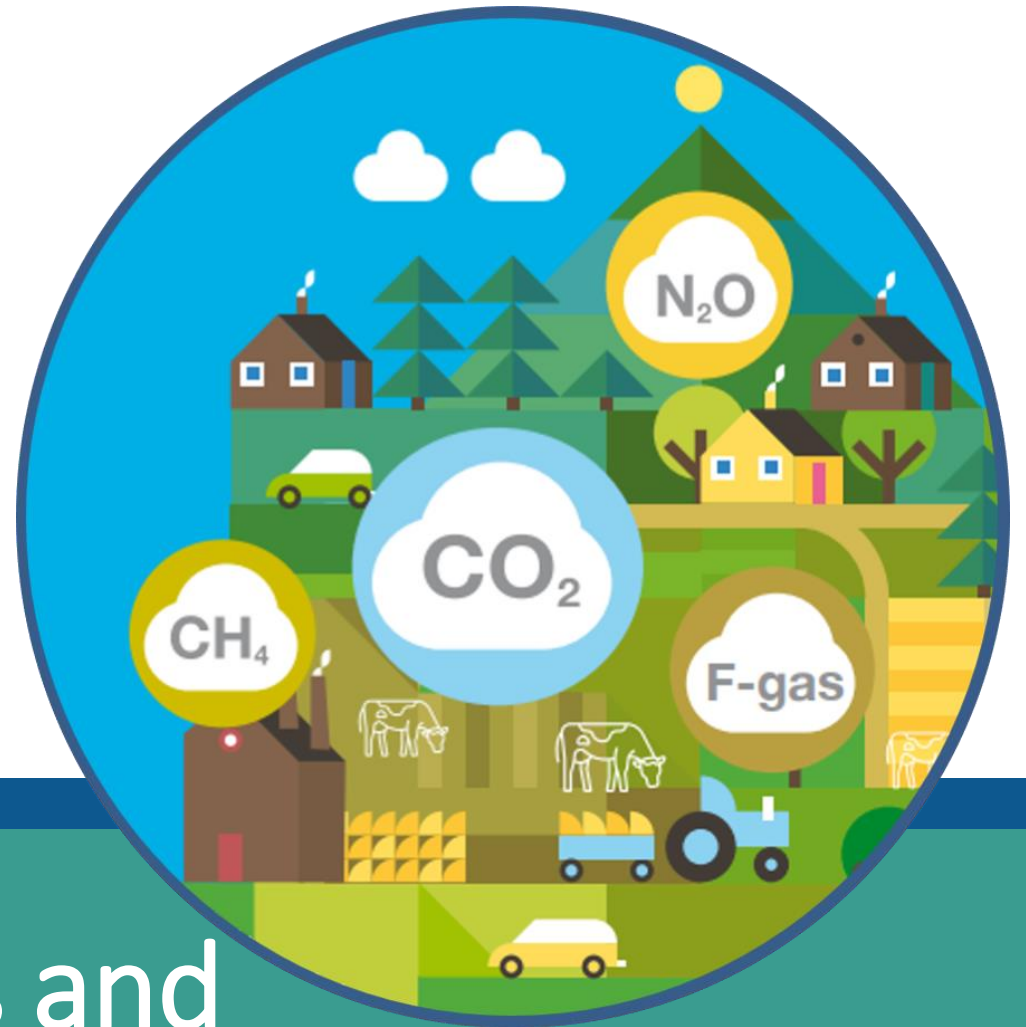
EPA Projections process and modelling methods

EPA Emissions Statistics team, June 2023

Introduction

- Background

- Key stakeholders ESRI, SEAI, Teagasc, DAFM

- Emissions Statistics Team: Inventories and Projections, sectoral approach

- How we produce our Projections and work with other Agencies under our National System for Projections and Policies & Measures

- Queries on models

Background

- National Climate Change Strategy 2007 – EPA responsible for developing national GHG projections

- Covers all key sectors of the economy (including LULUCF)

- Incorporates data from relevant State and other bodies

- Important at National level to inform policy (eg. Climate action and Low Carbon Development Bill 2014, Climate Action Plan, National Energy and Climate Plan)

- Required under EU legislation (previously MMR and now Energy Union Governance Regulation (*(EU) 2018/1999*)

- Necessary input to National Communications & Biennial Reports (elements of the UNFCCC Transparency process)

- Model used is a composite of several different sectoral models

Background (Air Pollutants)

- As with GHG emissions projections, Air pollutant emissions projections are required biennially on the 15th March with 2021 being a mandatory year. In practice Ireland makes a submission annually, one of a relatively small number of countries to do so.

- The EU submission is required under Directive (EU) 2016/2284 (National Emissions Ceilings Directive) on the reduction of national emissions of certain atmospheric pollutants, amending Directive 2003/35/EC.

- The NEC Directive harmonises the reporting obligations to the European Union with those of the UN Convention on Long Range Transboundary Air Pollution (CLRTAP) which has corresponding obligations for both Inventories and Projections.

- The NEC Directive requirements are transposed into National legislation (S.I. No. 232/2018), including the EPA's responsibility to produce Air Pollutant projections.

Projections and Policies and Measures EU Reporting = EPA Responsibility

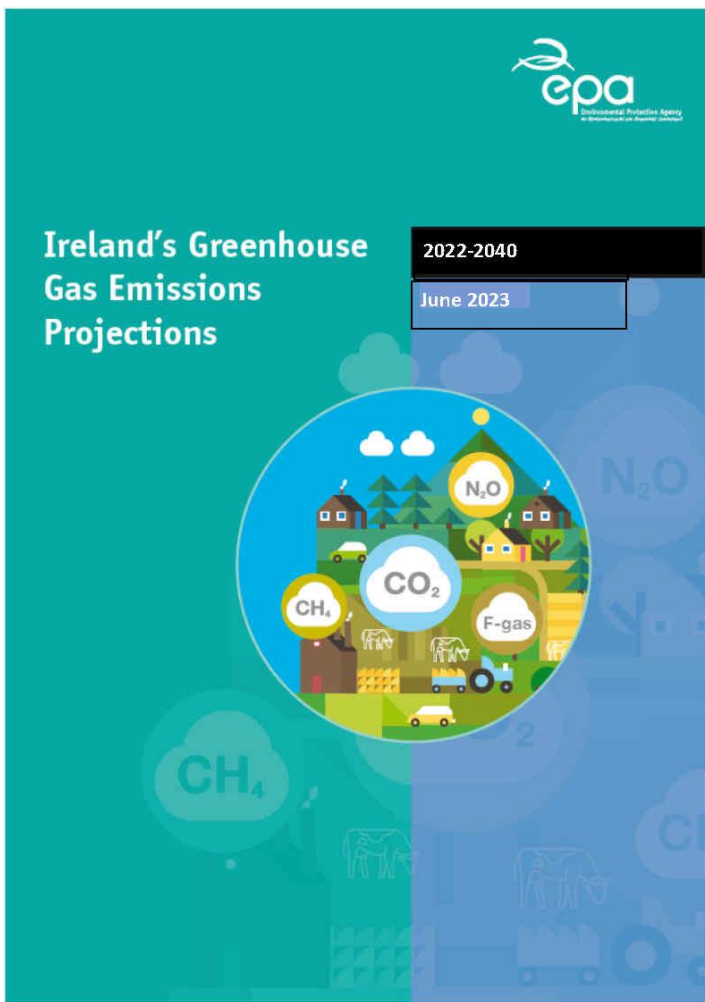**Latest Inventory = Base for Projections**

Policies & Measures savings calculations

Main Sectors: Energy*, Agriculture* Transport* Residential Manufacturing Comb Industrial Processes...

Climate Act 2023 – Budgets and Ceilings

Latest EPA Report on Projections

Ireland's Greenhouse Gas Emissions Projections

2022-2040

June 2023

Projected total greenhouse gas emissions 2022-2030

Sectors	Emissions 2018 (Mt CO_2 eq)	Projected Emissions 2030 (Mt CO_2 eq)	Percentage Reduction 2030 vs 2018	Target Reduction 2030 vs 2018
Electricity	10.3	3.9	-62%	~-75%
Transport	12.2	7.2	-41%	~-50%
Buildings (Residential)	7.1	3.7	-48%	~-40%
Buildings (Comm and Public)	1.5	0.8	-50%	~-45%
Industry	7.0	6.2	-11%	~-35%
Agriculture	23.4	19.0	-19%	~-25%
Other[19]	2.2	1.7	-21%	~-50%
LULUCF (no ceiling currently)	6.3	7.2	15%	N/A
Total with LULUCF	70.0	49.7	-29%	**-51%**

Scenarios WEM and WAM

With Existing Measures

Measures **committed** to by Government. Measure must be in place before the end of the latest Inventory year.

Certainty = Law; Agreement; Financial/Human Resources, Official Gov Decision

With Additional Measures

Assumes implementation of the WEM in addition to measures in Government **Plans** such as CAP 2023
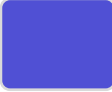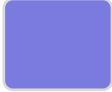
Plans with an implementation pathway that can be modelled.

National System for Projections and PaMs

- Institutional arrangements

- Stakeholder engagement

- Legal arrangements for reporting

- Procedural arrangements, reporting cycle, data sharing agreements

- Alignment with national inventory system (quality of inputs, files, QA/QC)

- Process for selecting assumptions

EPA activity and key stakeholders

Environmental Assessment & Strategic Environmental Assessment

Emissions Statistics

Climate Research

Emissions Trading & Registry

Industrial & Chemical Regulation

Intergovernmental Climate Science

Resource Efficiency & Behavioural Change

Climate Dialogue and Climate Ireland

Models that feed into Energy Projections

Model	Use	Inputs
I3E (ESRI)	Intertemporal CGE model, reproduces the structure of the economy in its entirety, including productive sectors, households and the government, among others	Households, firms and production, commodities, labour market, enterprises, government sector,
COSMO (SEAI)	Macro-econometric model designed for both forecasting and policy analysis	Fuel prices, economic assumptions and renewable energy capacity
Plexos (SEAI)	Integrated Energy Model, used for the National Energy Forecasts to model the Irish Electricity Market	Power plant portfolios, fuel prices, CO2 price
SEAI National Energy Modelling Framework	Produces the Energy projections that are then translated to emissions projections by the EPA using emission factors from the GHG Inventory	The model reads in the outputs from the macro-economic modelling, electricity modelling, renewable heat modelling
SEAI BioHeat Model	Bioenergy policy simulation model	Characterisation of building stock and current heating infrastructure; fuel prices

Assumptions – Energy and Economy

- Fossil Fuel Prices

- Macro Economic assumptions: population, GDP

- Carbon price ETS

- Carbon Tax

Table A.1 Key macroeconomic assumptions underlying the projections out to 2040

	2022	2025	2030	2035	2040
	Average Annual % Growth Rate				
GNI*	-3.8	3.4	3.3	3.3	3.3
	2022	2025	2030	2035	2040
Housing Stock ('000)	1,913	1,998	2,168	2,311	2,452
Population ('000)	4,933	5,052	5,257	5,471	5,694
EU-ETS: Carbon €/tCO$_2$	75	80	80	82	85
Carbon tax €/tCO$_2$ (WEM Scenario)	41	63.5	100	100	100
Coal €/toe	220	128	130	131	139
Oil €/toe	643	643	643	643	680
Gas €/toe	1391	554	473	473	473
Peat €/MWh	25	25	25	25	25

Models and assumptions for Agriculture Projections

Model	Use	Inputs
Teagasc FAPRI-Ireland Model	This model is a partial equilibrium, dynamic, multi-commodity model capable of producing supply and use-balance estimates including output, trade, domestic use stock and prices and which can also provide projections of the Economic Accounts for Ireland including agricultural income. Captures the dynamic interrelationships among the variables affecting supply and demand in the main agricultural sectors of Ireland	National Farm Survey data, agricultural activity levels, agricultural production, commodity supply and use balances and agricultural prices. Exogenous macroeconomic data are provided by the ESRI, information on agricultural policy is provided by DAFM.
Teagasc MACC (Marginal Abatement Cost Curve)	Quantifies and visualises the abatement potential of GHG mitigation measures, and the relative costs associated with each of these measures (2021-2030).	Based on inputting each measure into a model of the national GHG inventories for agriculture and land-use and land-use change (Teagasc) using the Baseline Scenario, generated by the FAPRI model.

Projections for remaining sectors

Model/Approach	Use	Inputs
LULUCF Sector	FERS implementation of Carbon Budget Model (CBM) from Canadian Forest Service used to project forestry activity based on different planting rates (WEM/WAM). Other sectors projected by EPA including impact of mitigation measures.	Forestry production and output forecasts received by FERS from DAFM and others. Area data key input for other sectors
Waste Sector	Extrapolation based on projected waste to landfill data	Projections of waste to be sent to landfill based on Waste management planning work
Product Use, F-gases	A number of different methods using depending on gases and expected phase out/phase in	Population projections and phase-out trajectory of individual F-gases based on F-gas regulation
Industrial Processes	Specific projection performed for cement industry output given high emissions intensity and small number of operators	Projected output agreed between EPA and Industry following discussion.

Technical Instruments/Software = Excel

Source → Linked → Data Processing → Linked → Output

	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM
12	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
60.11	970.32	942.06	1,126.91	1,101.22	867.63	488.65	151.91	183.51	218.75	803.07	803.37	794.22	787.32	0.
60.11	970.32	942.06	1,126.91	1,101.22	867.63	488.65	151.91	183.51	218.75	803.07	803.37	794.22	787.32	0.
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							

Sensitivity Analysis

= When key parameters are varied to see the effects

- Energy: Economic assumptions e.g. fuel prices. We look at multiple scenarios modelled at different price levels

- Agriculture: alternative projected activity data that assumes stronger growth in agricultural activity levels
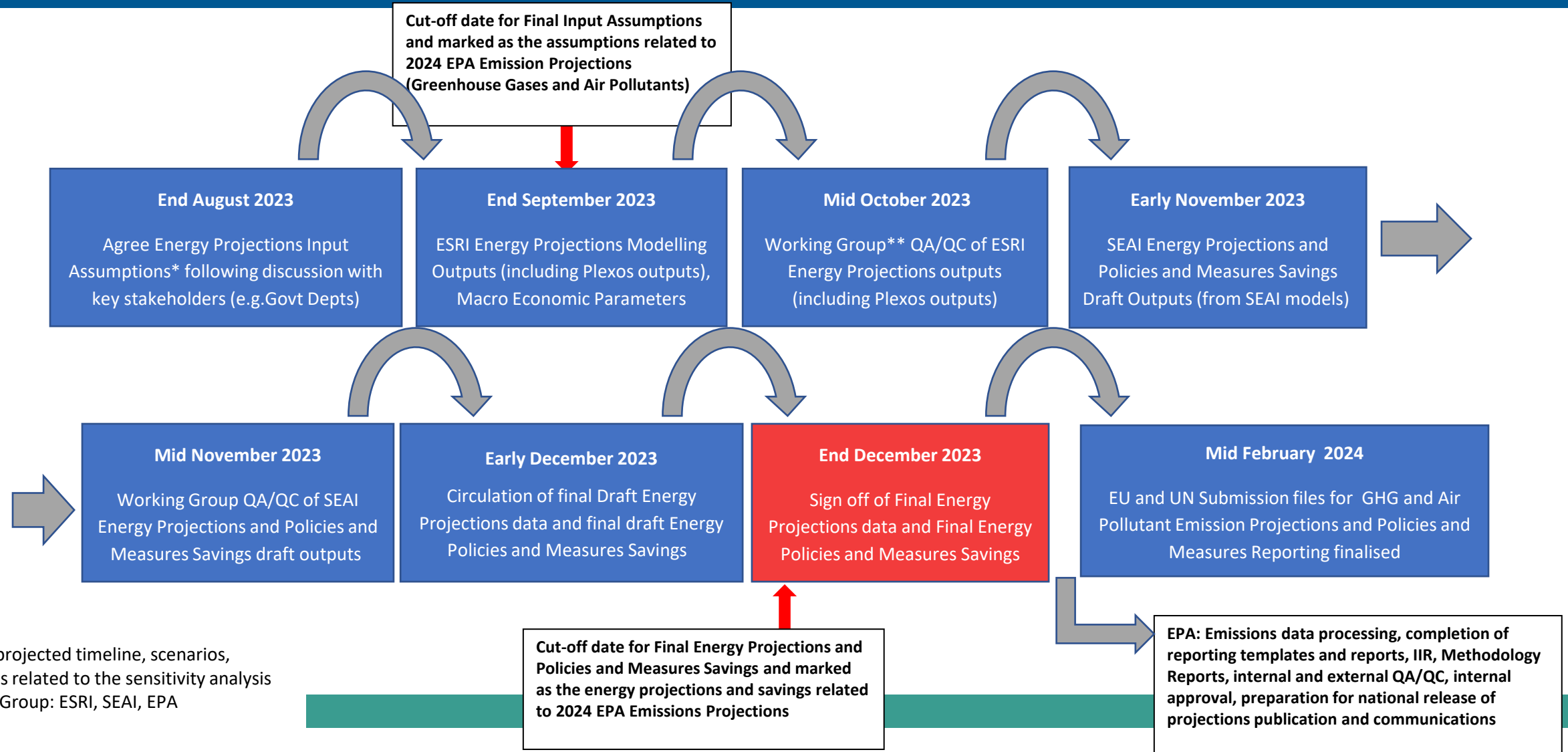
Model accessibility, openness and transparency

- EPA use models used by state bodies responsible for implementing measures in national plans

- We use WEM and WAM scenarios and they are run within the same modelling framework so that a direct (WEM/WAM) comparison can be made

- EU review process: independent review and feedback, improvement loop

- Key assumptions, data sources and methods are documented in the technical report prepared by the EPA for EU submission

- EPA publish the official national projections against which actions are measured

- FOI and AIE

Projections approach pros and cons

- Competing priorities can be difficult on timing. Competing demands on the components of the system.

- Composite model so not easy produce multiple scenarios – this limits the number of scenarios

- Other models can offer a different interpretation, useful for plausibility checks or ground truthing our results

- Fully consistent with the national inventory - same emission factors base year in our source data

Indicative Projections timeline for 2024

Cut-off date for Final Input Assumptions and marked as the assumptions related to 2024 EPA Emission Projections (Greenhouse Gases and Air Pollutants)

End August 2023

Agree Energy Projections Input Assumptions* following discussion with key stakeholders (e.g.Govt Depts)

End September 2023

ESRI Energy Projections Modelling Outputs (including Plexos outputs), Macro Economic Parameters

Mid October 2023

Working Group** QA/QC of ESRI Energy Projections outputs (including Plexos outputs)

Early November 2023

SEAI Energy Projections and Policies and Measures Savings Draft Outputs (from SEAI models)

Mid November 2023

Working Group QA/QC of SEAI Energy Projections and Policies and Measures Savings draft outputs

Early December 2023

Circulation of final Draft Energy Projections data and final draft Energy Policies and Measures Savings

End December 2023

Sign off of Final Energy Projections data and Final Energy Policies and Measures Savings

Mid February 2024

EU and UN Submission files for GHG and Air Pollutant Emission Projections and Policies and Measures Reporting finalised

*including projected timeline, scenarios, assumptions related to the sensitivity analysis
**Working Group: ESRI, SEAI, EPA

Cut-off date for Final Energy Projections and Policies and Measures Savings and marked as the energy projections and savings related to 2024 EPA Emissions Projections

EPA: Emissions data processing, completion of reporting templates and reports, IIR, Methodology Reports, internal and external QA/QC, internal approval, preparation for national release of projections publication and communications

Future activity

- More focus on PaM's work

- Climate Act 2021 - greater scrutiny of sectoral projections and policies and measures data prepared by the Agency

- PaMs resources increased in 2022

- EPA modelling resources increased in Q4 2023

Key Outputs

- Output files for EU reporting

- EPA Publications

- EPA website

- Public queries, datasets
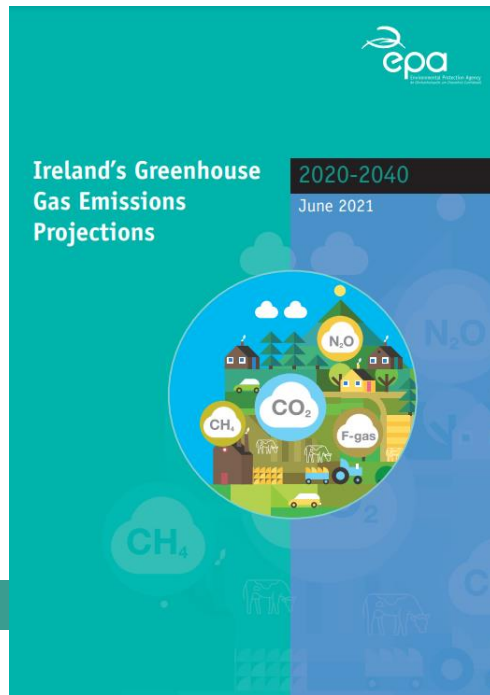
Annex XXV - Table 1a: Greenhouse gas projections by gases and categories [1]

Instructions (click the '+' in the left):

Ireland's Greenhouse Gas Emissions Projections 2020-2040 June 2021

Search

Browse by Climate Change

in: Climate Change

Greenhouse gas emissions

Greenhouse gas (GHG) emissions in Ireland decreased 3.6% in 2020. Learn more

Reportnet

The EPA's Role in addressing climate change

The EPA's role in addressing climate change challenges includes collating national greenhouse gas emissions and projections; regulating emissions from industrial sectors; supporting climate science research; supporting behavioural change and facilitating the National Dialogue on Climate Action.

epa | Greenhouse Gas EMISSIONS

What can you do?

Reduce your transport carbon footprint, improve the energy efficiency of your home and avoid food waste - a climate action you can do every day.

Remember:

"EVERY BIT OF WARMING MATTERS. EVERY YEAR MATTERS.

EVERY CHOICE MATTERS"

Intergovernmental Panel on Climate Change

Greenhouse gas emissions Ireland

Key messages

Greenhouse gas (GHG) emissions in Ireland decreased in 2019

Change in emissions since 2018

-4.4%

Despite the decrease, Ireland is still not on the pathway required to meet future targets and a climate neutral economy.

Latest emissions estimates

Ireland's latest greenhouse gas (GHG) emissions 1990-2019 are final figures based on the SEAI's final energy balance released in November 2020.

Latest emissions data

59.78 Mt CO2eq

Ireland's GHG emissions are estimated to be 59.78 million tonnes carbon dioxide equivalent (Mt CO2eq)

Energy ind[...]

Greenhouse gas emissions decreased b[...] in coal and peat use and an increase in [...] generation

Emissions mainly fr[...] generati[...]

-11.2[...]

Coal in electricity generation -69% in 2019

Early implementation of climate and environmental actions needed for long term improvement.
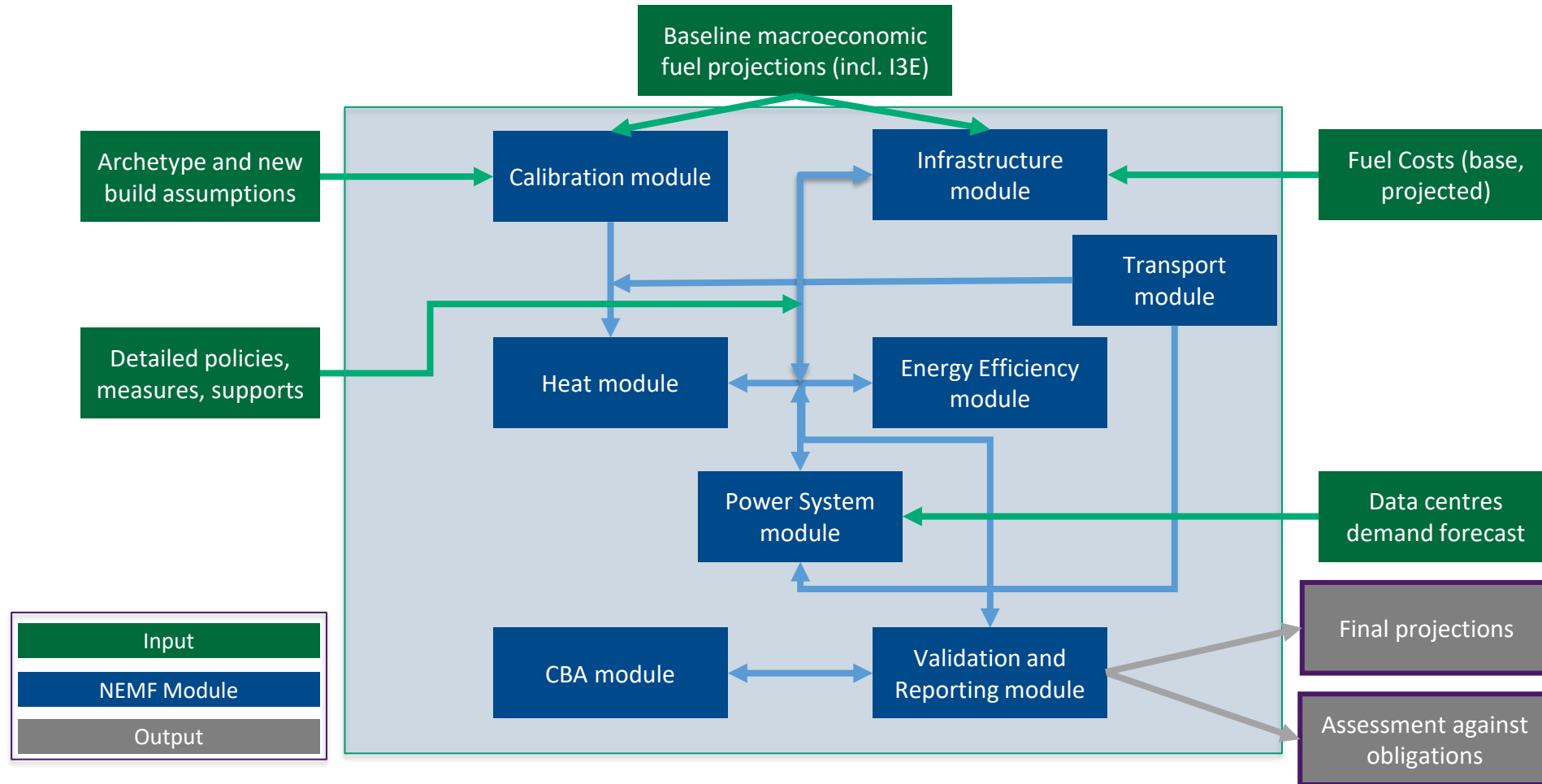
Learn more on
www.epa.ie/ghg

SEAI NEMF Structure with Inputs and Outputs

Macroeconomic Input Assumptions

- Guidance from European Commission on Wholesale Fossil Fuel Price Trajectories, ETS price, etc.

- Review latest price information to update historic data and consider adjustments

- Review alternative long term price trajectories to create envelope for sensitivities

- Agree set of wholesale fossil fuel prices, ETS prices, accounting for useful sensitivities

Gas Price Trajectories Comparison
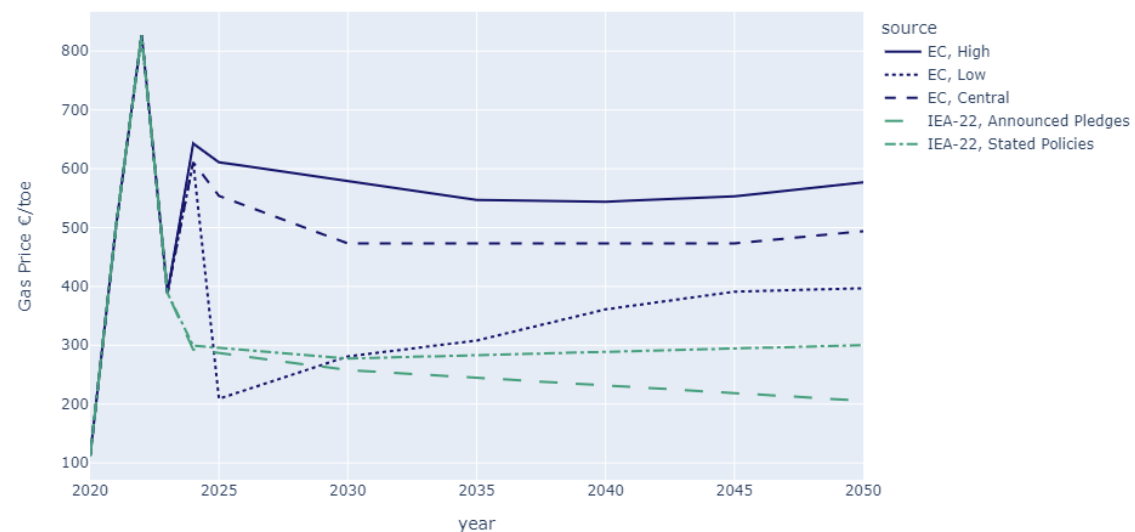
Policy Input Assumptions

- Review with relevant departments and agencies on changes from previous years
  - More **detailed policy assumptions** yield better outputs (implementation plans and credible risks)

- Account for risks materialising affecting likely deployment rates
  - e.g. CAP target, but strategy not fully formed
  - Plans **extending beyond 2030 targets** allow for more robust modelling

- Adjust support assumptions related to existing policies
  - e.g. availability of new financing for retrofits, adjustments to grant rates for domestic HPs to 2030 – NDP allocation

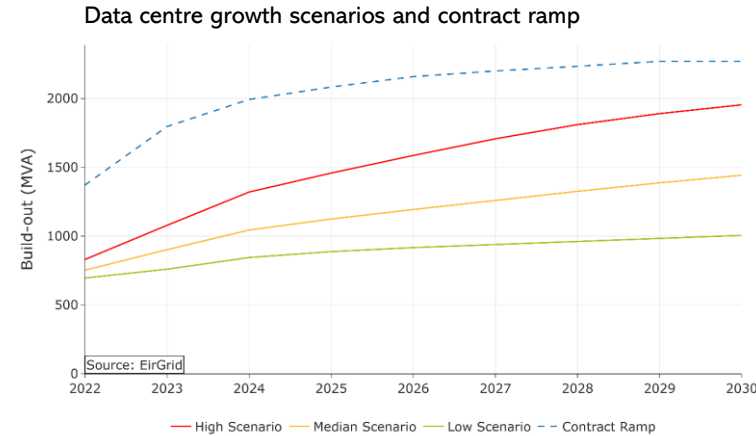**CAP23 on Renewable gases:**

- **2025** – up to 0.4 TWh in heat
- **2030** – up to 0.7 TWh in heat
- Production of up to 5.7 TWh biomethane by 2030
  - Modelled in heat sector – higher RES value.

SSRH
gov.ie - Support Scheme for Renewable Heat (SSRH) (www.gov.ie)
"The current National Development Plan includes an allocation of €300 million for the rollout of the SSRH for the period up to 2027."

seai SUSTAINABLE ENERGY AUTHORITY OF IRELAND

Calibration and Modelling Input Assumptions

- Calibration

  - Latest historic prices and energy demand from SEAI Energy Statistics

  - Changes in costs, tech suitability

  - Energy demand growth based on combination of I3E macro projections with subsector-specific estimates e.g. data centres, new builds, cement

- Modelling input assumptions where measure not in place

  - e.g. plant closure due to age, potential bans

  - Analysis of range of potential differences in implementation details

Data centre growth scenarios and contract ramp

Source: EirGrid

High Scenario — Median Scenario — Low Scenario -- Contract Ramp

| Projected Housing Output (New Build) 2022 – 2030 | | | | | | | | | |
Tenure	2022	2023	2024	2025	2026	2027	2028	2029	2030
Social homes	9,000	9,100	9,300	10,000	10,200	10,200	10,200	10,200	10,200
Affordable & Cost Rental homes	4,100	5,500	6,400	6,400	6,100	6,300	6,400	6,300	6,300
Private Rental and Private Ownership homes	11,500	14,400	17,750	18,200	19,800	20,400	21,500	23,000	24,000
Total Homes	24,600	29,000	33,450	34,600	36,100	36,900	38,100	39,500	40,500

YOU ARE HERE: HOME / STATISTICS / NEW DWELLING COMPLETIONS Q4 2022

New Dwelling Completions Q4 2022

Total new dwelling completions for 2022 close to 30,000

CSO statistical publication, 26 January 2023, 11am
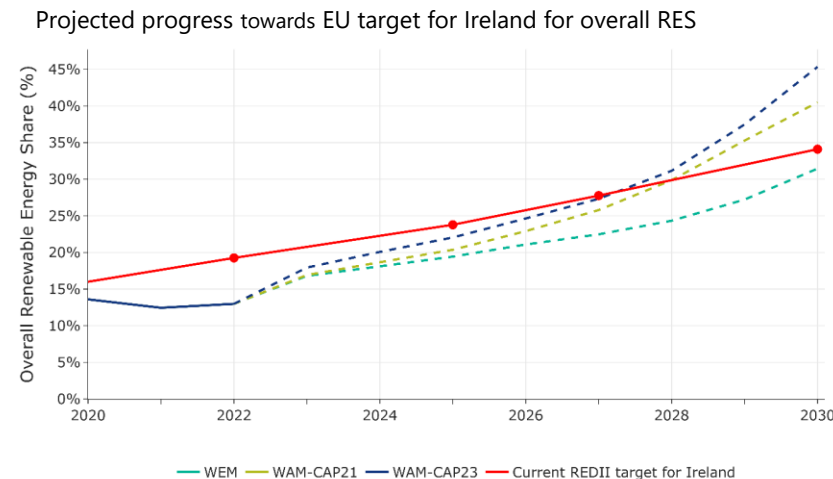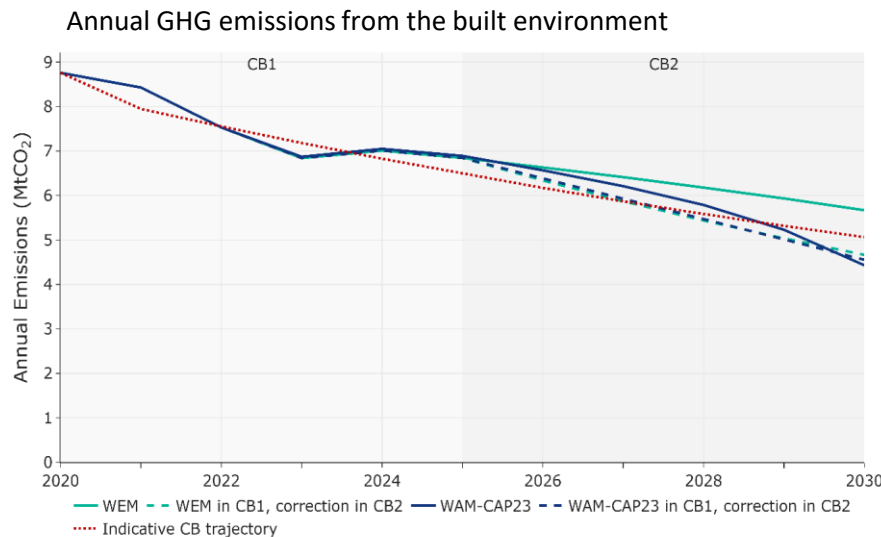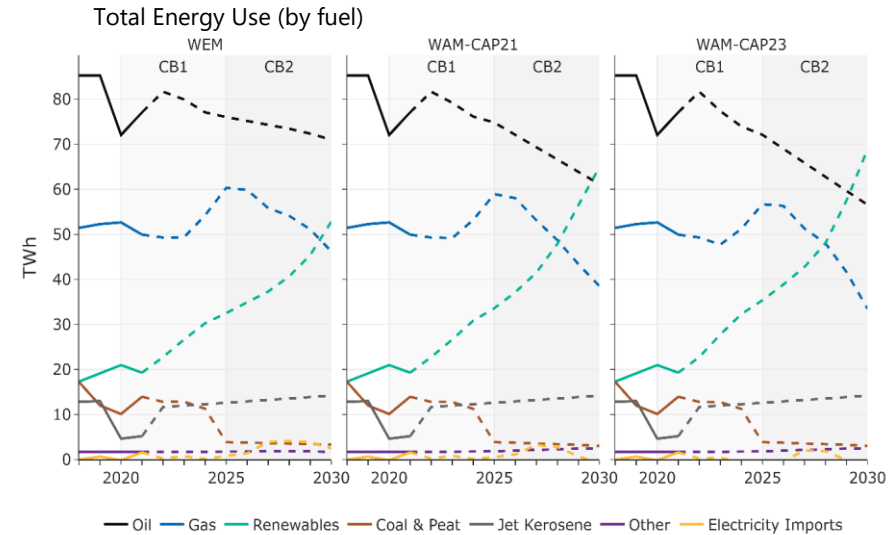
Scenario Modelling and Output Validation

- Scenario Modelling
  - Set up range of scenarios and begin process of iterative runs and validation
  - Review and refinement of sensitivities

- Output Validation
  - High level analysis of trends by sector and by fuel
  - Comparison across scenarios
  - Deep dive into drivers of any unusual trends and impact of changes in input assumptions

Electricity Use (by sector)

Solar PV alternative scenarios installed capacity deployment
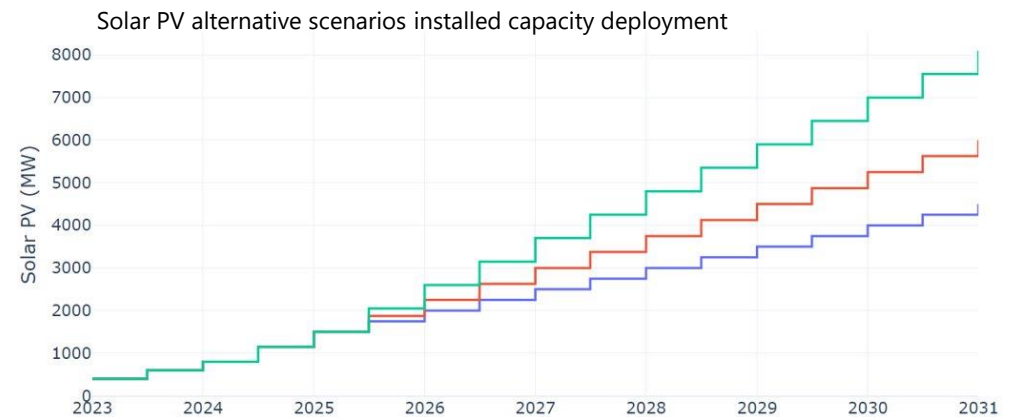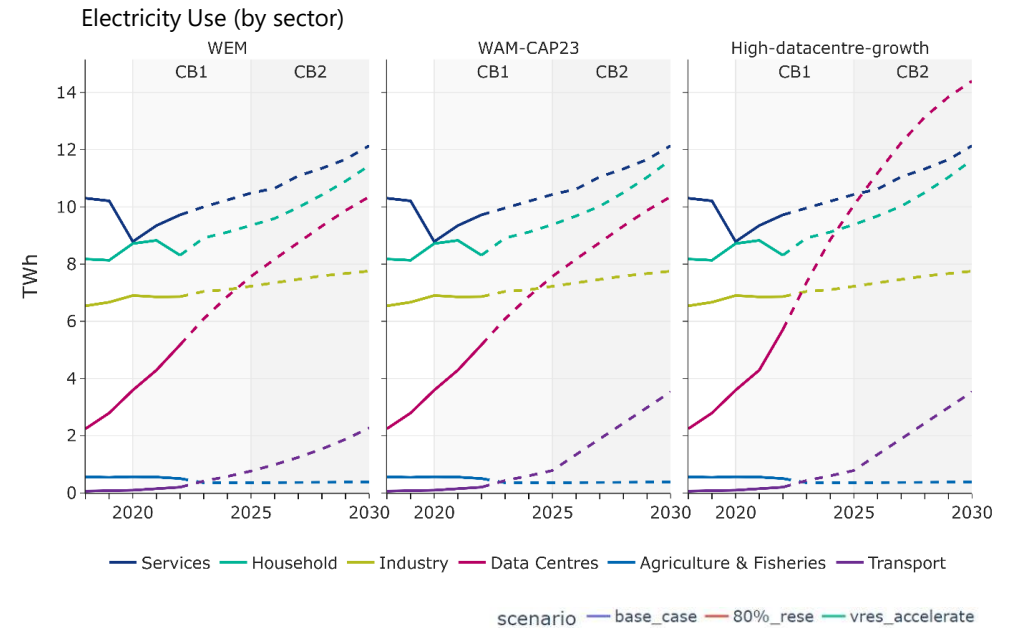
Reporting and Assessment

- Produce final outputs for submission to EPA
  - Review and provide explanations for trends by sector and fuel

- Assess scenario outputs against domestic and EU energy and emissions obligations
  - e.g. EED, RED, sectoral ceilings

Total Energy Use (by fuel)


Annual GHG emissions from the built environment

Projected progress towards EU target for Ireland for overall RES

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Questions and Discussion

seai SUSTAINABLE ENERGY AUTHORITY OF IRELAND

The Role of I3E in the NEMF

INSTITIÚID TAIGHDE EACNAMAÍOCHTA AGUS SÓISIALTA
ESRI **ECONOMIC & SOCIAL RESEARCH INSTITUTE**

Carbon Budget Working Group
Meeting 7

19 October 2023

The I3E model has been used to provide the macroeconomic outcomes and sector- and household-level energy demand as part of the SEAI's National Energy Modelling Framework (NEMF).
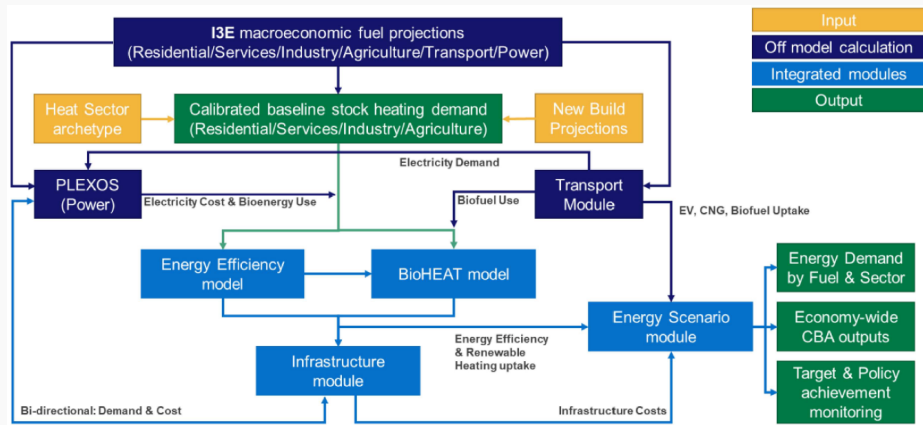
In calibrating the I3E model, we constructed an Energy Social Accounting Matrix (ESAM) for the year 2014 by using the following data sources:

- Supply and Use Tables
- Government accounts
- National accounts
- HBS, SILC, and LFS
- Energy Balance, BEUS, EXIOBASE, emissions inventory

Dynamic BaU

Although the model parameters are calibrated by using single-year data, the business-as-usual (*BaU*) path of the model is dynamic such that it includes the changes in

- the composition of energy demand by sectors
- international energy prices
- the levels of EU ETS price and carbon tax
- the EU ETS legislation
- the economic activity due to the COVID impact

between 2014 and the latest year.

Energy Demand Composition

Each year, the SEAI publishes the new Energy Balance Table, of which the latest one is available for 2022. Using the changes in the composition of energy demand since 2014 for each sector by each energy commodity, we are re-calibrating the related parameters in the model.

We assume that the composition of energy demand across commodities will stay constant at its re-calibrated status between 2022 and the end of the model horizon.

This process allows us to represent the current state of the energy demand.

Energy Prices

Like all CGE models, the I3E model solves the prices that ensure the equilibrium of supply and demand in all markets, including the factors of production.

Since Ireland is a small open economy, it has no control over international prices. As a net energy importer country, international energy prices play a crucial role.

Along the baseline scenario of the I3E model, we apply the updated energy prices and assume that they will stay constant at their 2023 levels until the end of the model horizon.

We use the average realised price between January and September 2023 taken from the World Bank pink sheet.

Carbon Prices

In addition to international energy prices, the path of carbon prices is also important.

Since Irish firms with a level of combustion above the threshold are subject to the EU ETS, the price in the EU-level market affects the major sectors, especially power generation, aviation, and certain manufacturing sectors.

The Irish government imposes a carbon tax on energy commodities to curb non-ETS emissions, mainly transportation and residential emissions.

We apply the realisations in the EU ETS price and the carbon tax between 2014 and 2023 and assume they will be constant at these levels until the end of the model horizon.

Scenarios

The number of scenarios we run depends on the requirements of the NEMF stakeholders. In the 2023 projections, for instance, we provide the following five scenarios.

- BaU: The path includes only historical realisations without any policy change
- CT: BaU + the trajectory of the carbon tax
- VEM: CT + EU ETS price trajectory
- High_VEM: VEM + high energy prices
- Low_VEM: VEM + low energy prices

Assumptions

The energy projections cycle starts with determining the agreed assumptions regarding the paths of international energy prices and the carbon price.

We use the projections provided by the SEAI for international energy and the EU ETS prices.

For the level of the carbon tax, we apply the trajectory determined by the Irish Climate Act, which envisages that its level increase by €7.5 until 2029 and €6.5 in 2030 and reaches €100 in 2030.

Carbon budgeting under framework climate laws: analysing diversity in national practice

Sadhbh O' Neill

Climate Change Advisory Council

Carbon Budgets Working Group 19th October 2023

Background

- Small scale research project for the Irish Climate Change Advisory Council 2022-3

- TOR:

  - Review approaches to carbon budgeting in selected countries

  - Review approaches to determining 'fair share' contributions under the Paris Agreement

  - Consider what lessons from above might be relevant to Ireland as the Council considers the next carbon budget programme from 2024

Context: The meaning of net-zero and how to get it right*

1. Front load emissions reductions

2. Targets should cover all GHGs

3. Don't bet on technofixes

4. Avoid the use of offsets*

5. Ensure an equitable transition

6. Align climate actions with other socio-ecological goals

7. Seize opportunity to address market failures & global inequity*
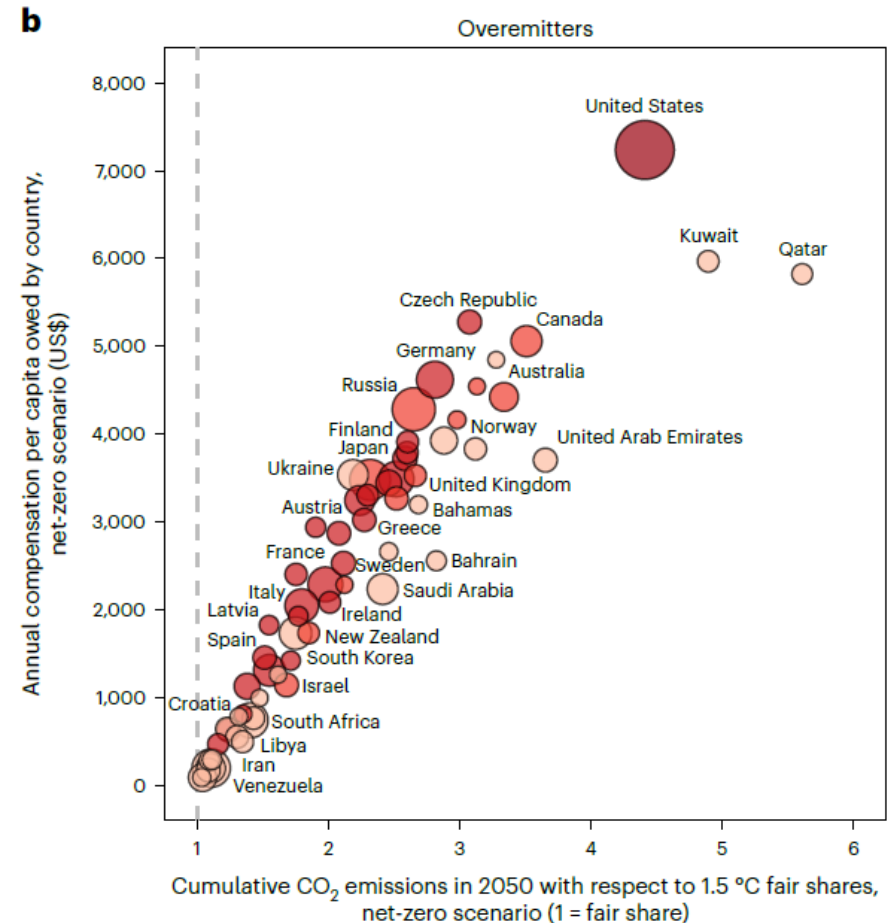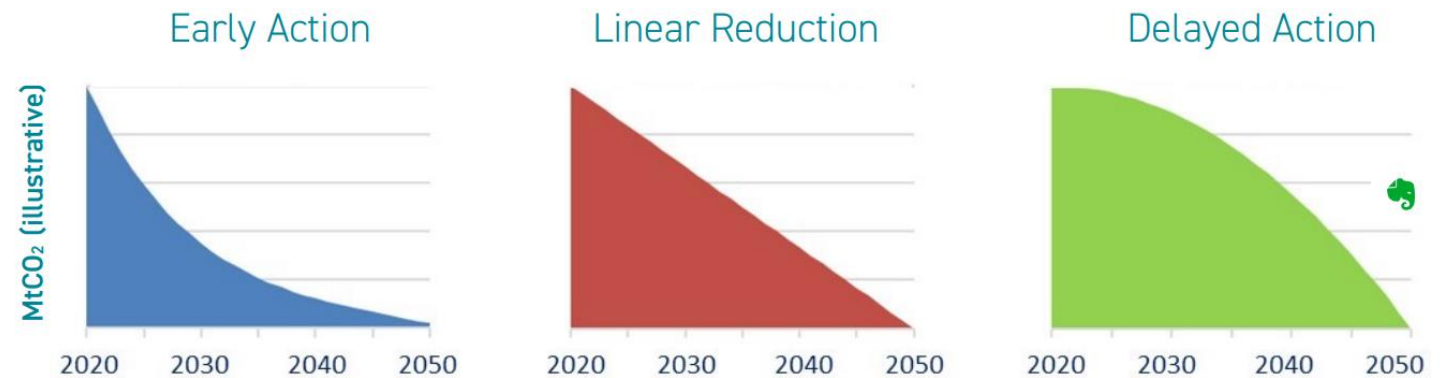

Sources: Fankhauser et al, 2022. The meaning of net zero and how to get it right. *Nature Climate Change, 12*(1), pp.15-21. Fanning, A.L. and Hickel, J., 2023. Compensation for atmospheric appropriation. *Nature Sustainability*, pp.1-10.

Carbon budgeting – design elements

- Framework laws
  - Targets
  - Principles
  - Institutional design
  - Policy planning cycle
  - Expert advisory bodies
- Targets or budgets?
  - Targets should be quantitative but only cumulative budgets properly reflect IPCC science
  - Selection of base year should reflect contribution to international equity
- Problems with net zero concept
  - NETS assumptions and overshoot
  - Land use and forestry sink assumptions
  - Blindspots

Targets vs budgets

▶ Targets: e.g. net zero by 2050

    ▶ This could imply a range of carbon budgets depending on the chosen pathway

    ▶ Mitigation could theoretically begin in 2029, and emissions could conceivably rise every year until then

    ▶ Focus is end-point rather than the pathway or cumulative emissions

▶ Budgets: reflects the long-lasting nature of CO2 in particular

    ▶ Stocks and flows, emissions and sinks/ removals

    ▶ Expressed in terms of <u>cumulative</u> emissions, not point in time or end goal

    ▶ It's the area under the curve that matters

Source: MaREI https://www.marei.ie/wp-content/uploads/2021/03/Our-Climate-Neutral-Future-Zero-by-50-Skillnet-Report-March-2021-Final-2.pdf

Normatively relevant criteria in assessing approaches to carbon budgets

- Emissions profile
  - Historical contribution
  - Per capita emissions
  - RE share/ CO2 intensity
  - Rankings
  - Committed emissions
- National policy and legislation
  - Framework climate law – goals
  - Institutional roles & expert bodies
  - Policy planning cycle
  - Accountability

- Carbon budgeting (or targets)
  - Accounting rules
  - Base year
  - Review process
  - Banking & borrowing
- Other
  - Aviation and shipping
  - Offshore mitigation
  - Just Transition
  - Public participation

Country	Emissions profile (CCPI ranking)	Committed emissions – phase out FF exploration?	National policy and legislation – NZ target?	Carbon budgeting process	Just transition/ equity principles in law?	Public participation in climate policy planning	Progress - on track?
UK	11	No	2050	CB model	No	No	No
Finland	15	Yes	2035	Targets	Yes	Yes	No
France	28	Yes	2050	CB model	No	Yes	No
Netherlands	16	Yes with CCS	95% by 2050	Targets	No	Yes	No
New Zealand	33	Yes	2050 (10% CH4 2030)	CB model	Yes	Yes	No
Ireland	37	Yes	2050 at the latest	CB model and 2030 target	Yes	Yes	No
Denmark	4	Yes from 2050	70% 2030 Net zero 2050	Targets	Yes	Yes	No
The EU	19	No	Net zero 2050 90% reduction by 2040	Targets	Yes	Yes	Awaited but probably no

Country	Base year	Targets/ CBs calculated using an equity principle?	NETS / removals assumptions?	Budgets or targets?	Banking and borrowing?	Review mechanism?
UK	1990*	No	Yes	5-year budgets, 12 years in advance	Yes with restrictions	Yes
Finland	1990	(Yes)	Yes	Targets	N/A	Yes
France	1990	No	No	Budgets	Yes with restrictions	Yes
Netherlands	1990	(Yes)	Yes	Targets	N/A	Yes
New Zealand	2017 for CH4** 1990	No	Yes	Budgets	Yes	Yes
Ireland	2018	No	Yes	Budgets	Yes with restrictions	Yes
Denmark	1990	Yes	N/A	Targets	N/A	Yes
The EU	1990	(Yes)	Yes	Targets	N/A	Yes

Conclusions and lessons learned

- There is considerable variation in national approaches

- Much of the budgeting happens in the policy planning process

- Carbon budgets are necessary but not sufficient to ensure NZ goals will be met

- Carbon budgets need to be embedded in political choices and policy debates

- Even the most robust, prescriptive carbon budgeting processes are not immune from politics and problems of implementation

1. *No backsliding principle*

2. *Make assumptions re NETs, offshore mitigation & climate risks/ damages explicit*

3. *Report CH4 as CO2e but GWP* can be useful as part of Paris Test*

4. *Include aviation & shipping emissions in CAP and report annually on non-territorial (consumption) emissions*

5. *CCAC should advise measures to address fossil fuel lock-in/ supply side*

6. *Address carbon budgets & limits in climate communications*

7. *Consider potential of sectoral just transition plans*

8. *Commission review of Ireland's 'fair share' contribution inc. finance, L&D, trade policies*

9. *Include section on 'fair shares' in Ireland's next NDC*

Thank you!