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Delivering on the Paris Agreement in a fragmenting world

PARIS REINFORCE final event, Sorbonne, Paris, November 15, 2022

Transforming Europe

Baptiste Boitier (*SEURECO*) on behalf of BC3, CMCC, EPFL, E4SMA, Fraunhofer ISI and NTUA

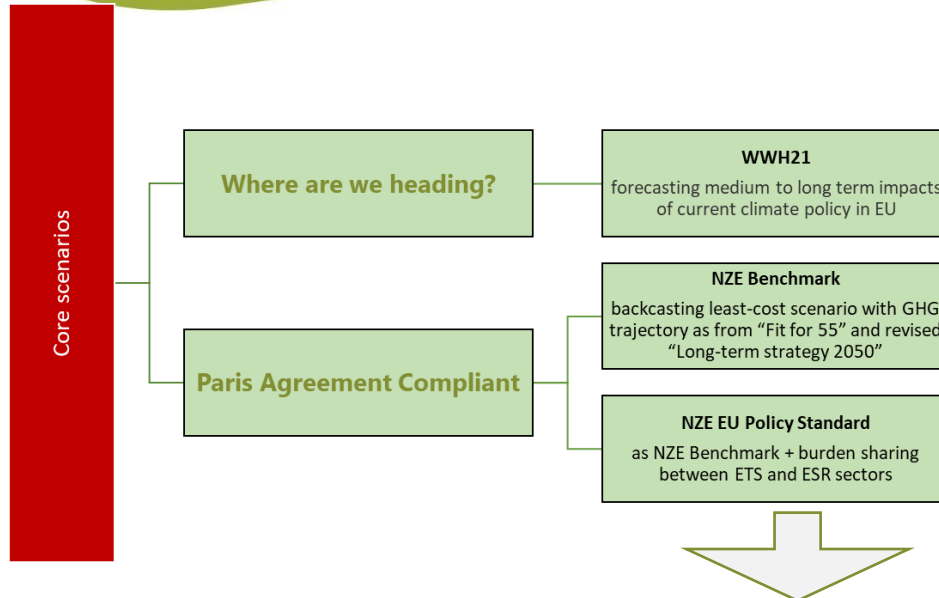


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- A modelling exercise mobilizing 7 different models

	Type	Institute	Geographical coverage
ALADIN	Bottom-up sector perspective (Transport)	Fraunhofer ISI	All EU-27 individualised + UK + NO + CH
E4SMA-EU-TIMES	Energy system model	E4SMA	All EU-27 individualised + UK + NO + CH + IS
FORECAST	Bottom-up sector perspective (Industry and Buildings)	Fraunhofer ISI	All EU-27 individualised+ UK + NO + CH
GCAM	Global Partial Equilibrium	BC3	EU15 (including UK) + EU13
GEMINI-E3	Global General equilibrium model	EPFL	EU28 (including UK)
ICES	Global General equilibrium model	CMCC	9 MS individualised + Benelux + Rest-of-EU + UK
NEMESIS	Macroeconometric model	SEURECO	All EU-27 individualised + UK + NO + CH + IS





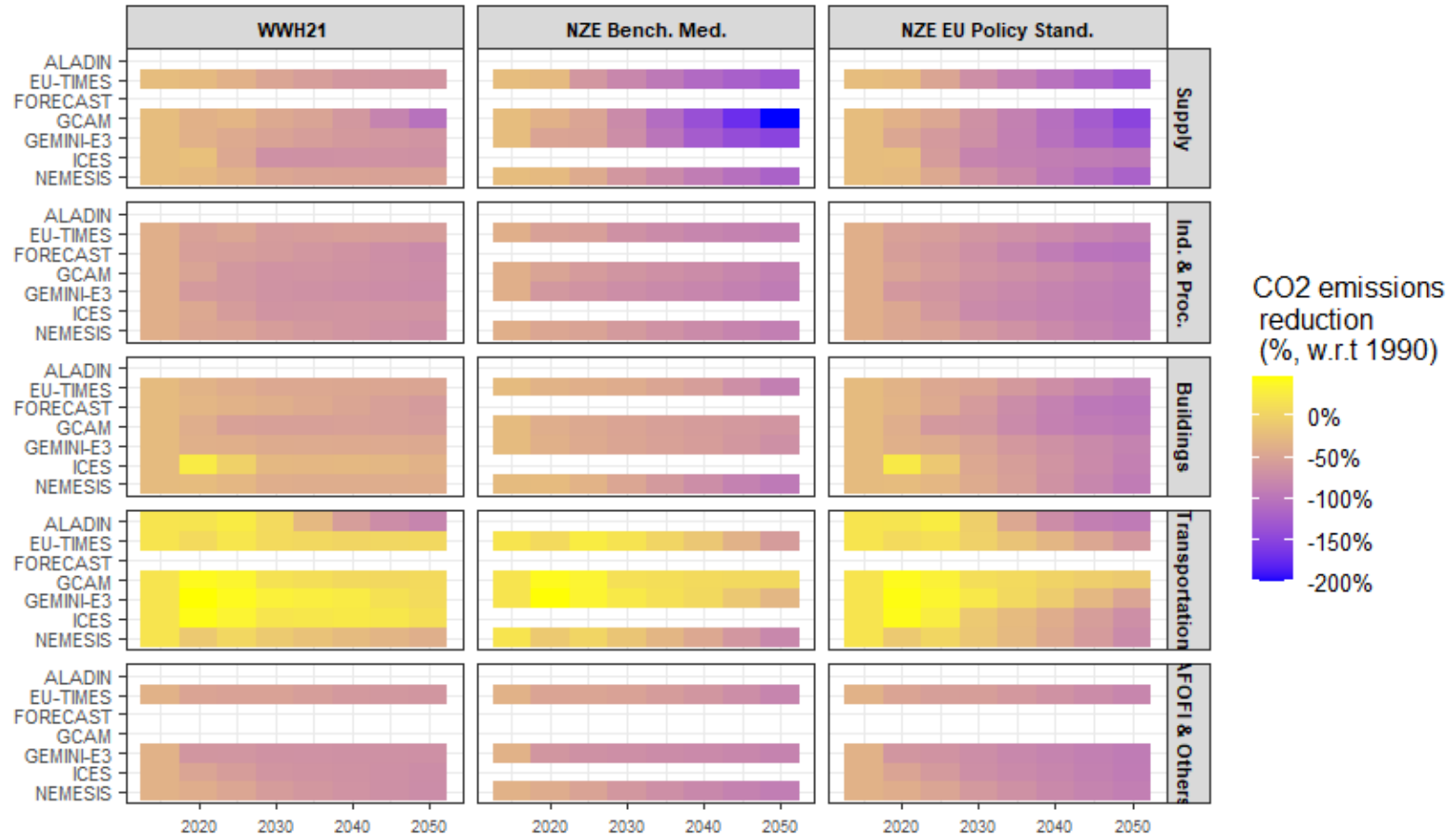
	WWH21	NZE Benchmark	NZE EU Policy Standard
ALADIN	X		X
EU-TIMES	X	X	X
FORECAST	X		X
GCAM	X	X	X
GEMINI-E3	X	X	X
ICES	X	X	X
NEMESIS	X	X	X

	WWH21*		NZE Benchmark**		NZE EU Policy standard**	
	2030	2050	2030	2050	2030	2050
GHG emissions reduction (w.r.t 1990)	-40%	carbon price equivalent	-55%	Net Zero Emission	-55%	Net Zero Emissions
EU-ETS GHG emissions reduction (w.r.t. 2005)	-43%		-61%	Adjusted to reach NZE EU-level target		
ESR GHG emissions reduction (w.r.t. 2005)	-30% (w. national targets)		-40% (wo. national targets)	-80%		



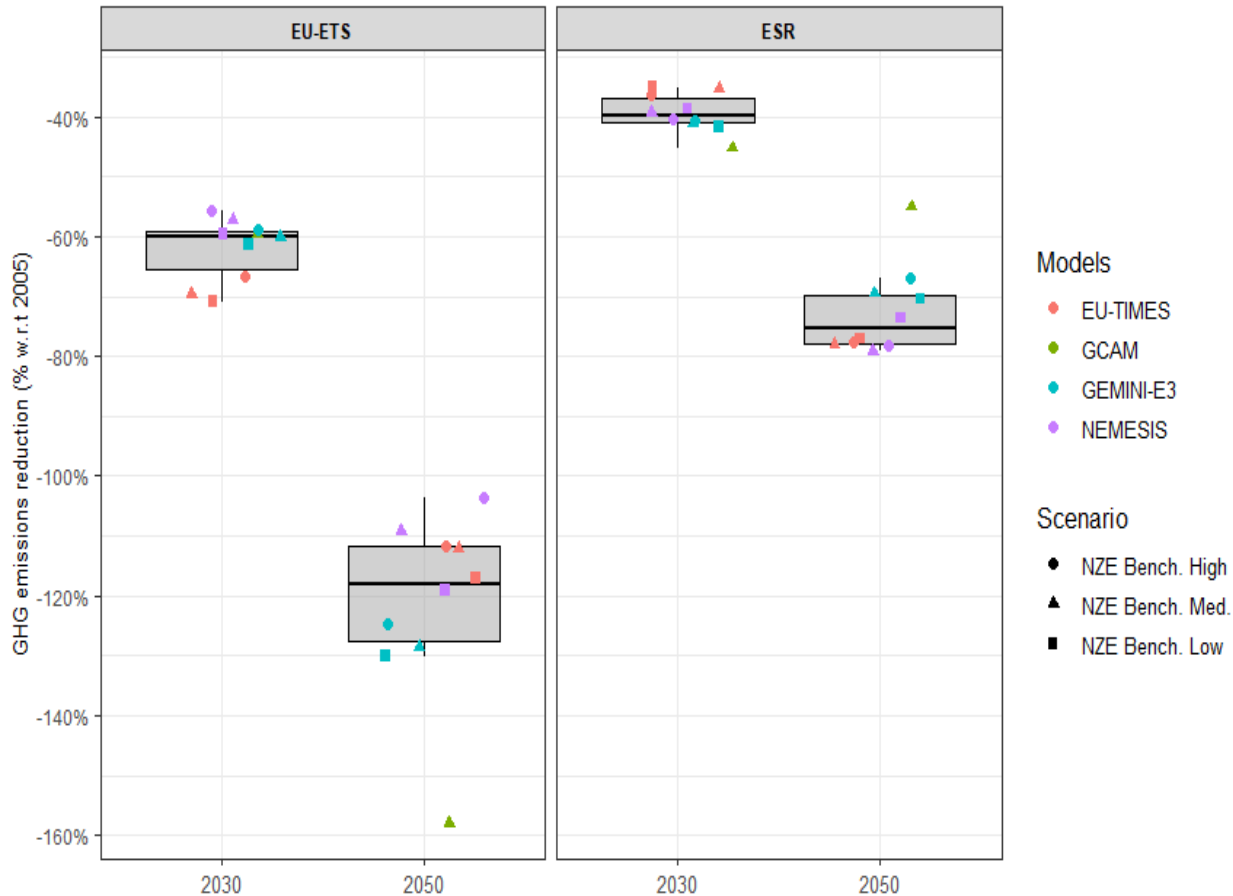
Speed of CO₂ emissions reduction by sector

- NZE is reached between 2035 and 2045 in the supply sector
- Decarbonisation is slower in other sectors and particularly in the transport sector



NZE in EU

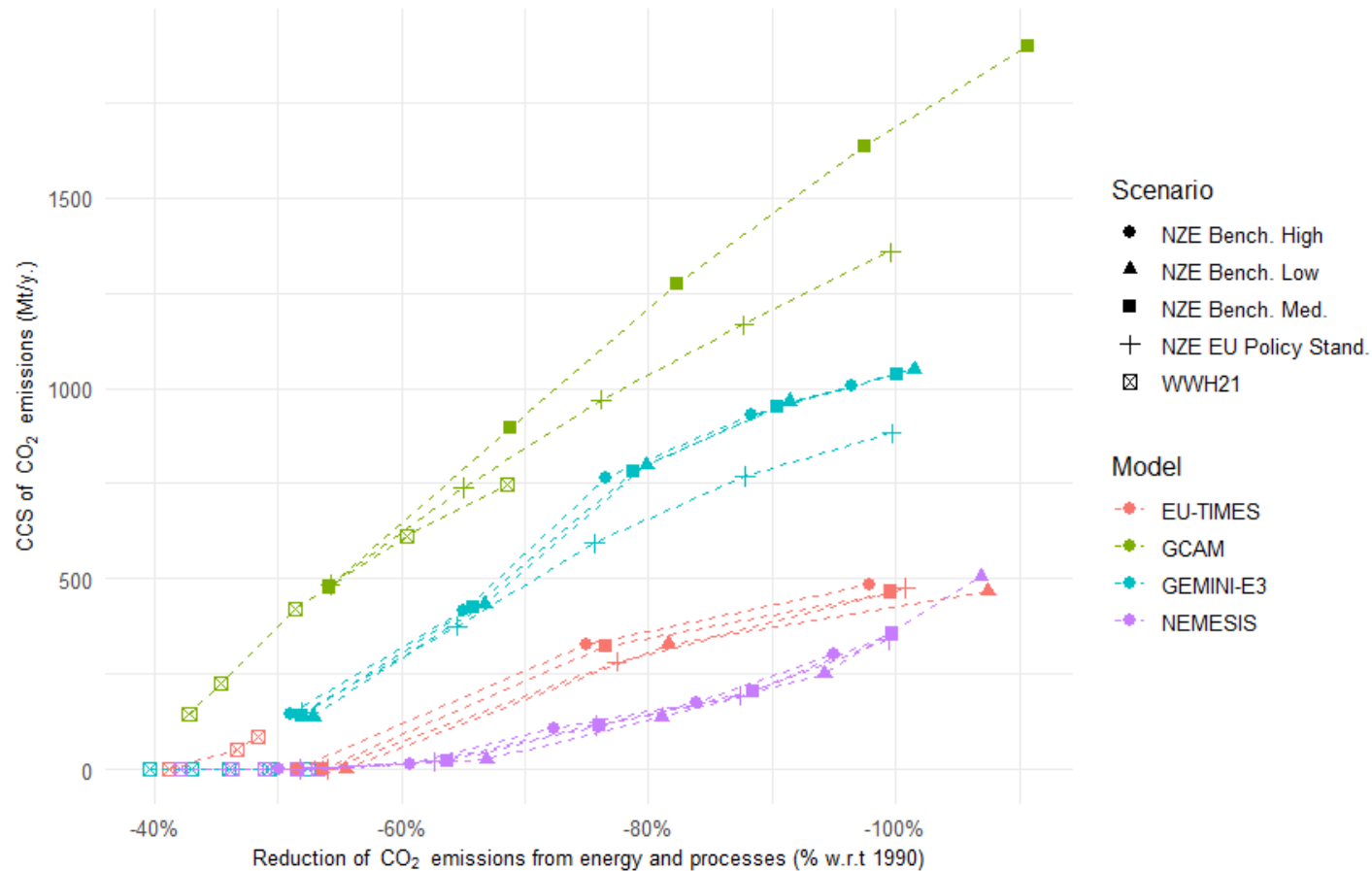
Burden sharing between the EU-ETS and ESR Sectors



- In 2030:
 - From -57% to -70% in EU-ETS
 - From -35% to -45% in the ESR sector
- European Commission proposal is within our range (-61% and -40% respectively)
- In 2050 (median values):
 - -120% for EU-ETS
 - -75% for ESR



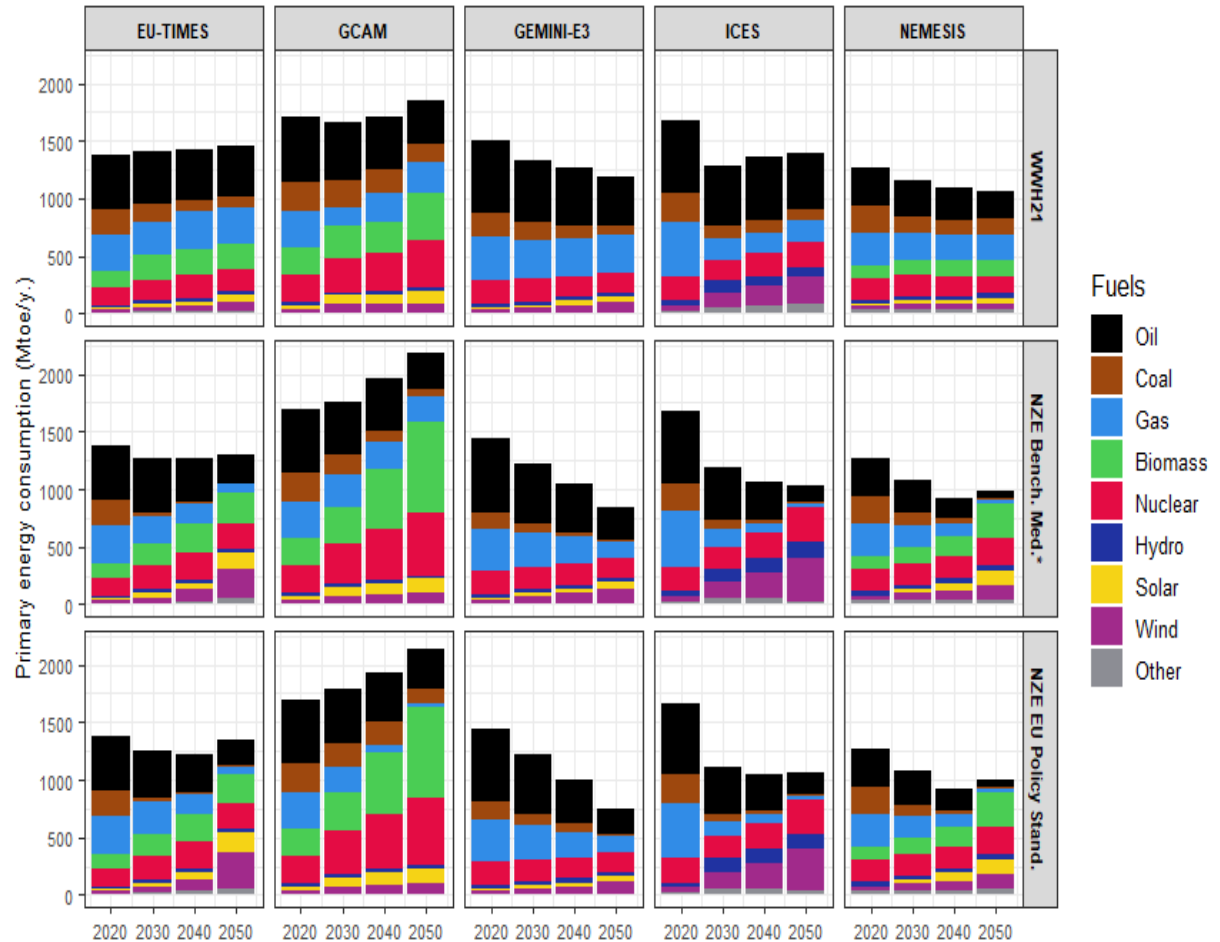
- Biomass with CCS is the only NETs mobilized by the models
- CCS takes up since 2030 in global models and a bit later in EU models
- Fossil fuels CCS is limited
- Biomass CCS is the larger, especially in EU models
- Global models rely strong on CCS, up to 1,9 GtCO₂/y
- Up to 450MtCO₂/y. in EU models



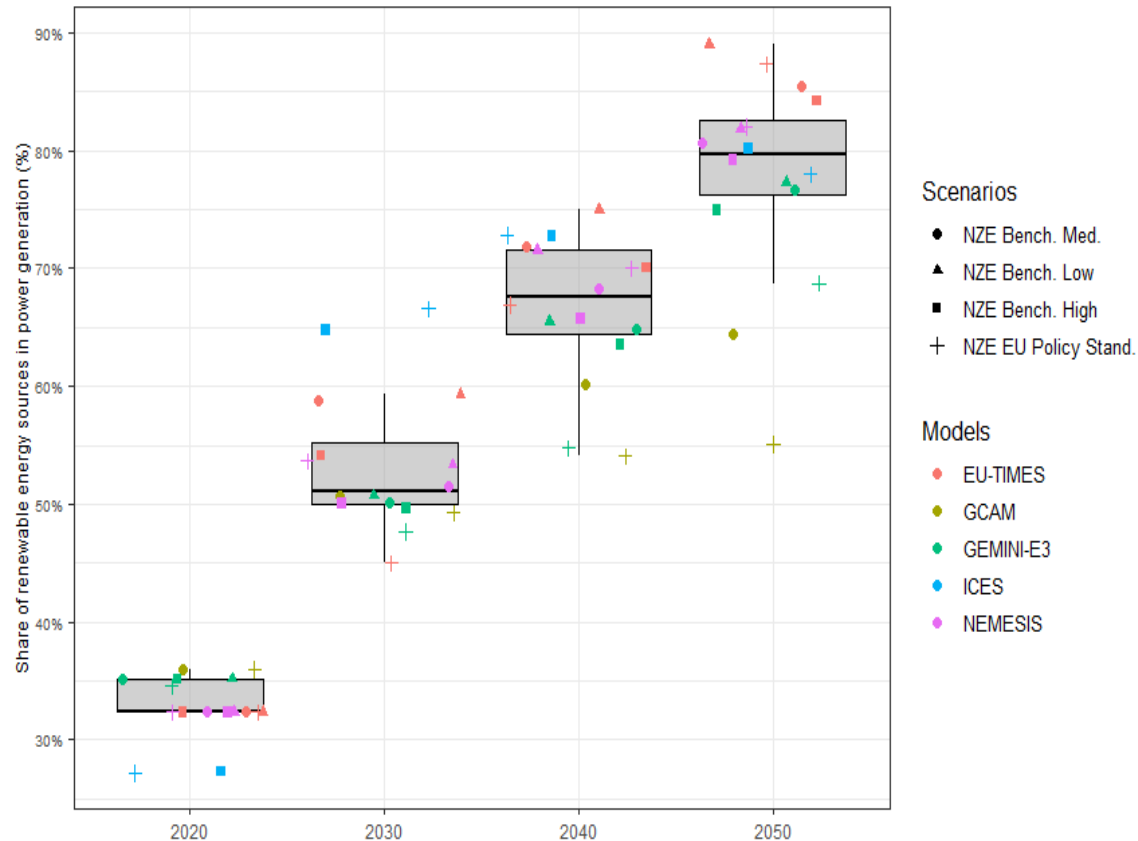
NZE in EU

Primary energy consumption by fuel

- Energy-system models project no or few energy consumption reduction
- Macroeconomic models rely more on energy savings
- Share of fossil fuels declines, from 75% in 2020 to around 25% in 2050
- Nuclear increases slightly and hydro remains relatively stable
- Renewable energy sources grow dramatically (around 75% in 2050), in particular solar (more than 1000GW) and wind (500 to 1000GW).



Share of renewable energy sources in power generation

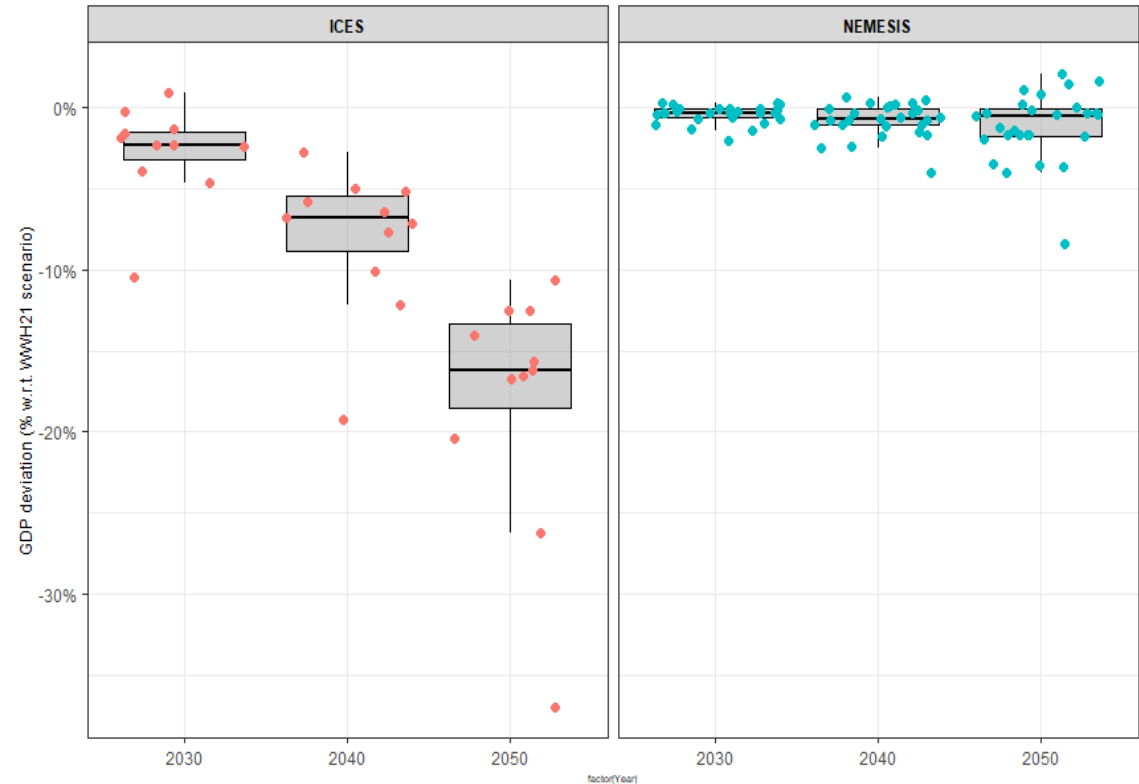


- RES share reaches 80% in 2050
- Electricity consumption grows in almost all sectors
- Hydrogen production is limited in 2030 (below 60GW) but grows dramatically between 2040 and 2050 (up to 500GW)
- Hydrogen demand differs between models, some show a strong uptake in the industry (up to 70Mtoe), others in the transport sector (up to 50Mtoe)
- E-fuels: the sector-specific model projects an important deployment in the transport sector (up to 20% of total final energy consumption)



GDP deviation by Member States in NZE scenarios

- Macroeconomic models show limited GDP loss, between -0,5% and -1,5% between 2020 and 2050 when implementing the NZE scenarios
- But, GDP losses can be larger when mitigation options are limited (e.g. no CCS, no H₂ and few technological details)
- In case of low availability of mitigation options, models reduce the demand that significantly the economic activity



Illustrative figure on GDP deviation in Members States + UK (w.r.t. the WWH21 scenario – NZE EU Policy Standard scenario)



- **Drastic reductions in emissions in all sectors**, with a particular and rapid effort in the power generation sector.
- **CCS role is critical**, and the deep decarbonisation of the EU power generation relies on BECCS
- **Energy saving potential needs to be further explored**
- **The role of renewable energies is essential**
- **Electrification of the energy uses will grow significantly**
- Uncertainty about technology to be used in the most hard-to-decarbonize sectors
- Availability of some key technology is essential to reach NZE to avoid increasing the economic burden of the climate transition.





Thank you!

Baptiste Boitier

Pierre Le Mouël

Paul Zagamé

baptiste.boitier@erasme-team.eu

pierre.le-mouel@erasme-team.eu

paul.zagame@erasme-team.eu

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