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Beyond the 2°C target

Evolution of primary energy mix in EU28 member states

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(Climate Analytics)

The IEA ETP 2017

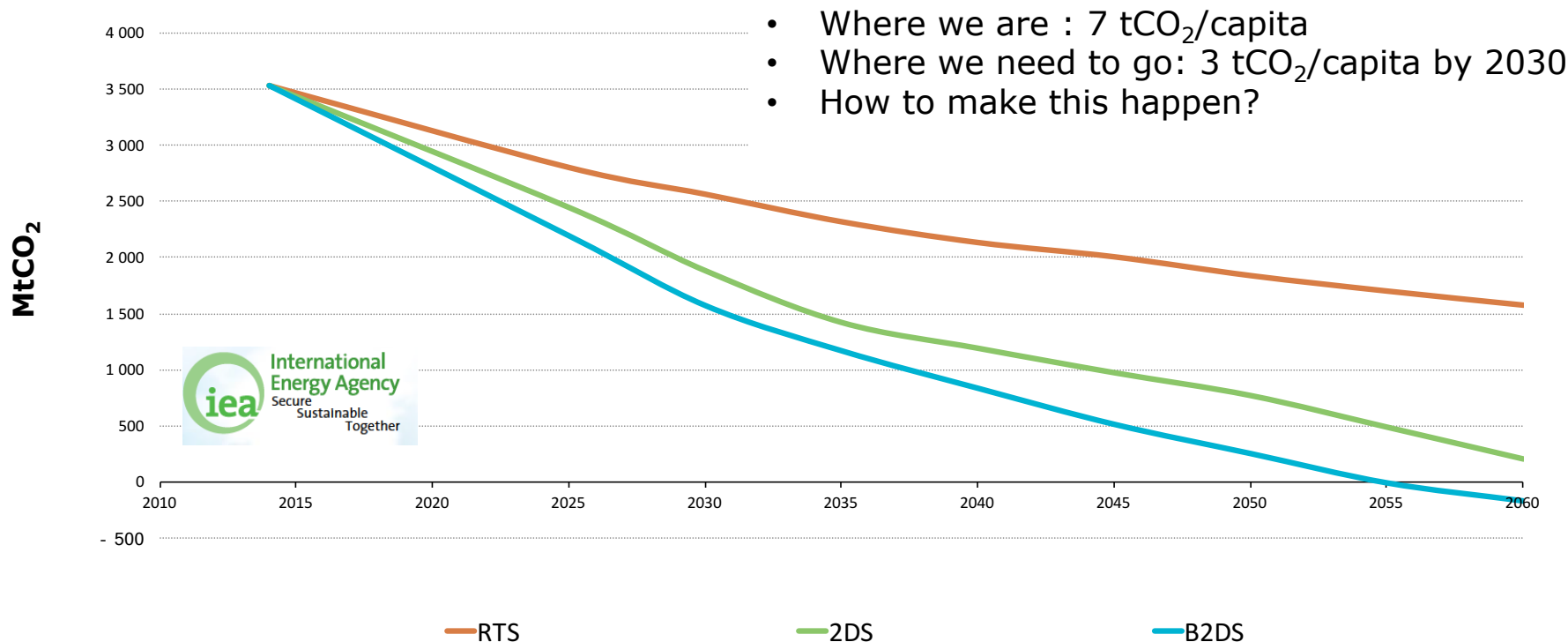


- IEA ETP 2017 provides a “Beyond 2°C” scenario for selected regions.
- EU28 is represented as an aggregated region.
- We downscale energy sector results to selected EU member states
- We show that fossil fuels (coal in particular) should decline sharply between now and 2030.

The IEA ETP 2017



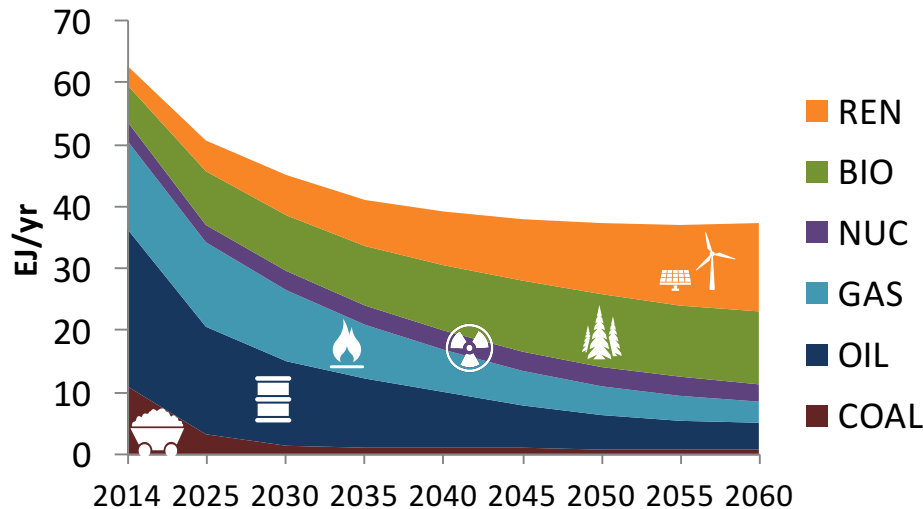
Direct Total CO₂ emissions | European Union



Beyond 2°C Scenario EU28



Total Primary Energy Supply

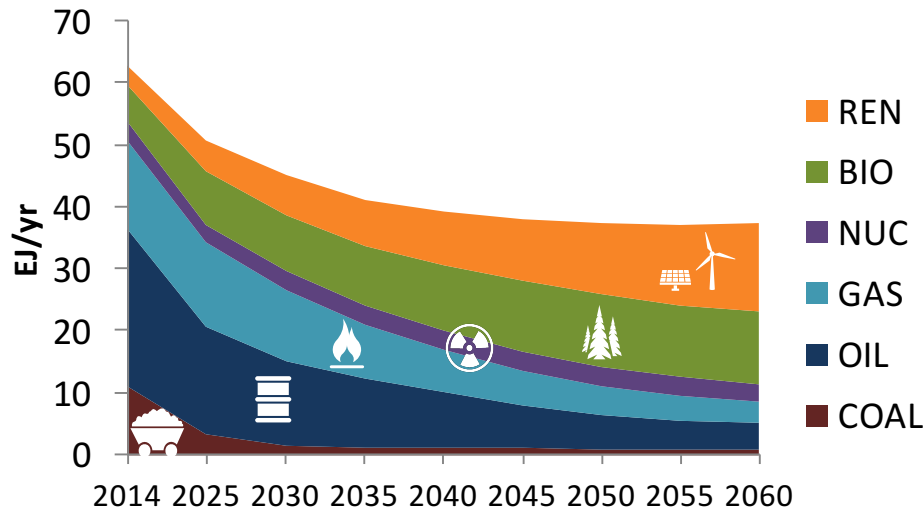


- Energy use declines over time
- Coal largely phased out by 2030
- No silver bullet


Beyond 2°C Scenario EU28





Total Primary Energy Supply



By 2030:

 **+5 % per year**

 **-3 % per year**

 **-13 % per year**

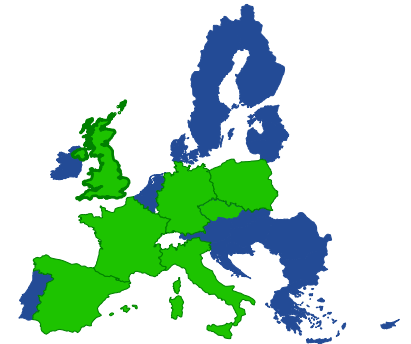
= 3.1 tCO₂/capita

- Energy use declines over time
- Coal largely phased out by 2030
- No silver bullet

Country-level downscaling

EU28 downscaling

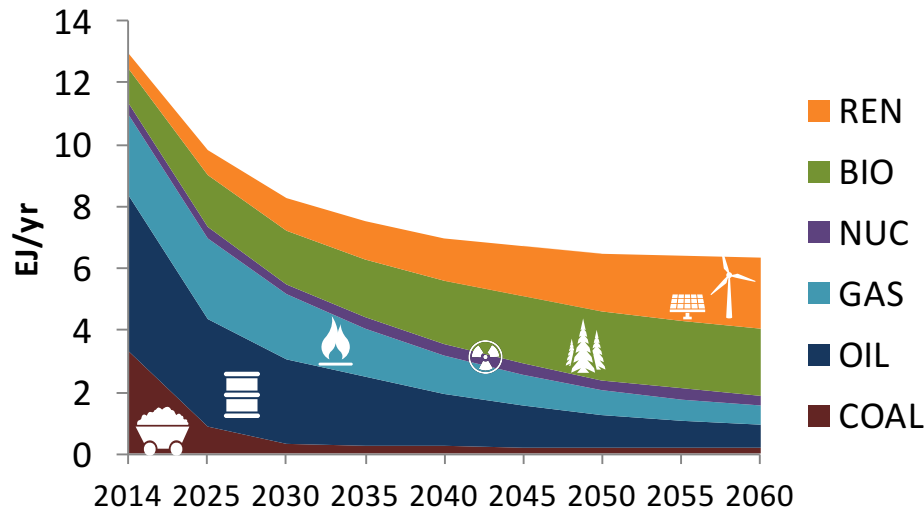
- **SIAMESE** = **S**implified **I**ntegrated **A**ssessment **M**odel with **E**nergy **S**ystem **E**mulator
- We use SIAMESE to downscale the IEA/ETP 2017 results at the country level.
- We use EU28 results as an input to SIAMESE.
- We use external projections for GDP and Population (source: SSP2)
- We downscale the European results at the country level:
 - Germany
 - France
 - UK
 - Italy
 - Spain
 - Poland
 - Czech Republic




Beyond 2°C Scenario Germany





Total Primary Energy Supply



By 2030:

 **+5 % per year**

 **-3 % per year**

 **-14 % per year**

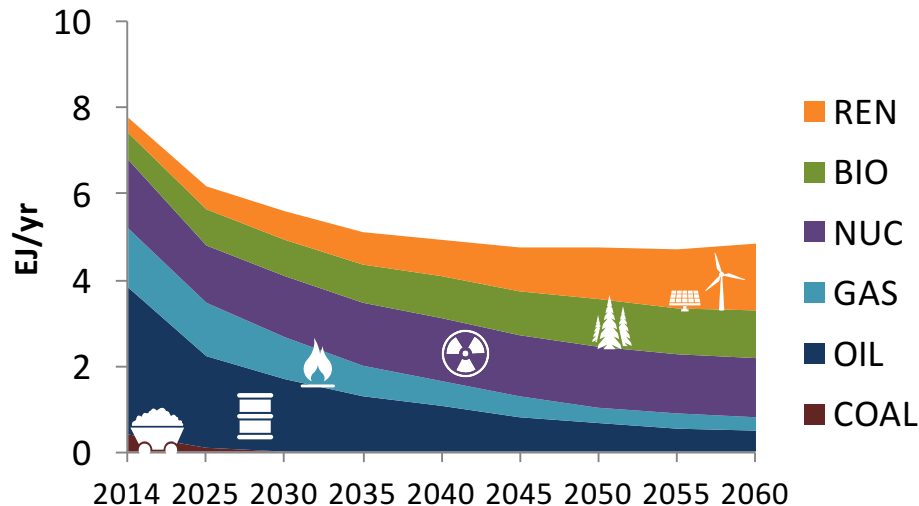
= 3.9 tCO₂/capita

- Energy use declines over time
- Coal largely phased out by 2030
- Less nuclear than the EU28

Beyond 2°C Scenario France



Total Primary Energy Supply



By 2030:



+4 % per year



-4 % per year

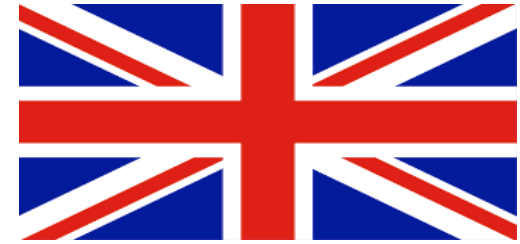


-14 % per year

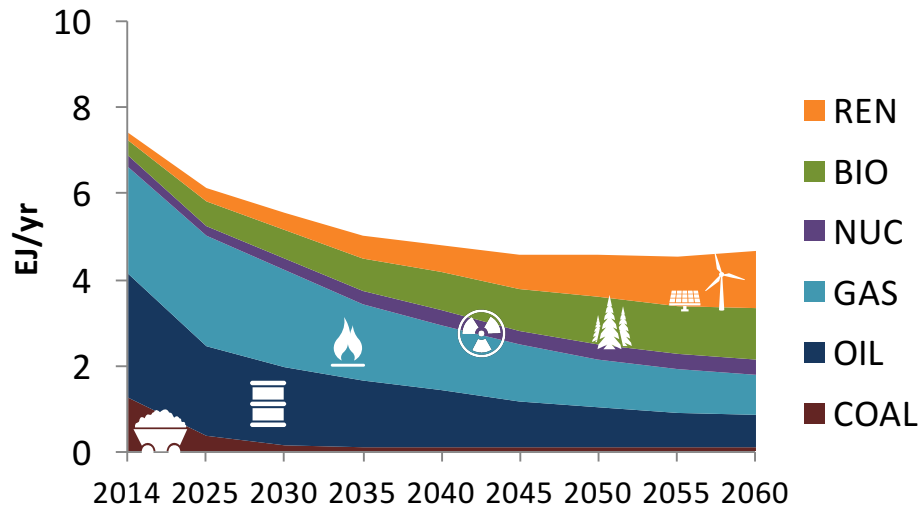
= 2.3 tCO₂/capita

- Energy use declines over time
- Coal phased out by 2030, from lower present day level
- Nuclear remains at about current levels


Beyond 2°C Scenario United Kingdom





Total Primary Energy Supply



By 2030:

 **+6 % per year**

 **-2 % per year**

 **-13 % per year**

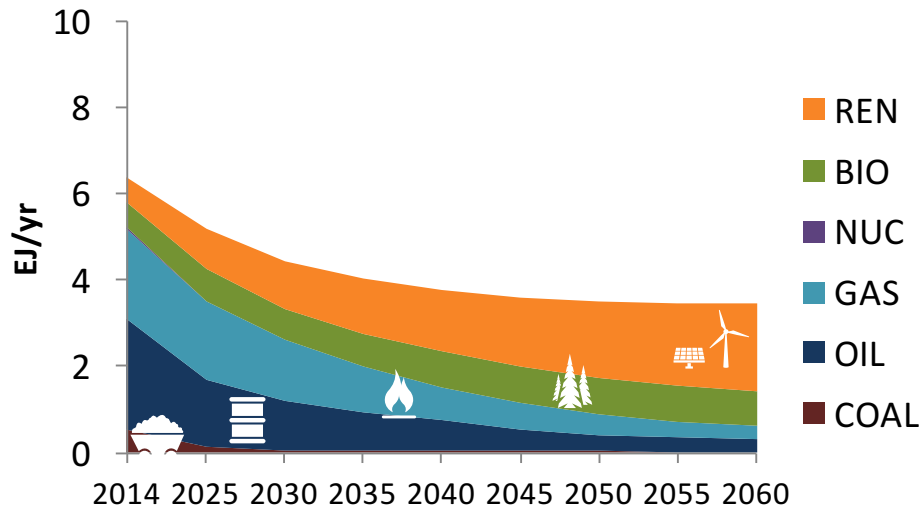
= 3.6 tCO₂/capita

- Energy use declines over time
- Coal largely phased out by 2030
- Gas with CCS increases
- Oil decreases less than EU28


Beyond 2°C Scenario Italy





Total Primary Energy Supply



By 2030:

 **+4 % per year**

 **-4 % per year**

 **-15 % per year**

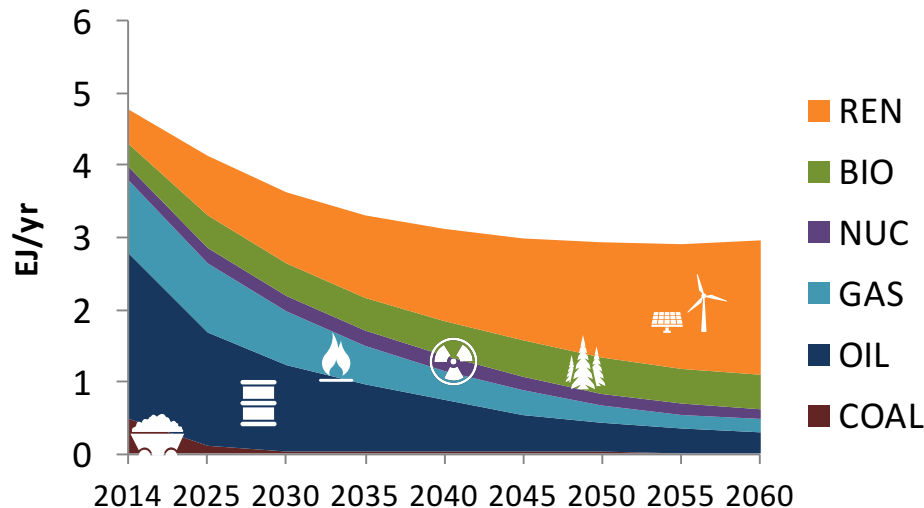
= 2.5 tCO₂/capita

- Energy use declines over time
- Coal phased out by 2030
- Deployment of Renewables is key
- No nuclear


Beyond 2°C Scenario Spain





Total Primary Energy Supply



By 2030:

 **+6 % per year**

 **-2 % per year**

 **-13 % per year**

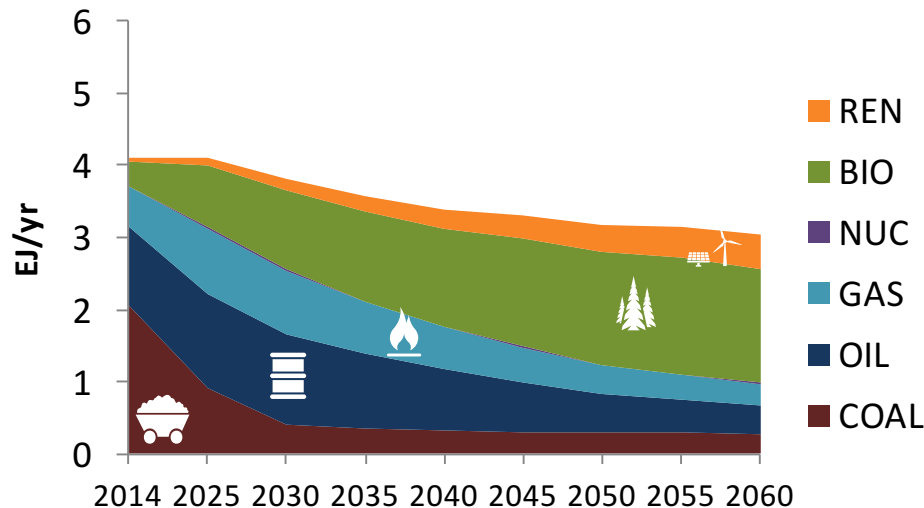
= 2.5 tCO₂/capita

- Energy use declines over time
- Coal phased out by 2030
- Deployment of Renewables is key

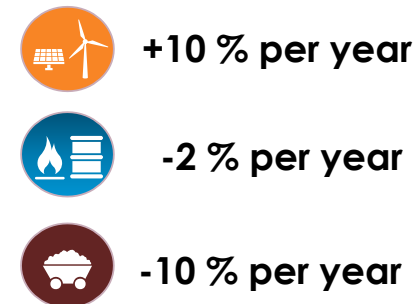
Beyond 2°C Scenario Poland



Total Primary Energy Supply



By 2030:



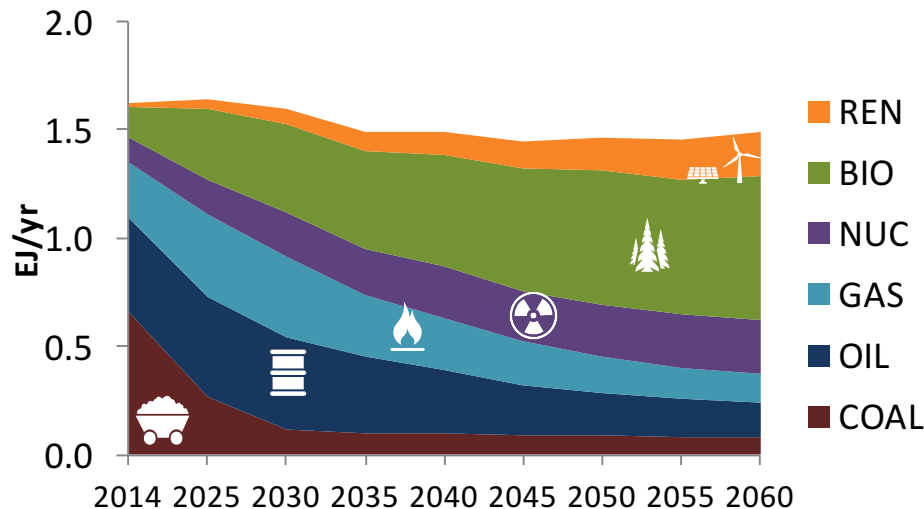
= 4.4 tCO₂/capita

- Energy use declines over time
- Biomass largely replaces coal
- Increasing CCS


Beyond 2°C Scenario Czech Republic





Total Primary Energy Supply



By 2030:

 **+9 % per year**

 **-1 % per year**

 **-10 % per year**

= 5.1 tCO₂/capita

- Energy use slightly declines over time (high GDP)
- Biomass largely replaces coal
- Increasing CCS
- Nuclear increases

Conclusions

- We downscale the IEA/ETP 2017 “Beyond 2°C” scenario at the country level for selected EU member states
- To do so we employ a “reduced complexity” energy system model: SIAMESE.
- Where the EU needs to go: 3 tCO₂ per capita by 2030 (beyond 2°C scenario)
- How to make this happen:
 - No silver bullet: a mix of low-carbon technologies
 - Energy efficiency is key: reducing energy use in all EU member state
 - Coal should be largely phased out by 2030 in all countries
 - Renewables development: particularly in Italy and Spain
 - Biomass consumption: particularly in Poland, Czech Republic
- Paris Agreement's “1.5°C” pathway would require deeper emission reductions

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Thank you!

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Backup slides

Major energy system transformation towards zero carbon needed for Paris Agreement

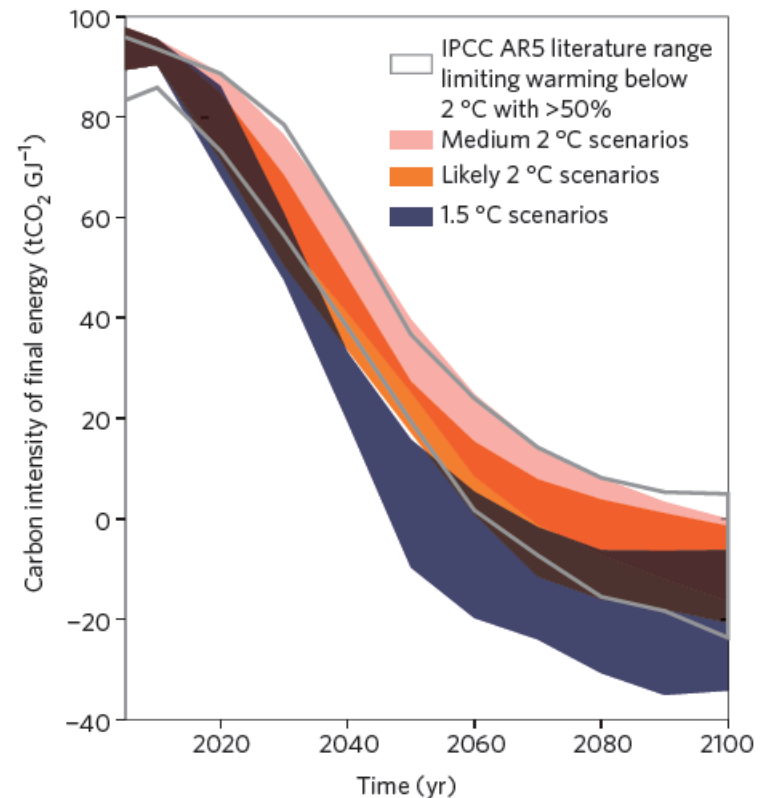


Energy system transformations for limiting end-of-century warming to below 1.5°C

Joeri Rogelj^{1,2*}, Gunnar Luderer^{3*}, Robert C. Pietzcker³, Elmar Kriegler³, Michiel Schaeffer^{4,5}, Volker Krey¹ and Keywan Riahi^{1,6}

- Requires the same technologies and transformations in the energy system as holding warming to below 2°C during the 21st century
- Decarbonisation of the energy system needs to be faster and more pronounced.

- Carbon intensity of final energy needs to be zero by 2050s



Rogelj et al. (2015)

Paris Agreement provides guidance on where we need to go

Article 2

Temperature goal



- “Holding the increase in the global average temperature to **well below 2°C** above pre-industrial levels and pursuing efforts to **limit the temperature increase to 1.5°C** above pre-industrial levels, **recognizing that this would significantly reduce the risks and impacts of climate change**”

Article 4

Emissions path

- “In order to achieve the long-term temperature goal set out in Article 2, Parties aim to **reach a global peaking** as soon as possible ..., and to **undertake rapid reductions** thereafter in accordance with best available science, so as to **achieve a balance between anthropogenic emissions by sources and removals by sinks of [GHGs] in the second half of this century**”