

Shale Gas & Avoiding Dangerous Climate Change

... cognitive dissonance or uncomfortable conclusions

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Sequential logic ...

- *What levels of climate change are we obligated to avoid?*
- *How does this translate to carbon budgets/emission pathways*
- *How do budgets divide between Annex 1 & non-Annex 1 nations*

- *Is shale gas a substitute or additional to other fossil fuels?*
- *Even if it's a substitute, can it fit within emission pathways?*
- *Conclusions for Annex 1 and non-Annex 1 nations*

UNFCCC to Copenhagen & Camp David

- *“stabilization of greenhouse gas concentrations ... at a level that would prevent dangerous anthropogenic interference with the climate system”*

Article 2

- *‘To hold the increase in global temperature **below 2 degrees Celsius**, and take action to meet this objective consistent with **science** and on the basis of **equity**’
(i.e. 90+% of not exceeding 2°C)*

Copenhagen/Cancun/Doha/Camp David

- *‘... **must** ensure global average temperature increases **do not exceed** preindustrial levels by more than **2°C**’*

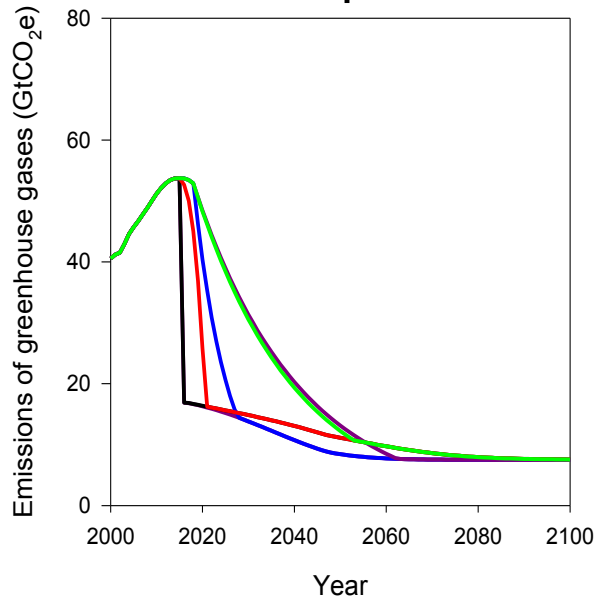
European Commission’s annual communication

What emissions pathways fit with 2°C?

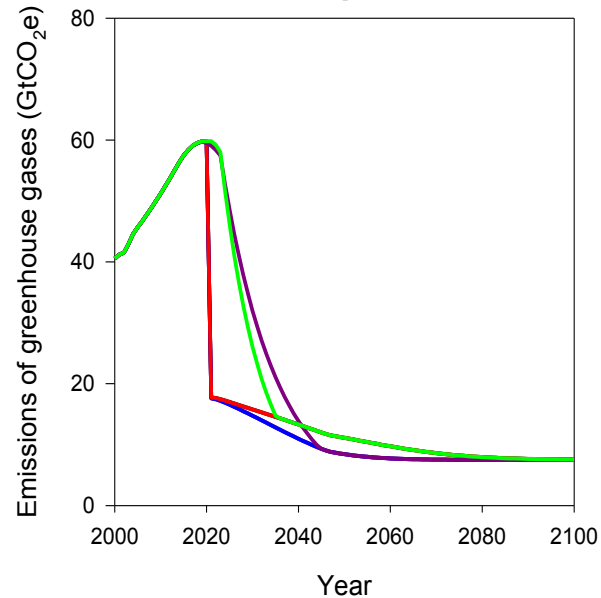
- In 2012 it is too late for a high probability of staying below 2°C
i.e. already blown the budget for our existing commitments
- So with a 60% chance of 'avoiding dangerous CC'
- ... and with reductions in deforestation & halving food-related emissions
- What is left for emissions from energy?
i.e. a pathway for 60% chance of avoiding dangerous climate change

Earlier peaks = lower reduction rates

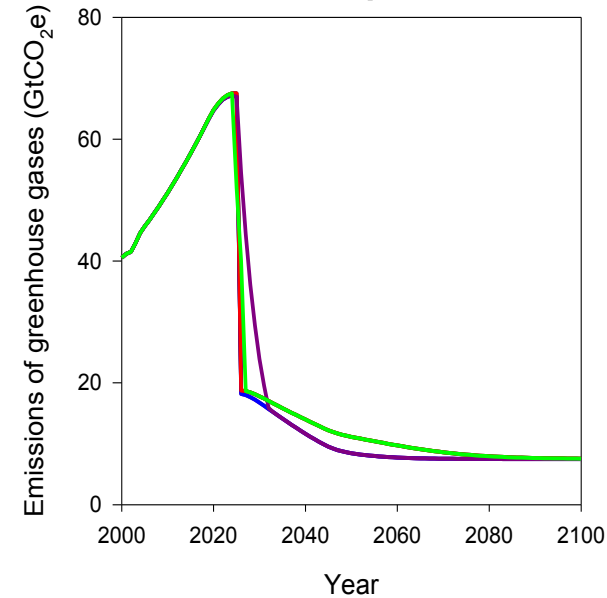
2015 peak



2020 peak

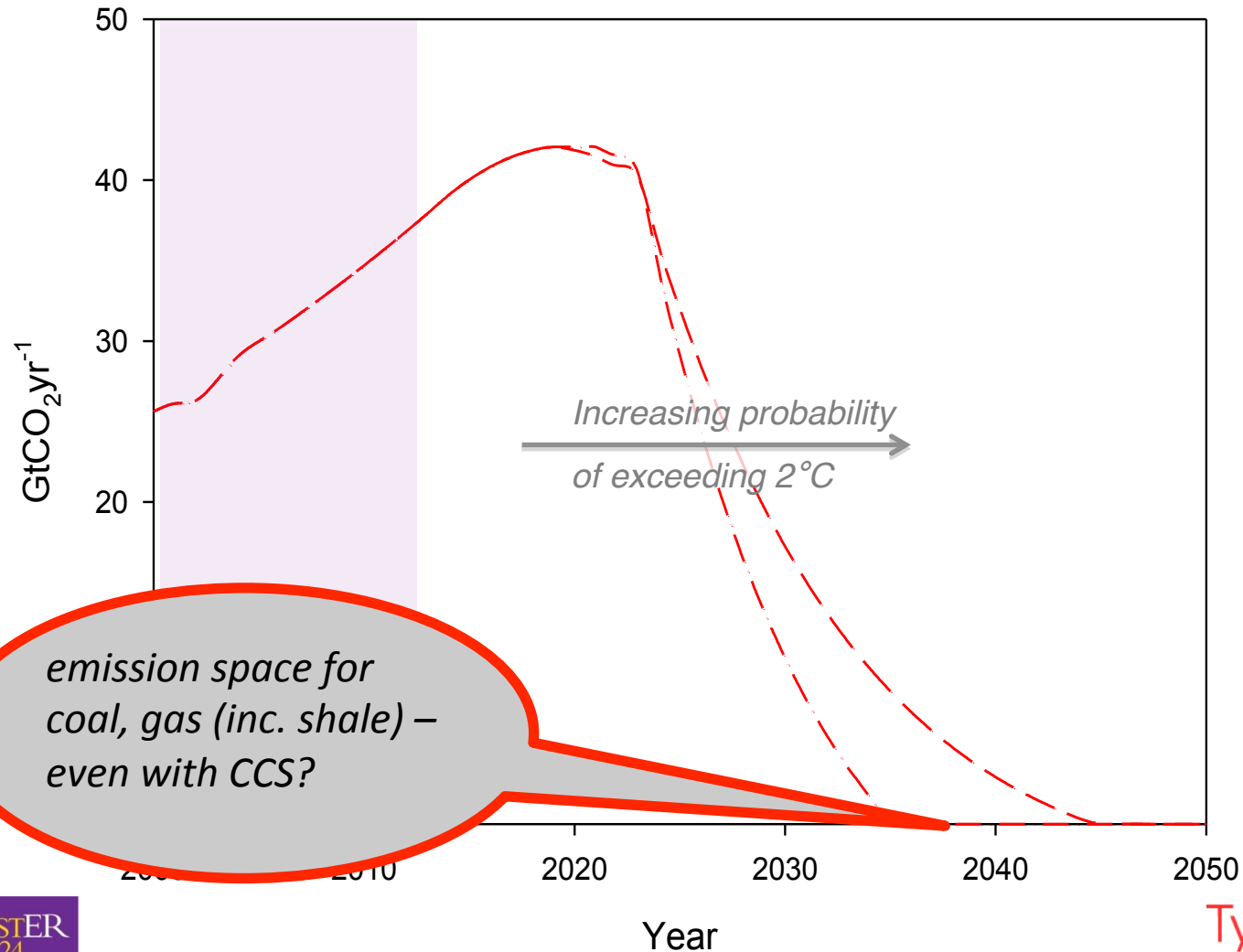


2025 peak



Anderson & Bows. 2008/11 Philosophical Transactions A of the Royal Society. 366. pp.3863-3882
For ~60% chance of staying below 2°C

For Energy - with 2020 peak & ~60% chance of <math> < 2^{\circ}\text{C}</math>



So what of shale gas

- It is a high carbon energy source (comprising 75% carbon)
- *“If a country brings any additional fossil fuel reserve into production, then in the absence of strong climate policies, we believe it is likely that this production would increase cumulative emissions in the long run. This increase would work against global efforts on climate change.”*
DECC: MacKay & Stone shale gas review 2013
- In an energy-hungry world without stringent carbon caps shale gas is likely to be used in addition & not as a substitute for coal or oil.
(other than for peat, has a fossil fuel ever substituted for another?)

The idealised case:

Shale as a substitute with CCS – what role then?

- Shale gas with CCS – lifecycle emissions projected to be $\sim 80\text{-}120\text{gCO}_2/\text{kWh}$
(*c.f. renewables & nuclear 5 to 20gCO₂/kWh*)
- If non-Annex 1 nations peak by 2025 before reducing at 5-8% p.a.
 - then 2°C obligation requires Annex 1 nations to be very-low carbon by $\sim 2030\text{-}35$
i.e. no emission space for shale in Annex 1 nations
- Even DECC's UK position is for the 2030 grid to be under 50gCO₂/kWh with heating on the grid & cars moving to electric
... so where does the gas go?

Conclusions

Non-Annex 1 nations

Shale gas as part of rapid carbon intensity reduction

if upstream emissions are managed

... but must lock out other fossil fuel infrastructures & enable CCS

Annex 1 nations

Shale gas incompatible with even weak version of 2°C commitments

- inc. with CCS

- » Need a *rapid reduction* in energy demand; and
- » and an increase in *very low/zero energy supply* necessary

Why such different conclusions?

Context

- Take science-based view of 2°C (*i.e. cumulative emissions not 2050 targets*)
- 'Fair' division of emissions between Annex 1 & non-Annex 1
- Explicit account of global deforestation and food emissions

NB: decarbonising power sector is not the same as “avoiding dangerous climate change”

Implications

- Timeframe of transition to low/zero carbon **energy** system significantly reduced
- Gas not compatible with such a science-based timeframe
- Gas with CCS only compatible (in non-Annex 1) with very high capture (over 95%)

NB: priorities should focus on genuinely low or zero carbon energy technologies

Shale gas:

a twentieth century fuel out of place in the twenty-first century?

- *“When I look at this [CO₂] data, the trend is perfectly in line with a temperature increase of 6 degrees Celsius, which would have devastating consequences for the planet.”*

Fatih Birol - IEA chief economist

- *“If a country brings any additional fossil fuel reserve into production ... it is likely that this production would increase cumulative emissions in the long run. This increase would work against global efforts on climate change.”*

DECC: MacKay & Stone shale gas review

Thank you

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