International Energy Agency

What role for CCS following COP21?

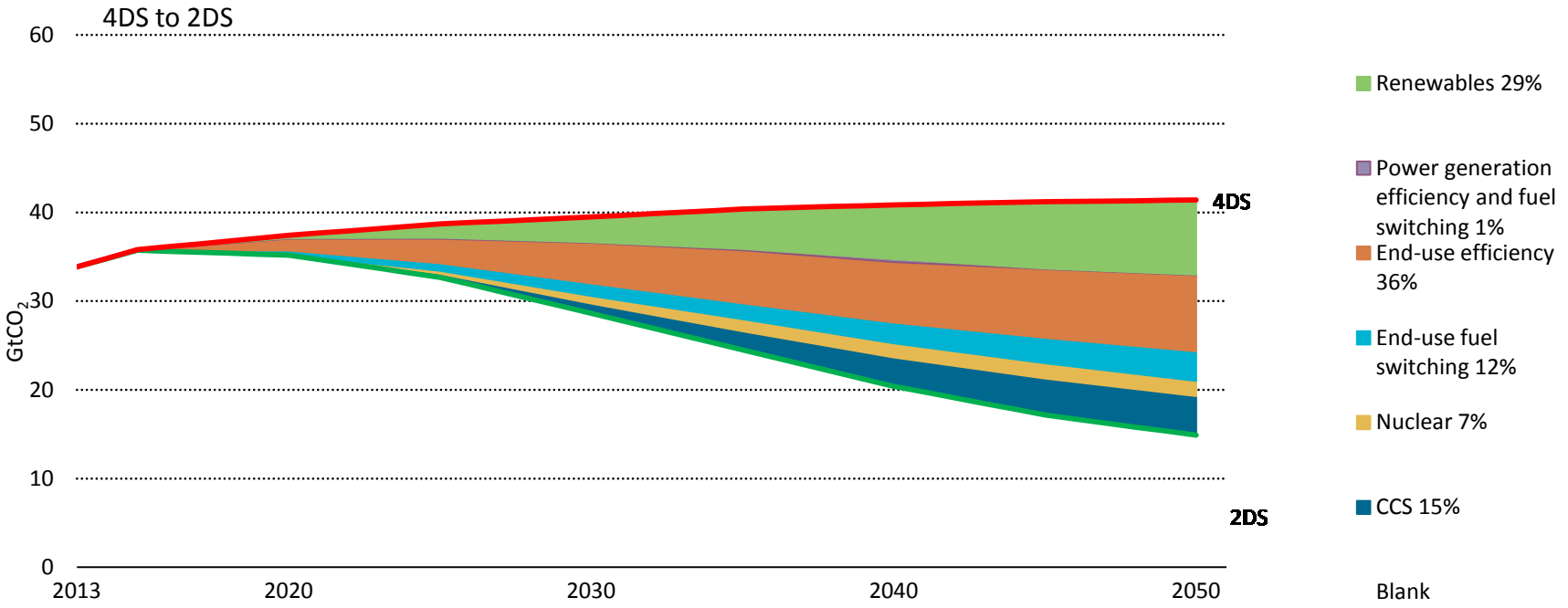
CSLF Workshop in association with the Carbon Capture and Storage Association, 29 June 2016

Philippe Benoit, Head, Energy Environment Division

Carbon capture and storage

Reaching the 2 degree ambition

Contribution of technology area and sector to global cumulative CO_2 reductions



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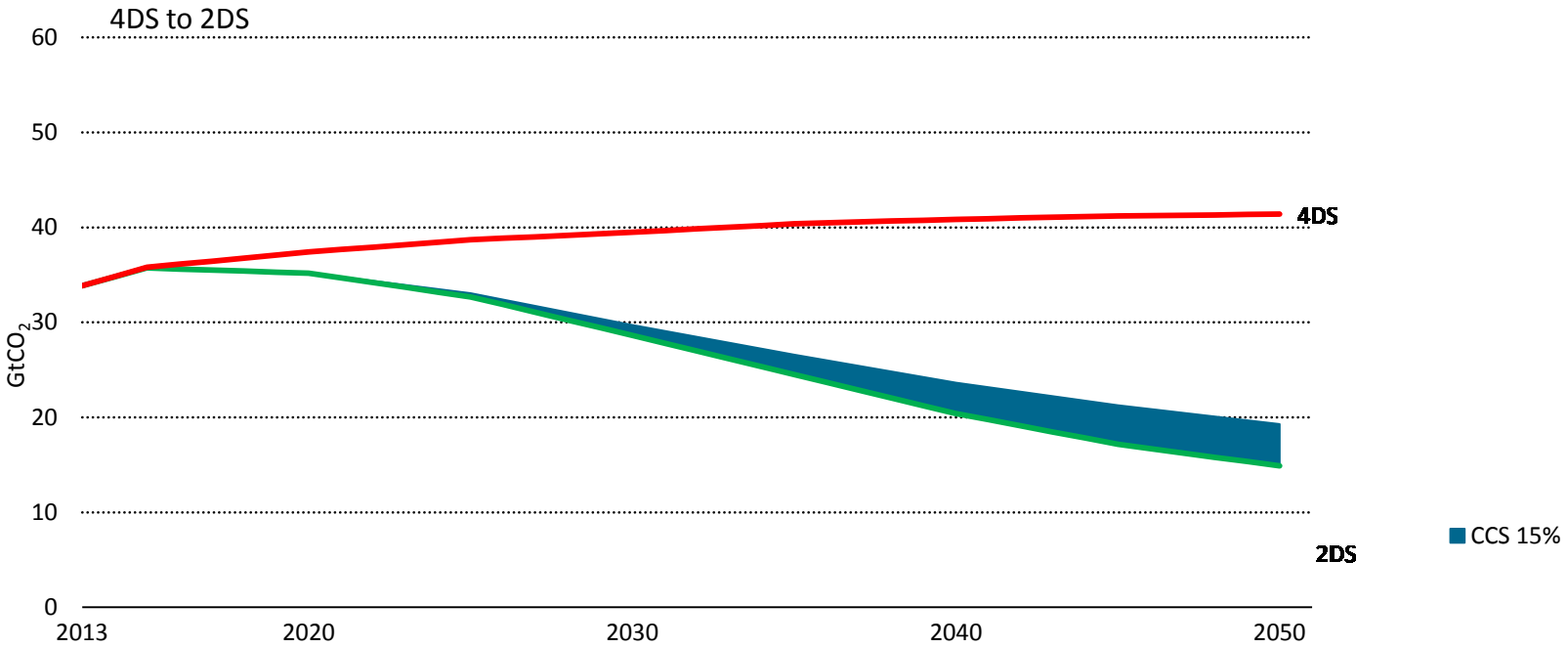
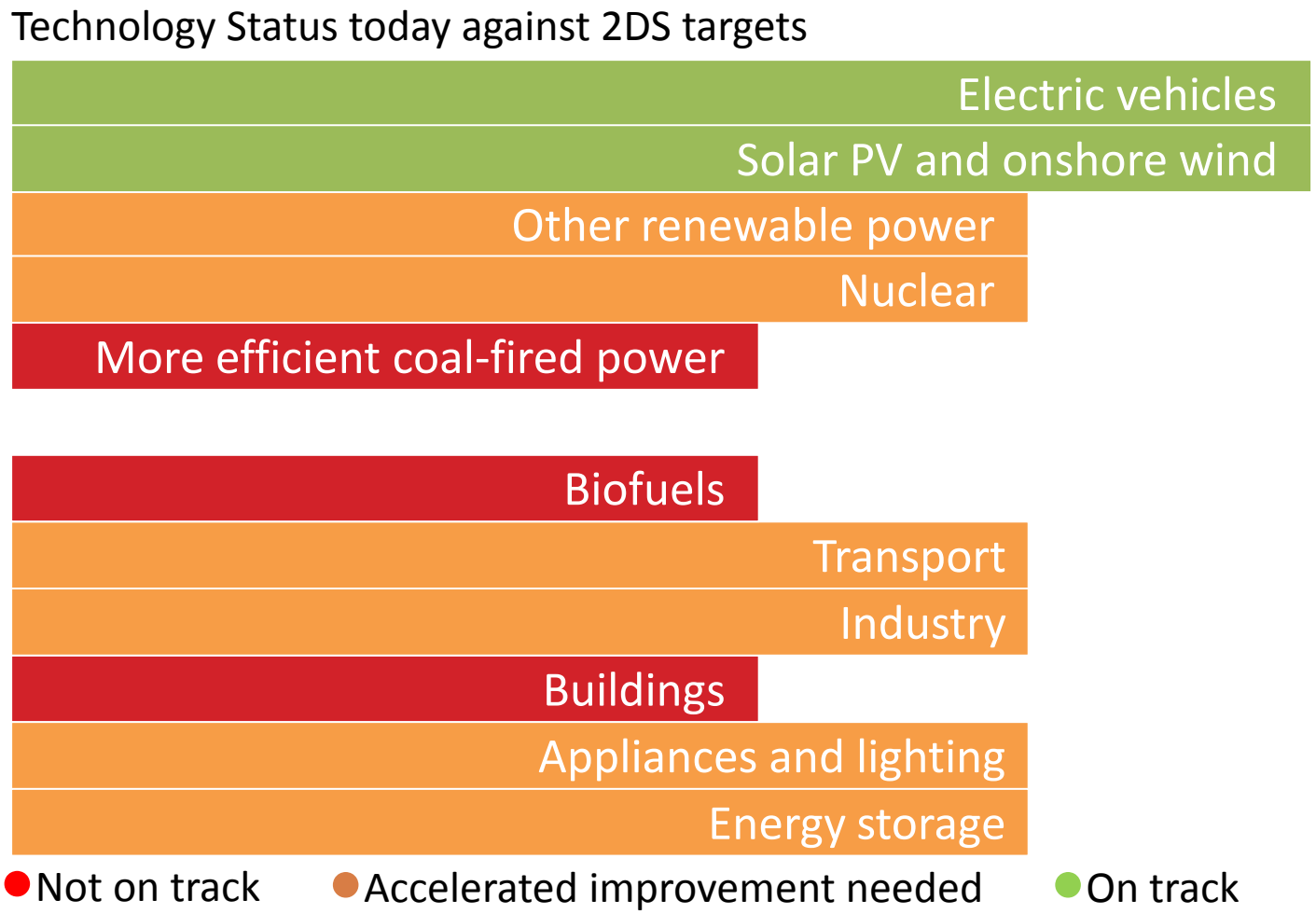


Progress in clean energy needs to accelerate



Clean energy deployment is still overall behind what is required to meet the 2°C goal, but recent progress on electric vehicles, solar PV and wind is promising

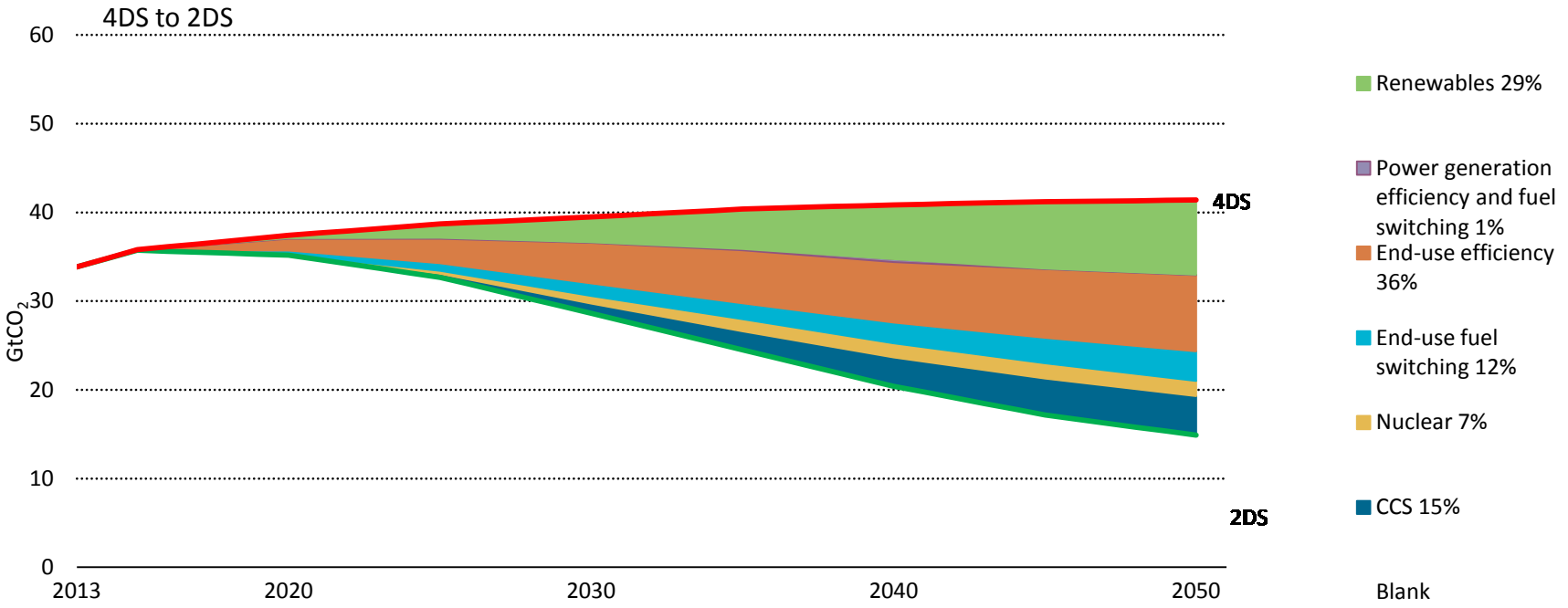
Paris Agreement: a new level of ambition . . . a revitalized need for CCS

- "Holding the increase in the global average temperature to **well below 2°C** above pre-industrial levels and to pursue 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;"

- "… Parties aim to reach global peaking of greenhouse gas emissions as soon as possible, recognizing that peaking will take longer for developing country Parties, and to undertake rapid reductions … so as to achieve **a balance between anthropogenic emissions by sources and removals by sinks … in the second half of this century …**"

Reaching beyond the 2DS …

Contribution of technology area and sector to global cumulative CO_2 reductions



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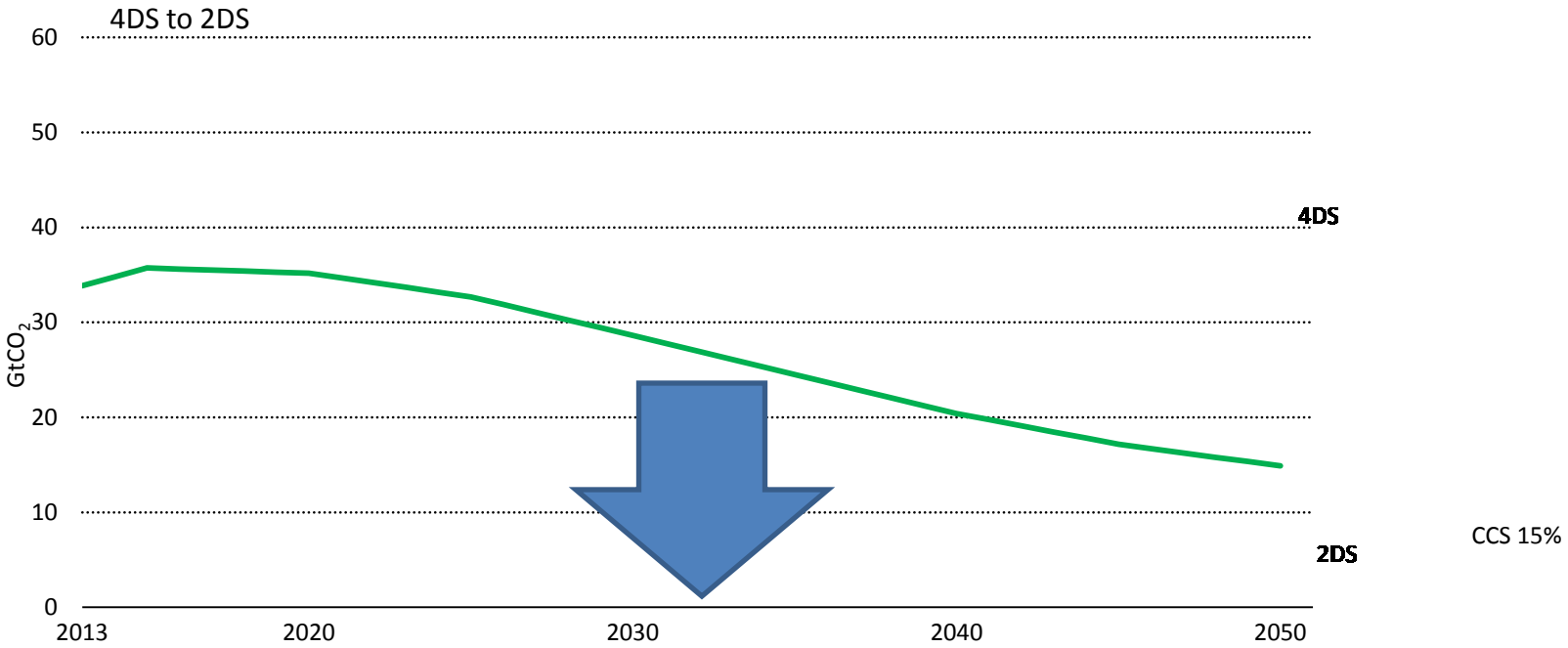
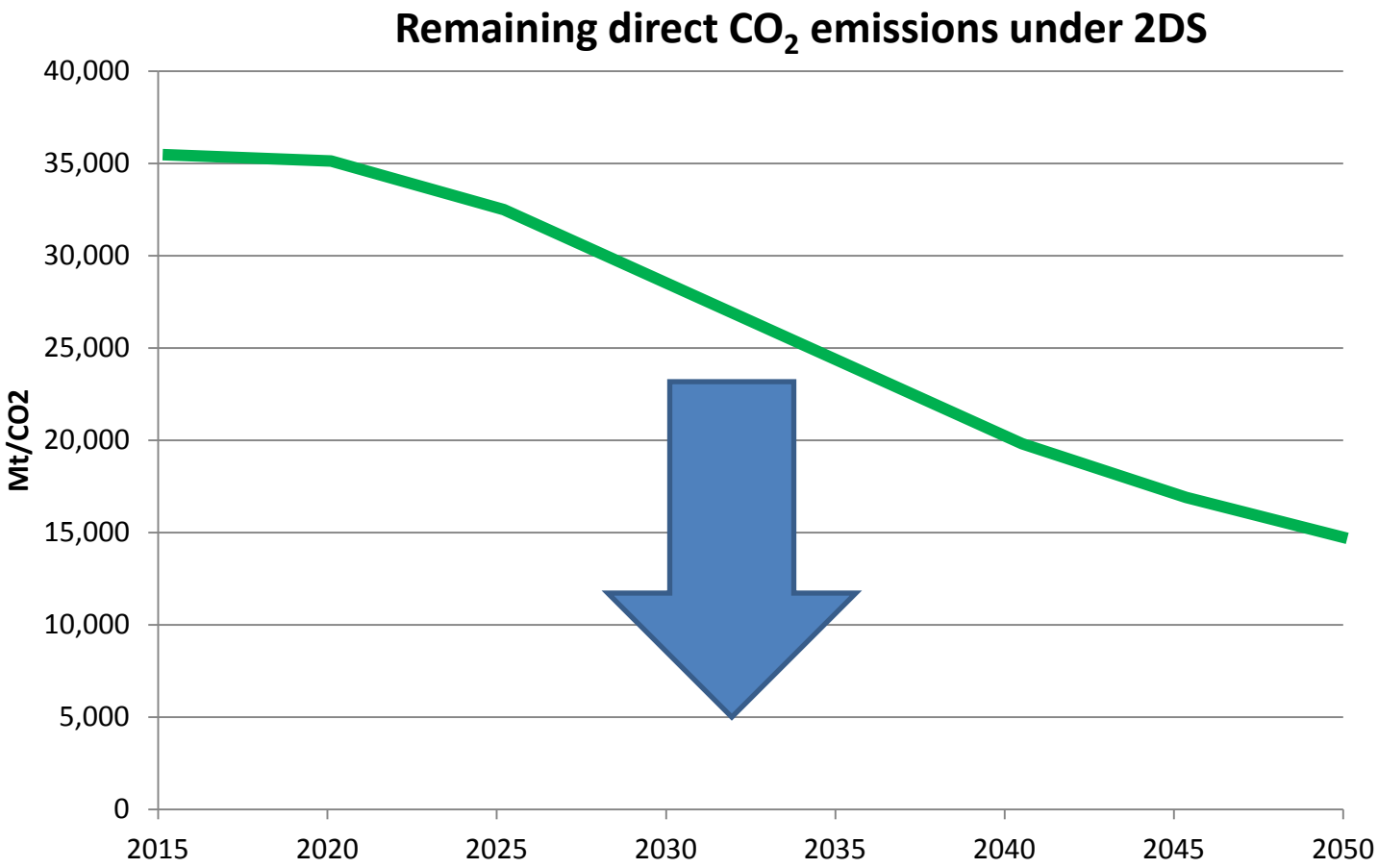


. . . to 'well below 2': Role for CCS on residual emissions



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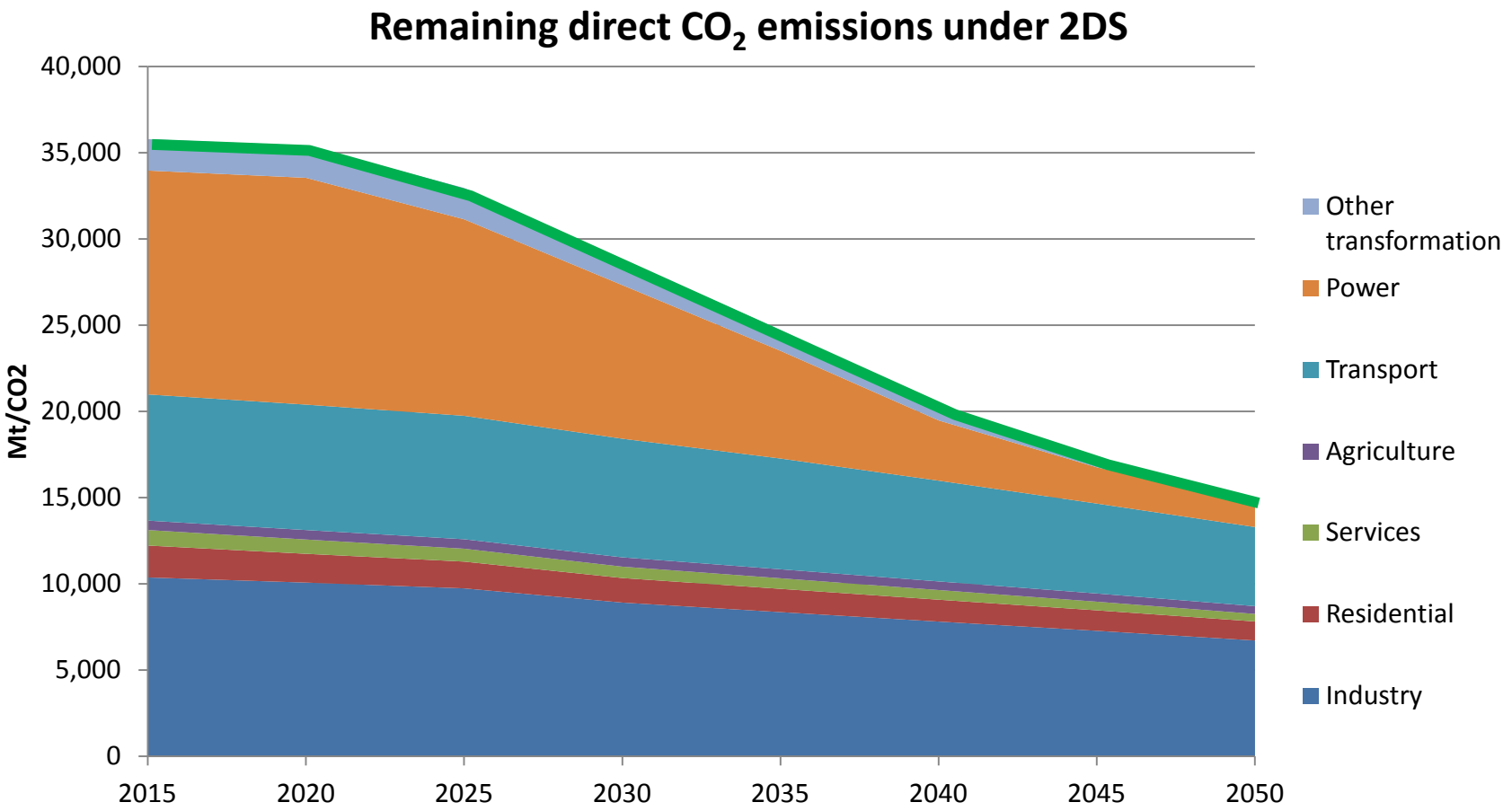
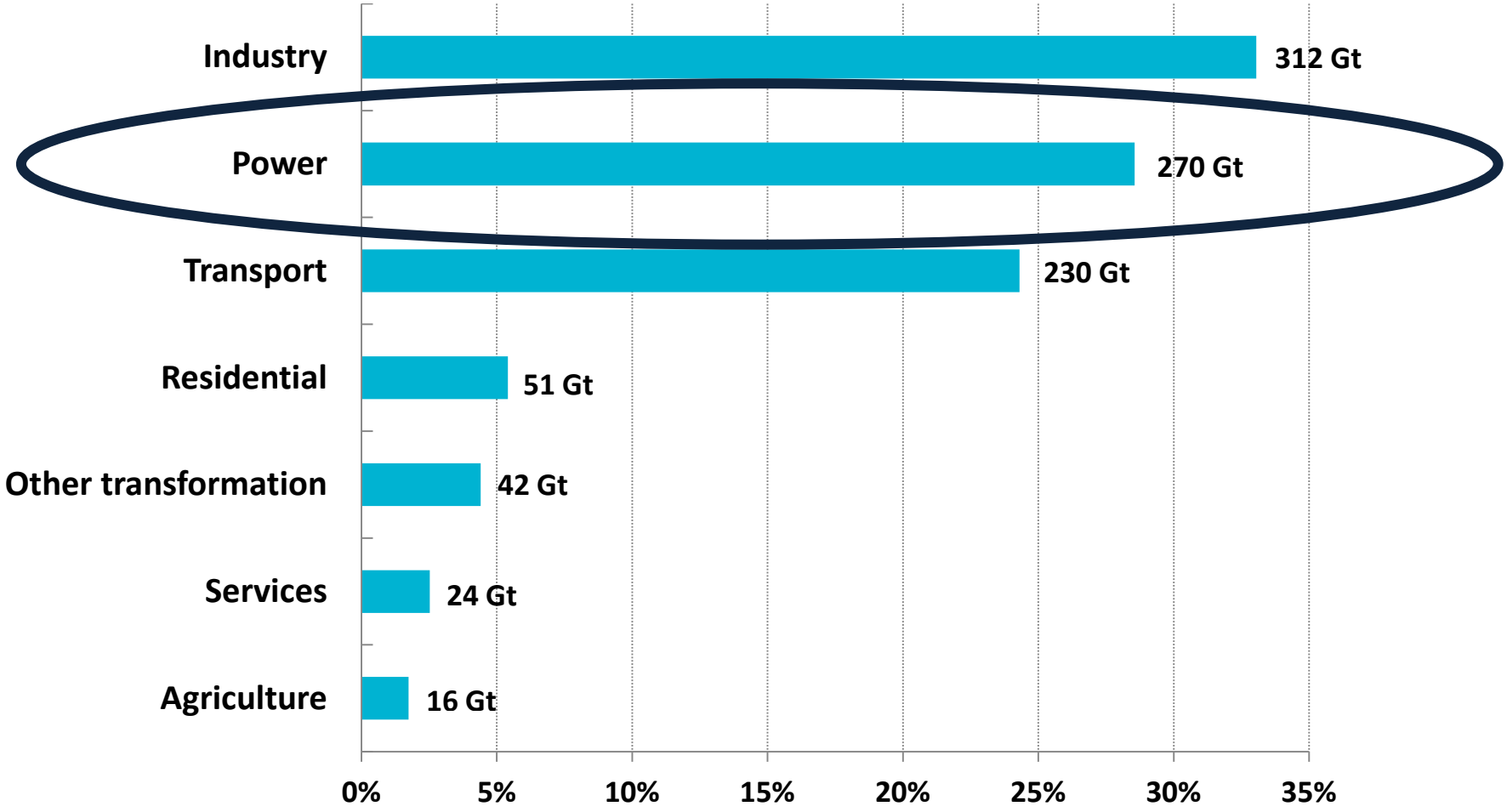
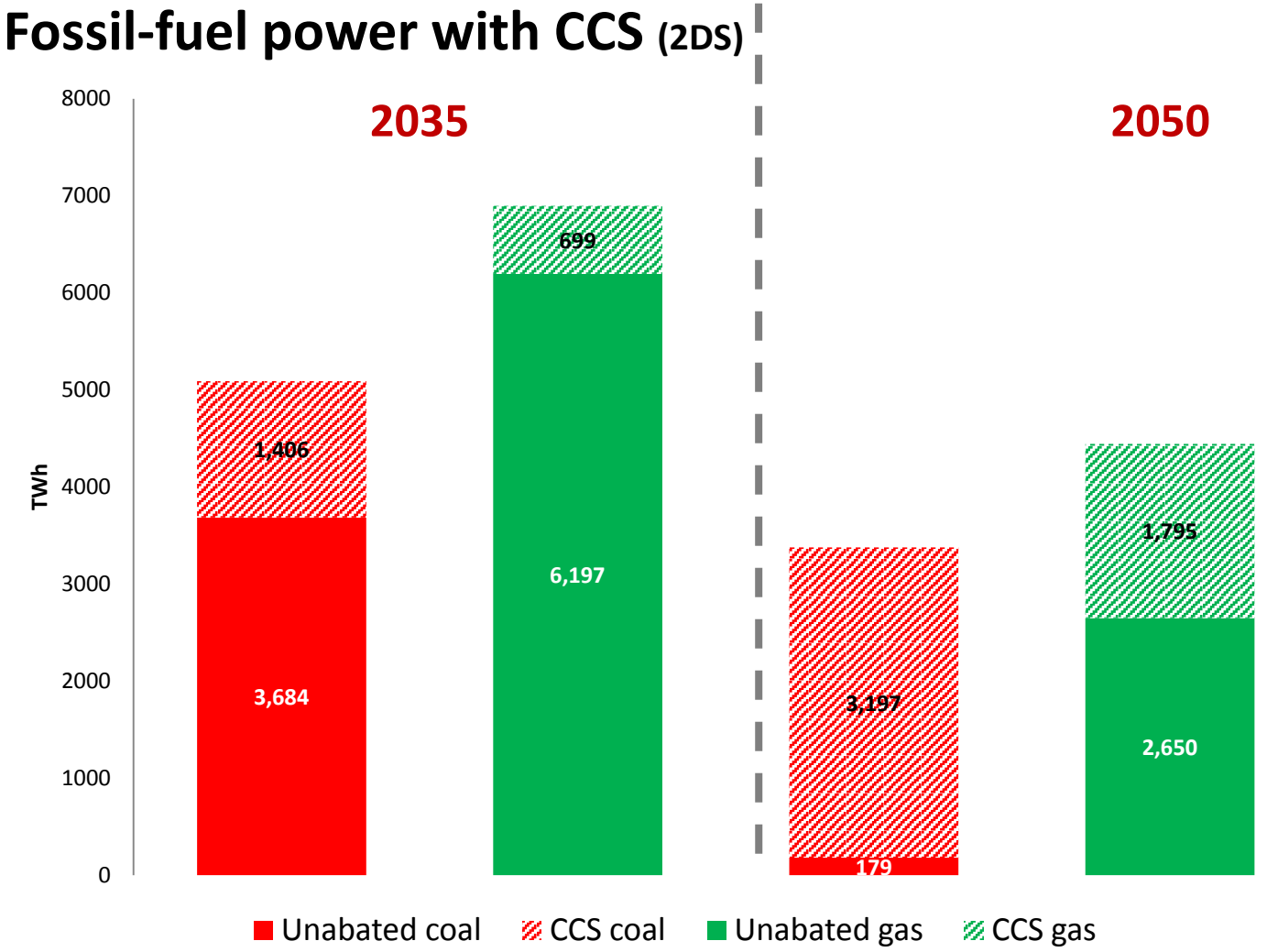


Sectoral shares of cumulative residual 2DS emissions - 2015-2050



CCS: key to increasing ambition for low-emissions pathway



ETP 2014, 2015

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CCS Retrofit: the key to 'unlocking' emissions to get to 2 degrees and below

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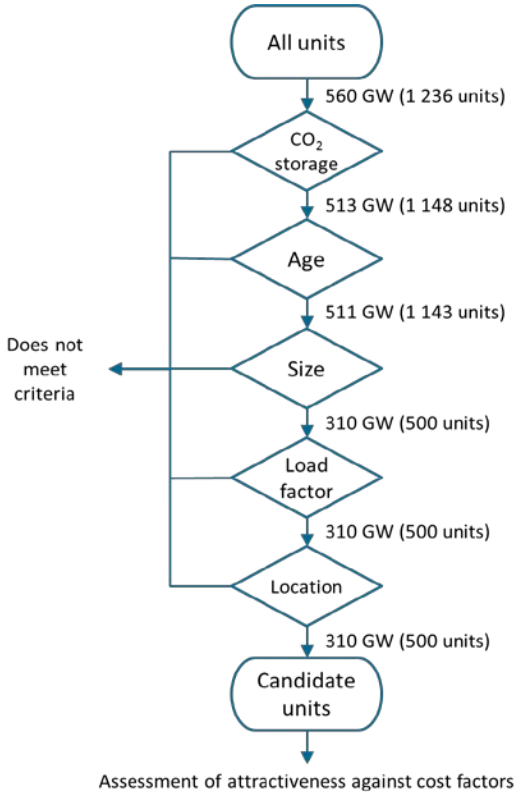
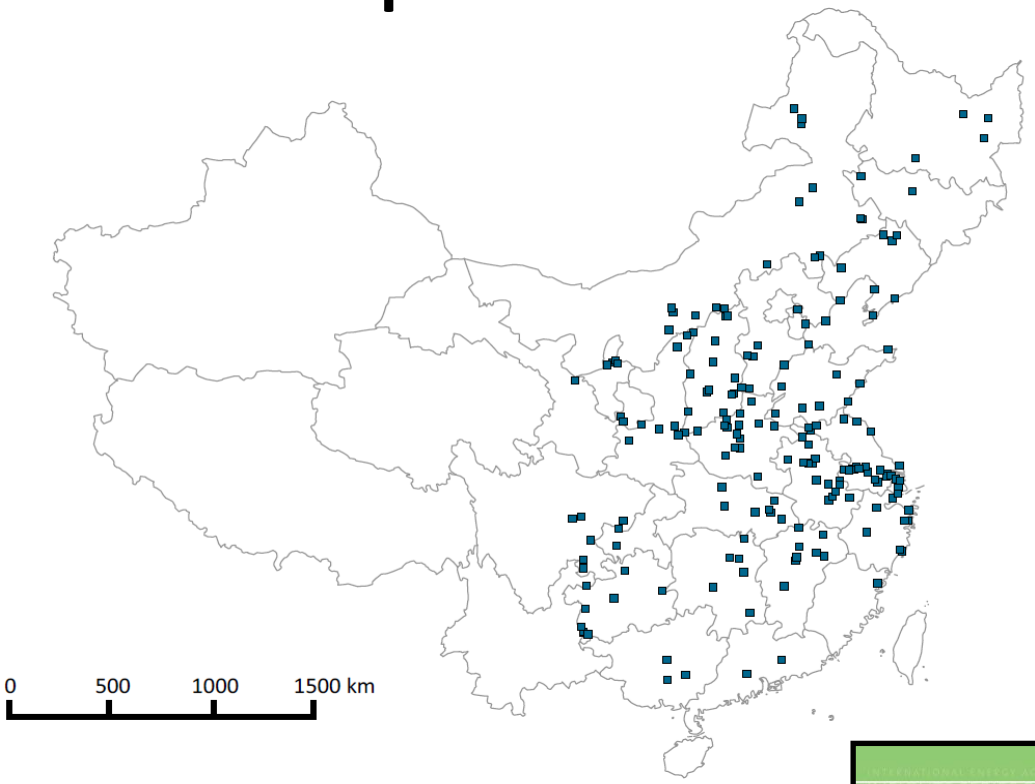
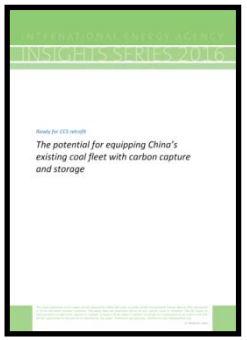


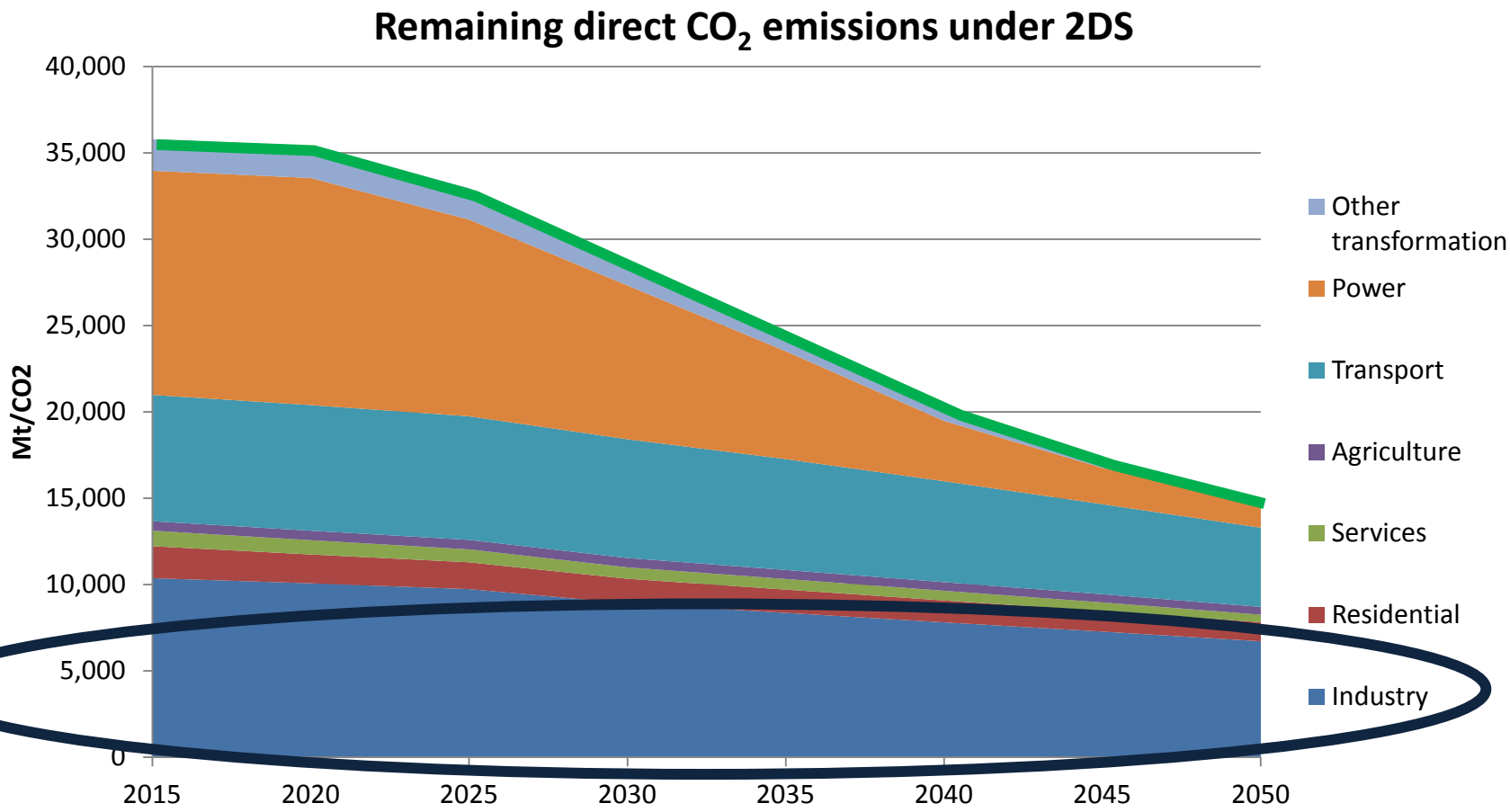
310GW of plant 'suitable' for retrofit



IEA/CEC China joint report (May 2016):



. . . to ‘well below 2’: Role for CCS on residual emissions



Despite 3Gt CO_2 captured and stored, 7Gt of CO_2 emissions **remain** from **industrial sources** in 2050 under 2DS.

How much more can CCS do in industrial applications under ‘well below 2°’?

Industry-CCS: enabling clean products to tackle greater ambition

- CCS is a critical technology for many process industries with high specific emissions per tonne of product:
  - Steel: 1,9 – 2.1 tCO_2 / t of steel
  - Cement: 0.8tCO_2 / t of cement
- Applying CCS can enable clean products, with -50 to -80% CO_2 / t of cement or steel
- …but: what would drive this?
  - Product standards & mandates
  - CO_2 price
  - Customer demand (to an extent)

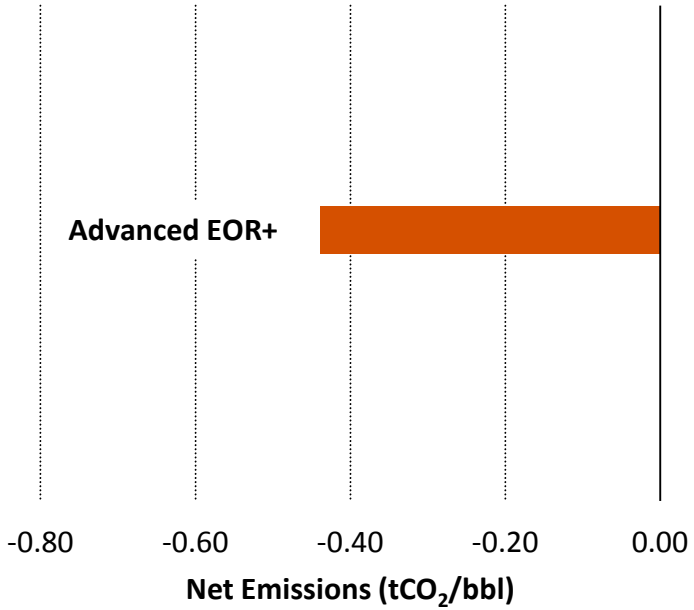





Using EOR+ to accelerate CCS innovation and deployment

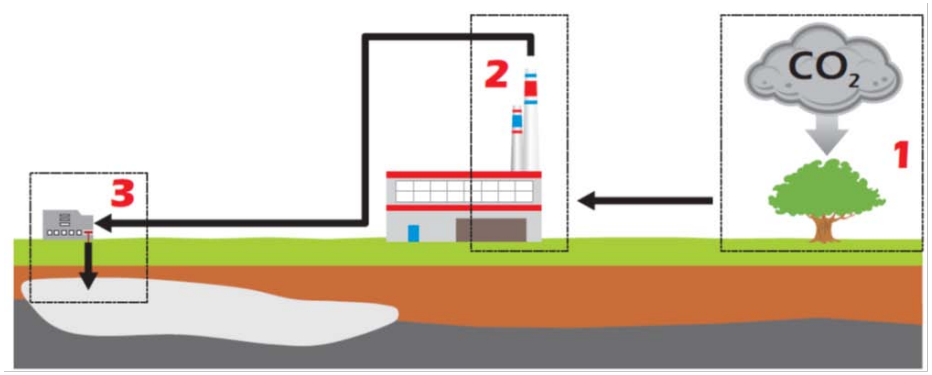
- *"EOR+": co-exploiting oil extraction and CO_2 storage for climate purposes, including MRV*
- *In "Advanced EOR+", operators increase the volume of CO_2 injected above minimal amounts typically used → greater oil output, greater CO_2 storage*
- *EOR+ has significant technical potential to store CO_2 globally: from 60Gt to 350Gt. (Note: total cumulative volume of CO_2 stored in 2DS is ~100Gt until 2050.)*

*EOR+ can be **beneficial to climate**: Additional CO_2 stored significantly outweighs the CO_2 from additional oil*



Greater climate ambition means need more negative emissions: Re-energising BECCS

- Combination of bioenergy with CCS can deliver net negative emissions and reduce atmospheric concentrations of CO_2
  - Can address 'overshoot' of carbon budgets in medium term – essential in achieving 2 degrees in many climate models (IPCC)
- But…not all BECCS is good BECCS
  - Sustainability of biomass – social and economic issues; competition with food production; loss of biodiversity; pressure on water resources etc
- Availability of geological storage will be critical!



Storage Capture Biological sequestration

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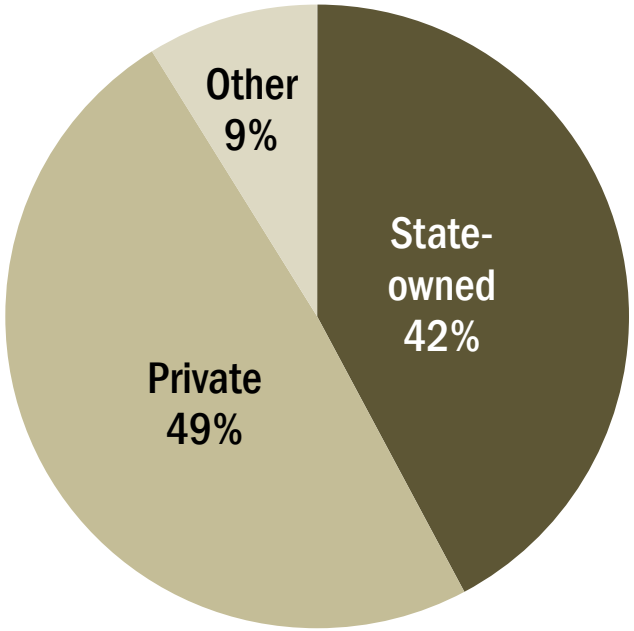
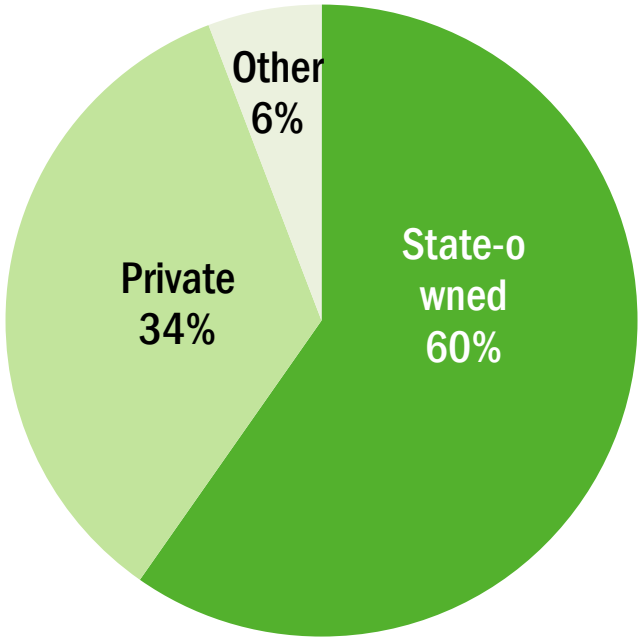
SOEs own a large share of

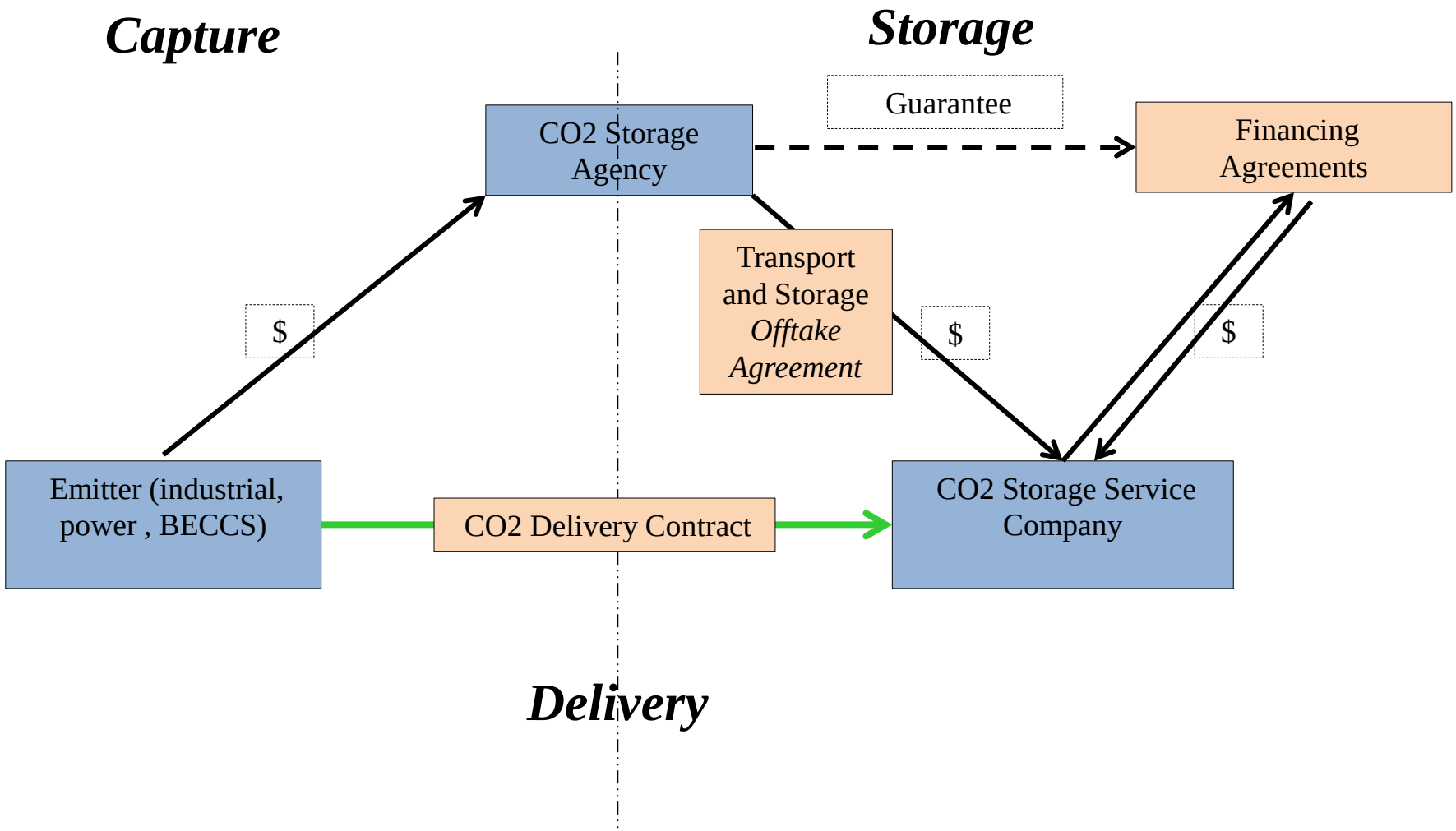
Ownership of fossil fuel generation capacity

3 702 GW





Changing the business model: the Storage Service Company (offtake)



Conclusions

Getting to 'well below 2°C' means more need for CCS:

- **Greater, faster deployment of CCS, notably more in power and more retrofits**
- **Greater emphasis on CCS in industry (where alternative solutions do not yet exist in many sectors)**
- **More BECCS**
- **Changing the business model:**
  - **EOR+: a better way to generate net lower emissions**
  - **Storage Service companies**

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Thank you

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Explore the data behind ETP