Renewable Energies for Industries

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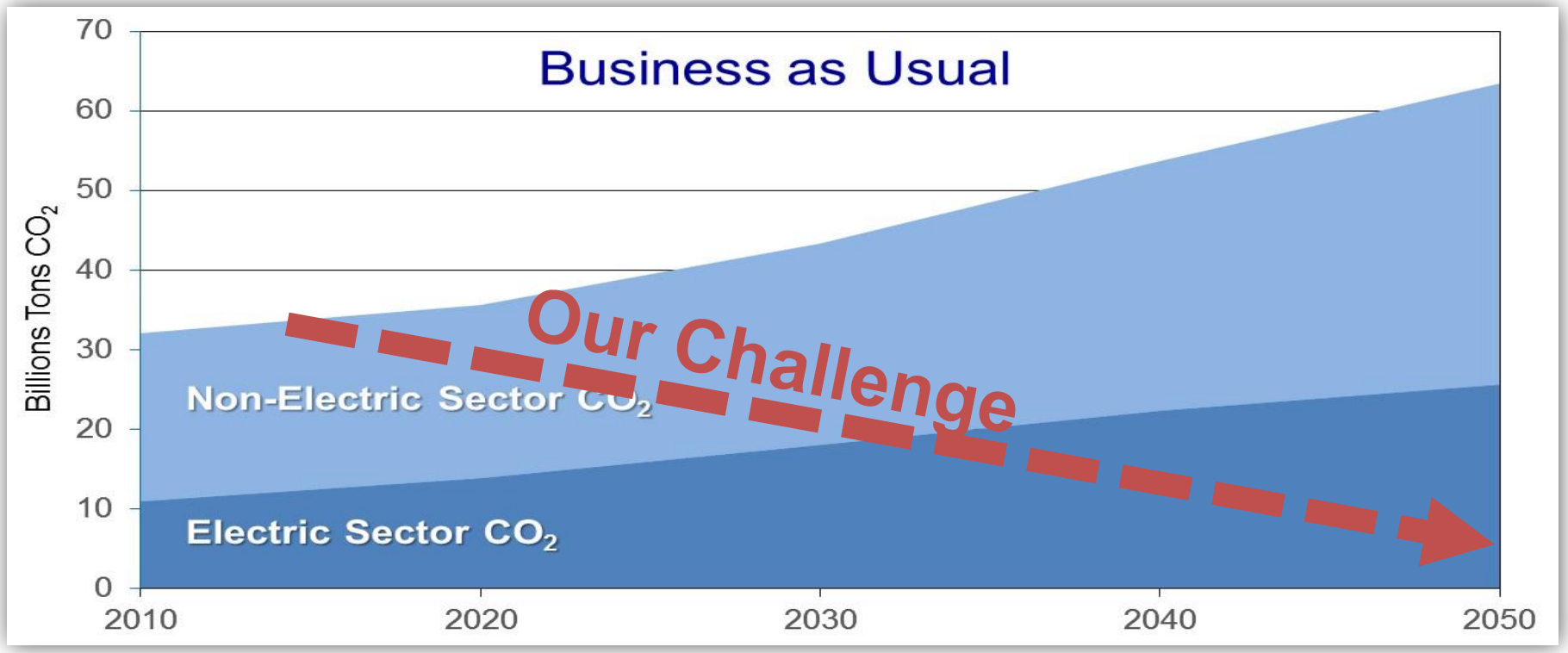
Taking stock

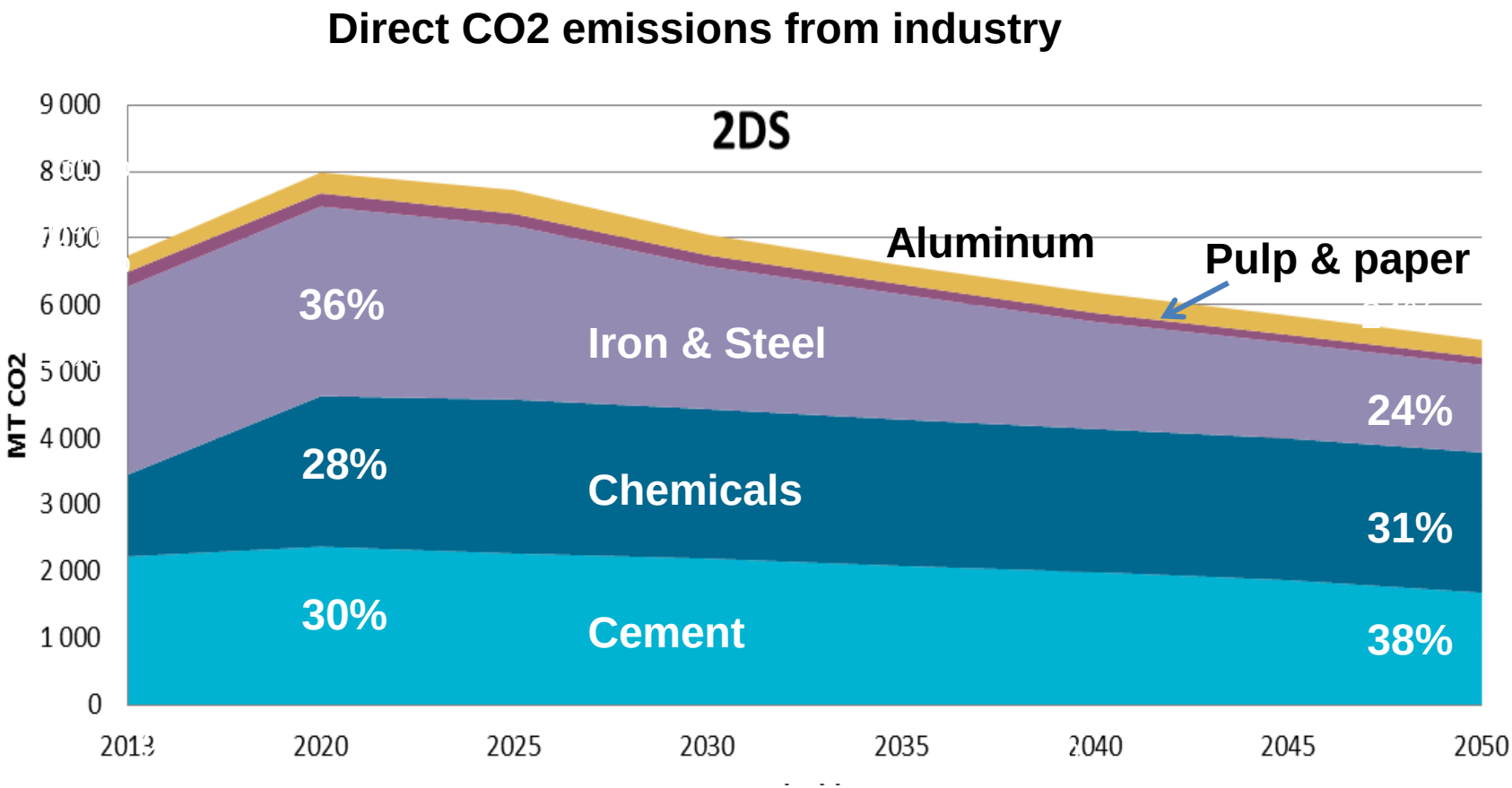
1. The challenge gets bigger
2. Heavy materials the major issues
3. BECCS and bioenergy can only contribute
4. Options for direct heat surge
5. Massive electrification is a must
6. Hydrogen to play multiple roles
7. Innovation is critical

The challenge gets bigger



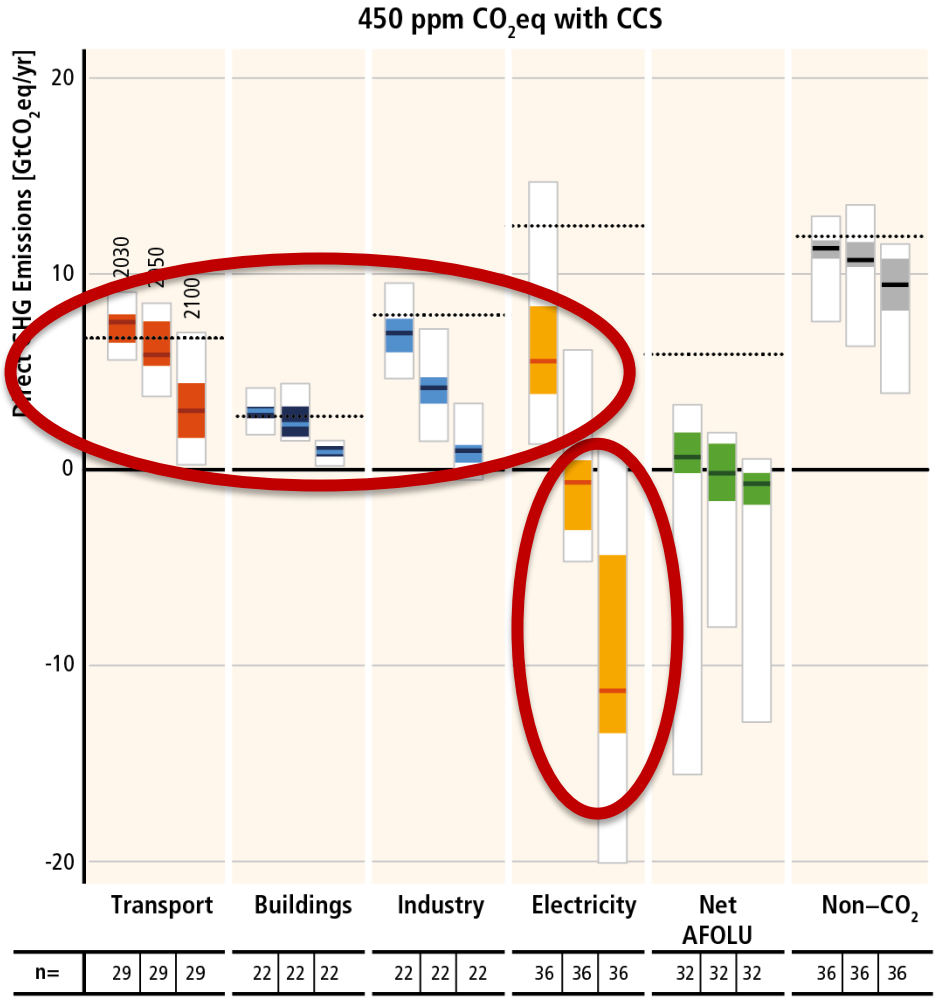
As the power sector gets decarbonised, the attention must shift to direct uses of fossil fuels if « well below 2° » is to be achieved

Materials is the major issue

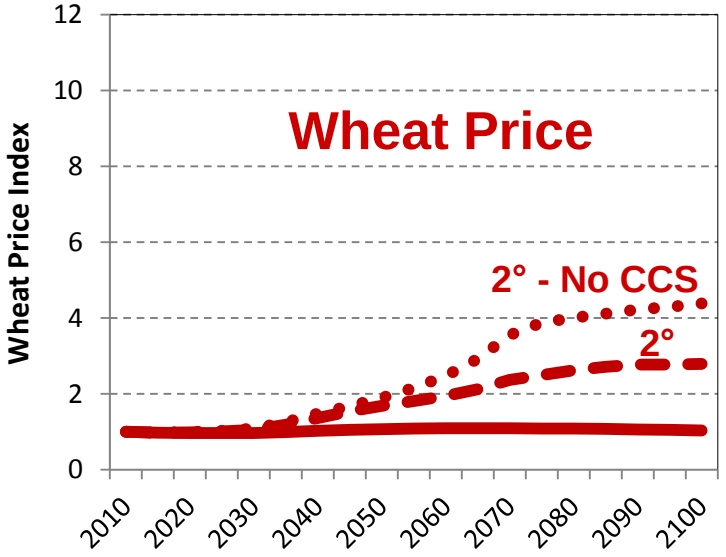


Iron & steel, chemicals and cement production still represent the bulk of industrial emissions by 2050

Bioenergy and BECCS can only contribute



Source: IPCC, AR5, SPM



Source: Muratori, et al., 2016

Industry may provide more BECSS options than the power sector

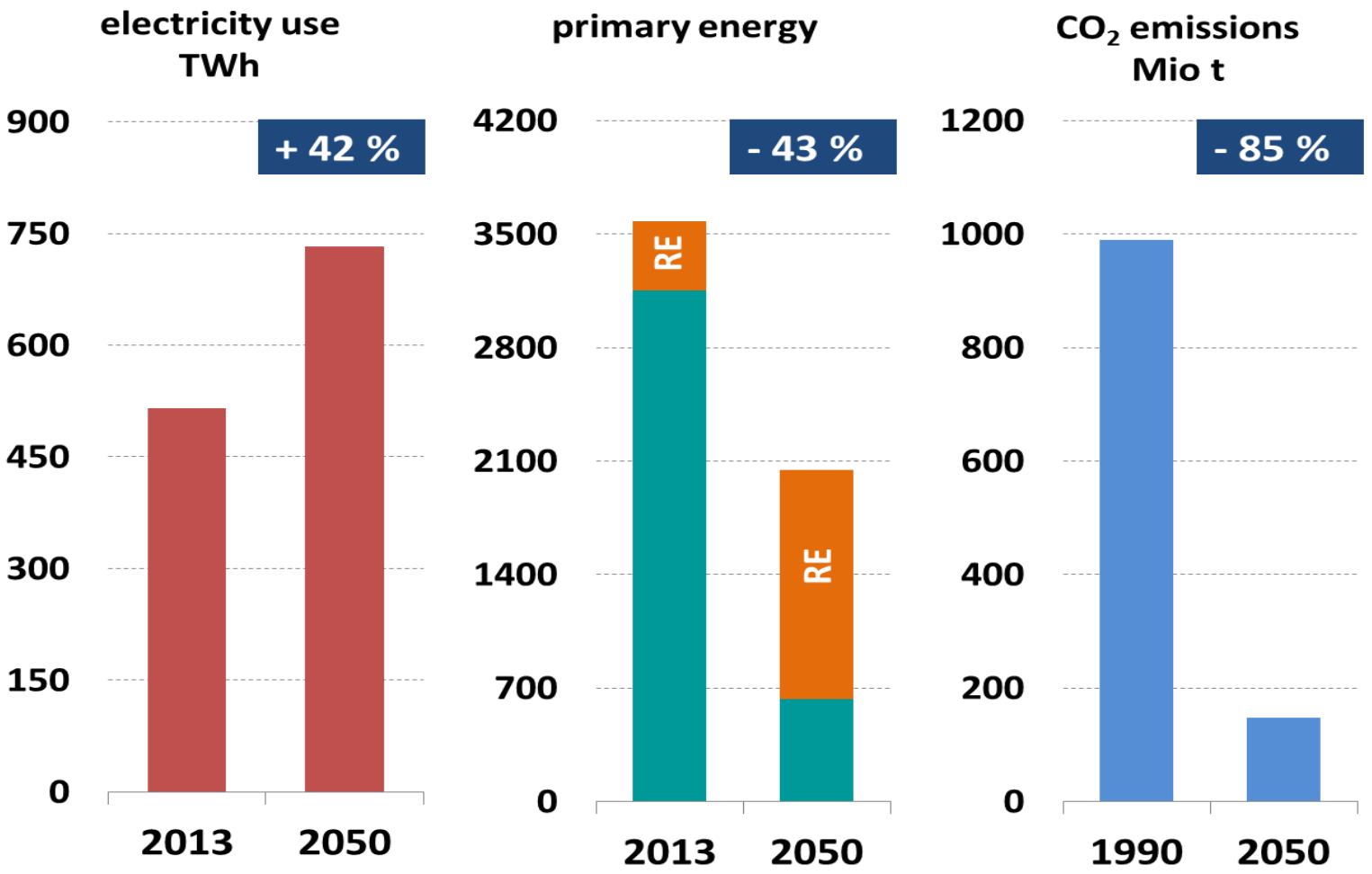
Bioenergy and CCS may both be limited

More should be done to reduce gross emissions

Options for direct heat surge

Solar heat offers many options, including for extraction and possibly chemicals

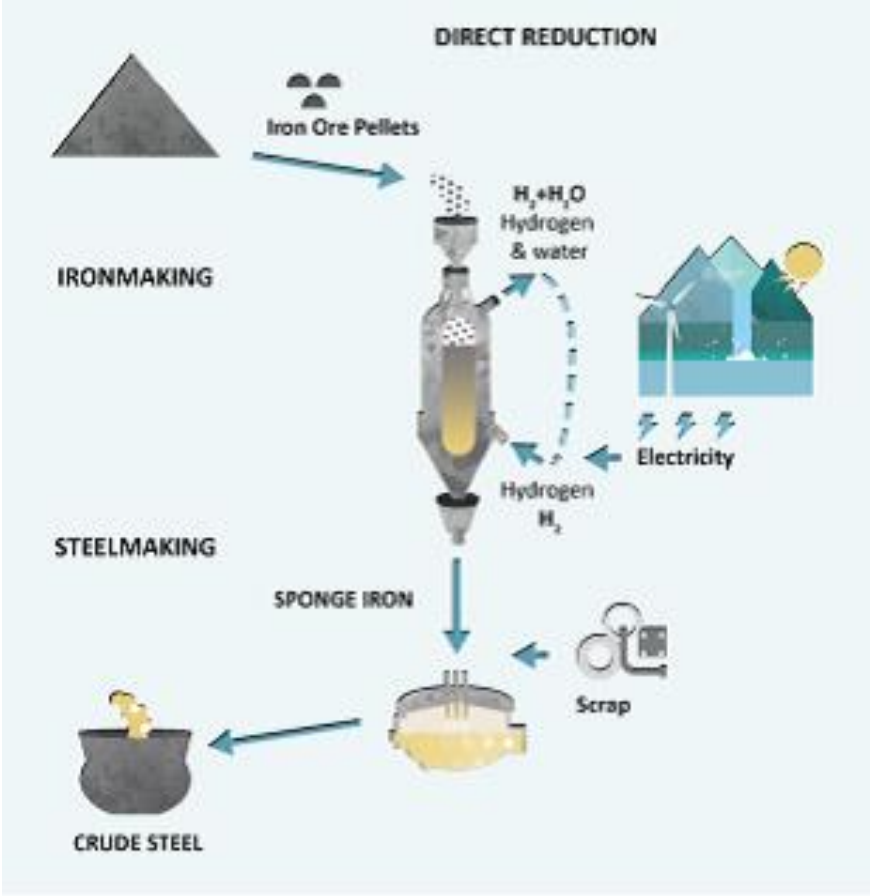
Massive electrification is a must



Modelling by Fraunhofer ISE suggests deep decarbonisation of Germany based on massive electrification of end-use sectors

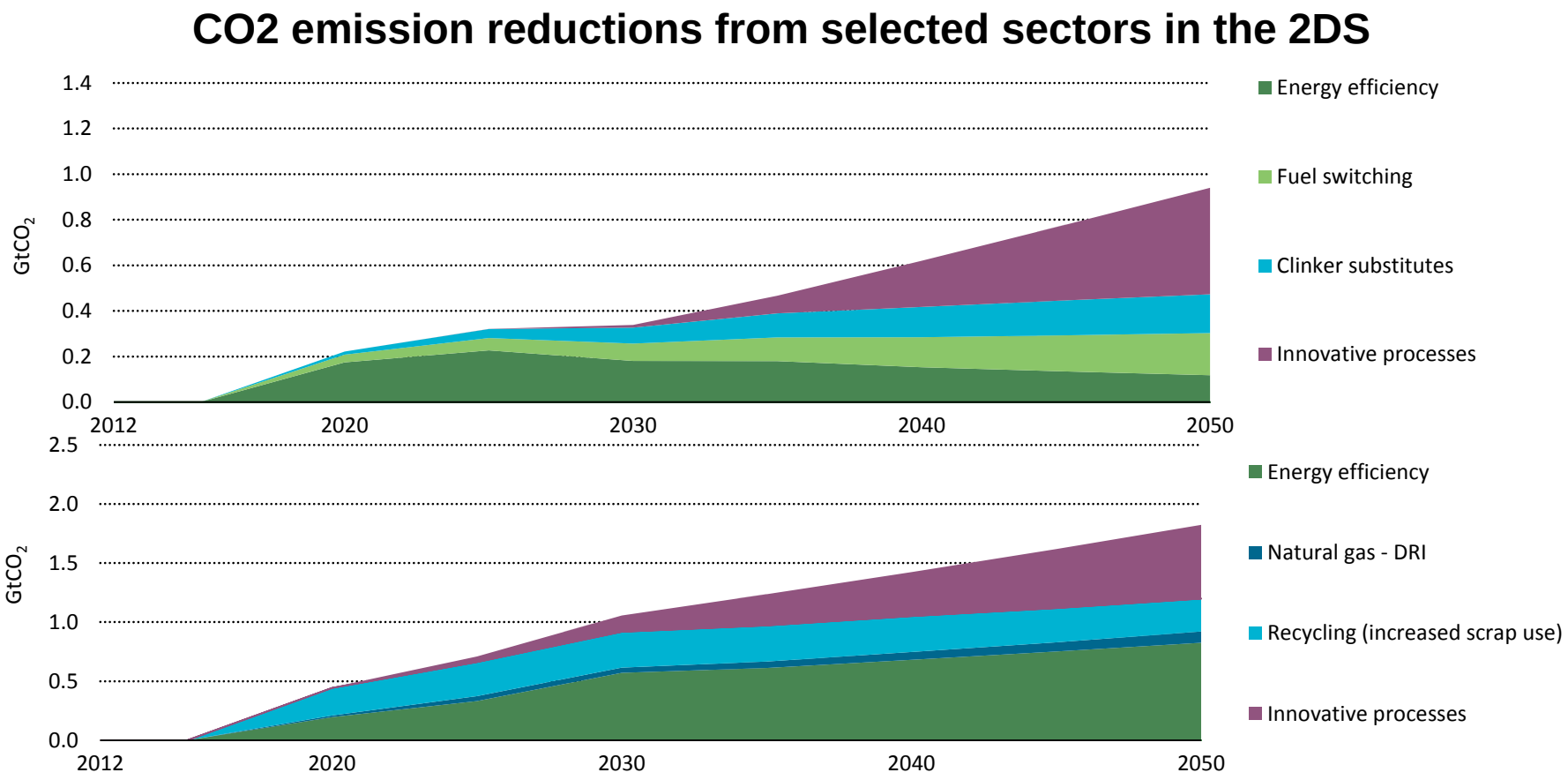
Electricity – and hydrogen

- **CO2-free steel making options:**
  - Direct iron reduction with hydrogen from renewables and electric arcs (Hybrit Projekt)
  - Electrolysis/electrowinning (ULCOwin/ULCOlysis)



Hydrogen may play multiple roles as energy vector and as processing agent

Innovation is critical



Achieving the 2DS requires significant industrial innovation
"Well below 2°C", esp. if CCS is limited, requires even more

Innovation is critical *(Did I say it already?)*

EU-backed SOLPART: high temp particle heating for industries

Participants: CNRS (lead), CEMEX, DLR, Abengoa, OCP, etc.

The project aims at developing a 800-1000°C solar process for energy intensive industries such as cement factories, phosphates…

How to get there?

1. Carbon price no silver bullet
2. Sector coupling may help manage variability
3. Integrate efficiency and renewables uptake
4. Work with equipment manufacturers
5. Procurement key to kick-start deployment
6. Shifting materials
7. Governments to support innovation
8. Emiciency?