

CCS and CCU in the JRC Science for Policy Report: The POTEnCIA Central scenario: An EU energy outlook to 2050

November 2019

The JRC POTEnCIA Central Scenario¹ describes the evolution of the EU energy system from 2018-2050 based on the policy landscape at the end of 2017. The objective of the report is to purely serve as a reference document to which future policy targets or reporting can be compared against. This was performed not only Europe wide but individually for each member state, and the report provides detailed graphics of each member state. Furthermore, this report highlights the disparity between EU and Member State ambition and the policy framework which underpins those ambitions.

Summary

- The report describes evolution of the EU energy system from 2018-2050 using European and member state policy at the end of 2017.
- The report is designed to serve as a reference document
- The 2030 the EU energy and GHG emissions reductions targets set by the EU framework for climate and energy are missed.
- The 2050 EU climate targets are missed, and emissions reductions only total a 47% reduction from 1990 levels, well above the climate-neutrality target.
- Investment expenditure totals 72.5 trillion EUR over the period 2016-2050, 11.5% of GDP. Primarily (68%) linked to the satisfaction of energy needs (electric vehicles and appliances).
- CCS accounts for 8% of the EU net-electricity generation in 2050. Ramping up from 2040. This is a blend of gas (5%) and coal (3%) power generation with CCS at 90% capture rate, totalling 171.5Mt/CO₂ pa from power generation alone.
- CCS is viewed as a technology to address process emissions for the cement and iron & steel industry, resulting in 98Mt/CO₂ p.a. capture (81Mt and 17Mt respectively).
- Hydrogen with CCS, CCU, BECCS and DACCS are all not considered.

Carbon Price Trajectory

The modelling was based on a carbon price trajectory which from 2030 – 2050 increases from 25 EUR/tonne to 121 EUR/tonne (Figure 1).

¹ MANTZOS LEONIDAS; WIESENTHAL TOBIAS; NEUWAHL FREDERIK; RÓZSAI MÁTÉ, 2019. The POTEnCIA Central scenario: an EU energy outlook to 2050. Publications Office of the European Union JRC118353. DOI [10.2760/32835](https://doi.org/10.2760/32835). Available at: https://publications.jrc.ec.europa.eu/repository/bitstream/JRC118353/potencia_central_scenario_online.pdf

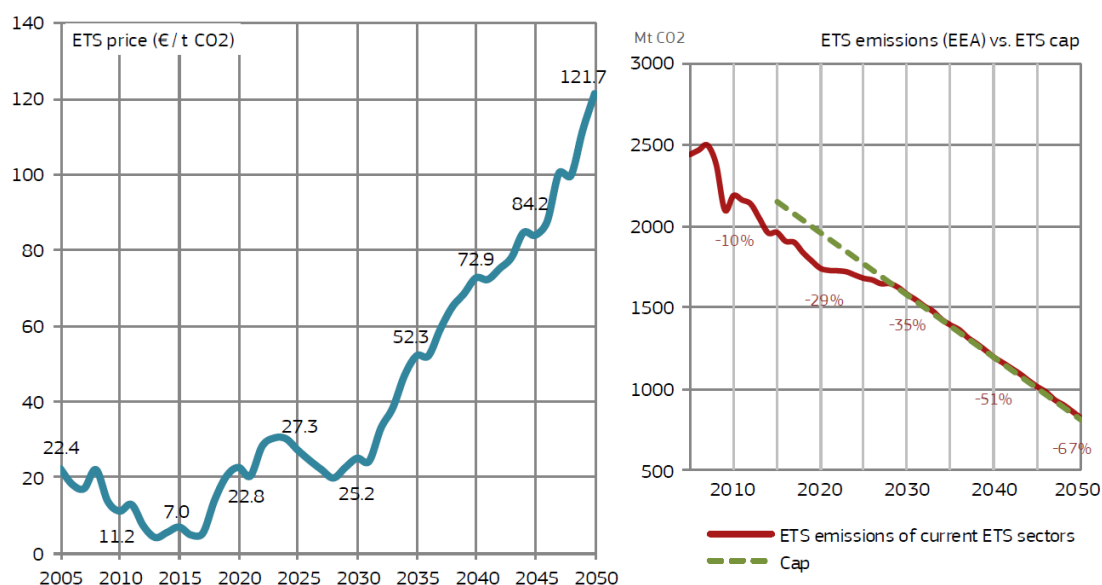


Figure 1: Future CO2 price and ETS emissions trajectories used from 2017 - 2050.

Carbon Capture and Storage

Power Generation:

Carbon capture and storage is mentioned at length in the Central scenario. However, the industry does not start until 2030, with the real increase in volume from 2040, when carbon reaches 72.9 EUR/tonne. The deployment of CCS is initially all for coal power, but an increase in gas power generation with CCS results in a total of 8% of the 2050 net-electricity generation produced using CCS (3% coal, 5% gas) (Figure 2). This corresponds to a total of 171.5Mt/CO2 capture per annum from power generation.

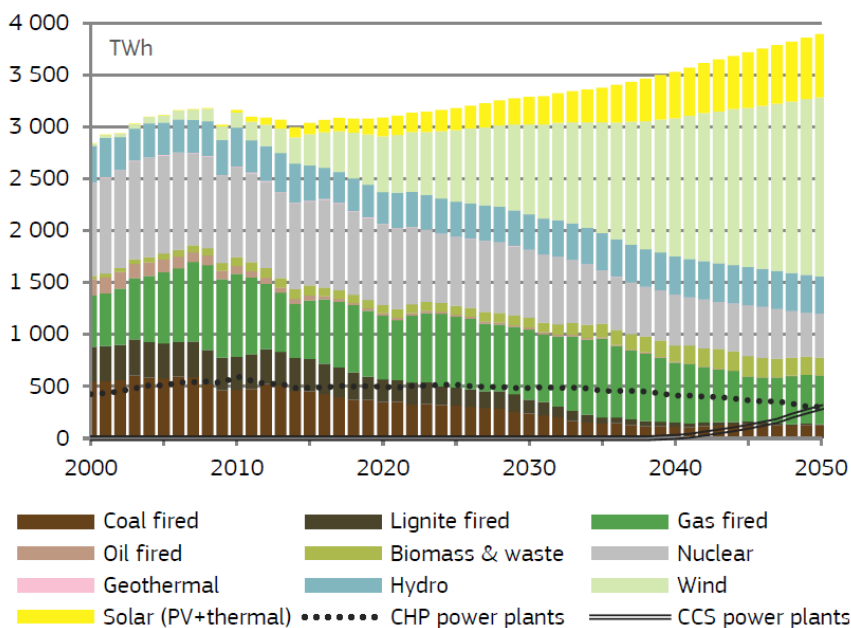


Figure 2: Past and Future European Electricity Generation Technologies 2000-2050

Industry:

CCS is not seen as a major solution for industry; however, the report does recognise the need for CCS to address process emissions in the cement and iron & steel manufacturing sectors. In 2050 across Europe it is predicted that there will be approximately 81Mt/CO₂ pa and 17Mt/CO₂ pa capture for the cement and steel industries respectively.

Hydrogen:

Hydrogen manufacture is seen as only from electrolysis. The uses of which will be predominantly for the transport industry, with a slight focus of heavy transport. In 2050 1.5% of total electricity generation (~55TWh) will be specifically for electrolysis produced hydrogen.

Minor amounts of hydrogen will also be used for the steel industry as a reducing agent in the coking process.

Aside from this, hydrogen from methane reforming and CCS is not even mentioned as an option. This is one of the largest take away messages from 2017 policies and the missed climate targets.

CCU, DACCS, BECCS: These are not mentioned at all in the Central Scenario