

Assessment of the role of CCS in the provision of long-term

Publieke samenvatting / Public summary

Aanleiding

The Paris Agreement on Climate Change aims to keep the average global temperature increase well below 2°C. As part of this, the power sector will likely need to decarbonise completely by 2050 and will increasingly have to rely on low-carbon electricity generation, transmission and storage based on IRES (Intermittent Renewable Energy Sources).

Doelstelling

The project's overall aim was to assess the advantages and disadvantages of different electricity generation portfolios in the Netherlands in 2050 with respect to CO₂ emissions, costs and system adequacy. In particular, the role of CCS was evaluated within these portfolios. The portfolios were in line in 2050 climate change mitigation target and the related decarbonisation strategy in the Dutch industrial sector. The project had the following sub-objectives: • to determine different feasible power generation portfolios for the Netherlands with and without power plants with CCS (natural gas fired and/or biomass fired) in the long term (around 2050); • to assess the impact of decarbonisation of the industrial and other sectors by electrification, CCS, or hydrogen use on the Dutch power system; • to assess the system adequacy of the Dutch power system within a European scope so that the dynamics in the European power system are taken into account in the calculation of the electricity import and export potentials; and • to assess the long-term system

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adequacy of the Dutch power system taking over many weather years, including years with extreme weather.

Korte omschrijving

The first step in developing a cost-optimal and reliable zero carbon power system is to have a power model to work to. This programme developed just that for Western Europe in 2050. The study looked at ways to maintain a reliable and cost-optimal national electricity system that was consistent with the Paris Agreement while being robust enough to cope with variable weather patterns. Limitations of previous studies are addressed. Specifically, the study considered realistic future costs, demand and other constraints and tested the reliability of a country's power systems for both favourable and unfavourable weather conditions. The scenarios play down the role of hydrogen as a means of electricity storage and the potential for hydrogen production based on otherwise curtailed electricity. Next to intermittent renewable energy sources (IRES), low carbon firm capacity formed part of the cost-optimal generation mix. In most scenarios, the share of low carbon firm capacity was above 80% of peak load.

Resultaat

Despite the small changes in total IRES generation between favourable and unfavourable weather conditions, emissions differ by up to 70 Mt CO₂ a year and systems costs by up to 3%. The assessment found that high IRES penetration will require a high dependence on cross border transmission, batteries and a shift to new types of ancillary services to maintain a reliable power system. Carbon capture and storage (CCS) capacity, more specifically bioenergy with CCS, forms part of a cost optimal power generation portfolio.

Voor meer informatie over de TSE / Energie-Innovatie regelingen die RVO aanbiedt, ga naar www.rvo.nl/tse.