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JRC report on fossil fuel electricity generation in the EU: modernisation needed to meet policy targets

The future portfolio of European power plants needs to be consistent with the EU energy and climate change goals set for 2020. For an optimal and yet feasible choice, the European Commission's Joint Research Centre (JRC) has examined the technology and fuel options, together with the conditions that would lead to it. The report "Future fossil fuel electricity generation in Europe" focuses on the assessment of the role that fossil fuel technologies will play in the future EU power system. It assumes that due to the rising electricity demand in Europe fossil fuels are likely to remain the backbone until at least 2030 and foresees a need of up to 635 GW of new fossil fuel power plant capacity. The JRC reference report emphasises that the share of non-fossil fuel power generation needs to be increased and that the share of fossil fuel power generation will only be compatible with the EU policy goals if three factors converge: the commercialisation of carbon capture technology is enabled; CO₂ prices are more attractive, and coal and gas prices are higher than today.

The research, conducted by the JRC Institute for Energy (IE), considers a number of scenarios for the evolution of the European electricity system that describe alternative views for the role of non-fossil fuel (nuclear and renewable) power generation, the development of fossil fuel and CO₂ prices and technology development. Based on these scenarios, the report identifies the corresponding power-plant mix and assesses the impact of its deployment on the objectives of European energy and climate change policies.

As Europe is expected to continue to rely on coal and gas for the bulk of its power generation in the short to medium term, the study looks at forthcoming energy needs to assess their impact on the fossil fuel power generation sector. It finds that, in a business as usual scenario, up to 635 GW of new fossil fuel power plant capacity would need to be constructed in the EU by 2030 to meet the increasing demand for electricity and the need to replace retiring power plants. This would require an investment of between 250 and 600 billion euros, depending on the power plant technologies chosen.

If carbon capture technology is not commercialised before 2030, there could be increased construction of:

- conventional coal plants if CO₂ prices in the European Emissions Trading Scheme (ETS) are low, or
- natural gas power plants if carbon dioxide credit prices are high.

In the short term, the widespread use of natural gas would reduce CO₂ emissions and increase the competitiveness of European industry by maintaining low electricity prices, since there is no need for immediate investment in more expensive coal technologies. In the longer term however, this could significantly undermine the security of energy supply in the EU and its ability to meet its sustainability targets.

If there is no significant increase in the penetration of nuclear and renewable energy technologies, annual CO₂ emissions from the power sector will only reach a 20%

reduction by 2020 with the combined deployment of efficient natural gas combined cycle plants in the short term and the commercialisation of carbon capture and storage technologies as of 2015-2020.

Regarding carbon capture technologies, the study affirms that despite their higher capital costs, they can help control the costs of producing fossil-fuelled electricity in a carbon-constrained environment where the price of CO₂ is higher than today, which is likely to be the case in the EU. In this context, the European Strategic Energy Technology Plan proposes ways to support carbon capture and storage R & D and demonstration plants.

The report concludes that for a sustainable and secure energy system with significantly reduced CO₂ emissions to become feasible, there is an urgent need to invest both in increasing non-fossil fuel power generation and in carbon capture technologies to ensure that they are ready for immediate deployment.

To download JRC's Reference Report "Future fossil fuel electricity generation in Europe", please visit: www.jrc.ec.europa.eu/rr

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