

## Climate scenarios differ on transformation of the energy system

**The energy system in Europe is transforming rapidly and more renewable electricity is being produced. A growing share of the development of new renewable electricity capacity is enabled through corporate Power Purchase Agreements (PPAs). It is very uncertain, how the energy system will evolve, so different organisations make projections of it to be able to plan the infrastructure and to foresee the changes. These projections show a large variety in e.g. fossil fuel prices, electricity production and consumption, which lead to a large spread in carbon emissions.**

In the master thesis, which this article is based on, future energy projections of the energy system in the United Kingdom were chosen. Two different reports were found which contained seven and four scenarios each. From those, three data series were extracted, namely the price of gas, the renewable electricity production and the price to emit carbon dioxide (CO<sub>2</sub>). These data series were chosen because they are the main price drivers, i.e. influencing the future electricity market price.

The future development of the price drivers in the UK until 2035 show large differences between the different sources and scenarios. However, general trends can be seen: the gas price is increasing slightly, and the renewable electricity production and carbon price are increasing considerably.

The, in total, eleven scenarios describing the future development of the energy system in the UK were combined into three general emissions scenarios; with low, medium and high carbon emissions. The low-emissions scenario consists of a high gas price (including carbon taxes), much renewable electricity and a high carbon price. Most of the original scenarios do not lead to emissions fulfilling UK's new climate target of net zero emissions in 2050. Therefore, new policies need to be

introduced to put UK on track to fulfil its target. Following our findings, some suggestions for these policies are to increase the gas and carbon prices and to support the growth in renewable electricity.

In addition to the analysis of the climate scenarios, the climate impact from a renewable PPA was calculated to determine how it is contributing to decrease the carbon emissions. This was done by comparing the emissions from the electricity production from a wind or solar farm to the emissions from the electricity production mix in the grid. The amount by how much the emissions are decreased depend on the scenario and the renewable electricity technology. The change spans from a 91% decrease in case of a high emissions scenario and wind power PPA to an increase in the emissions of 3% in case of a low emissions scenario and solar power PPA.

This means that companies which choose to procure electricity through a PPA can reduce their emissions from electricity consumption as long as they plan their PPA carefully, namely, to replace fossil-based power plants across the European energy sector. Moreover, through PPAs they are contributing to additional renewable energy being built, which is contributing to the overall transformation of the energy system.

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