The effects of socio-environmental constraints on Norway’s renewable energy potential

Marianne Zeyringer¹, James Price², and Eline Mannino¹

¹University of Oslo, Mathematics and Natural Sciences, Technology Systems, Norway (m.zeyringer@ucl.ac.uk)
²University College London, UCL Energy Institute, United Kingdom (james.price@ucl.ac.uk)

The decarbonisation of power production is key to achieving the Paris Agreement goal. Wind and solar energy have matured and decreased in cost rapidly into cost-effective decarbonisation solutions. However, the location of renewables effects the impact on the environment and the communities they are sited. Thus, socio-environmental constraints can strongly limit the overall capacity potential affecting the technology choices, resulting costs and political feasibilities of reaching the national emission reduction targets. Nevertheless, socio-environmental acceptance is usually not considered when studying the transition to a net-zero energy system.

Norway has one of the best wind energy potentials in Europe and a large scale deployment in combination with increased interconnection could have effects on the rest of the European power system. However, recent projects have been facing large opposition. This may be surprising as Norway has very low population density but the right to unspoilt nature is strongly anchored in the Norwegian culture and Sami reindeer herding could be disturbed by wind projects. In 2019 the Norwegian Water Resources and Energy Directorate (NVE) proposed a national framework for wind energy which defined the most suitable areas for wind energy development. After massive protests the framework was recently withdrawn by the government. Offshore wind energy is often seen as a potential solution as socio-environmental opposition is expected to be lower but it is more expensive. However, it is as socio-political decision to choose a more expensive technology, site or mitigation option. A spatially-dependent capacity assessment under different socio-environmental scenarios and their effect on energy system design is missing to allow for such discussion.

Here, we close this gap by analysing the NVE framework, previous concessions and related opinions, literature, newspaper articles and perform interviews with key stakeholders to design three scenarios of socio-environmental acceptability for onshore/offshore wind and solar energy. Based on the here developed scenarios we then conduct a GIS analysis to determine the spatially dependent capacity potential per technology and scenario. Finally, we implement these geospatial capacity scenarios into a high spatial and temporal resolution electricity system model for Europe ("highRES Europe") to analyse the effects on the Norwegian and European electricity system design in 2050.