Norway’s role as a flexibility provider in a renewable Europe

This report examines possibilities for Norway to provide Europe with flexibility services and in particular balancing energy used to smooth the variations caused by power production from variable renewable sources.

All the scenarios we examined show a potential for storage and flexibility services both between hours within a day, from days to weeks and between seasons. The patterns depend on the renewable energy share in Europe and on Europe’s energy policy. For example the patterns within a day are more pronounced when the share of Renewable Energy Sources (RES) is high. The existing Norwegian flexible hydropower system seems well able to cope with this variation, mainly due to the large storage capacity of 85 TWh in the Norwegian reservoirs. In addition to the flexibility in the existing system, there is a large potential to increase the installed capacity in the Norwegian hydropower system without any additional reservoirs or new developments in unregulated rivers.

The balancing capabilities of hydropower are well known, but the potential to provide the same kind of services in the natural gas systems (fields and pipelines) is potentially equally high but less explored. Our results indicate that it could be valuable to offer flexible deliveries to Europe from the Norwegian natural gas value chain. This is flexibility that is needed in addition to the seasonal, weekly and hourly balancing from the hydropower system. Our analysis of variation here shows that the capacity of the storage in natural gas fields, conventional storages and pipeline storage will be able to handle this challenge.

Norway has large energy resources in both natural gas and hydropower, and these resources also have a large potential in storage and energy balancing services. Europe is integrating large amounts of renewable energy with limited storage options, and will probably need several tens of thousands MW in energy balancing capacity and large energy storage volumes. Our analysis show that Norway can contribute to the balancing and storage needs with both hydropower and natural gas. The need for flexibility in the European system depends on the mix of policy instruments to develop more renewable energy, to introduce CCS in fossil fuel power production and energy savings.

The cost of new infrastructure for distribution, transmission and export is today financed through the national grid tariffs and in the end fully paid by the consumers. This is reasonable as it benefits the consumers through increased security of supply. However, it is uncertain whether this principle is acceptable also for investments driven primarily to provide commercial balancing and reserve services to Europe. Capacity markets for generation are expected to be established, and Norway should take an active role to ensure these markets are not introduced nationally and uncoordinated. This is a major governance challenge that must be addressed.

In our opinion an increased focus on providing flexibility services from the Norwegian export system will be a way of securing hydropower and natural gas an important role in the future European energy system.