



WP1

Roadmap for energy balancing from hydropower

The main objective of WP1 is to provide a roadmap for the deployment of large-scale energy balancing from Norwegian hydropower under scenarios given by the development of the European energy system and integration of intermittent renewable energy sources. The scenarios set the framework for analyses in the other work packages, while the results throughout the project will feed back into the roadmap. Work package 1 integrates the trans-boundary, national, regional and local perspectives by providing scenarios on European and national level, but taking into account case study results on regional and local level from work package 4 and 5. The roadmap aims at:

- Pointing out steps in the process of deploying the flexibility of Norwegian hydropower with large amounts of pumped storage.
- Drawing a time line for such use of hydropower until the year 2050.
- Addressing limitations and barriers regarding political framework, environmental requirements, public acceptance, business models and investment needs.

Task 1.1 – Scenario development

The first important step is to provide scenarios for the future development of the RES share, regulatory framework, energy policy, environmental requirements and transmission grid in the European energy system. These scenarios will define substantial input to the other work packages, determining the scope for the work in these. The scenarios for the development of relevant changes related to the energy system in relevant European countries (NO, SE, DK, DE, NL, BE, UK) will be selected and defined by the use of literature, workshops and expert consultation. The time horizon considered is the period until the year 2050.

Task 1.2 – Identification of transmission grid limitations

Limitations and bottlenecks in the Norwegian and European transmission grid related to flexible operation of hydropower plants with increased capacity and pumped storage hydropower development in Norway will be identified. Relevant literature and on-going projects on transmission grid development will be reviewed.

Task 1.3 – Assessment of alternative balancing options

Currently available and future alternative options for balancing services and energy storage will be considered based on the comparison of alternative solutions in work package 2.

Task 1.4 – Time line design

Drawing time lines for different alternatives of deploying energy balancing and storage using Norwegian hydropower will be based on the conclusions from findings in the other work packages. This will include development steps, barriers and recommendations to the industry, authorities and research.

Task 1.5 – Roadmap revision

Towards the end of the project the roadmap will be revised according to the results and gained knowledge from the other work packages. Stakeholders, project partners and external reviewers will be consulted for feed-back.