

## Summary

In May 2007, Finnish Energy Industries launched a project funded by the Ministry of Trade and Industry, aimed at investigating the amount of exploitable hydropower in Finland and evaluating the possibilities to increase hydropower generation within each water system. The aim is to provide public discussion and political decision-making with information on how much hydropower generation can be increased and what measures are required for increasing hydropower generation. The Ministry of Agriculture and Forestry participated in funding the work to ensure that the projects under investigation would also be examined from the point of view of flood prevention. The report at hand is the final report of the shared investigation.

In this report, exploitable hydropower refers to all the hydropower that can be technologically and economically be developed independent of whether there are reasons preventing the development, such as environmental protection legislation. The presented recommendations have been provided by Oy Vesirakentaja, the company that carried out the work, not by the commissioning parties or the operators.

## Results of the study

According to this report, the exploitable hydropower in Finland totals 1,710MW, 6.7 TWh/a in energy. This corresponds to approximately half of the developed hydropower.

In addition to the overall increase in electricity consumption, Finnish electricity supply must also be prepared for an increase in wind power production, and therefore, for an increase in occasional production fluctuations. As a quickly reacting alternative, hydropower is not only a renewable energy source but primarily provides important regulating power. This kind of hydropower can be significantly increased by further developing those of our water systems which have already been harnessed for power generation. All projects increasing the amount of regulating power should be carefully examined, because the alternatives include only power from pumped-storage plants which are high in energy consumption and gas turbine plants.

Technologically and economically significant hydropower generation, which is suitable for quick regulation of electricity generation, could be increased by 2020 by 470MW, 1.3 TWh/a in energy. Approximately a quarter of this energy will probably come about through planned machinery replacements in existing power plants. The most important other development projects are located by the Kemijoki, Iijoki and Kymijoki rivers along which over half of Finland's developed hydropower is located. The usability of this developed capacity for power regulation would be significantly improved through the proposed supplementary development.

To ensure that the projects will materialise, they will have to be redesigned to correspond to the current ideas of water system construction, which will require further reports and close cooperation with electricity producers and authorities. Due to that and the necessary environmental impact assessment and permit processes, the implementation will at best take several years. For six of the projects, the valid environmental protection legislation and decisions should be revised.

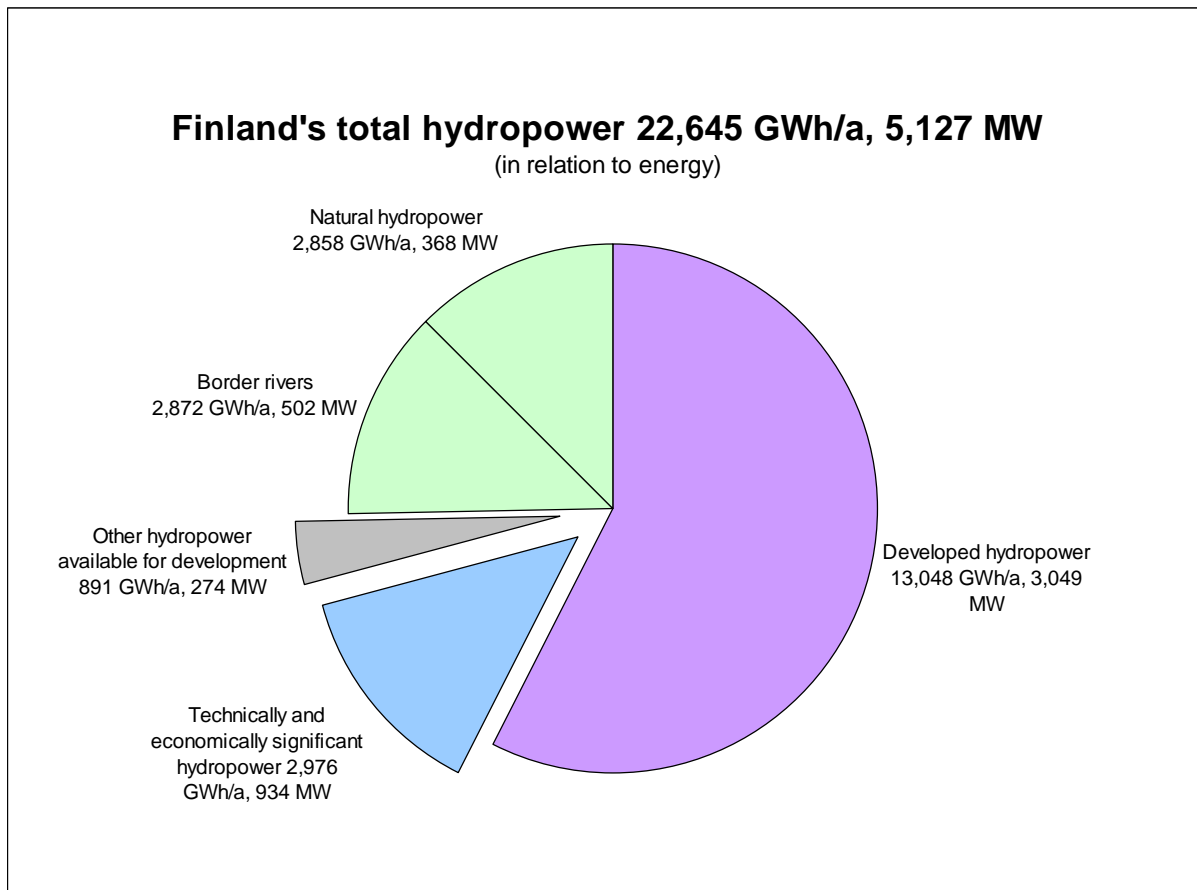
In addition to the above, technologically and economically significant hydropower exists by the Ounasjoki river and the middle course of the Iijoki river, totalling 460MW in output capacity and 1.6 TWh/a in energy. Both water systems are protected.

Small-scale hydropower can be harnessed in different water systems to a total of approx. 60MW, 220 GWh/a. Before 2020, approximately half of this amount is estimated to materialise, assuming that the Government support policies will remain at least at the current level. The rest of Finland's hydropower generation capacity is located in border rivers or other water systems which cannot be harnessed for various reasons.

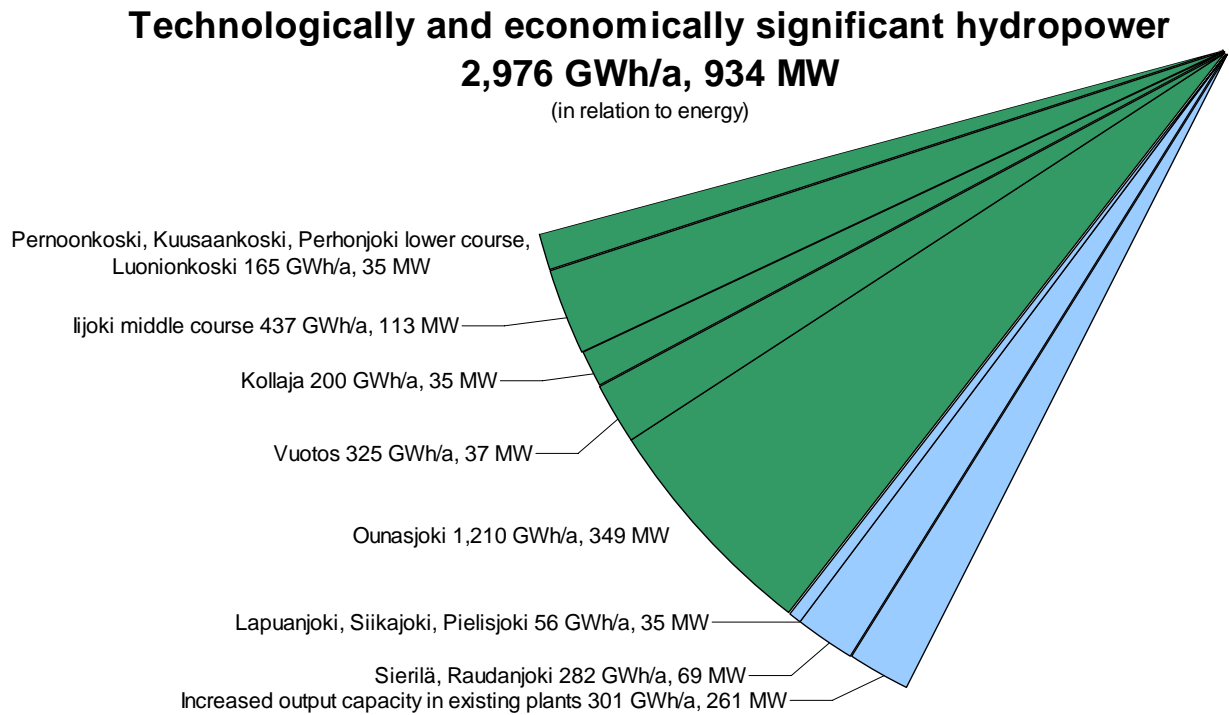
It would be important to reconcile the requirements of the electro-economy and primary industries in Finland, such as the fish industry, in line with other countries. This requires goal-oriented work and clear plans that are jointly supported by the different interest groups. The starting point should, however, be the efficient use of our largest water systems in the regulation of power generation.

In 2006, hydropower producers paid approx. a total of EUR 30million of real property tax in their production localities in Finland. This is equivalent to the municipal income tax generated by approx. 7,500 jobs. The technologically and economically significant projects would thus significantly increase the municipal real property tax revenues.

Climate change will affect the extent and seasonal timing of floods. Thus, the majority of Finland's regulation permits should be revised. Many of the hydropower economy-related plans presented in the report concern water systems which include flood risk sites significant from the point of view of residential areas and key societal functions. Implementing technologically and economically significant hydropower projects would simultaneously improve the preconditions for flood prevention in these water systems.



**Figure 1.** Finland's total hydropower by amount of energy generation.



**Figure 2.** Technologically and economically significant hydropower by amount of energy generation. Green indicates protected sites.