

Finndøla hydropower plant

Approval for the use of EKOenergy-ecolabeled sales

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The hydropower plant

- Name: *Finndøla*
- Owner and contact information: *Finndøla Kraftverk DA*
- Year of construction: *1971/73*
- Installed capacity: *104 MW*
- Annual electricity production (on average): *300 GWh*
- Fall height: *303 meters*
- Tunnel length: *7030 meters*
- Turbine type: *2 Francis turbines*

Finndøla hydropower plant is located in Fyresdal municipality in Telemark county, south-eastern Norway. The plant is owned by Finndøla kraftverk DA, a company owned 50/50 by Agder Energi Vannkraft AS and Skagerrak Kraft AS. Finndøla is a typical Norwegian-style hydropower plant, producing power from redirected water flows through long tunnels between large reservoirs. The power plant utilizes water that originally went to Gausåni, Finndøla and Bondøla rivers.

Finndøla catchment area

Finndøla powerplant has its water intake in Gausvatn reservoir (that also collects water from Gromvatn and Votna reservoirs) and water outlet in Fyresvatn reservoir. The original flow out from Gausvatn is north, to rivers Gausåni, Finndøla and Bondøla. There is a dam here today. There is also a dam at Ulvsvatn – upstream from Bondøla river (see Figure 1 for an annotated map).

The overall hydrology of the Finndøla catchment area is typical for this region – low flow over the winter months due to freezing temperatures, high flow during spring floods, low to medium during summer months (dependent on weather, rain and air temperature), and usually high again in autumn due to rain.

The water quality in the area has been affected by long-term, long-transported acidification in the 1990s. This is typical to most of the lakes and waterways in southern Norway and has had significant effects on the freshwater ecology and fish biodiversity. However the

conditions in the Finndøla catchment area have improved and a report in 2017 (discussed in more detail in the next section of this document) classified the pH levels in the Finndøla catchment area as either “good” or “very good”.

Fish

- Have migratory fish moved upstream before the power plant was built: *Unknown, as no data on the river conditions before the 1970s is available.*
- Is there a fish pass or other solution to safeguard the migration of fish upstream and downstream: *Yes, there is a fish ladder upstream from Finndøla power plant.*

Unfortunately there is limited data available on the river conditions before the 1970s (when the power plant was built), therefore it is unknown what the original fish habitats were like. It is likely that the catchment area was inhabited by brown trout and other freshwater fish species that are still found in the original river reaches (Gausåni, Finndøla and Bondøla). In Fyresvatn (the outflow reservoir) there are European whitefish (*Coregonus lavaretus*), Trout (*Salmo trutta*) and Artic charr (*Salvelinus alpinus*). In addition, there are self-sustained populations of land-locked brown trout in both Gausvatn and Grimvatn (the Finndøla intake reservoirs).

In 2017 a report on the fish biodiversity and ecology of the Finndøla catchment area was produced by Gustavsen Naturanalyser environmental consultant. They carried out data collections on the water quality (such as pH, temperature etc) and fish surveys in 12 locations across the Finndøla impact area. They found fish of various sizes at most locations studied. They also identified some ripple and pool habitats perfect for fish reproduction and recruitment.

There is also a fish pass further upstream from the Finndøla power plant on river Bondøla. The fish-ladder is in Einangfossen and is monitored by Arendalsvassdragets Brugseierforening (a company that owns reservoirs on the watercourse, but is independent of the owners of the Finndøla power plant). There are some disagreements between the local residents and environmental organisations with regards to the effectiveness of the fish-ladder. According to some locals, the fish-ladder is occasionally clogged by twigs, especially in flood situations. This may lead to poorer upstream migration opportunities. The 2017 report collected fish survey data from this location and states the presence of small and medium sized fish. In comparison, no adult-size fish were found. Had there been a gathering of adult fish at the bottom of the ladder, that would be a clear indicator that the fish-ladder is not working effectively.

Mitigating measures

- Are there measures identified to minimise the impact of this power plant? *Yes, minimum flow requirements of 1.5 m³/s over the summer months*

There is a minimum water flow of 1.5 m³/s in the summer months, measured at Finndøla VM. The water is released from Ulvsvatn. This summer minimum flow ensures waterflow in Bondøla and lower Fyresdalsåna, both known spawning sites for local brown trout. Data from 3 years of automated measurements from 2015-2017 show that the water flow is actually kept significantly above the requirement for much of the summer period. Interestingly, the authors of the 2017 report suggest summer water flows of 1.2 - 1.3 m³/s for short periods could be acceptable if the average water flow still exceeds 1.5 m³/s.

Finally, according to the report, the lowest observed water flows in the months outside of

the summer, when minimal flow is not safeguarded by the conditions of the permit, are not critical for fry or other freshwater organisms. However, the irregular water flow in autumn can possibly reduce the migration potential of fish. Therefore, an extension of the minimal flow safeguarding period into the autumn months should be considered in the future.

Conclusion

Overall, the Finndøla power plant catchment area is a sub-optimal environment for fish species and other aquatic organisms, due to the highly modified nature of these waterways for energy production, as well as the historic acid rain pollution. Nevertheless, the conditions are improving. Continuous flow and connectivity through the catchment area is insured throughout the summer months through minimal flow requirements and a presence of a fish-ladder in Bondøla river. With this in mind, and due to the willingness of the owners of the power plant to provide all the reports and information required, we believe Finndøla power plant is acceptable for EKOenergy approval.

References

<https://www.nve.no/kdb/sc782.pdf> (the permit, in Norwegian)
<https://www.ae.no/virksomhet/vannkraft/kraftstasjoner/finndola-kraftstasjon/>
<https://www.statkraft.com/energy-sources/Power-plants/Norway/Finndola/>



Figure 1. A map of the Finndøla catchment area. Red place marker indicates the location of the power plant.



Figure 2. The main tunnels and inflow/outflow reservoirs of Finndøla power plant.

Figure 3. A fish-ladder at Einangfossen, upstream from Finndøla power plant. Image taken from the Gustavsen Naturanalyser environmental report.