



Norway

Electrification of the Norwegian shipping fleet

Landstroemsforum is a Norwegian Electrotechnical Committee (NEK) initiative for electrification of the Norwegian shipping fleet. The forum consists of key stakeholders in the maritime business, such as ship owners, harbours, ferry route owners, environmental organizations and equipment manufacturers. The members meet regularly to discuss technical challenges related to the electrification of the fleet and have also started to publish papers.

A broad spectrum of stakeholders, including the authorities, manufacturers, organizations, and end users, oversee the NEK-driven project. It is financed by Enova, an enterprise owned by the Norwegian Ministry of Climate and Environment. Enova invests over three hundred million dollars every year in solutions aimed at reducing greenhouse gas emissions in Norway, developing energy and climate technology and strengthening security of supply.

The challenge

Norway has the world's second longest shoreline, despite being only the 62nd largest country by area. Only Canada has a longer shoreline. The country's many fjords and islands stretch the shoreline to 100 910 kilometres, which is seven times longer than the shoreline of the United Kingdom. For this reason, many Norwegian roads rely on ferries to cross fjords and to reach the islands. In total, there are 129 ferry crossings connecting regional roads in Norway. In addition to this are all the public ferries owned by the municipalities, private ferries and ferry crossings between Norway and neighbouring countries.

Electric ferries

In 2018, two electric ferries began operating over the Sognefjord, which is one of the world's longest fjords. Since then, the number of electric ferry crossings has risen rapidly. By the end of 2021, the total number of electric ferry crossings will be 60. In addition, 25 ferry crossings are already planned to be electrified after 2021.

Probably the world's largest electric ferry

The ferry MF Bastoe Electric, which operates between Horten and Moss (across the Oslofjord), is 143 metres long and 21 metres wide. The battery capacity is 4 300 kWh and the charging connection system, which is automatic, has a capacity of 9 000 kW. The ferry can take up to 600 people and 200 cars. Due to international maritime safety regulations, the ferry must have diesel engines as a backup. It saves approximately six million litres of diesel fuel per year.

Standards for ships

Due to limited docking time (approximately 10 minutes), all charging systems for the ferries in the harbours need to be automatic. Because there are still a lot of developments and innovations in connection systems, the shore connection interface is not yet ready for standardization. All other installations on the ship are based on standards, such as the [IEC 60092](#) series for electrical installations in ships.



NEK identified a gap for a specific standard addressing the relevant type of batteries used for propulsion. For this reason, the NEK maritime committee, NK 18, has developed a Norwegian specification for batteries in ships. The specification NEK NSPEK 411 gives additional requirements to [IEC 62619](#) (for secondary cells and batteries containing alkaline or other non-acid electrolytes, and safety requirements for secondary lithium cells and batteries, for use in industrial applications) to cater for the marine environment. Earlier in 2021, the NEK NSPEK 411 was presented and offered to IEC to be further developed into an International Standard. In addition, NEK has also started revision of the specification, which will further improve the proposal to IEC, and hopefully make the process to an International Standard smoother and faster.

Standards ashore

The grid to charger connection is based on a Norwegian standard (NEK 399) for electrical systems and electronic networks. The lack of such a standard from IEC triggered NEK to start this project. Among the technical details, it specifies the interface between the grid owner and user.

Shore to ship installations

The main task has been to facilitate electricity from shore to ship when ships are in a harbour. This will reduce emissions of both CO₂ and NO_x. The Norwegian commercial fleet consists of approximately 3 500 ships. The electrical solutions in these ships vary greatly, as do their size and purpose. Today, there are approximately 120 shore to ship installations along the coast and several more are planned.

Results from Landstroemsforum

Decisions within the forum (decisions in principle) have been made for voltage level and frequency. Another decision covers the responsible interface between grid and harbour, as well as harbour and ship, which is an important condition for building business models.

A guide to show relevant standards for shore connections has also been made. The guide is downloadable free of charge but is only available in Norwegian.

At the moment, the forum is working to finding a common solution for the automatic fast connections for ferries. Standardization in this area is still premature as a great deal of innovation is still occurring. Nevertheless, it is important to start the standardization process at an early stage in order to accumulate experience as the shipping business improves the solutions.

