European Commission

GPP In practice

Issue no. 42
June 2014

Technology-Neutral Procurement of a Full-Electric Ferry

Background

The Norwegian Directorate of Public Roads is responsible for building, maintaining and operating roads and ferry routes across Norway. The Directorate wished to procure a ferry between the two villages of Lavik and Oppedal, across Sognefjord, one of the western fjords of Norway. The Directorate decided to proceed with a tender to develop a new ferry that was 15 - 20 % more energy efficient than the ferry currently in operation, i.e. a diesel operated one. The tender refrained from requiring a specific technology.

The Directorate published the first stage of a two stage tender procedure in 2010. The ferry is currently being built and will begin operating on 1 January 2015.

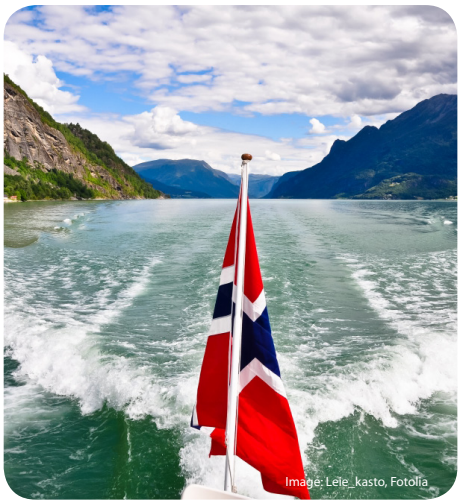
Image: Lele_kasto, Fotolia

Procurement objectives

The Norwegian Directorate of Public Roads opted to use a competitive dialogue in order to explore innovative solutions with prospective ferry operators. This was carried out as part of a two stage procurement procedure, i.e. pre-qualifying bidders before entering into the competitive dialogue phase. The Directorate established an advisory group while developing the tender documentation and the evaluation criterion, in order to involve the end-users and assess the technological need.

In order to develop a solution, ferry operators bid for the tender while working in partnership with both engineering firms and ship building yards.

Criteria used

Subject matter of the contract: The design and build of an energy efficient, low environmental impact ferry.

Technical specifications:

The tender specifications required a ferry with a capacity for 120 cars and 360 passengers, without prescribing a certain technology. 'Energy efficiency' was specified in terms of low fuel consumption and 'low environmental impact' was specified in terms of reduced emissions as a result of a selected energy carrier or technical solution.

Award criteria:

The Norwegian Directorate of Public Roads developed an evaluation model with 6 evaluation criteria. The criteria and their respective weightings were as follows:

Price: 60 %
Quality 40%, broken down into:
kWh/PCU* km = 18 %
MJ/year = 6 %ton CO_2/year = 6 %
kg NOx/year = 4 %
Innovation = 6 %

Contract performance clauses:

As part of their final offer each bidder proposed their design of the ferry as well as performance data in relation to the environmental aspects of the ferry. If during the execution of the contract the ferry should underperform on any of these aspects, the winning bidder will incur financial penalties.

Results

Four transport (ferry) operators participated in this tender. Each operator entered into a consortium together with a ship builder, technology developer and/or engineering company. The 3 unsuccessful bidders were compensated for the time and resources spent on the bid.

*PCU = Passenger Car Unit

The cost of this vessel was more expensive than a typical reference vessel. However, fuel cost per km is 70 % lower than for conventional diesel-electric ferries (€3.1/km for battery ferry compared to €10/km for a conventional diesel-electric ferry). It is important to notice that the fuel cost of this ferry is only 8 % of OPEX (operational expenditure) and 4 % of the total vessel cost for the battery driven ferry, while fuel cost for a conventional diesel-electric ferries is approximately 20-25 % of OPEX, which constitutes 15 % of the total vessel cost. The winning shipping company worked with a Norwegian shipyard and a large engineering and electronics company, who co-developed this new ship as the world's first electrically-powered car ferry. The engineering and electronics company developed everything from the battery to the propulsion, and the shipping yard developed the body of the ship.

The ships batteries will be recharged in the breaks between crossings, a process that the developers estimate will take approximately 10 minutes. Batteries will be installed at each port, as the local grid is not equipped to deliver such a large amount of power in such a short space of time. The port batteries will recharge the ferry's battery during the 10-minutes breaks between crossings and will be slowly recharged from the local grid, while the ferry is sailing between the ports. The batteries have already been produced and are ready to be installed at the ports. One of the battery modules, and the corresponding charging system, has been tested on a diesel-electric propulsion ferry. This testing has demonstrated that it is quite a simple process to connect the battery module to the grid.

Environmental impacts

The ferry previously serving this route used approximately one million litres of diesel a year, emitting around 2680 tons of CO_2 and 37 tons of NOx. It is estimated that the energy which will be used to charge the batteries for this ferry will result in emissions of just 75 g CO_2/kWh, due to the fact that the electricity will be derived from the Nordic grid, which uses a very high percentage of renewable energy to generate power. Hundreds of ferries link Norway's mainland to the islands off its coast and provide routes across its many fjords. Using today's battery and recharging technology, all crossings of up to 30 minutes in duration could be served by electrically powered vessels. The European Sulphur Directive was recently introduced into European and national legislation. The new sulphur directive requires that the sulphur content in the fuel of vessels plying the Baltic Sea, North Sea and English Channel be reduced to 0.1 % in 2015. A mandatory requirement of this tender was that the sulphur content used should be below 0.05 %, therefore, this ferry will automatically comply with the new legislation.

The design of the ferry also lends to further energy savings. The ferry is a catamaran with two slim hulls, which results in it offering less resistance to water than a conventional ferry. The hulls are lighter than those of a conventional ferry, as they are made of aluminium as opposed to the more conventionally-used steel. The ferry is equipped with electric motors to drive the ship's two screws, each of which is powered by a battery weighing 10 tons. These characteristics result in the new vessel weighing half of that of a similar, conventionally-designed ferry. This saving has also had a direct impact on the specifications of the drive system. Whereas the ferry currently serving the route has an engine with an output of 1,500 kW or more than 2,000 horsepower, the battery in the new ferry will have an output of 800 kW. In normal conditions, operating at a speed of 10 knots, a battery power of 400 kW is sufficient.

This electrically powered ferry won a competition for Energy & Environmentally Efficient Ferries organized by Norway's Ministry of Transport. A 10-year contract was awarded to the winning bidder, due to the fact that the investment in developing a new ferry is so high, and that a shorter term contract would have not been attractive to a bidder.

The Directorate aimed for a minimum of a 15-20 % improvement of energy efficiency and environmental impact of this ferry in comparison to the previous conventional, diesel ferry which was procured and delivered in 2010. The resulting improvements are as follows:

- kWh/PCUkm: 37 % reduction
- MJ/year: 60 % reduction
- ton CO_2/year: 89 % reduction
- kg NOx/year: 100 % reduction

Lessons learned

This tender demonstrated to the Norwegian Directorate of Public Roads that electric vehicles can come out on top in technology neutral tenders if the right technical specifications and award criteria are used.

The Norwegian Directorate of Public Roads has used the competitive dialogue procedure in previous tenders and has learned from their experiences that whether or not competitive dialogue should be used depends greatly on the complexity of the procurement.

For more information, please see European GPP criteria for Transport.
Contact details: Edvard Thonstad Sandvik, The Norwegian Directorate of Public Roads, edvard.sandvik@vegvesen.no