

# **ELMAR - Supporting South Baltic SMEs to enter the international supply chains & sales markets for boats & ships with electric propulsions**

**Ferries on Curonian lagoon and river service – feasibility study**

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## 1. Description of Curonian lagoon and navigable rivers in Lithuania

The Curonian lagoon (also known as Kursiu marios, Kurshskij zaliv, Kurische Haff) is a large (length 95 km, width up to 48 km) shallow (mean depth of 3.8 m, the maximum 5.8 m) coastal water body in the south-eastern part of the Baltic Sea. The outlet of the lagoon to the Baltic Sea, Klaipeda Strait, is artificially deepened down to 12 m. The Lagoon is fresh in its wide southern and central parts, being under strong influence of the river Nemunas.

([http://www.corpi.ku.lt/nemo/cur\\_lag\\_desc.html](http://www.corpi.ku.lt/nemo/cur_lag_desc.html))

## 2. Description of the current state of ferries on Curonian lagoon and river service

There are 2 ferry lines in Klaipeda port operated by AB “Smiltynes Perkela”. The ferries are operating between Klaipeda port and Curonian Spit in 2 places:

1. New ferry terminal;
2. Old ferry terminal.

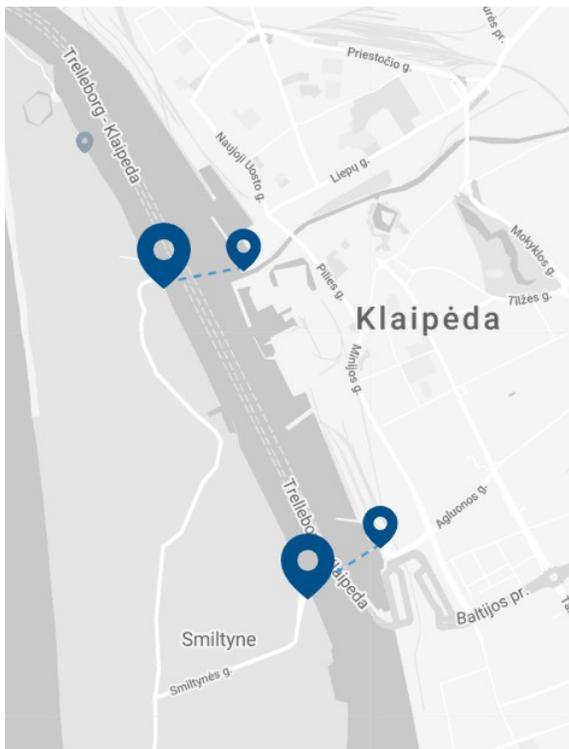


[https://en.wikipedia.org/wiki/Curonian\\_Lagoon](https://en.wikipedia.org/wiki/Curonian_Lagoon)

Old Ferry Terminal (Northern Horn) – the most often visited port and Curonian Lagoon’s coast site in Klaipeda. The main people flood is made by pedestrians and cyclists (cars are not transported here). After the voyage, You may go either towards the sea or towards the Sea Museum (Dolphinarium). There is also a direct voyage to the most visited museum in Lithuania!

New Ferry Terminal – is situated several kilometers away from the Old Ferry Terminal. It carries not only pedestrians and cyclists but also light motor vehicles and trucks. (<https://www.klaipedainfo.lt/en/ferries-klaipeda-smiltyne/>)

In 2019 the ferry operator AB “Smiltynes Perkela” has transported over 2 mln. passengers between main land and Curonian Spit. (<https://www.keltas.lt/apie-mus/statistika/>). These figures does not include the amounts of



<https://www.keltas.lt/en/>

passengers transported by other smaller ship operators working in Klaipeda port.

Curonian Spit is a UNESCO World Heritage Site, attracting many tourists each year. Therefore, the movement of yachts, boats and ships in this area is very active. It is possible to specify the routes that are very attractive as from the passenger transportation perspective as from leisure boating perspective. The routes are:

- Klaipeda – Smiltyne (Old and new ferry terminals);
- Klaipeda (Old ferry terminal) – Sea Museum;
- Curonian lagoon passenger transportation: Klaipeda –Juodkrante – Nida;
- Kaunas – Nida – Klaipeda passenger transportation;
- Curonian lagoon leisure trips: Klaipeda – Nida, Minge – Nida;
- Passenger transportation in Klaipeda port by private companies.

The terminals operated by AB „Smiltynes perkela“ are served by the following ferries:



The ferry ship „Nida“ (2006) services the Old Ferry Terminal floods. It may hold up to 700 passengers. Ferry „Kintai“ (1977), which is more like a city symbol, holds up to 477 passengers.

Ferries „Žalgiris“ (2009), „Baltija“ (2005), „Neringa“ (2004) – carry up to 40 light motor vehicles, and during the closed season – 100 passengers.



Curonian lagoon leisure trips: Klaipeda – Nida, Minge – Nida and passenger transportation in Klaipeda port is done by private companies. There is a variety of ships driven by fossil fuel engines that propose to tourists a variety of different routes and vessels:

- *Dreverna – Juodkrante – Dreverna*
- *Dreverna – Nida – Dreverna*





- Drevena – Minge – Uostadvaris – Drevena
- Drevena – Juodkrante – Nida – Minge – Drevena

### 3. Development of ferries on Curonian lagoon and river service

In start of 2019 there was a tender announced by AB “Smiltynes perkela” for buying of new high-speed passenger vessel-catamaran for transporting till 250 passengers and till 60 bicycles.



The route of the passenger catamaran „Smiltynė“ to Nida was operated by AB „Smiltynes perkela“ for four years from 2014 till 2018. High speed vessel was operating from June till September and was a popular one (<https://www.klaipedainfo.lt/naujienos/smiltynes-perkela-planu-kursiu-mariose-neatsisako-taciau-siemet-i-nida-neplauks/>).

The plans of the operator AB „Smiltynės perkela“ to renew the operation at this route the following year. (<https://www.keltas.lt/2019/01/29/smiltynes-perkela-paskelbtas-naujas-konkursas-laivui-i-nida-statyti/>)

Kaunas – Nida – Klaipeda passenger transportation; In 2019 passenger transportation with the high speed vessel with underwater foils was renewed. The vessel can travel at the speed around 60 km/h what is very important for this route of 240 km long (<https://www.laivasraketa.lt/>).



### 4. Legal issues, infrastructure demands and trends and possibilities for developing electric mobility on the water in Lithuania.

As it was analyzed in “Sales market analyses Estonia, Latvia, Lithuania region” international regulations such as Kyoto Protocol and Paris climate conference are pushing decision makers to move energy and transport sector towards nature friendly development course. In Lithuania at the moment the steps toward clean transport are being implemented into the case studies and future development plans.

In Klaipeda port development study (<https://www.portofklaipeda.lt/uploads/DOKUMENTAI/2018/Priedas%207.pdf>) possibility for the ships, coming to pier, to receive power from shore, instead of generating it by own port generators, is foreseen. The estimations of power needs are included into the future port development and at the moment is as follows:

- Available power - 140.08 MW including 10% free reserves;
- Peak usage power - 87.50 MW;
- Average usage power - 44.11 MW.

From the figures above we see that port infrastructure is sufficient at the moment for the appearance of electric driven passenger vessels, charging in the port. From the analysis done in “Sales market analyses Estonia, Latvia, Lithuania region” we can suppose that it could be 4 potential cases with e-mobility solutions integrated:

1. Passenger ferry transporting people between Klaipeda port and Curonian Spit. In 2019 AB “Smiltynes perkela” was announcing a tender for buying of 2 hybrid ferries for transporting around 400 passengers. There could be a need in near future to replace existing ferry operating on the line Old Ferry Terminal – Sea Museum with a smaller capacity (around 300 passenger). This ferry predominantly should be hybrid or fully electric driven.
2. Passenger transportation line that could link different parts of the city with different stops on the Curonian spit. This ferry could be a small electric driven with around 50-passenger capacity.
3. In longer perspective the ferries planned to operate between Klaipeda and Nida could be of a hybrid solution, providing the possibility to work on electricity while maneuvering and staying by the quay wall.
4. The ferry operating on the Kaunas – Nida – Klaipeda route could also use hybrid technology solutions on board.

Concluding above assumptions, the most real cases are the electrified ferries, operating in Klaipeda port. Small electric ferry with around 50-passenger capacity could be a solution with better perspectives due to smaller building and operating costs. This solution is taken as the base for the preliminary concept development of an electric driven ferry operating in Klaipeda port.

## **5. Preliminary concept development of potential electric driven ferries and river service transport**

Preliminary concept of a passenger transportation line that will link different parts of the Klaipeda city with different stops on the Curonian Spit will be described in this chapter.

The transport is projected as electric driven waterbus for 50 passengers.

*Main characteristics of the vessel:*

- Hull type – catamaran;
- Length over all LOA – 20 m.;
- Breadth B – 6 m.;

- Draft D – 1 m.;
- Displacement – 37,9 t.
- Passengers – 48, 2 with disabilities;
- Crew – 2;
- Inland waterway vessel category: III group

Electric driven waterbus will be operating in port of Klaipeda with the cruising speed of 8 knots by the following route: New projected port in area of Wood Terminal – New Ferry Terminal – Old Ferry Terminal – Sea Museum – New projected Deep Sea Port. Below is the distance between projected stops and travel times are provide together with the scheme of the route.

*Information about projected route of electric waterbus in Klaipeda port*

Stop Nr.	Route	Distance, km	Travel time with the speed of 14 km/h, min.
1 - 2	Wood Terminal – New Ferry Terminal	6,37	26
2 - 3	New Ferry terminal – Old Ferry Terminal	2,43	10
3 - 4	Old Ferry Terminal – Sea Museum	1,57	6,4
4 - 5	Sea Museum – Deep Sea Port	2,87	11,6
<b>Sum</b>		<b>13,24</b>	<b>54</b>

*Scheme of projected route with stops of electric waterbus in Klaipeda port*



The vessel is designed by the following rules and regulations:

General arrangement composition, onboard systems and other design components are chosen by the following rules and regulations:

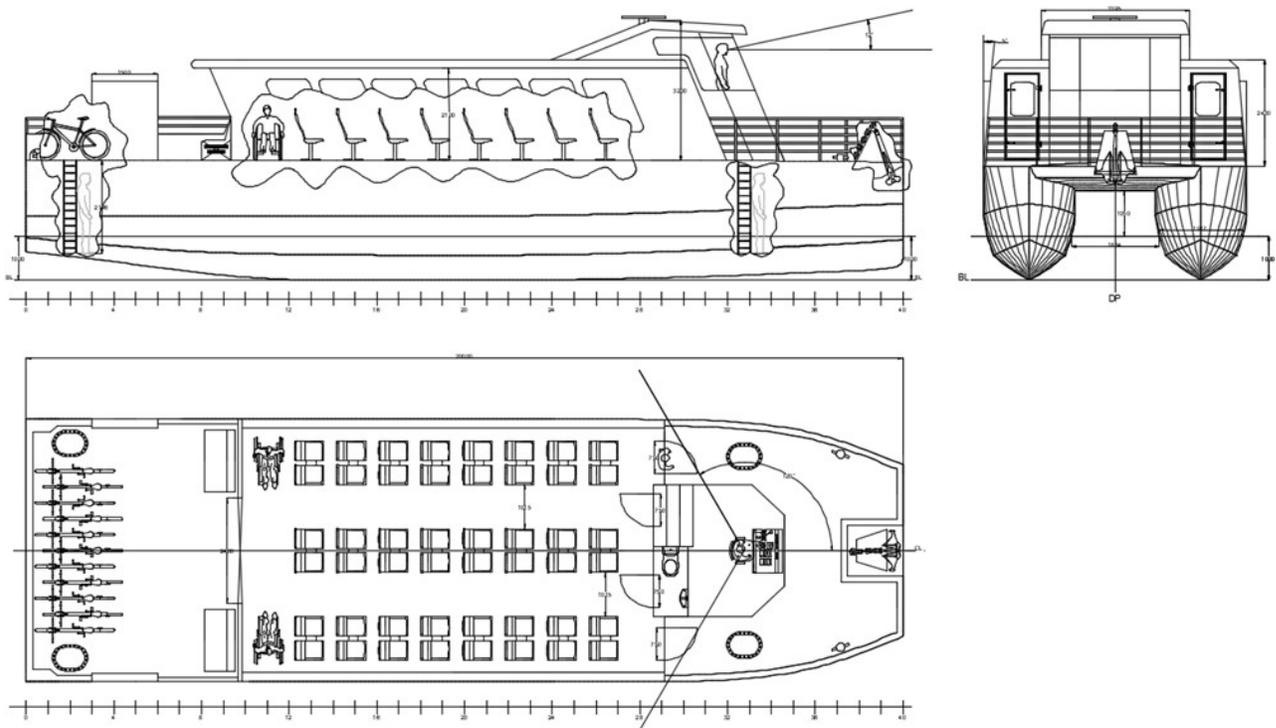
- HN 113:2001 „Ships. Hygiene norms and regulations“;
- European Standard laying down Technical Requirements for Inland Navigation vessels ES-STRIN 2019;
- Classification society DNV GL rules and regulations.

The vessel stability is calculated and proved complying with the regulation by the following loading cases:

- Full supplies (100 %), fully loaded vessel (with all passengers);
- 10 % of supplies, empty vessel (without passengers).

The water resistance and the necessary propulsion power is estimated. For the cruising speed of 14 km/h estimated total power should be 53,2 kW. For the projected route of the vessel the necessary battery capacity is estimated, which is 102,26 kWh. The estimation includes capacity 20% reserves for the battery aging effect and bad weather conditions. The power of the electric motor and the battery capacity is enough for the vessel to travel 2 hours with the speed of 14 km/h and to make one round trip in the port of Klaipeda.

Below is the preliminary general arrangement of the projected electric driven passenger ferry/waterbus is shown.



Designed ferry complies with the specific requirements for inland waterway electric driven passenger ships. Electric system is composed of the following main components:

1. Two electric energy sources, independent from the quantity of electric motors. EAS Marine batteries are chosen;
2. Electric switchboards;
3. Electric propulsion motors 2x 3-phase electric motors „EMRAX 268“ (<https://emrax.com/e-motors/emrax-268/>);
4. Electric driven bow thrusters;
5. Wireless charging equipment IPT Technology (<https://ipt-technology.com/>);
6. Main electric motors control equipment.

At the moment stops Nr. 1 and Nr.5 are not existing. For the first period the route of the vessel could be between stops Nr. 2 and 4. In this case one wireless charging station could be enough to maintain average battery loading around 60-80% of total vessel battery capacity. With the appearance of the stops Nr. 1 and 5 it would be optimal to arrange 2 intermediate charging stations on the projected route.