CLEAN SHIPPING ACTIVITIES ONWARDS-
NORTH SEA COMMISSION, KIEL, 23 OCTOBER 2018

Kai Bedringås, Adviser infrastructure, Møre and Romsdal county, Norway
DISPOSITION

- Ideas for future activities on clean shipping

- Clean shipping topics:
  - shore side electricity at ports

- Examples of good practise in Norway

- LNG – a fuel towards the zero-emission society

The questionnaire on clean shipping (if time permits)
IDEAS FOR FUTURE ACTIVITIES

• Ideas for clean shipping activities ahead:

  - develop clean shipping network («get to know people»)

  - follow up and support EU regulations on clean shipping

  - Report on clean shipping projects briefly at group meetings
IDEAS FOR FUTURE ACTIVITIES II

Ideas for future clean shipping activities:

- Provide examples of clean shipping initiatives

- Challenge members of the Transport group to provide news from their areas, e.g. in the form of a questionnaire
HOW TO MANAGE THE POSITION AS TASK HOLDER CLEAN SHIPPING?

Keep in touch with:

• Other members of the Transport Group

• Conference of Periperal Maritime Regions (CPMR – Melissa Frödin)

• The Secretary of the North Sea Commission (Jon Halvard Eide)
HOW TO MANAGE THE POSITION AS TASK HOLDER CLEAN SHIPPING?

Keep in touch with:

• West Norway Office (region office in Brussel: Merete Mikkelsen, Jorunn Kristina Skodje)

• The Baltic Sea Commission

• European Sustainable Shipping Forum (ESSF)
EUROPEAN SUSTAINABLE SHIPPING FORUM (ESSF)

- The group assists the EU Commission in supporting sustainable maritime transport

- Some issues discussed in subgroups of ESSF:
  - implementation of the sulphur directive
  - Gas cleaning techniques (sulphur removal)
  - Introduction of LNG-fuelled vessels

ESSF is changing: new subgroups are being formed. Call for the renewal of membership of ESSF, deadline 10 October 2018.
ELECTRICITY FOR VESSELS AT PORT

- Diesel engines on board the vessel generates electricity for lighting, ventilation etc. and is a source of pollution of ports and surroundings

- Shore-side electricity supply
EU DIRECTIVE 2014/94 on the deployment of alternative fuels infrastructure

Article 4, paragraph 5 states:

“Member States shall ensure that the need for shore-side electricity supply for... seagoing ships... is assessed in their national policy frameworks. Such shore-side electricity supply shall be installed as a priority in ports of the TEN-T Core Network, and in other ports, by 31 December 2025, unless there is no demand and the costs are disproportionate to the benefits, including environmental benefits.”
What is the responsibility of the ship owner in this article?

• Must a ship owner use the shore side electricity if installed in the port?
Final declaration from the Conference of Peripheral Maritime Regions (CPMR) General Assembly in Helsinki, October 2017:

“The NSC is calling upon the IMO and relevant EU institutions to develop and implement a common set of regulations for the use of shore side power supply in the cruise industry as a way of reducing emissions, and to motivate ship owners to make the necessary investments to accommodate their ships for connecting during port calls”
REPORT FROM MEETING WITH CRUISE LINES INTERNATIONAL ASSOCIATION (CLIA) ON 19 JUNE 2018

Jon Halvard Eide met Paul Antenna, Manager of CLIA:
• Paul emphasized the point in the EU resolution that ...unless there is no demand and the costs are disproportionate... (ref. article 4, paragraph 5).

• CLIA does not want the introduction of international/European regulatory requirements for using shore-side equipment in cruise vessels

• Paul claimed that few cruise ports in Europe, probably only Hamburg, have shore-side systems to serve cruise vessels, requiring an electric power supply of 7 - 10 MW.
Report from meeting with CLIA contd.

Relevant actions i:
• Study the upcoming paper from CLIA on clean shipping, and consider which positions the CPMR & NSC could support, e.g.:

  • Support the introduction of the EU standard for shore-side electricity in ports
  • Call for tax exemptions for cruise vessels equipped with shore-side systems
Report from meeting with CLIA contd.

Relevant actions ii:
• Monitor the speed of introduction of shore-side systems in the cruise industry

• Investigate the capacity of ports to provide cruise vessels with shore side systems, including a technical requirement of 7 – 10 MW

• Follow relevant activities in the European Sustainable Shipping Forum (ESSF) and establish contacts with national members
CLEAN NORTH SEA SHIPPING (CNSS)

- A project under the Interreg IVB North Sea Region Programme
- Emissions to air and greenhouse gases from ships in the North Sea and ports
- Part of the North Sea Commission Strategy, contributing to Europe 2020 strategy
- A very comprehensive project and report in 2014: Need for follow-up?
The first LNG ferry was set in operation in February 2000 in Molde, Norway. Capacity: 86 cars and 300 passengers

Safety was a crucial topic
GOOD PRACTICE: ALL-ELECTRIC FERRY OPERATING LAVIK – OPPEDAL (SOGNEFJORD, NORWAY)

- Capacity: 120 cars, 360 passengers
- Set in operation 1 January 2015
UPCOMING: HYDROGEN FERRY UNDER DEVELOPMENT IN NORWAY

Photo: Fiskerstrand

- In operation from 2021
- Fuel cells and batteries to cater for energy-efficient operation
KB1
Kai Bedringås; 21.03.2018
UPCOMING: AUTONOMOUS CONTAINER SHIP - YARA BIRKELAND

The ship will replace 40,000 road trailers per year from 2020

- Capacity: 120 TEU (Twenty Feet Equivalent Unit)
- Electric batteries (7 – 9 MWh) as energy carrier
- Testing of autonomous capability in 2019
UPCOMING: DEVELOPMENT OF AN ALL-ELECTRIC FAST-FERRY IN NORWAY

Rogaland County Municipality and Maritime CleanTech develop an electric high-speed 150 passenger vessel between Stavanger and Hommersåk (a distance of about 21 km)

• The EU program Horizon 2020 has awarded 11.7 Million Euros
• In operation in 2022
• Charging at Stavanger and Hommersåk
LNG IN SHIPPING

EU DIRECTIVE 2014/94 on the deployment of alternative fuels infrastructure

Article 6, paragraph 1 states:
Member States shall ensure...that an appropriate number of refuelling points for LNG are put in place at maritime ports throughout the TEN-T Core Networks by 31 December 2025.
DEMAND SIDE: CURRENT FLEET OF LNG-FUELLED SHIPS

• 120 LNG ships in operation worldwide

• 126 confirmed lng newbuilds

SOURCE: DNV GL, 2018
SUPPLY SIDE: 67 LNG SUPPLY LOCATIONS FOR SHIPS WORLDWIDE TODAY, AND MANY MORE PLANNED

*There may be several bunkering facilities/modes for one location. The count includes local storages, bunker ship loading facilities and truck loading facilities. Locations where LNG fuelled ships can be bunkered by truck or by ship is not counted.

Source: DNV GL

Updated 1 February 2018
THE QUESTIONNAIRE – ANSWERS

• What facilities for LNG and/or methanol exist in ports in your area?

  • Hirtshals (Denmark): One bunkering facility
  • Frederikshavn: LNG-production and bunkering is being planned
  • Brunsbuttel – Elbehaften (Germany): LNG bunkering facilities.
  • Mongstad (Norway): one LNG-tank of 1000 m3 in operation.
  • Sandefjord: LNG by truck
  • Stavanger: Skangas offers LNG to all the terminals
THE QUESTIONNAIRE – ANSWERS

• In which ports are shore side electricity installed?

• Frederikshavn is tendering a facility for larger capacity, to supply Stena Line.

• Port of Sandefjord: Ferry terminal Pier I East: 6500 kW, 1 connection “NG3”. Thorøya Quay: 1 MW, 1 connection

• Port of Bergen (Norway) has four shore power connection points:
  1 point: 1,5MW, 440-690V, 50/60hz
  3 points: 0,35MW, 440-690V, 50/60hz
and eight more connections during in 2018:
  0,5MW, 440-690V, 50/60hz
THE QUESTIONNAIRE – ANSWERS

• Port of Kristiansand (Norway): Europe’s largest facility for shore side electricity was opened 10 September 2018: Capacity up to 16 MW, cofunded by a Horizon 2020 project, integrated in eight 20 feet containers.

• The public ports Karmsund, Stavanger, Sandnes, Sirevåg and Egersund (Norway) offers shore-side electricity. No facilities offer high voltage (> 1000V). All facilities are equipped with low voltage 60 Hz shore connection. Capacity in terms of MW is unknown.

• Mongstad (Norway) will have shore-side electricity ready for operation autumn 2018
THE QUESTIONNAIRE – ANSWERS

• Which shipping lines are involved in the development of cleaner vessels?

Stena Line, Color Line, Fjord Line, NorLines, Norled, Eidesvik, and some Ro-Ro lines calling at Aalborg.

A project for an autonomous and emission-free ferry-connection in Aalborg.
THE QUESTIONNAIRE – ANSWERS

• Do you or stakeholders from your region take part in relevant EU-projects like Connecting Europe Facility (CEF), EnviSuM, GoLNG, Green Cruise Port, Horizon 2020?

• Aberdeenshire (Scotland): CEF Interreg and Horizon 2020.

• Port of Bergen: Green Cruise Port – Interreg Baltic Sea Region

• Rogaland County Council (Norway) with partners: Horizon 2020
CONCLUSIONS AND RECOMMENDATIONS

Clean shipping – a very interesting and important topic!

• Keep in touch with relevant institutions (people) involved in clean shipping

• Support EU directives for introduction of shore-side power at ports

• Support EU directives for introduction of LNG in shipping
THANKS FOR LISTENING!

Contact details:

kai.bedringas@mrfylke.no
Interreg
North Sea Region
European Regional Development Fund
PRIORiTY 4 so far…

7 approved projects
70 partners
€12.6 million allocated

€15.8 million for new projects
<table>
<thead>
<tr>
<th>NUTS3 Region</th>
<th>Count</th>
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<tbody>
<tr>
<td>Prov. Oost-Vlaanderen</td>
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<tr>
<td>Groningen</td>
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<td>Noord-Holland</td>
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<tr>
<td>Vestlandet</td>
<td>4</td>
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<tr>
<td>North Eastern Scotland</td>
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<tr>
<td>Prov. Antwerpen</td>
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<tr>
<td>Braunschweig</td>
<td>3</td>
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<tr>
<td>Friesland</td>
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<td>Drenthe</td>
<td>3</td>
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<tr>
<td>Västsverige</td>
<td>3</td>
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<tr>
<td>Leicestershire, Rutland and Northamptonshire</td>
<td>3</td>
</tr>
<tr>
<td>Eastern Scotland</td>
<td>3</td>
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<tr>
<td>Highlands and Islands</td>
<td>3</td>
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<td>Brussels</td>
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<tr>
<td>Bremen</td>
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<td>Zuid-Holland</td>
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<td>Zeeland</td>
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<td>Northumberland and Tyne and Wear</td>
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<td>West Yorkshire</td>
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<td>Prov. West-Vlaanderen</td>
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<tr>
<td>Hamburg</td>
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<td>Lüneburg</td>
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<td>Sjælland</td>
<td>1</td>
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<tr>
<td>Nordjylland</td>
<td>1</td>
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<tr>
<td>Oslo Og Akershus</td>
<td>1</td>
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<tr>
<td>Nord-Norge</td>
<td>1</td>
</tr>
<tr>
<td>East Middle Sweden</td>
<td>1</td>
</tr>
<tr>
<td>Sydsverige (Skåne län)</td>
<td>1</td>
</tr>
<tr>
<td>East Yorkshire and Northern Lincolnshire</td>
<td>1</td>
</tr>
</tbody>
</table>
7 projects running in Priority 4
Calls 7 & 8 (SC meeting 11-12 December)

• Call 7 –
  o 5 full applications and 1 extension
  o Requested ERDF (incl. prep. costs): € 9.5 million
  o Requested Norwegian: € 1 million

• Call 8 –
  o 3 expressions of interest
  o Requested ERDF: € 5.5 million
  o Requested Norwegian: € 350.000

➤ Remaining funding € 341.979 (ERDF)
SEEV4-City
Smart, clean Energy and Electric Vehicles for the City
**CENEX, UK** (Loughborough)
Operational Pilot
coordinating the implementation of the pilots

**Oslo Kommune, Norway**
Operational Pilot

**City of Leicester, UK**
Operational Pilot

**KULeuven, BE** (Kortrijk)
Operational pilot

**City of Amsterdam, NL**
Operational Pilot

**Amsterdam ArenA, NL**
Operational Pilot
AMSTERDAM ENERGY ARENA

Peak shaving to even energy consumption

Grid services for stable power supply

- 3.0 MW power and 2.8 MWh capacity
- Batteries from 148 Nissan Leaf electric vehicles
- Storing enough energy to charge 500,000 iPhones or supply 7,000 Amsterdam households for one hour
- Saving 115,663 tons of CO2
- System lifetime: 10+ years

Increase self-consumption of solar power produced on the roof

Back-up power supply for Johan Cruyff Arena during events

Further energy services to the neighbours

AFAS Live

Load Management of car charging in the car park and V2G extension

Johan Cruyff ARENA

EATON

NISSAN

bam

Amsterdam

THE MOBILITY HOUSE
THE MOBILITY HOUSE

ENERGY STORAGE SYSTEM (ESS) ONLINE

State of Charge: 43%
Grid Frequency [Hz]
ESS Power [kW]
CO₂ Savings: 396 kg
This Dutch football stadium creates its own energy and stores it in electric car batteries
...just imagine...

everyone wants to own a shopping trolley...

SUV Shopping Utility Vehicle
Model 2016, luxury chrome version, low mileage, extended loading capacity

...where to park?
Saturation Point

Bologna (Italy)
Figure 4: Significance of car-sharing for deciding to no longer own a car or deciding against purchasing one.
• at least 20,000 users

• replacing > 6,000 cars
THANK YOU!

Interreg North Sea Region Programme
Joint Secretariat
Information on the Status on Fehmarnbelt Fixed Link

Visit of the NSC Transport Group
22 October 2018 in Kiel

Karin Druba  MWVATT – PG FBQ
karin.druba@wimi.landsh.de
Fehmarnbelt Fixed Link

European Dimension

Scandinavian-Mediterranean Corridor within the TEN-T framework

9.000 km rail
6.000 km motorways
Fehmarnbelt Fixed Link

European Dimension

Immersed tunnel
Longest combined tunnel road and rail
Length: 17.6 km
Costs: ca. 7.1 bn Euro
The tunnel is financed using the **state guarantee model** and via EU funding:

- Estimated construction costs are €7 billion, incl. a reserve of almost €1 billion
- Loans are taken out on the international financial markets
- Loans are guaranteed by the Danish state (AAA)
- Loans are repaid with the revenue from the users of the tunnel
- Estimated repayment period: 36 years ("Green Zone")

The revenue also covers the cost of operation and maintenance of tunnel

The state guarantee model was used on the Great Belt and Öresund Fixed Link projects with great success
Fehmarnbelt Fixed Link

Status October 2018

Status on the Danish side:

Construction Act passed on **28 April 2015**

Status on the German side:

- Plan Approval Application: 18 October 2013
  
  Hearing process in 2015 in Schleswig-Holstein → **3,100** responses

- First Amendment Application: 13 June 2016
  
  Hearing process in 2016 → **12,600** responses

- Second Amendment Application: 21 December 2017
  
  "Small participation procedure"

- Expected Plan Approval Decision: End of **2018**
Fehmarnbelt Fixed Link

History

1863 The Holstein engineer Gustav Kröhnke has the idea of a direct connection across the Fehmarnbelt

1963 Opening of the Fehmarnsund Bridge

1992 The Transport Ministers of Germany and Denmark decide on preliminary investigations for a fixed link

2008 Denmark and Germany sign the State Treaty on 3 September 2008
<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>Decision for the construction of an immersed tunnel</td>
</tr>
<tr>
<td>2013</td>
<td>18 October: the application for a plan approval is submitted in Germany</td>
</tr>
<tr>
<td>2015</td>
<td>28 April: the Construction Act was passed by the Danish Parliament</td>
</tr>
<tr>
<td>2016</td>
<td>Conditioned contracts were signed with four major constructors</td>
</tr>
<tr>
<td>2018</td>
<td>End of 2018: plan approval decision is expected. Court cases</td>
</tr>
<tr>
<td>2020/21</td>
<td>Ground breaking</td>
</tr>
<tr>
<td>2028</td>
<td>Opening</td>
</tr>
</tbody>
</table>
## Fehmarnbelt Fixed Link

### Positive Prospects of the Project

<table>
<thead>
<tr>
<th>Net employment effects</th>
<th>During planning, constructing and operating period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improvement of the transport connection</td>
<td>Hamburg to Copenhagen by train: 4.5 → 2.5 by car: 5.2 → 4 h</td>
</tr>
<tr>
<td>Opportunities for change and development</td>
<td>New economic, societal, and cultural relations between Northern Germany and Scandinavia New trade, tourism, jobs, and new chances for living and working (commuting) Cross-border labor and sales market</td>
</tr>
</tbody>
</table>
Flexible and seamless transport:
- No waiting time and no shunting
- No need for booking in advance
- No impact of weather conditions
- No traffic jams in the summer
- Open 24/7/365

Faster transport:
- Substantial time savings between Rødby and Puttgarden— and between Copenhagen, Lübeck and Hamburg

More capacity for the increasing traffic between Central Europe and Scandinavia
Fehmarnbelt Fixed Link

Why?

Improved railway in the region and in Europe

- New opportunities for the railway – international traffic, freight and commuting

- Hamburg-Copenhagen in 2 ½ hours instead of 4 ½ hours by train

- Freight traffic avoids 160 km detour between Copenhagen and Hamburg

- A part of the future European Transport Network (EU/CEF)
Fehmarnbelt Fixed Link
Immersed Tunnel

Standardelement

Schleswig-Holstein. Der echte Norden.
Fehmarnbelt Fixed Link
The Hinterland Connection

Four separate projects in Schleswig-Holstein

I. Tunnel: from Puttgarden to Rødby

II. Road: Upgrading of the federal road B 207 to a four-lane motorway from Heiligenhafen Ost to Puttgarden (16.3 km)

III. Rail: Electrification and upgrading to a twin-track railway from Lübeck to Puttgarden

IV. Fehmarn Sound Bridge: Replacement
Fehmarnbelt Fixed Link
Protests in the Region
Dialogue Forum Fehmarnbelt Fixed Link since 2011

Aim
Public Participation, Transparency, Review of Facts, Discussion

Speaker
Dr. Christoph Jessen

30 participants
Opponents
County Ostholstein and Municipalities
Trade Union
Chamber of Commerce
Project Promoters
Land Schleswig-Holstein

Livestream from Oldenburg
www.fehmarnbelt-dialogforum.de
**Dialogue Forum Fehmarnbelt Fixed Link**

<table>
<thead>
<tr>
<th><strong>Start</strong></th>
<th>5 September 2011 in Eutin/Kreis Ostholstein</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Regular Meetings</strong></td>
<td>4-5 meetings per year in Oldenburg/Kreis Ostholstein since 2016: 4 round tables, project committee</td>
</tr>
<tr>
<td><strong>Organisation</strong></td>
<td>informal, follows-up the formal procedure of the project, independent, own agenda</td>
</tr>
<tr>
<td><strong>Financing</strong></td>
<td>Budget: 102,000 Euro per year</td>
</tr>
<tr>
<td></td>
<td>Land Schleswig-Holstein: 50,000 Euro</td>
</tr>
<tr>
<td></td>
<td>Project promoters: DB AG, Femern A/S each: 25,000 Euro</td>
</tr>
<tr>
<td></td>
<td>Business Association: 2,500 Euro</td>
</tr>
<tr>
<td><strong>Success</strong></td>
<td>Comprehensive and transparent information, Decision of German Bundestag to support non-statutory noise protection along the new/enlarged railway connection</td>
</tr>
<tr>
<td><strong>To be done</strong></td>
<td>Coordination of planning: tunnel, rail and road connections</td>
</tr>
<tr>
<td></td>
<td>Improved measures of noise protection</td>
</tr>
</tbody>
</table>
Thank you for your attention!

Karin Druba
E-Mail: karin.druba@wimi.landsh.de
FJORD & PORT OF KIEL

FJORD OF KIEL:
- Natural deep water harbour
- Located at the Kiel-Canal
- 33,000 ships passing the fjord every year.

PORT OF KIEL:
- 7.4 mio. tons of cargo
- 2.1 mio. passengers
- 250,000 trucks & trailers
- 200,000 pax-cars

PORT OF KIEL GROUP OF COMPANIES

State Capital City of Kiel
100 % Shareholder

SEEHAFEN KIEL GmbH & Co. KG

SEEHAFEN KIEL Stevedoring GmbH
100 %

FLUGHAFEN KIEL GmbH
100 %

PORT EVENT KIEL GmbH
74.9 %

KombiPort Kiel GmbH
50 %

SEEHAFEN KIEL Cruise GmbH & Co. KG
33.33 %

northvail GmbH
6.5 %
DEVELOPMENT IN CARGO HANDLING

PORT TERMINALS IN KIEL

CANAL PORTS

AIRPORT

NORWEGENKAI

OSTSEEKAI

OSTUFERHAFEN

SCHWEDENKAI
PORT AREAS AT THE KIEL-CANAL

BULK CARGO HANDLING
TERMINALS IN THE INNER HARBOUR

FROM ROAD TO SEA

Oslo (Color Line)
Daily from Norwegenkai

Göteborg (Stena Line)
Daily from Schwedenkai

Klaipeda (DFDS)
Daily from Ostuferhafen

St.Petersburg (DFDS)
Once a week from Ostuferhafen

Sundsvall (SCA)
Twice a week from Ostuferhafen
FEERY SERVICES IN THE 1970ies

COLOR LINE: KIEL – OSLO

„Color Fantasy“ & „Color Magic“: Biggest ferries in Baltic
## STENA LINE: KIEL – GÖTEBORG

![Image of Stena Line ferries](image)

<table>
<thead>
<tr>
<th>Vessel</th>
<th>„Stena Germanica“ (alt)</th>
<th>„Stena Germanica“ (neu)</th>
</tr>
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<tbody>
<tr>
<td>Length</td>
<td>175 m</td>
<td>240 m</td>
</tr>
<tr>
<td>Passengers</td>
<td>1,700 Passengers / 600 Cabins</td>
<td>1,300 Passengers / 500 Cabins</td>
</tr>
<tr>
<td>Cargo Capacity</td>
<td>1,600 Lane metres</td>
<td>4,200 Lane metres</td>
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## SCHWEDENKAI AND NORWEGENKAI

![Aerial view of the harbor](image)
PORT RAILWAY TERMINAL

Moving cargo in Hinterland transport „from road to rail“
32,000 trailer and container in 2017

SCHWEDENKAI SHUNTING AREA
PASSENGER PORT OF KIEL

- Color Line: 1,1 Mio.
- Stena Line: 0,4 Mio.
- DFDS Seaways: 0,1 Mio.
- Cruise: 0,6 Mio.

Passagiere gesamt: 2,2 Mio.

CRUISE TERMINAL OSTSEEKAI
ITINERARIES IN NORTHERN EUROPE

KIEL’S CRUISE SHIP DEVELOPMENT

Passengers in 1,000
No. of calls
Gross tonnage in 1,000
(secondary axis)

(secondary axis)

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SECOND CRUISE TERMINAL BUILDING AT OSTSEEKAI UNDER CONSTRUCTION

LOGISTIC CENTER OSTUFERHAFEN

OSTUFERHAFEN SPECIFICATIONS

- Maximum Draft: 11.2 m
- Length of quay: 379 m
- Total area: 440,000 m²
- Container area: 54,000 m²
- Multi-purpose area: 16,000 m²
- Roll-on/Roll-off area: 16,000 m²
- Carrying capacity: up to 1,400 cars
FERRY SERVICE KIEL - KLAIPEDA

Traffic Volume per year: 100,000 Lkw & Trailer / 2,1 Mio. Cargo tons

FREIGHT CENTER
OSTUFERHAFEN KIEL

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BALTIC FERRY - 100 YEARS AGO

BALTIC ROPAX-FERRY OF TODAY
EMISSION CONTROL AREA (SECA)

CLEANER ALTERNATIVE MARINE FUELS

OBJECTIVE: REDUCTION OF AIR EMISSIONS RELATIVE TO USE OF HFO
What are the alternatives?

Four ways
- Marine gas oil with 0.3 % sulphur
- Heavy fuel oil and scrubbers
- New fuel
- Reduce operations and adjust to new situation

Three new fuel options
- LNG
- Methanol
- Electricity

In the end we will see a combination of all

BUNKER FUEL AND OIL PRICE

BW80
Bunkerworld Index

Featured Ports

<table>
<thead>
<tr>
<th>Port</th>
<th>IFO380</th>
<th>IFO180</th>
<th>MDO</th>
<th>MGO</th>
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<tbody>
<tr>
<td>Singapore</td>
<td>277.00</td>
<td>297.00</td>
<td>474.00</td>
<td>464.03</td>
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<tr>
<td>Rotterdam</td>
<td>337.00</td>
<td>394.01</td>
<td>-</td>
<td>451.01</td>
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<td>Houston</td>
<td>258.00</td>
<td>295.55</td>
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<td>558.58</td>
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<tr>
<td>Fujairah</td>
<td>287.50</td>
<td>330.00</td>
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Fuel Prices

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<tr>
<th>Port</th>
<th>IFO380</th>
<th>IFO180</th>
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<tbody>
<tr>
<td>Singapore</td>
<td>378.50</td>
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<td>Houston</td>
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<tr>
<td>Fujairah</td>
<td>371.50</td>
<td>603.50</td>
</tr>
</tbody>
</table>
EXHAUST GAS CLEANING SYSTEMS
SCRUBBERS USED BY COLOR LINE

OPEN LOOP SEA WATER SCRUBBER
STENA GERMANICA RUNS ON METHANOL

STENA GERMANICA – MAIN ENGINE
EMISSIONS AND GREEN HOUSE GAS

- 100% use of green power since 2014
- Waste water reception facility
- Waste management (Marpol I, IV, V)
- E-forklifts (currently 10 pieces)
- E-cars (currently 5 pieces)
- Ongoing transition to LED-technology
- Photovoltaic systems
- Building energy efficiency

ONGOING PROJECTS
- Air quality measuring's
- Onshore power for all inner city ports
- E-Tugmasters / E-reach stackers
WASTE WATER RECEPTION FACILITY

Ostseekai Cruise Terminal / Waste Water Reception Facility capacity: 300 m³/hr

SEEHAFEN KIEL GMBH & CO. KG:
AIR QUALITY MEASURING 2018

Measuring Point Hegewischstraße
Measuring Point Ostseekai
Measuring Point Ostuferhafen
Measuring Point Maritime Museum
AIR QUALITY MEASURING 2018: MONTHLY MEASURING RESULTS

All results for NO2, PM 10 and PM 2.5 for the period of April to July 2018 significantly fall below the applicable regulatory thresholds governing air quality in the area.

SHORE POWER FOR FERRIES IN KIEL

SHORE POWER AT NORWEGENKAI
- Technical planning completed
- Tender issued and awarded
- Building starts on 25.10.2018
- Completion date: Spring 2019

SHORE POWER AT SCHWEDENKAI
- Technical planning in progress, most likely as a combined system for the Stena Line ferry and cruise ships
- Tender process in planning
- Planned Completion date: 2020
SHORE POWER FOR CRUISE SHIPS

High power demands of cruise ships result in shore side investments amounting to several million euros.

Ready for operations: 04/2020

LNG-OPERATION IN KIEL

As from May 2019: LNG fuel feedings in the port of Kiel at Ostseekai berth no. 27