LNG fuel – a Norwegian Ferry tale

Finn Arne Rognstad

Head of Nordic region

Trusted to deliver excellence

Rolls-Royce

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World leading supplier addressing four global markets:

Civil Aerospace

- Aero engines
- Helicopter engines

Defence Aerospace

- Aero engines
- Helicopter engines

Marine

- Ship Design
- Equipment systems

Energy

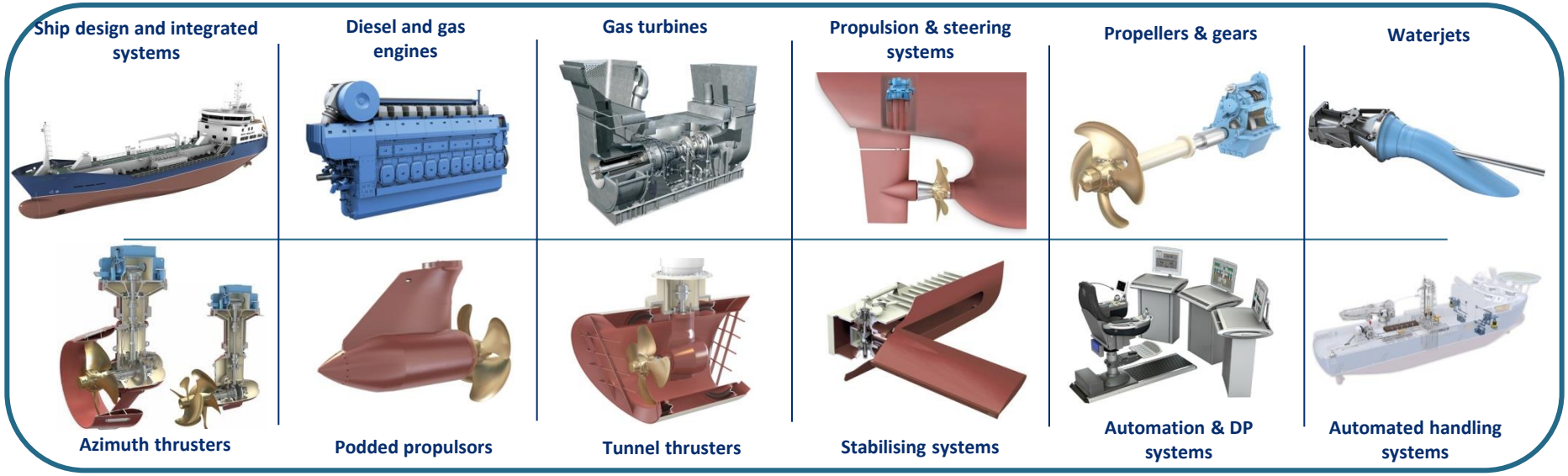
- Gas turbines

39 000 employees

Rolls-Royce

The Rolls-Royce marine business

- 2010 revenue - £2.6 billion
- 4,000 customers; 7,000 employees
- Equipment ~ 30,000 vessels; sales & service activities in 35 countries
- Comprehensive range of power & propulsion products, systems and services



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LNG fuelled ferries in Scandinavia

i) Øksfjord: 2
q3 2015

BOREAL TRANSPORT

a) Vestfjorden: 4

TORGHATTEN

b) Trondheimsfjord: 3

c) Moldefjord: 3

Glutra (2002)
Tresfjord (repower)

Fjord1

d) Bjørnafjord: 4

e) Boknafjord: 2

f) Oslo – Nesodden: 3

NORLED

g) Stockholm - Turku: 1

VIKING LINE

h) Bergen - Hirtshals: 2

fjordline.com

Total: 24

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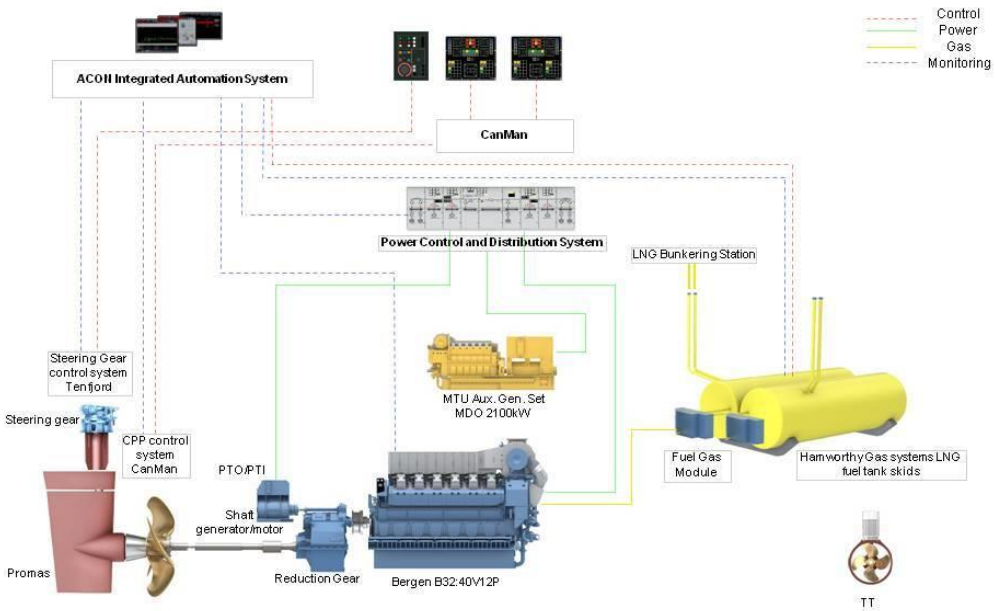
Torghatten

1 x Bergen BV12 gas Propulsion engine
1 x MTU fuel Generator engine
1 x RR HSG drive
2 x LNG tanks and Integrated LNG system
Promas system

•The gas fuel consumption is 650kg/hr at 78% load (equal to 159 g/kwHr)
•Not using diesel back up
•Some initial adjustment issues with LNG system



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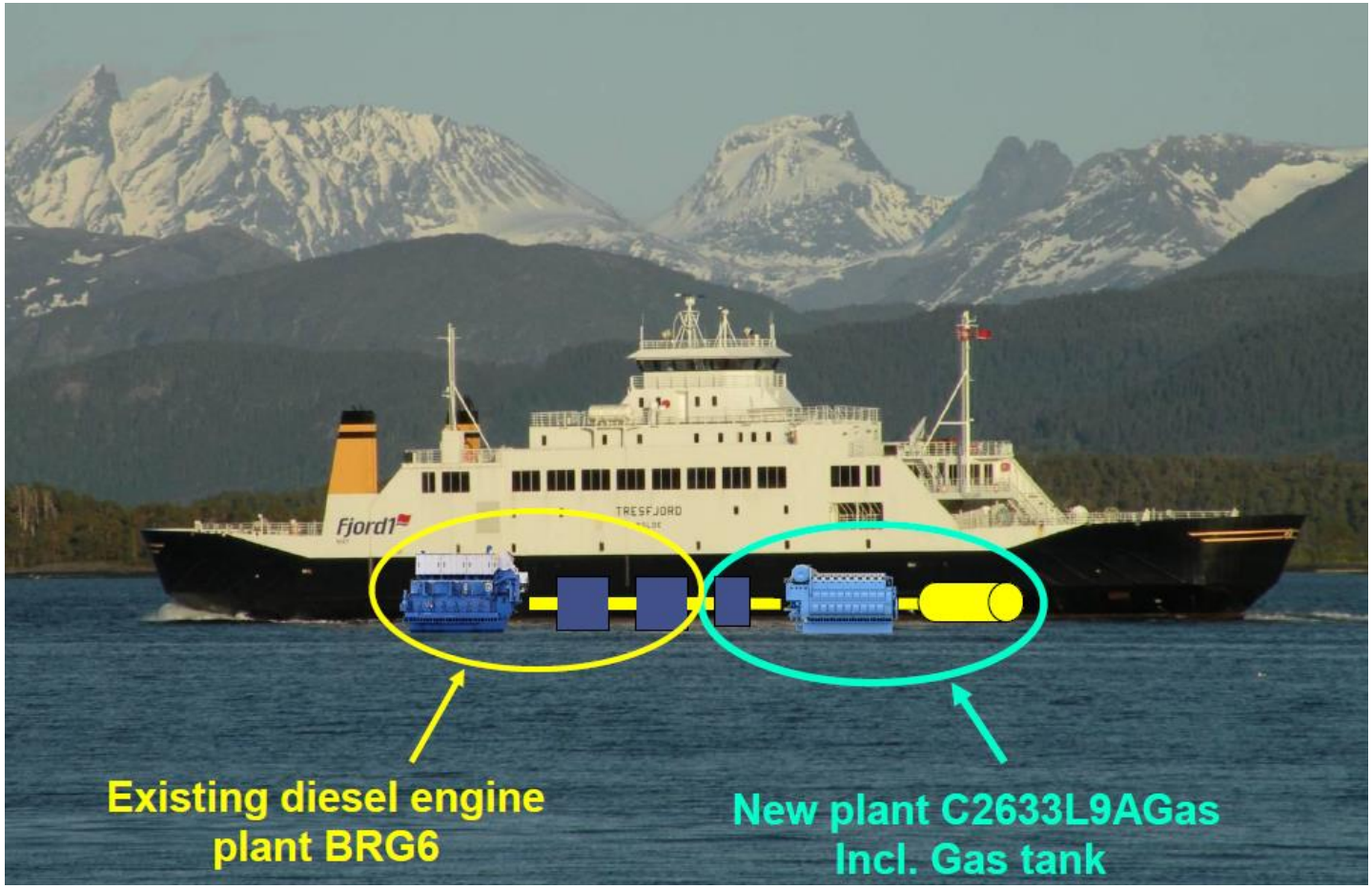
Tresfjord conversion project



Conversion of propulsion system from liquid fuel to natural gas

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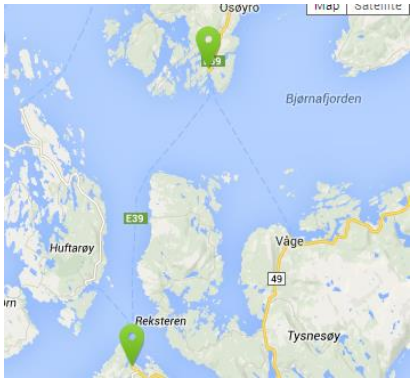
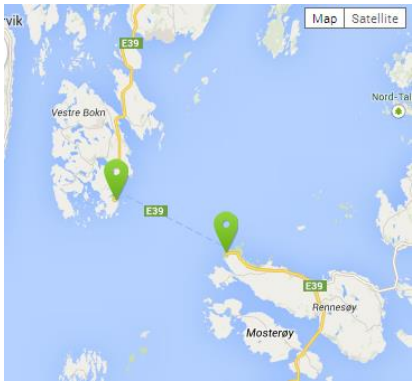
E-39 Bergen – Stavanger route

- **Operating in Bjørnafjord and Boknafjord**

- **6 ferries making 35 port calls each every day**
- **75,000 port operations per year**
- **In operation since 2007**
- **Engines have passed 40,000 running hours**
- **No downtime due to LNG over the past 6 years**





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Fjord1

Bergensfjord class
5 vessels built 2006/7
Gas/Electrical propulsion
4 Bergen K engines (discontinued)
Emergency shut down LNG principle

Fjord 1 claims 25% fuel efficiency gain!

Boknafjord
1 vessel built 2012
Gas/Electrical propulsion
3 x Bergen C6 gas Generator engines
1 x Bergen C6 fuel Generator engine
4 x RR Azipull propulsors
Inherently safe LNG design
New hydrodynamic design

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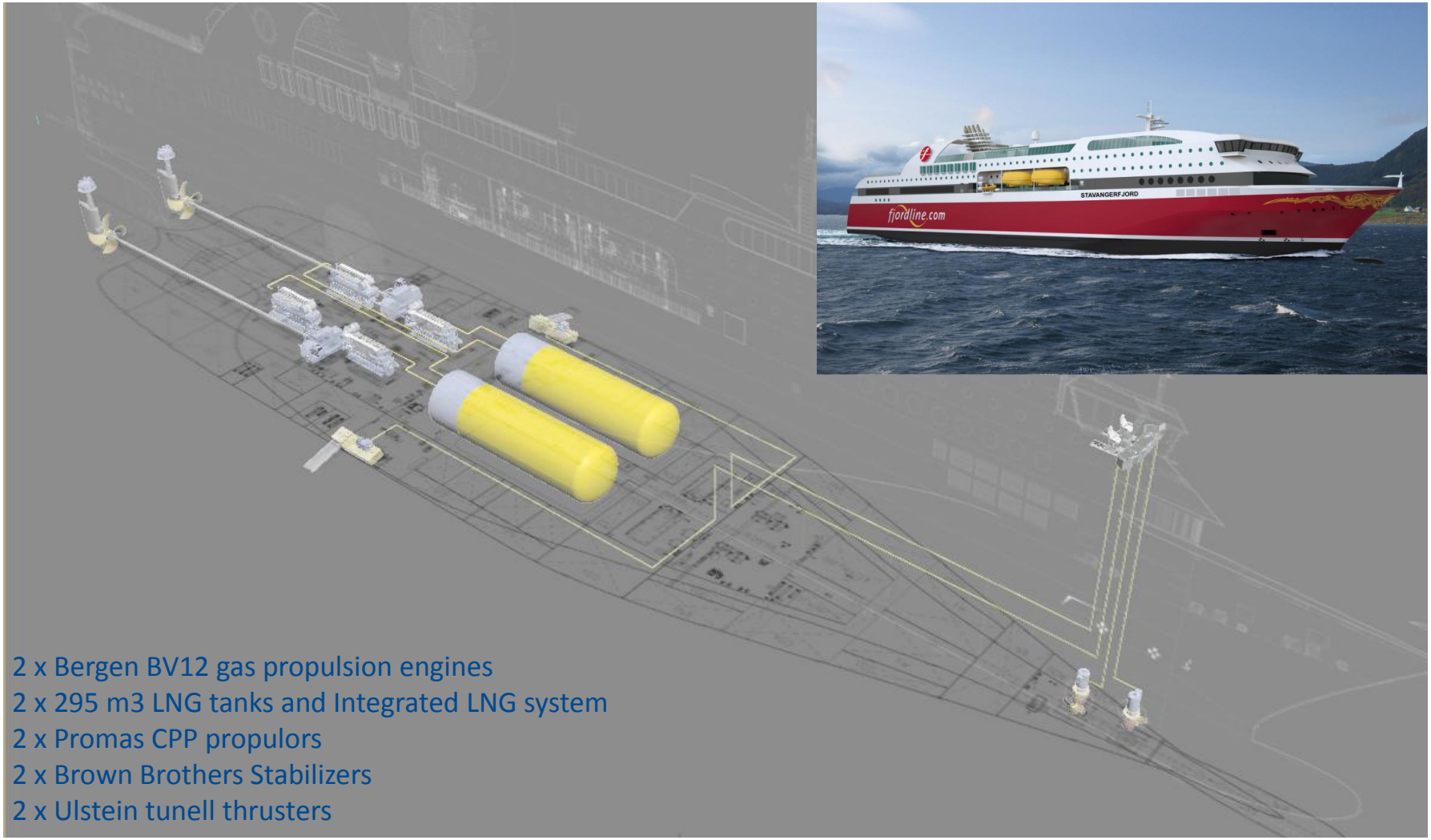
Fjordline RoPax



2 x Bergen BV12 gas propulsion engines
2 x 295 m3 LNG tanks and Integrated LNG system
2 x Promas CPP propulors
2 x Brown Brothers Stabilizers
2 x Ulstein tunell thrusters

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LNG fuelled ferries in Scandinavia - Infrastructure

a) Truck from Hammerfest, 1000 km to LNG terminals in Moskenes and Lødingen
b) Truck from Kolsnes (Bergen) 600 km
c) Truck from Kolsnes (Bergen) 500 km
d) Truck or ship from Kolsnes (Bergen)to LNG terminal at Halhjem
e) Truck from Kolsnes (Bergen) 100 km
f) Truck from Kolsnes (Bergen) 500 km
g) Truck from terminal in Nynäshamn to bunkervessel in harbour
h) LNG terminal at Risavika (Stavanger)

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LNG terminal Halhjem

LNG storage for ferries @ Halhjem

The bunkering terminal @ Halhjem
1000 m3 storage capacity

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LNG plant/terminal Risavika

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Summary

- LNG operation with ferries since 2001 (Glutra)
- No incidents or reported near incidents either onboard or during bunkering
- LNG preferred by chief engineers and operators
- Maintenance better. No lub oil change
- Teething problems present, but overcome
- Vast collective experience between operators, engine/equipment manufacturers and authorities
- Sharing of best practice in Scandinavian shipping community.

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Other LNG fuel projects

NOR SHIPPING

Next Generation Shipping Award 2011

- **Ro-Ro vessel under construction in China for Norwegian Norlines**
- **Winner of “Next Generation Shipping Award” 2011**

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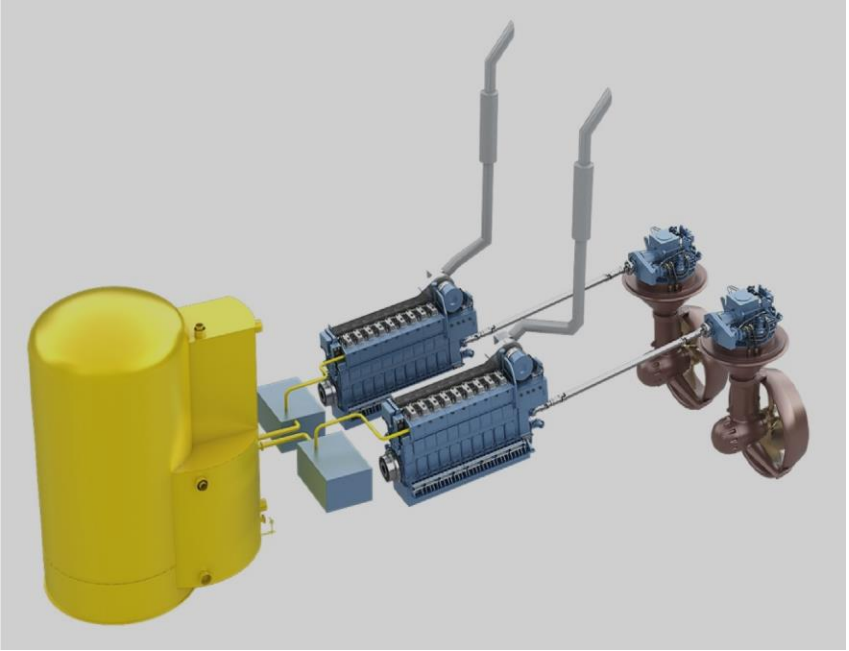


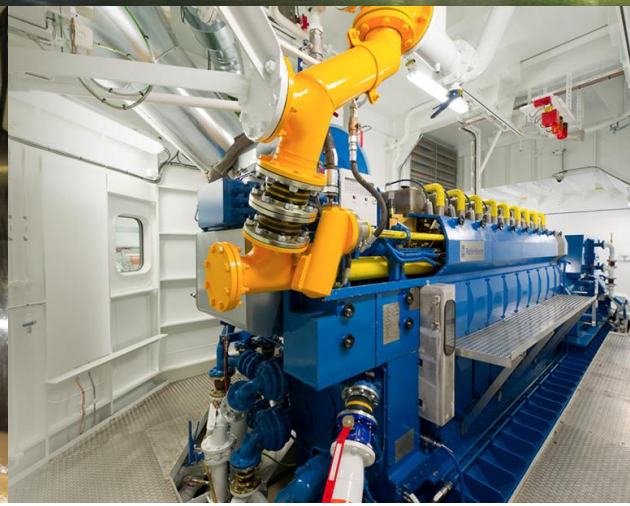
- 65t bollard pull
- Mechanical drive
- Rapid ramp up time
- No diesel
- 80cubm LNG tank
- 2 x coldbox of 100%

”Showing the brute force of LNG”

Rolls-Royce

Thank You !

- Clean Engineroom
- Clean engine (40.000 hrs)
- Clean Fjords!!



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