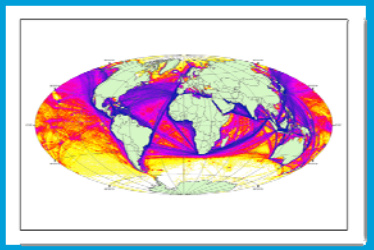
Emission reducing fuels - the way forward

Terje Sverud, Head of Section Environment Advisory

JAPAN-NORWAY MARITIME WORKING MEETING 3 JUNE 2015

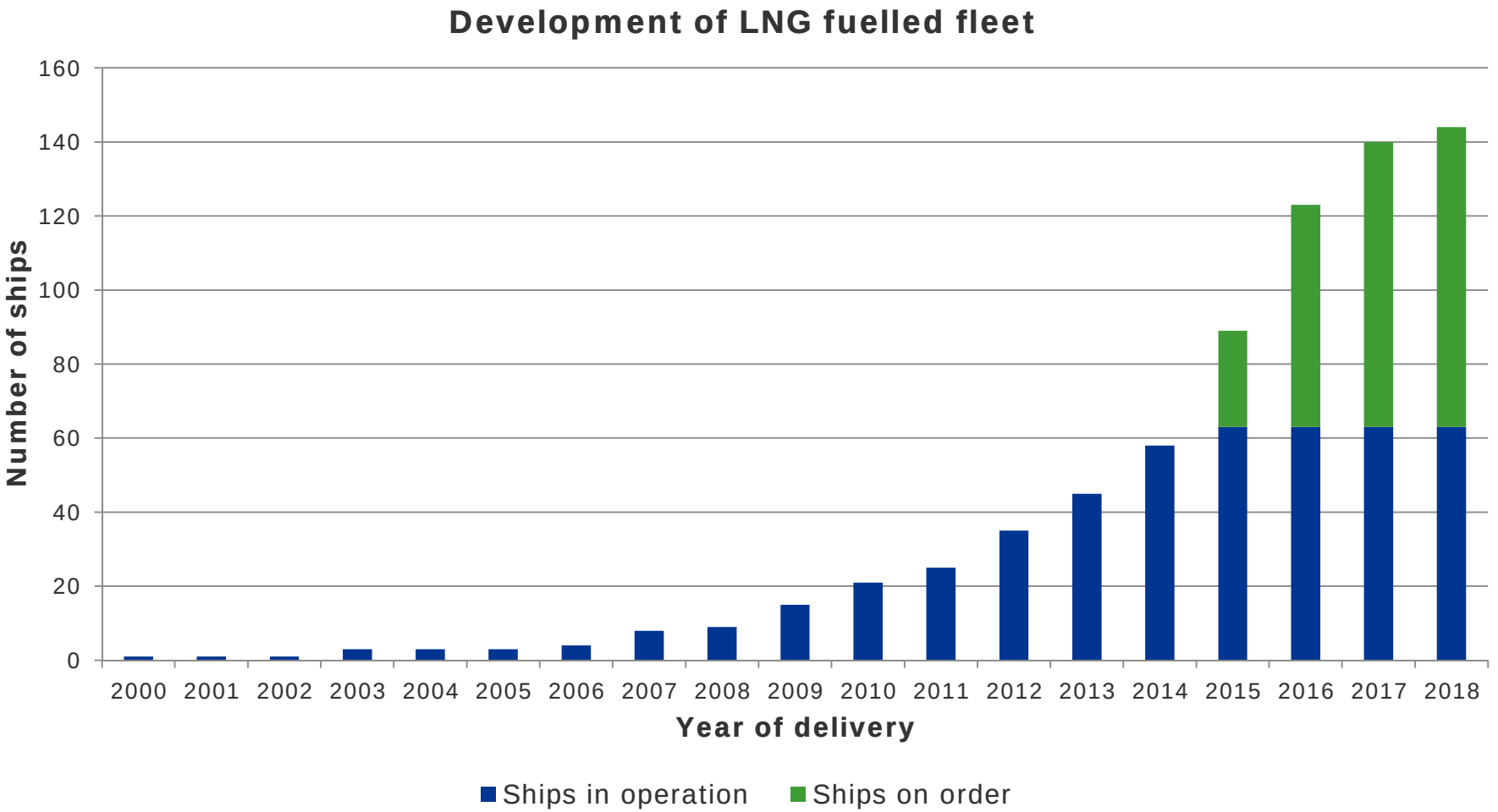
The industry is now at the start of two major “revolutions”

For the first time in 100 years, the shipping industry is now considering alternative fuels



In the span of 5 years, shipping has gone from being one of the least transparent industries to being one of the best monitored

LNG fuelled ship projects – where are we heading?



Updated 07.05.2015

Excluding LNG carriers and inland waterway vessels

Maritime battery systems – where are we heading?

- **Eidesvik: Viking Lady, hybrid supply vessel, retrofit in Norway 2013**
- Østensjø: Edda Ferd, hybrid supply vessel, built by Astilleros in Spain 2013
- Østensjø: large hybrid offshore construction vessel, built by Kleven in Norway 2016
- Fafnir Offshore: hybrid supply vessel, built by Havyard Ship Technology, Norway
- Selfa Arctic: hybrid fishing boat, built in Norway 2014
- SVITZER: 4 battery hybrid tugboats, built by ASL Marine, Singapore
- KOTUG: RT Adriaan, hybrid tugboat in Rotterdam, retrofit 2012
- Foss: Carolyn Dorothy hybrid tug of LA, built by Foss' Rainier Shipyard, USA 2009
- **Scandlines: 4 battery hybrid ferries, retrofit 2013**
- Foss: Campbell Foss hybrid tug of LA, retrofit by Foss' Rainier Shipyard, USA 2012
- NORLED: Finnøy, hybrid ferry, retrofit, Norway 2013
- NORLED: Folgefonn, hybrid/pure battery ferry in Norway 2014
- Fjord1: Fannefjord LNG, hybrid hybrid ferry, retrofit
- Scottish Government: Hybrid ferry in Scotland, built by Ferguson in Glasgow
- University of Victoria: Tsekola II, hybrid research vessel, retrofit in Canada
- **NORLED: 100 % battery ferry, new build Fjellstrand in Norway 2015**

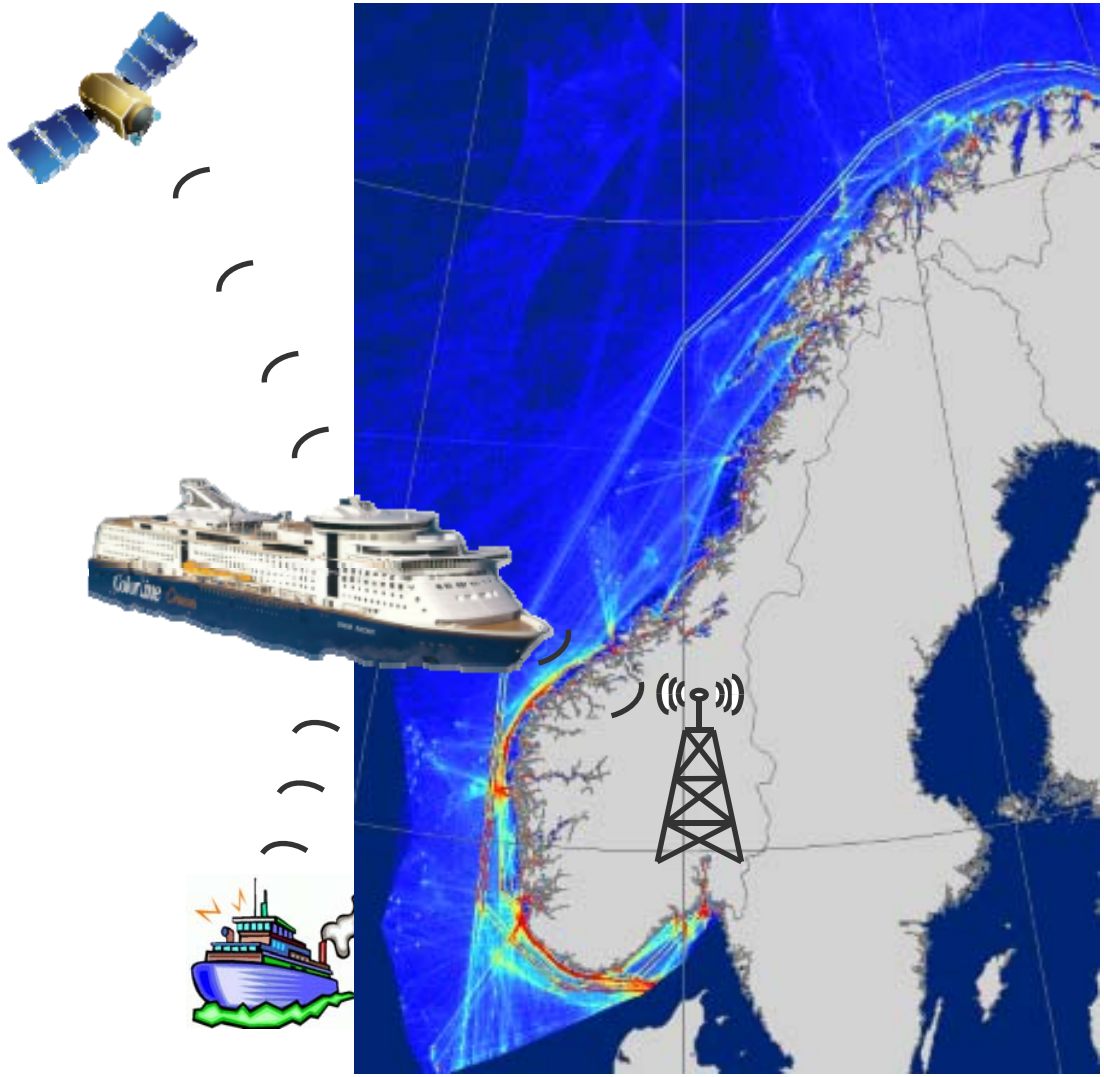
The way forward – in Norway

The Norwegian Government aims to contribute to a transition towards use of green fuels in the maritime sector

Environmentally friendly fuels, measures, and means towards 2040:

- Detailed analysis of the characteristics of maritime traffic, fuel usage, and emissions from shipping in Norwegian waters
- Analysis of the emission reduction potentials and cost-benefit of alternative fuels towards 2040, covering:
  - Biofuels
  - Electricity
  - LNG

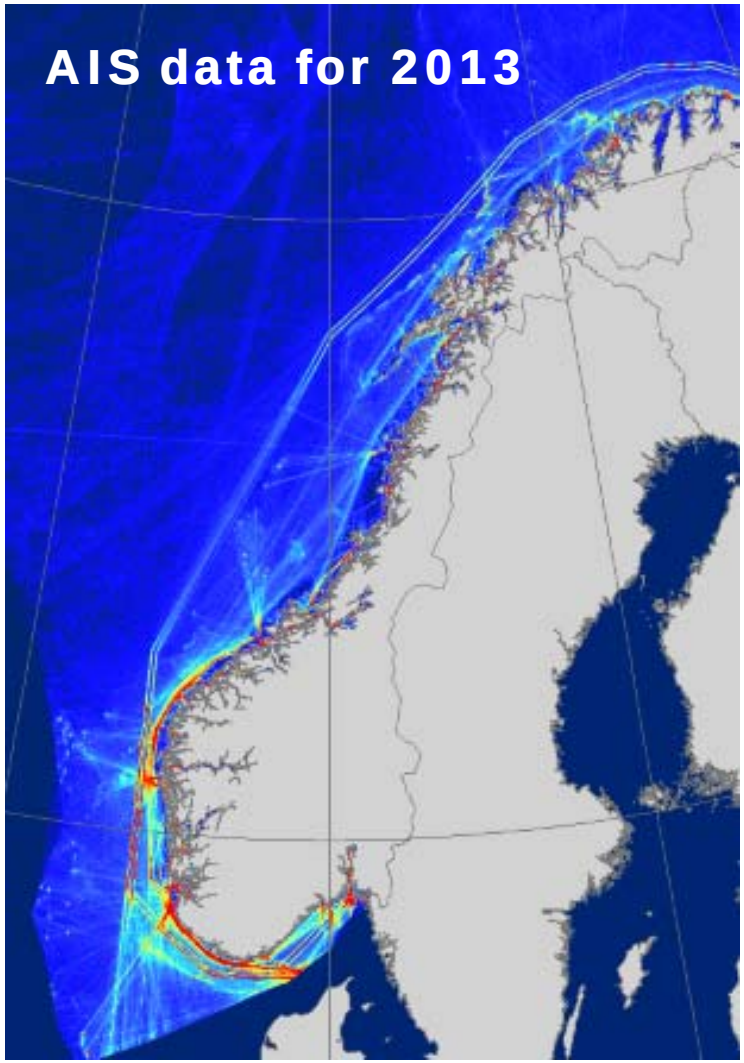
We need to know where are before we decide where to go

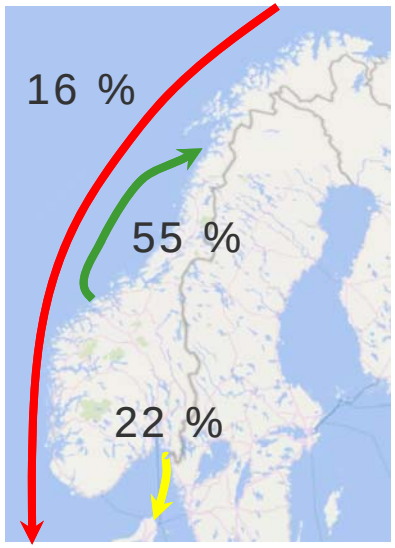


AIS data for 2013:

- Every 6th min
- 6700 different vessels
- Millions of records

Where are we today – traffic and emissions in Norwegian waters





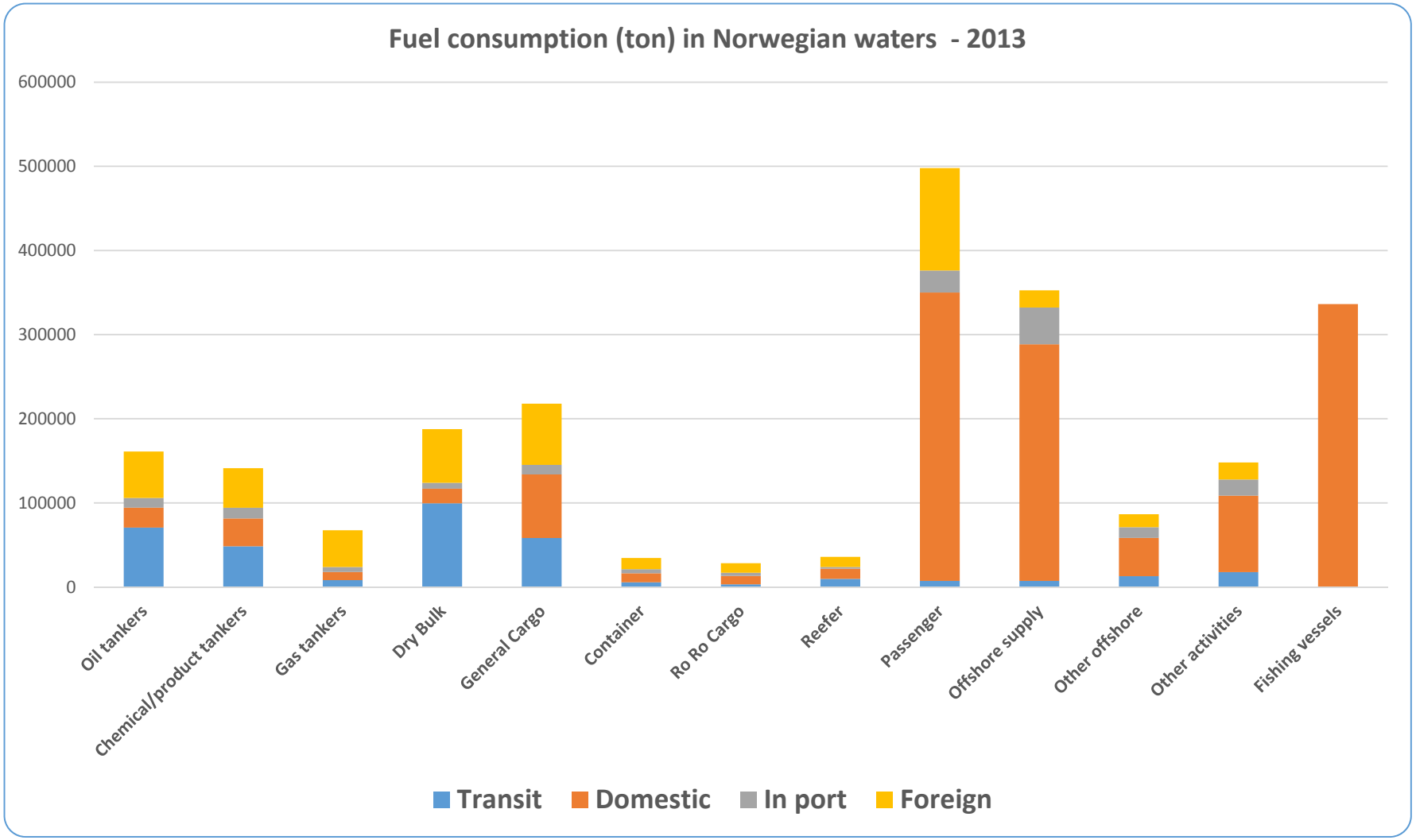
Separation of traffic types:

- Domestic traffic
- Transit traffic
- Foreign traffic

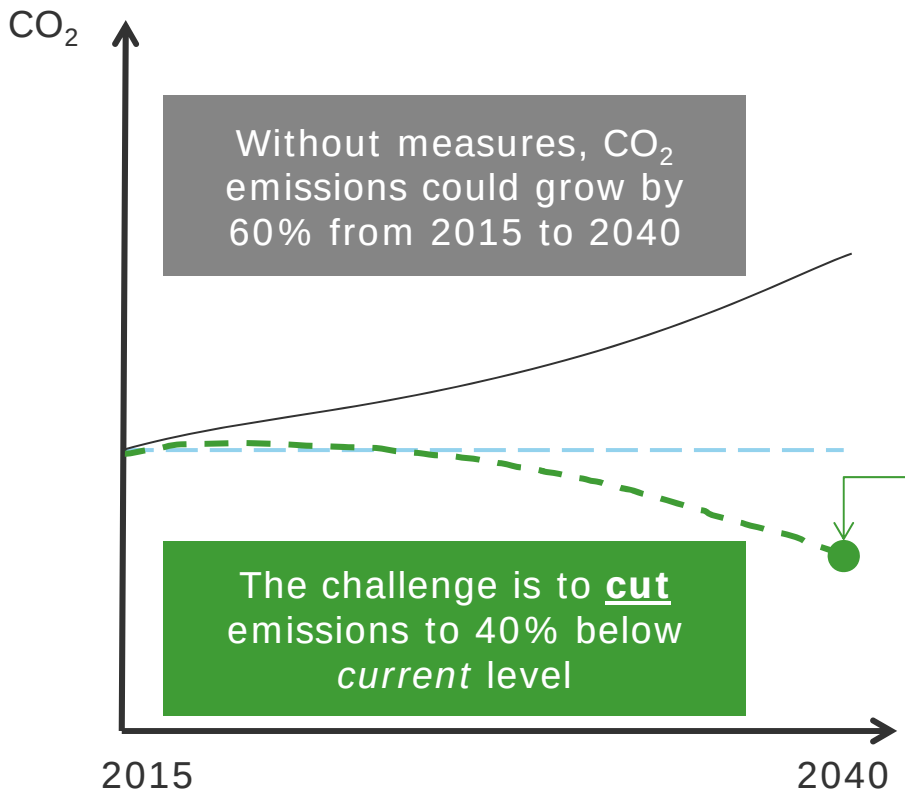
Emissions from *domestic* traffic 2013:

CO_2	4.1 mill. ton	9 % of Norw. emissions
NO_x	52 000 ton	34 % of Norw. emissions
SO_x	4 500 ton	25 % of Norw. emissions
PM	2 300 ton	

Where are we today – Fuel consumption in Norwegian waters



The way forward – Emission reduction potentials

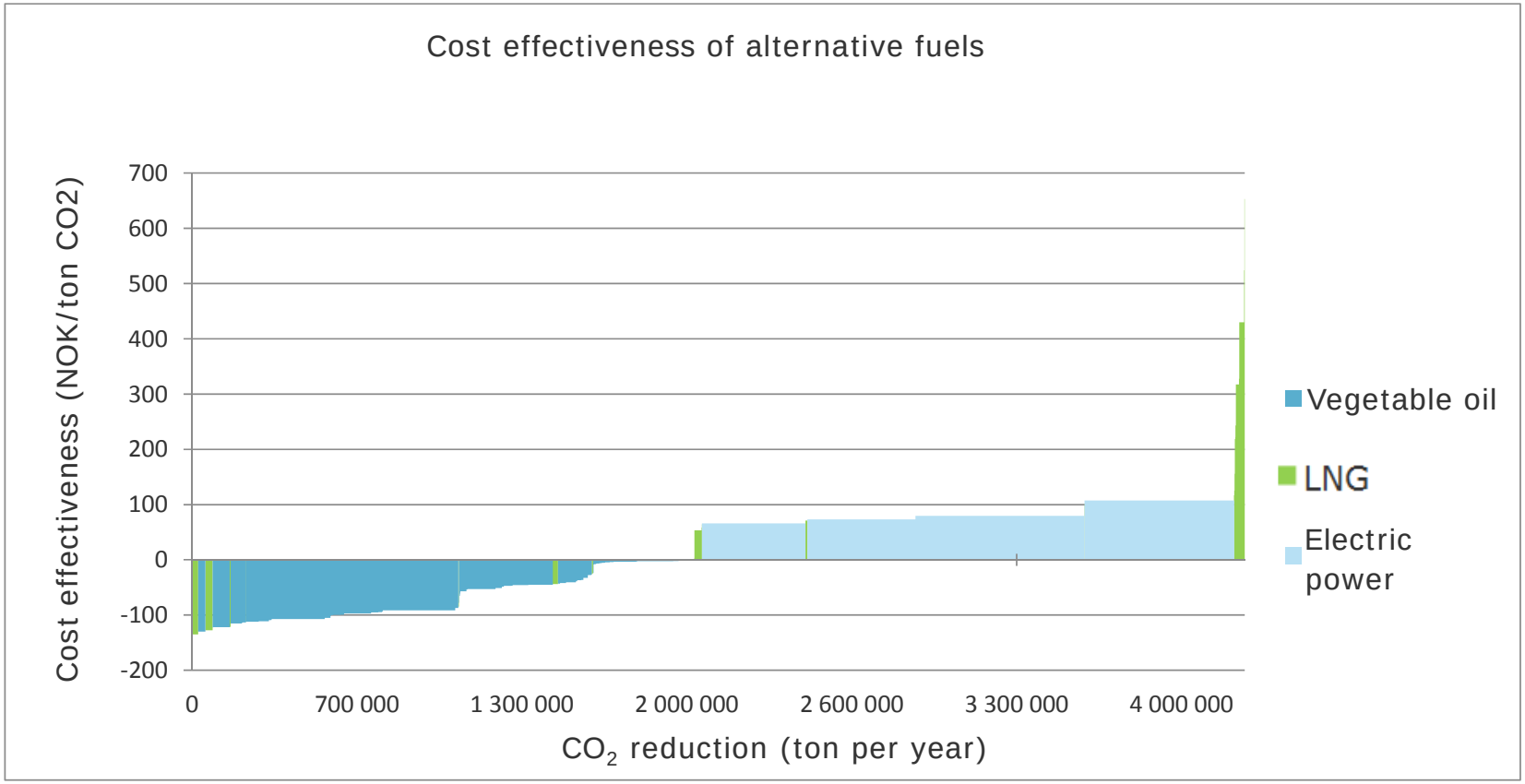


Calculations show that this can be realised by introducing green fuels on 2700 ships (1/3 of the fleet) by 2040:

- Cargo ships and fishing vessels use sustainable biofuels
- Passenger vessels use electric propulsion
- Offshore vessels use LNG

Emissions of NO_x, SO_x, and PM can also be cut through use of green fuels

The way forward – Cost effectiveness of CO_2 reduction measures



The figure illustrate findings that are valid across fuel-price scenarios:

- LNG and biofuels is cost effective in a business perspective for many ship segments
- Electric power comes at a cost, but the cost is not high
- The major contributions to CO_2 reduction comes from electric power and biofuel

Summing up

- AIS-data and better analytical methods have given new insight in fuel consumption and emissions – including the ability to separate domestic, foreign and transit traffic
- Using green fuel to reduce 2040 CO_2 emissions to levels below those of 2015 requires the use of zero-emission options such as biofuels and electricity
- Several measures will give cost-effective CO_2 reductions. The cost effectiveness will vary with fuel price for all measures
- Norway has formed a basis for further work with policy instruments to encourage the transition towards green fuels

Emission reducing fuels – the way forward

Contact:
terje.sverud@dnvgl.com

www.dnvgl.com

SAFER, SMARTER, GREENER