Nye energibærere

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MARINTEK

Tema for presentasjon

- Skipsfartens energiforbruk og miljøutfordringer
- Alternative drivstoff, LNG – bakgrunn, status, egenskaper
- Infrastruktur og teknologi
- Norsk nærskipsfart, eksempelskip

Maritim transport - drivstoff

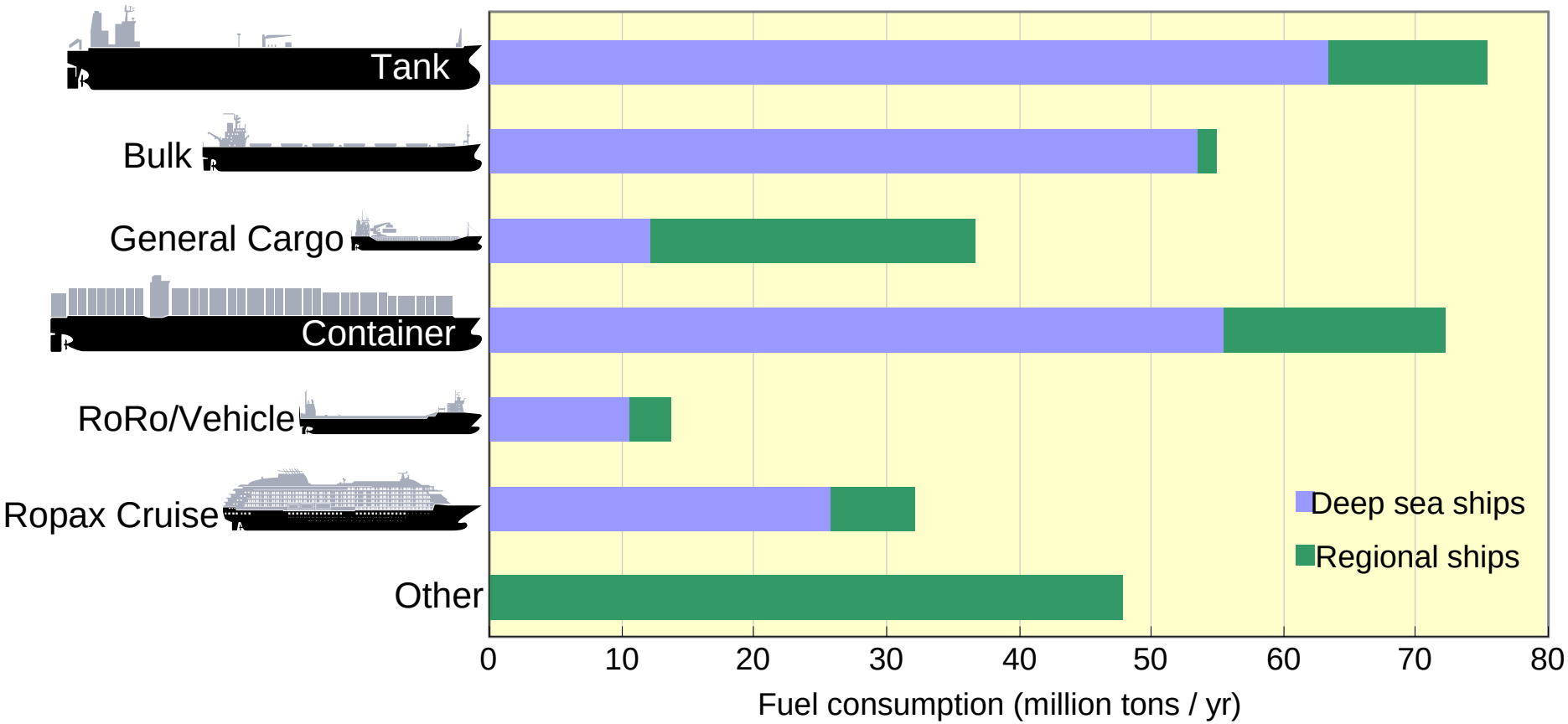
Maritime transport er i dag helt avhengig av fossil energi.

De fossile energikildene er en endelig ressurs.

Er det alternativene til fossil energi?

Hvordan ser forbruket ut i dag?

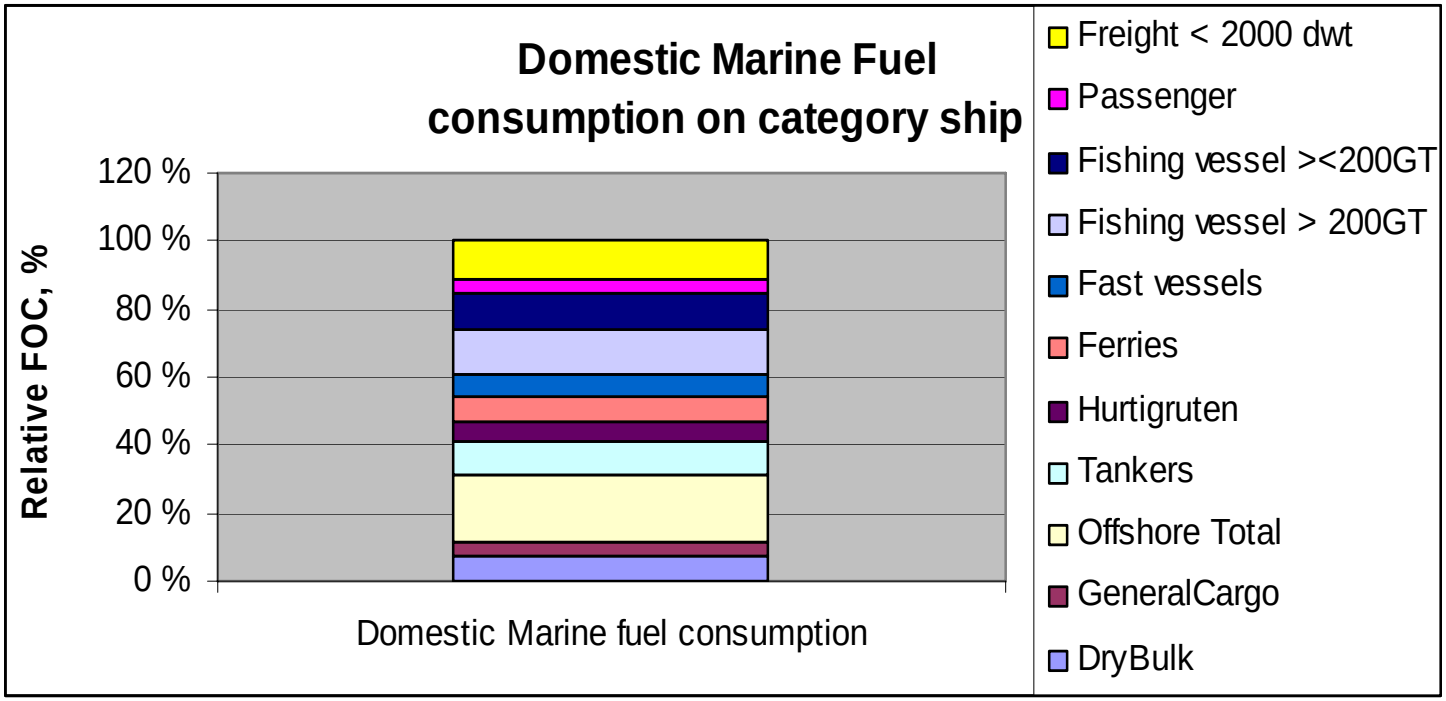
Status 2007 Fuel consumption by ship category



The total fuel consumption:	333 mill ton/year (3.3% of the world fossil fuel oil consumption)
Deep sea:	220 mill ton/year
Regional:	113 mill ton/year

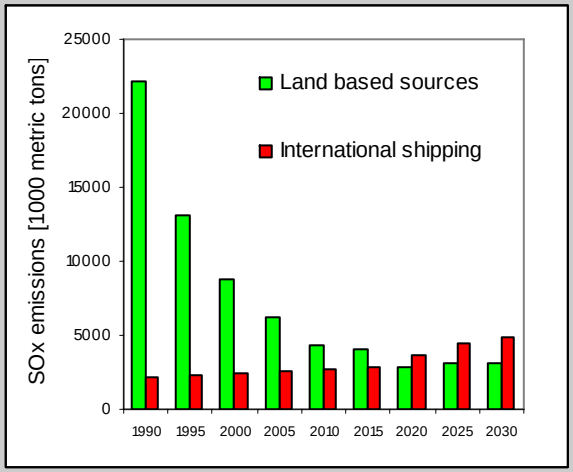
Norwegian Domestic Marine Fuel Consumption

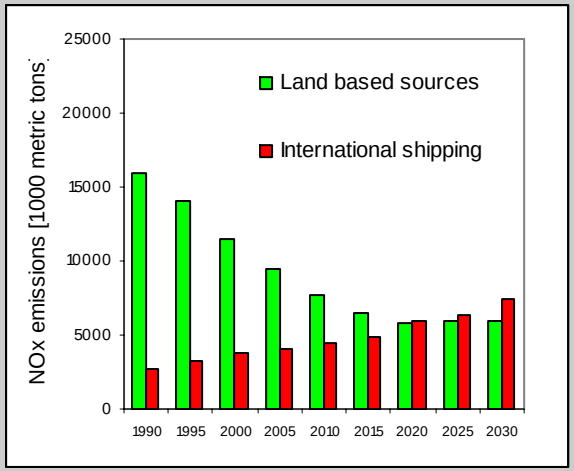
Year: 2007	Mill litre	Mill tonn
Total domestic consumption of marine fuels	1462,4	1,26



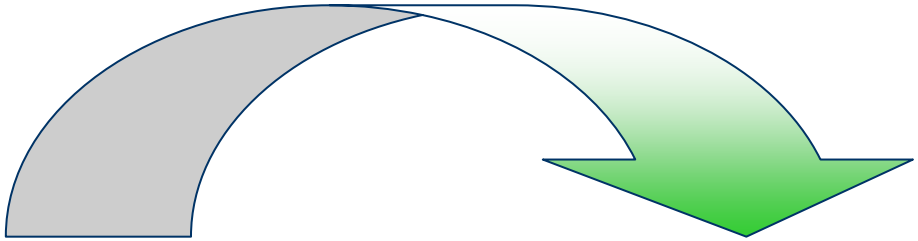
Harmful emissions

Prognoses from EC





Reduksjon i avgassutslipp fra skip

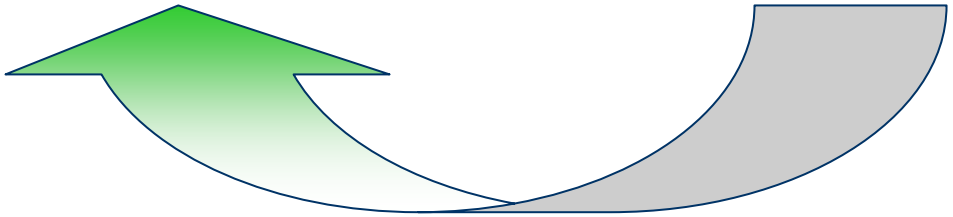


Teknologi

- Renere drivstoff
- Bedre motorer
- Avgassrensing

Regelverk / økonomiske virkemidler

- IMO
- EU / USA
- Nasjonale

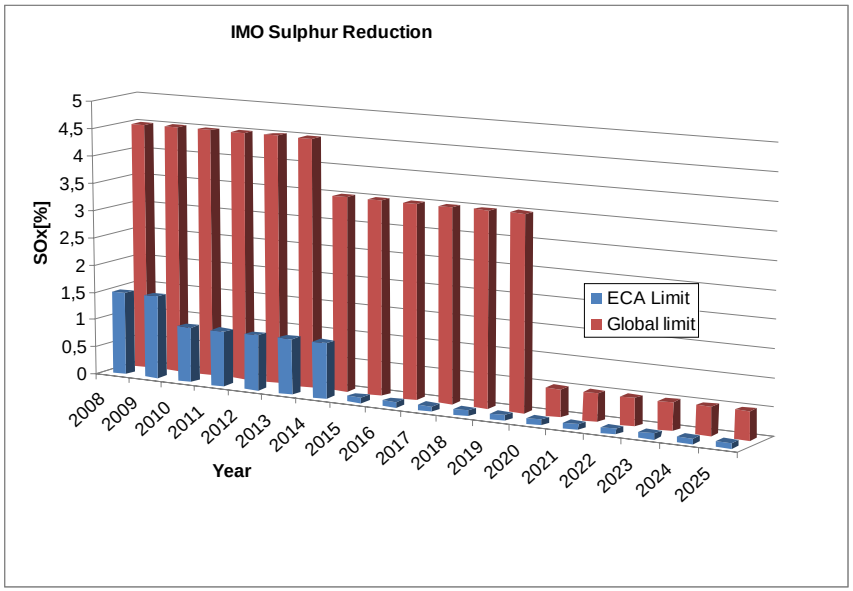


Skadelige utslipp til luft er hovedutfordringen

Nye strengere utslippsgrenser for svovel og NOx fra IMO

IMO - Future limits of harmful emissions from ships
MEPC - 57th session: 31 March – 4 April 2008

Stricter IMO limitation on SOx



Global sulphur limitations

- Global cap from 4,5% to 3,5% effective from 1. January 2012
- Global cap from 3,5% to 0,5% effective from 1. January 2020

SECA (Sulphur Emission Control Area) limitations

- New sulphur limit from 1,5% to 1,0 % effective from 1. March 2010
- New sulphur limit from 1,0% to 0,1 % effective from 1. January 2015

PM (Particulate Matters) regulated indirectly by the sulphur reduction

IMO - Future limits of harmful emissions from ships
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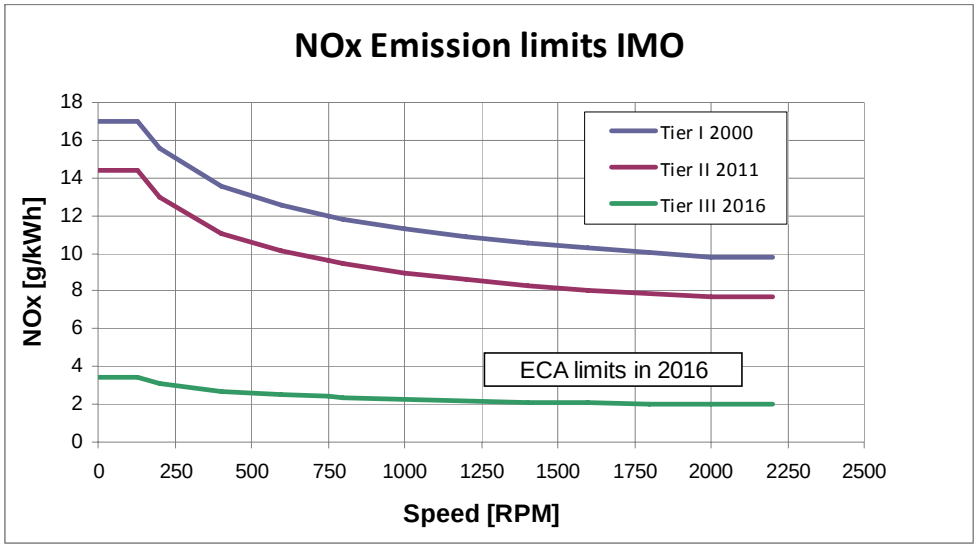
Stricter IMO limitation on NOx



Global NOx limitations

- Tier II ⇒ 20% reduction of today's limit for new ships after 1. January 2011

SECA becomes Emission Control Area (ECA) from 1. January 2016

- SOx limit of 0,1% fuel sulphur (as in SECA)
- NOx Tier III ⇒ 80% reduction from today's limit (new ships)

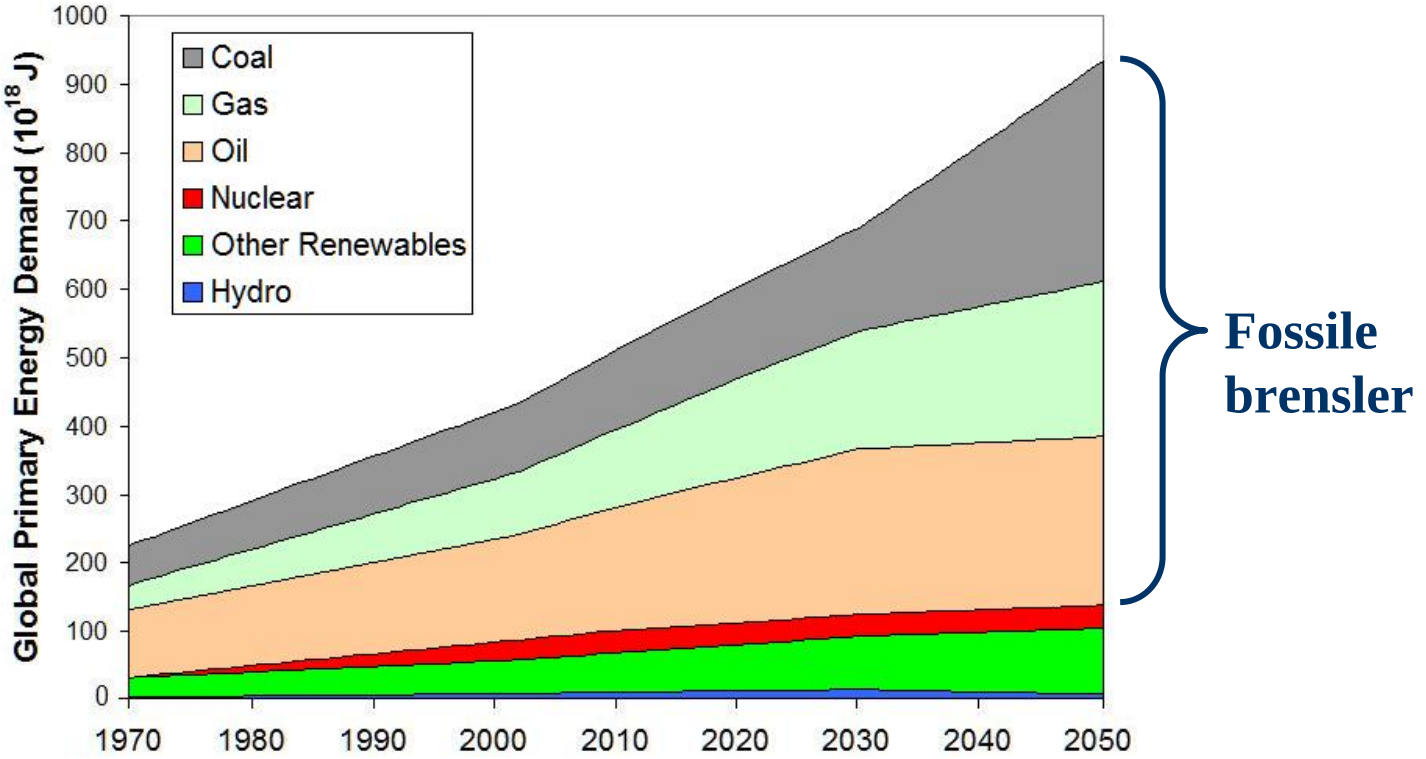
IMO - Future limits of harmful emissions from ships

MEPC - 57th session: 31 March – 4 April 2008

Possible new Emission Control Area (ECA)

- Baltic Sea
- North Sea
- West coast of USA
- Gulf of Mexico
- Tokyo Bay

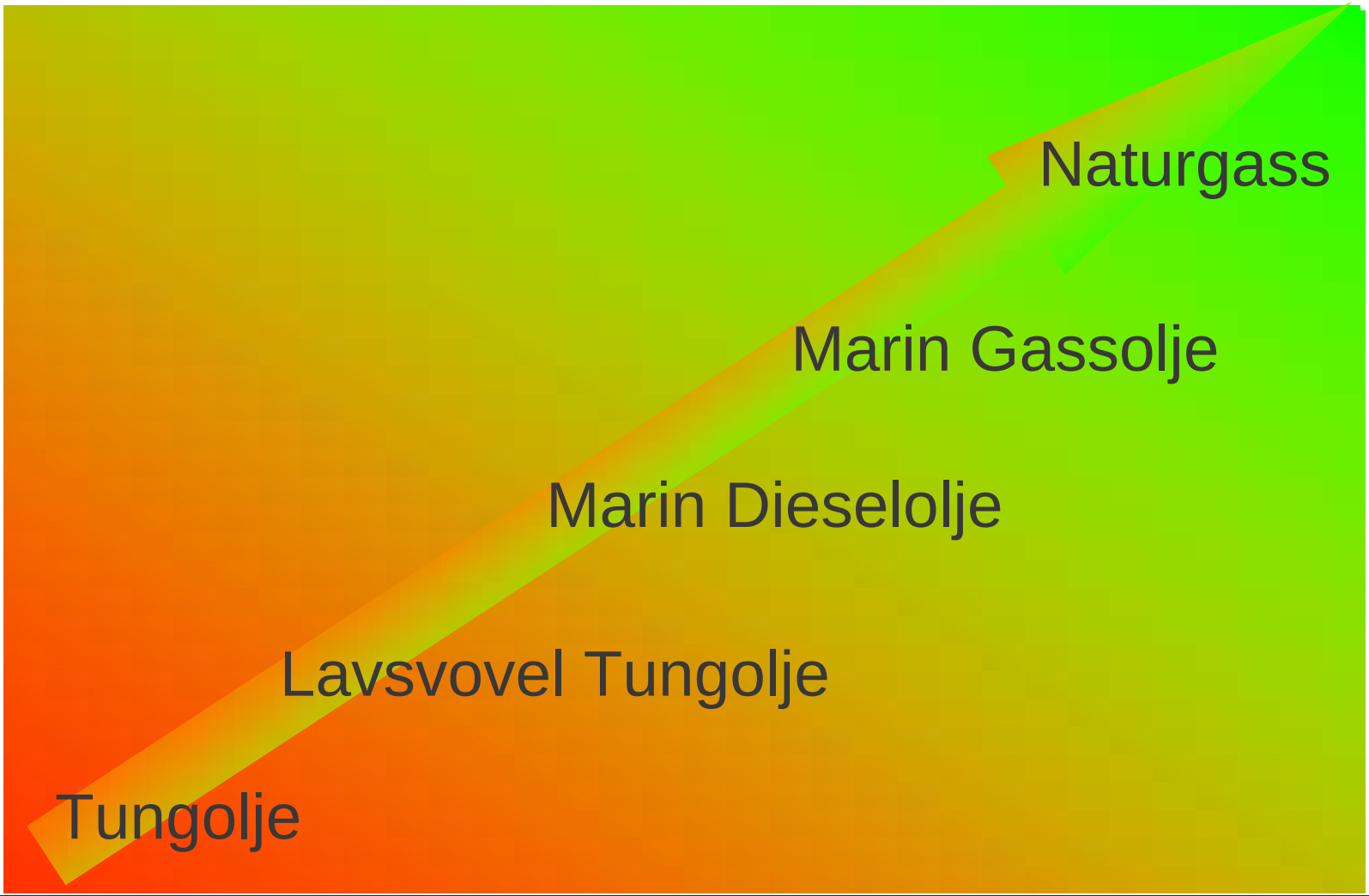
Bunkers for skip i et 50 års perspektiv?



Kilde: IEA

Vi tror energikilden til skip vil være basert på fossile kilder i lang tid, men at drivstoffet vil bli renere enn i dag

Renere drivstoff



H2

BIO

Renere drivstoff

Renere drivstoff

- Mindre svovel og nitrogen
- Mindre aske
- Mindre sot
- Mer forutsigbare egenskaper
- Mer hydrogen

Fordeler

- Mindre partikler og svoveloksider
- Mindre CO2
- Større mulighet for optimalisering av forbrenning
- Forenkler NOx tiltak som EGR, SCR, m. fl.

Er naturgass (LNG) et reelt alternativ?

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Hva er miljøgevinsten?

Hva med investeringskostnader for gasskip og prising på LNG?

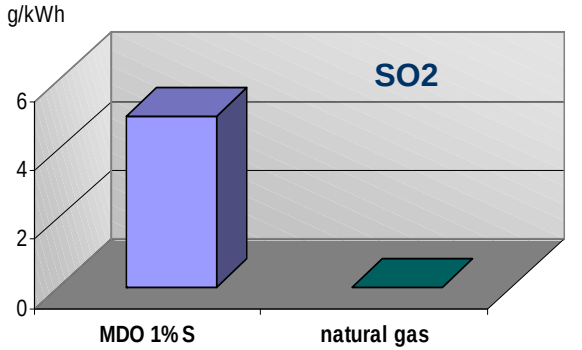
Hva med tilgjengelighet på LNG?

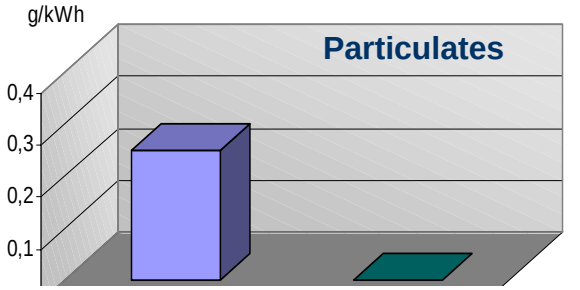
Hvilke erfaringer har vi så langt?

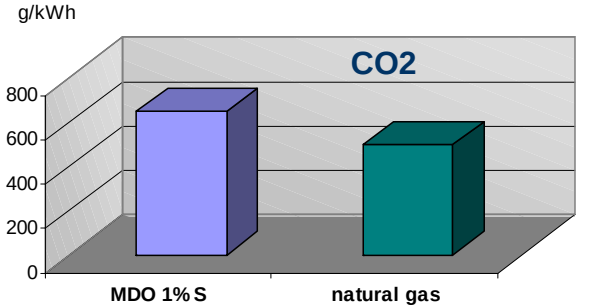
Exhaust emission - Natural gas vs MDO

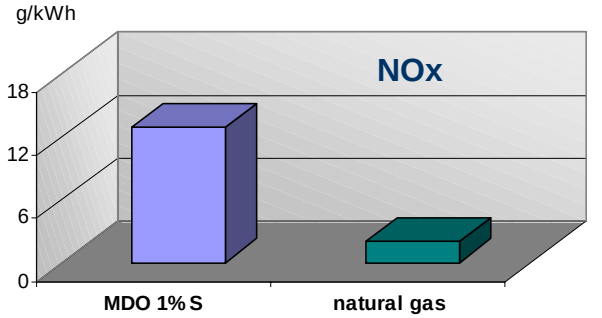
- Sulphur emission is eliminated
- Particulate matters is close to zero
- CO2 is reduced by 26%
  Due to unburned methane the net reduction of greenhouse gases are in the range of 0% -15%
- NOx is reduced by 80-90%

Source: Rolls-Royce Marine





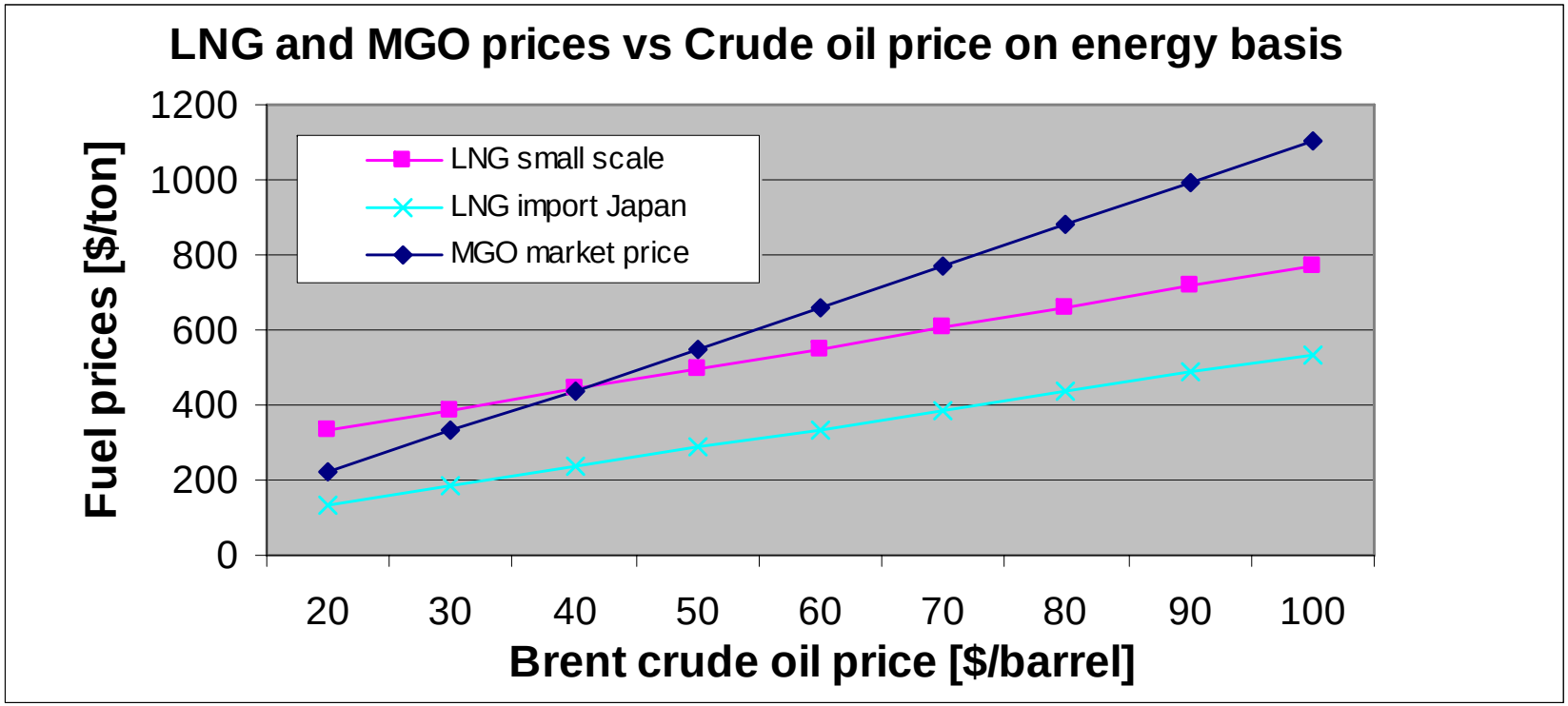




Hva med investeringskostnader for gasskip?

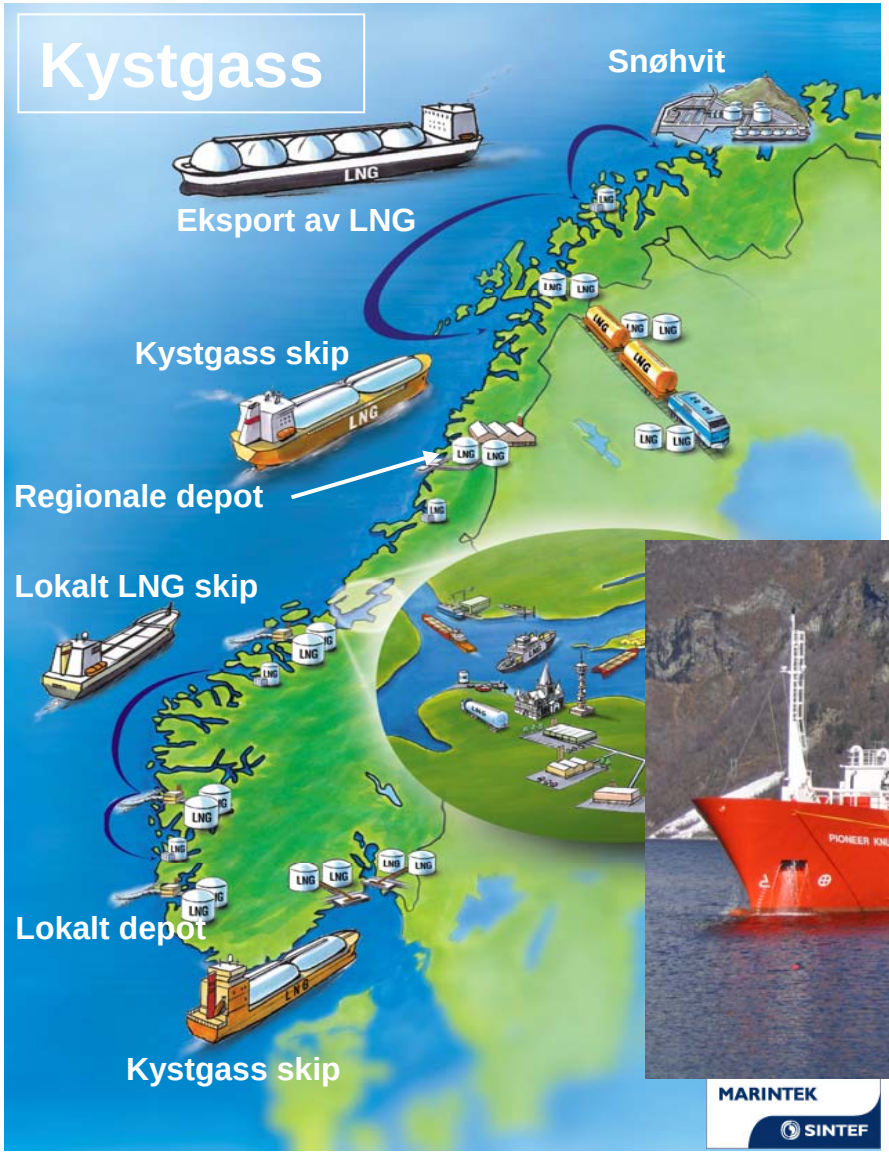
- LNG drevne skip har høyere investeringskostnader,
  - +10-15% av totale investeringskostnader
- Disse kostnadene må forsvares ved lavere driftskostnader
- Viktige faktorer for å få god økonomi
  - Gasspris
  - Avgiftsreduksjon, NOx, S,
  - Andreavgifter? CO2 avgift, Mineralolje avgift
- Finansiering, NOx fondet

Price level LNG vs Marin Gas Oil (MGO)



At high crude oil price LNG has a significant price margin to Marin Diesel Oil (MDO)

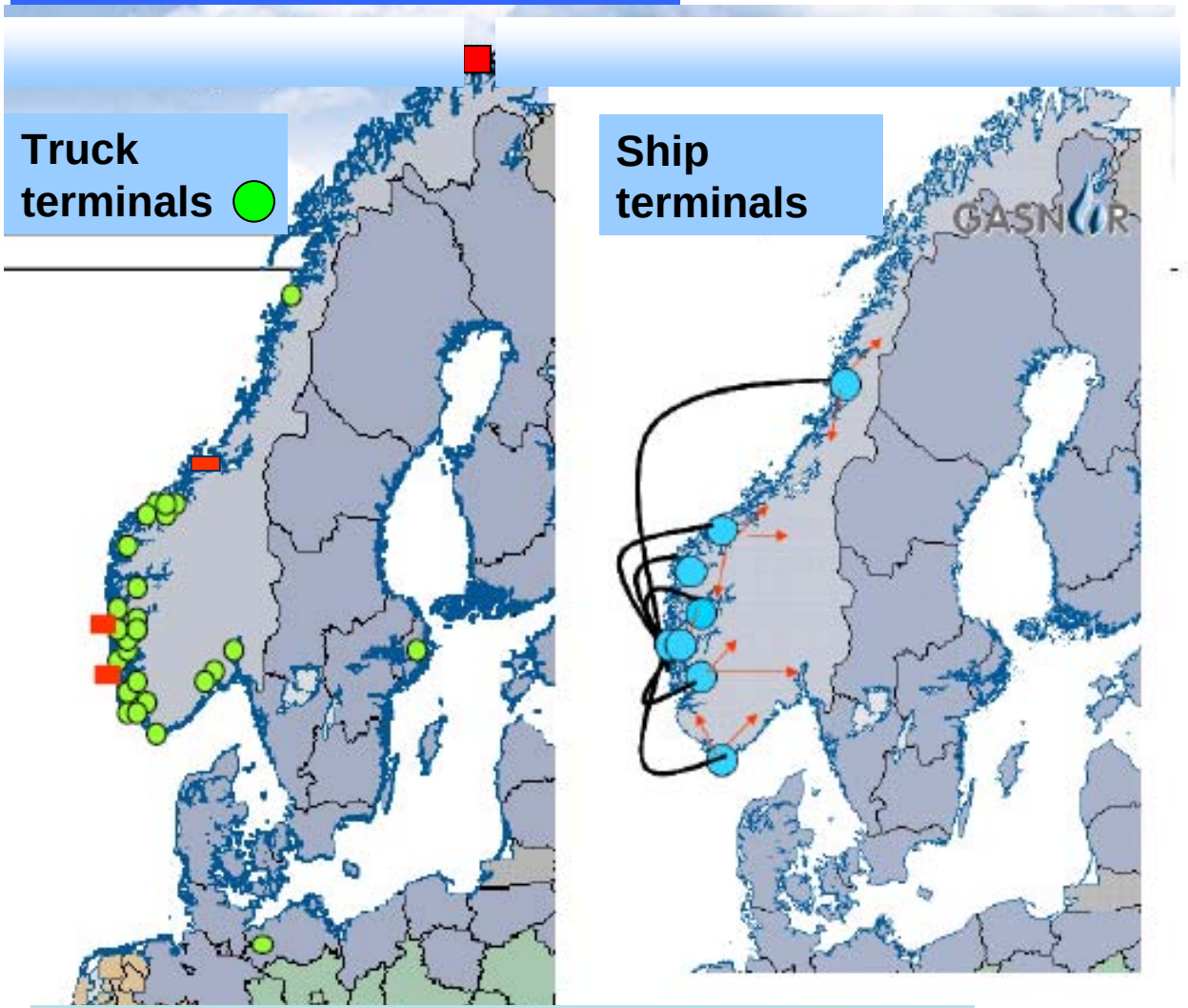
Small scale distribution of LNG



Covering the coast of Norway

- LNG source - base load LNG or receiving terminals or small scale LNG production
- LNG could be further distributed by truck or rail way or distributed by locale pipeline.

LNG distribution in Norway



Source: Gasnor

Small scale LNG production -100 ton/day

Extended production capacity – 200 ton/day (2007)


Pioner Knutsen 1000 m3 LNG carrier
Loading at the LNG plant
KNUTSEN OAS
NATURGASSVEST
LNG truck loading

LNG truck –Vacuum isolated (56m3)

Receiving terminal 1500 m3

Gasnor New LNG vessel 1. quarter of 2009

LNG bunkering station at ferry berth

Capasity: 2x 500m^3 LNG

LNG transferred by pump

Filling time for the large LNG ferries about two hours

Refuelled every third night

Natural gas as fuel for ships - experience

The first LNG ferry Glutra 2000

Two Supply Vessels 2003

Two new supply vessels on order

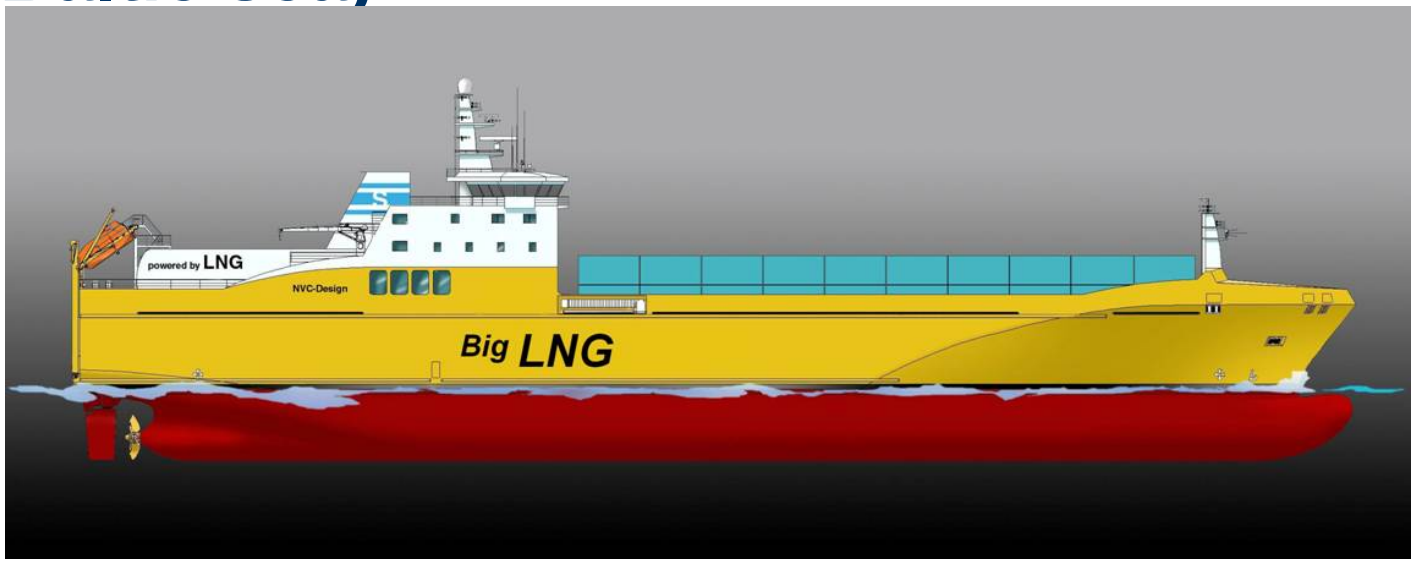
Series of five LNG car ferries 2007

Seven new ferries will be ordered

Three navy vessels on order

R&D program – LNG fuelled ships

Example RoRo Freight ship (fixed route in Baltic sea)



Main challenges:

- Location of LNG storage tanks
- High cost level

Cost level (estimate)

- Building cost Heavy fuel operation: about 25 mill €
- Additional cost for LNG propulsion (gas only): about 2 mill € (+8%)

LNG powered RoRo freight ship (gas only)

Gassdrift (LNG) er et reelt miljøvennlig alternativ

Men naturgass er en fossil energikilde

BIP prosjektet ”Nyfrakt”

En nasjonal dugnad innen maritim næring.

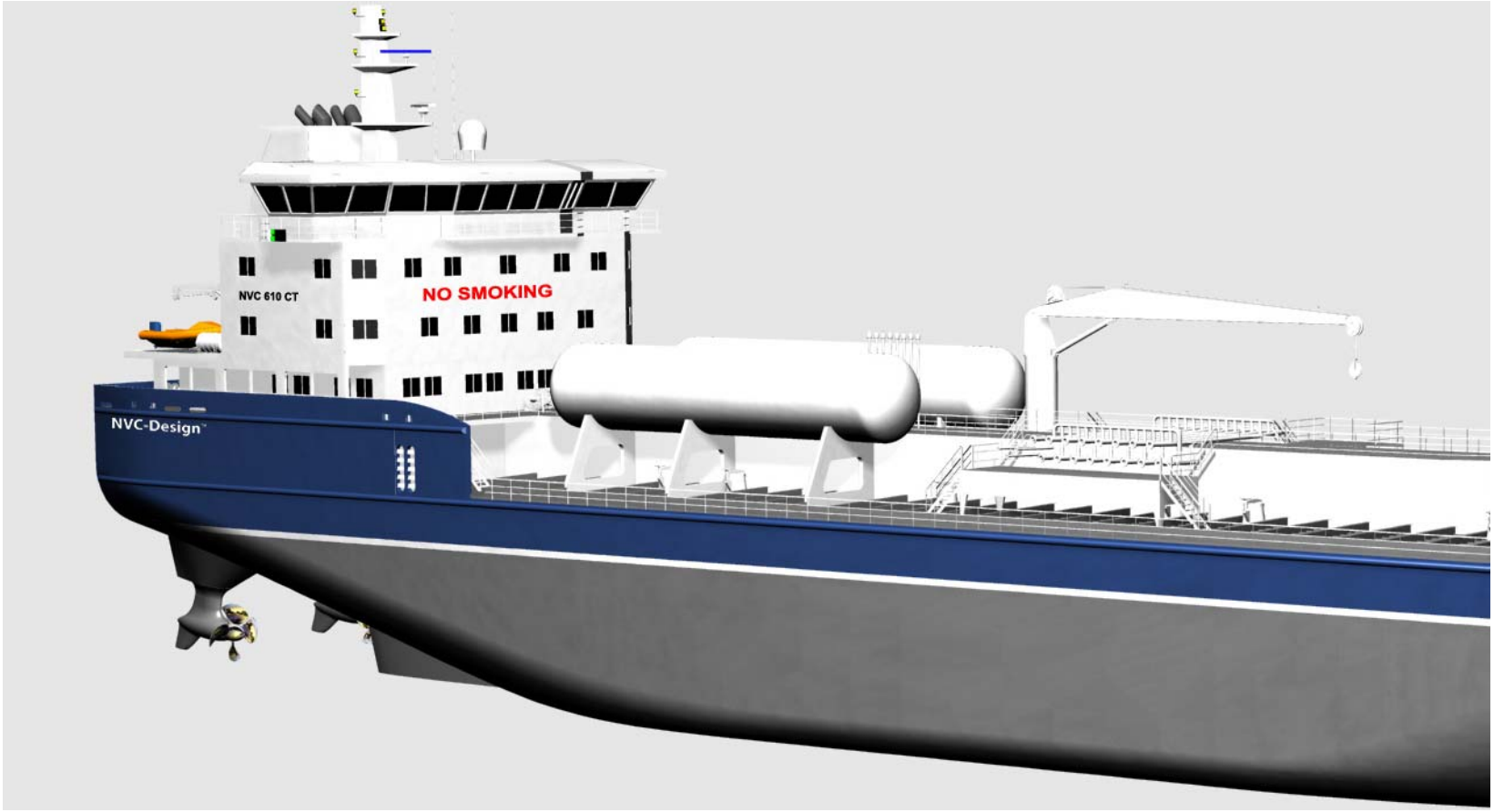
Skape en ny generasjon kystflåte.

- Kosteffektiv
- Miljøvennlig
- Sikker
- Pålitelig

Last fra land til sjø!

Sterk fokus på alternative drivstoff

LNG Fuelled Projects



Ja!

LNG er et reelt alternativ

Takk for oppmerksomheten

www.marintek.sintef.no