WELKOM

PLATFORM SCHONE SCHEEPVAART

Ministerie van Infrastructuur
en Waterstaat

Klimaatmaatregelen Zeevaart EU

Platform Schone Scheepvaart
Energietransitie in de zeevaart
22 november 2022

Inhoud

- Achtergrond: EU Green Deal – Fit For 55%
  - EU Klimaatwet; maatregelen die de zeevaart raken: ETS, FuelEU Maritime, RED, ETD, AFIR
    (*FuelEU Maritime, RED en AFIR in presentatie Bas Kelderman*)
- Centrale rol EU Emissiehandelssysteem (EU-ETS)
- Focus op ETS-zeevaart
  - Voorstel Commissie
  - Positie Raad
  - Wensen EP – Triloog
- Energy Taxation Directive

- *Vragen / discussie?*

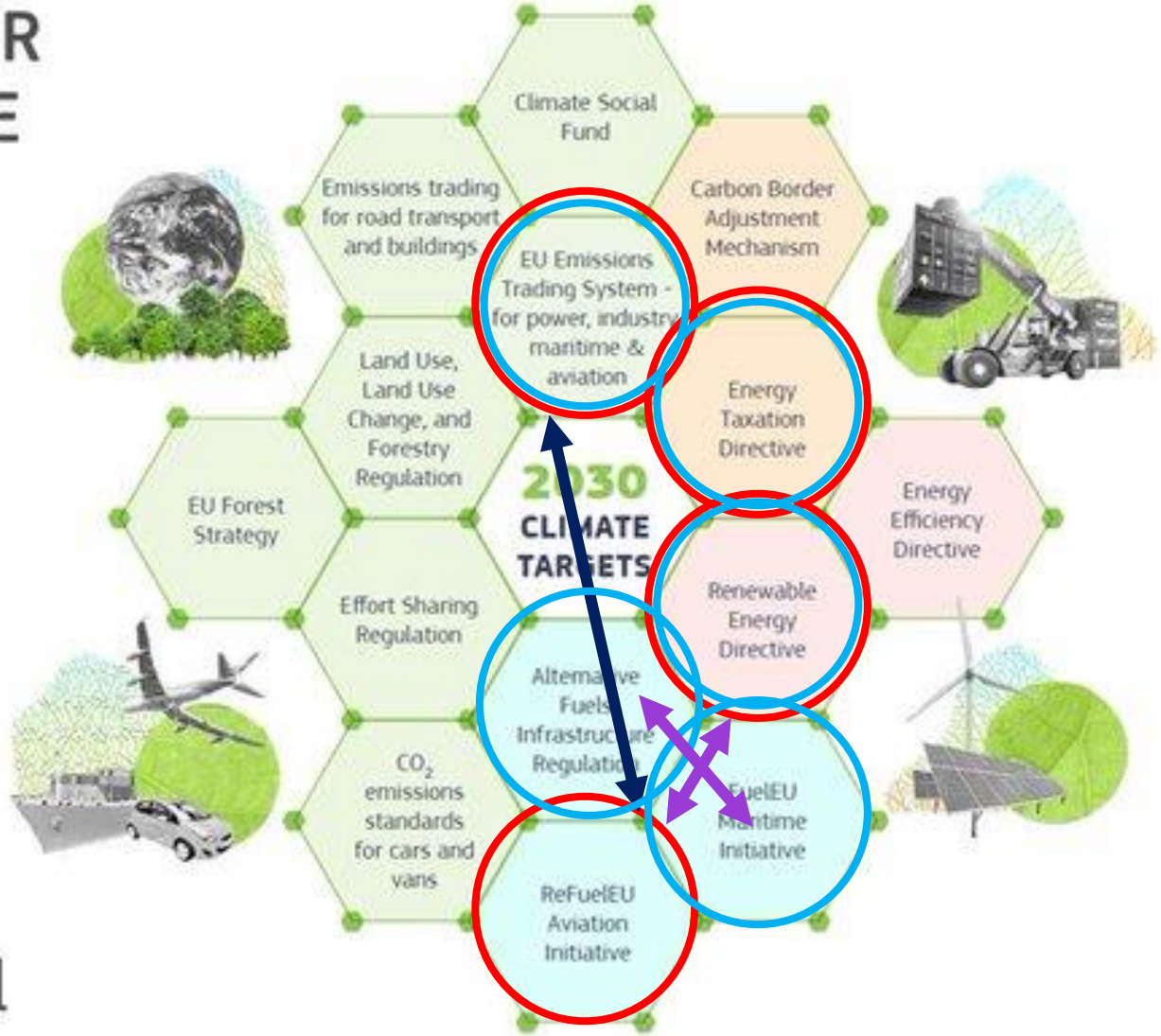
EU Green Deal - Fit For 55 (1)

- EGD - Klimaatwet - beleidsmaatregelen
  - EU moet voldoen aan Klimaatakkoord Parijs
  - Daarom wettelijke verplichting emissiereductie van 55% in 2030 (tov 1990)
  - Doel: klimaatneutraal in 2050
  - Combinatie duurzame economische groei en sociale cohesie

- Fit For 55% - Economie breed pakket aan voorgestelde maatregelen
  - Gericht op alle sectoren, inclusief transport en zeevaart
  - Om de 55% reductie doelstelling in 2030 te realiseren
  - Centrale rol voor Emissiehandel

EUROPEAN GREEN DEAL

REACHING OUR 2030 CLIMATE TARGETS



#EUGreenDeal

European Commission

EU Green Deal - Fit For 55 (2)

- Fit For 55% - Maatregelen die de zeevaart raken

  - **EU-ETS**; uitbreiding naar de zeevaart
  - **FuelEU Maritime**; standaard voor koolstofintensiteit mariene brandstoffen
  - **Renewable Energy Directive**; doelen voor het aandeel van hernieuwbare energie in de aangeboden brandstoffen
  - ***Energy Taxation Directive***; differentiatie in de belastingen op fossiele en hernieuwbare brandstoffen
  - ***Alternative Fuel Infrastructure Regulation***; uitrollen van de voor hernieuwbare brandstoffen benodigde infrastructuur

EU Emissiehandelssysteem (ETS)

Voornaamste karakteristieken:

- Iedere ton CO_2 moet betaald worden
  - Stimuleert reductie van emissies/ verduurzaming
- Jaarlijkse dalende ‘Cap’ op emissies
  - Garandeert realisatie doelstelling (61% reductie per 2030 tov 1990)
- EU-ETS reguleert grofweg de helft van de totale EU-emissies
- Kosteneffectief: reductie start daar waar het goedkoopste
- Levert revenuen
  - Versnellen emissie reductie en innovatie (Innovatie Fonds)
    - Ook de scheepvaart komt in aanmerking
  - Betalen sociale kosten (Social Climate Fund & Modernisation Fund)

EU-ETS – Voorstel uitbreiding naar de zeevaart (1)

- Zeevaart onderdeel bestaande ETS (geen maritieme pilaar)
- Scope
  - 100% emissies intra-EU reizen + havens & 50% emissies extra-EU reizen
  - Schepen boven 5000 Gross Tonnage die vracht en passagiers vervoeren
  - Emissies: CO_2
- Gefaseerde invoering vanaf 2024
  - Bij start 20% vd emissies betalen over 2024, 45% over 2025, 70% over 2026, 100% vanaf 2027
- Verantwoordelijke entiteit: ‘Shipping company’ (ISM-houder)
  - Jaarlijkse betaling over emissies voorgaande jaar

EU-ETS – Voorstel uitbreiding naar de zeevaart (2)

- Monitoring, Rapportage en Verificatie van emissies (MRV-Verordening)
  - Zowel per individueel schip als op company niveau
  - Emissies over reizen binnen en van en naar de EU, plus binnen havens
    - Definitie port of call: waar passagiers en/of vracht van/aan boord gaan
- Uitvoering, toezicht en handhaving door de “Administering Authority”
  - Voor ETS in NL de Nederlandse Emissieautoriteit (NEa)
  - Handhaving door de Inspectie Leefomgeving en Transport (ILT)
- Review bepalingen
  - Bezien functioneren ETS-zeevaart
  - Bezien consequenties van IMO-maatregelen

ETS-zeevaart – Algemeen Akkoord Raad (1)

"Algemeen Akkoord" Milieuraad 28 Juni - enkele aanpassingen aan voorstel:

- Monitoren andere broeikasgassen (CH_4 and N_2O)
- Monitoren ook door *general cargo* schepen boven 400 GT
- Uitzonderingen (tot eind 2030)
  - Ferries naar en tussen kleine eilanden en Public Service Obligations
  - Outer most regions
  - IJsklasse IA en IA Super
- Ontwijken tegengaan
  - Transshipment havens binnen 300 nautische mijlen vd EU uitsluiten van definitie 'port of call'
- Tijdelijk extra revenuen voor GRIE, CYP, MAL

ETS-zeevaart – Algemeen Akkoord (2)

Review bepalingen

- Uitbreiding van de scope?
  - Van 5000 naar 400 Gross Tonnage?
  - Andere broeikasgassen (CH_4 and N_2O)?
  - Van “Tank to Wake”naar “Well to Wake” emissies?
  - Andere scheepstypes?

- Andere items:
  - Co-existentie met mondiale maatregelen (IMO Market Based Measure)
  - Functioneren van ETS-zeevaart; bijv risico koolstof lekkage, ontwijking

ETS-zeevaart – Triloog met EP (1)

- Er wordt in “*triloog*” onderhandeld tussen EP, Raad en Commissie
- Wensen EP:
  - Snelle start – 100% rechten vanaf 2024
  - 100% over extra-EU emissies (ipv 50%), tenzij goede internationale afspraken
  - Uitbreiding scope naar 400GT en Off Shore
  - Uitbreiding scope naar andere broeikasgassen
  - Ocean Fund
  - Risico transshipment tegengaan

ETS-zeevaart – Triloog met EP (2)

Mogelijk compromis Raad – EP – Commissie

- Invoering in 3 stappen vanaf 2024: 45%, 70%, 100%
- Andere broeikasgassen per direct in MRV, per 2027 in ETS
- Off shore schepen boven 5000GT per direct in MRV, per 2027 in ETS?
- Bezien andere vrachtschepen boven 400 GT in MRV
  - Besluit over ETS na review
- Uitzonderingen ongeveer gelijk
- Idem risico transshipment tegengaan

ETS-zeevaart – Vervolg

Politiek akkoord eind dit jaar

Start opstellen gedelegeerde en uitvoeringshandelingen

- Advisering en besluitvorming via Climate Change Committee – Maritime Group
- Betreft uitwerking details in de regelgeving

Verwachting vooralsnog:

- start MRV-verplichtingen ETS-zeevaart per 1 januari 2024
- Inleveren ETS-rechten 1^{e} keer in 2025

Bezien hoe stakeholders informeren

- Verwacht actieve rol NEa

Energy Taxation Directive

- Per 2023:
  - Verhogen minimum belasting op – fossiele - brandstoffen
  - Differentiatie belasting afhankelijk van externe kosten brandstoffen
  - Uitbreiden scope naar scheepvaart (en luchtvaart)

  - Wegtransport: kan positieve impact hebben, gelijker speelveld in EU (tarieven NL nu hoger)
  - Luchtvaart en scheepvaart: vraagtekens over effectiviteit (vooral door risico ontwijking)

  - Kans van slagen beperkt, want besluitvorming met unanimiteit

EU Klimaatmaatregelen Zeevaart

VRAGEN?

Ministerie van Infrastructuur
en Waterstaat

FuelEU Maritime

Platform Schone Scheepvaart

Lelystad, 22 november 2022

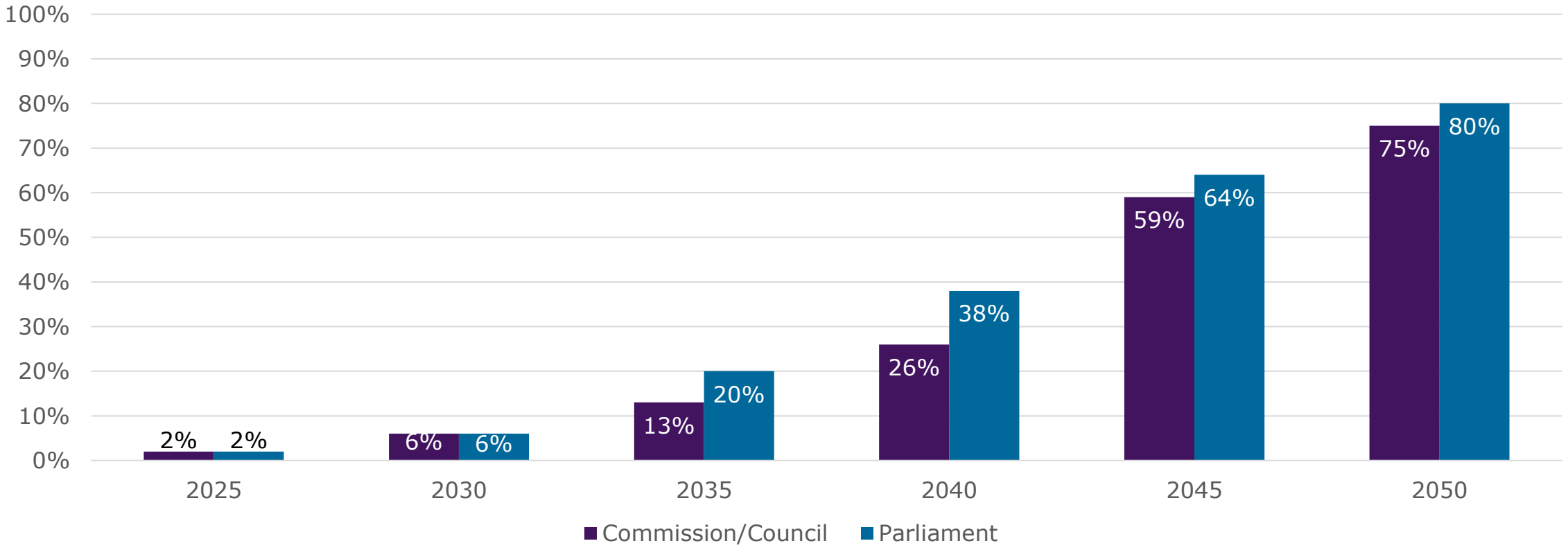
FuelEU Maritime

- Scope:
  - Schepen boven 5000gt
  - 100% van intra-EU en 50% van extra-EU (EU↔niet-EU) emissies
  - Walstroom voor container- en passagiersschepen
- Doelgericht: Vermindering (WtW) broeikasgasintensiteit (CO_2, CH_4, N_2O) schepen
  - Oplopende reductiepercentages per 5 jaar
  - Hernieuwbare en koolstofarme brandstoffen
  - Biobrandstoffen o.b.v. voedsel- en voedergewassen behandeld als (minst gunstige) fossiel
  - Pooling van schepen om emissieloze schepen te stimuleren en storten/lenen nalevingsoverschotten
- Toezicht op monitoring, rapportage door private verificateurs

Tijdslijn FuelEU Maritime

- Juli 2021: Publicatie Fit-for-55-pakket door Europese Commissie
- Juni 2022: Algemene oriëntatie (onderhandelingspositie) Raad
- Oktober 2022: Stemming Europees Parlement
- Nu: Trilogen, onderhandelingen Raad-Parlement-Commissie
- 1 Januari 2025: Beoogde inwerkingtreding
- ...
- 2030 (2027) Evaluatie en mogelijke herziening

Reductiedoelen (Startpunt trilogen)



Subdoel RFNBO

- Voorstel Europees Parlement:
  - Vanaf 2030: 2% van energiegebruik door RFNBO (hernieuwbare brandstoffen van niet-biologische oorsprong)
  - Uitzondering (t/m 2034) voor bedrijven met 3 of minder schepen binnen scope
  - Voor 2028 toetsing door Europese Commissie op beschikbaarheid en betaalbaarheid → mogelijke aanpassing subdoel
  - Mogelijkheid om via pooling aan subdoel te voldoen
  - Multiplier: 2 (t/m 2034)
- Raad:
  - Geen subdoel, wel multiplier: 2 (tussen 2025 t/m 2029), 1,5 (2030 t/m 2034)

Andere discussiepunten (vanuit Raad en Parlement)

- Uitzonderingen:
  - 5% van de energie voor schepen onder ijsklasse
  - Additioneel energieverbruik tijdens varen onder ijscondities
  - Public Service Obligation (tussen Cyprus-EU of breder)
  - Passagiersschepen naar eilanden (100.000 ↔ 200.000 inwoners)
  - 50% van de energie voor reizen van/naar ultraperifere gebieden
    - *Uitzonderingen t/m 2029*
  - Containerhavens binnen 300nm van EU-grens niet meegenomen als port call (waardoor reis volledig wordt meegenomen →voorkomen uitwijking)
- Bestemming van de boetes
- Mogelijkheden om af te wijken van standaardwaarden emissiefactoren voor fossiele brandstoffen

Samenspel FuelEU met AFIR en RED op vraag-aanbod

- Alternative Fuel Infrastructure Regulation
  - Verplichting aanbod walstroom in zeehavens van TEN-T kern- en uitgebreid netwerk
  - Voldoende bunkerlocaties voor LNG (Parlement: +ammonia en waterstof)
- Renewable Energy Directive
  - Verplichting voor brandstofleverancier
  - Doelen transportsector:
    - 13% reductie broeikasgasintensiteit in 2030 (Parlement: 16%)
    - 2,6% RFNBO in 2030 (Raad: 2,6% vrijwillig doel; Parlement: 5,7% bindend doel)
  - Nationale implementatie:
    - Keuze lidstaat in hoe verplichting vorm te geven en verdeling over modaliteiten

Bedankt

Bas Kelderman

bas.kelderman@minienw.nl

06 219 739 00


PLATFORM SCHONE
SCHEEPVAART

Impact Fit for 55 on Dutch shipping sector

Platform Schone Scheepvaart, 22 November 2022

CE Delft

Committed to the Environment

CE Delft

- Independent research and consultancy since 1978, focussing on environmental policies
- Transport, energy and resources
- More than 20 years of experience in the shipping sector
- 75 employees, based in Delft, the Netherlands
- Clients: IMO, European Commission, German, UK and Dutch government, shipping companies, ports, trade associations and environmental NGOs.

Outline of the presentation

- Overview of new EU and IMO regulations
- Obligations from the Fit for 55 proposals for ships and shipping companies
- Likely dates of implementation
- Cost impacts for ships and shipping companies
- Possible strategies for shipping companies

Expected future regulations the coming years

On a global level

- Energy Efficiency Existing Ship Index (EEXI) – *from January 1st, 2023*
- Annual Operational Carbon Intensity Indicator (CII) and CII rating – *from January 1st, 2023*
- Negotiations are going on mid-term measures aimed at promoting sustainable fuels – *possible introduction 2025-2030*

On a European level

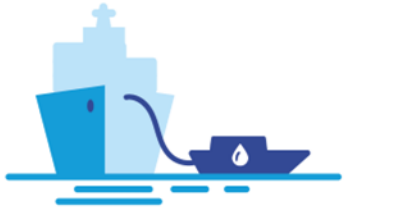
- EU-package Fit-for-55 measures on climate targets (55% reduction in 2030 compared to 1990)
  - Fuel EU Maritime
  - Emissions Trading Directive (EU ETS)
  - Energy Tax Directive (ETD)
  - Alternative Fuel Infrastructure Regulation (AFID)
  - Revision Renewable Energy Directive (REDIII)

Obligations from the Fit for 55 proposals

1. Ships at sea

2. Ships in port

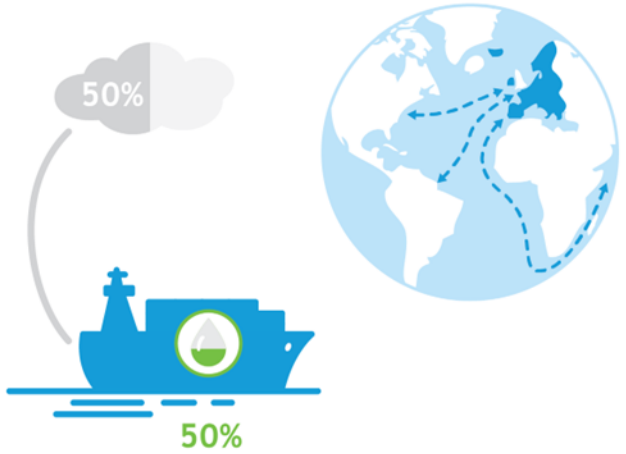
3. Bunker operations



Obligations from the Fit for 55 proposals
1. Proposed EU requirements for ships at sea

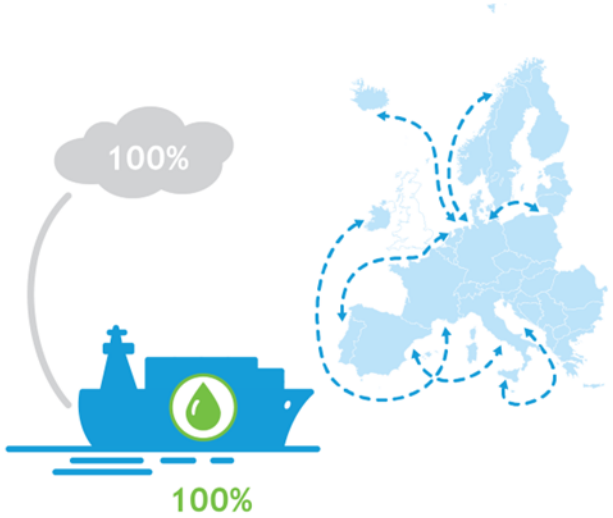
- **FuelEU Maritime:** lower GHG intensity of fuels
- **EU ETS:** surrender CO_2 emission allowances

Voyages between EEA and non-EEA



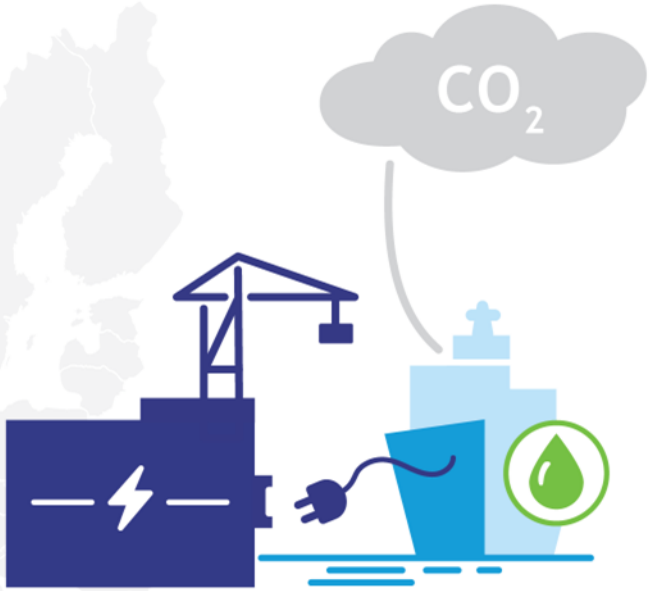
FuelEU Maritime applies to 50% of fuel
EU ETS applies to 50% of CO_2 emissions

Intra-EEA voyages



FuelEU Maritime applies to 100% of fuel
EU ETS applies to 100% of CO_2 emissions

Obligations from the Fit for 55 proposals
2. Proposed requirements for ships in EU ports



- **EU ETS:** surrender CO_2 emission allowances

- **FuelEU Maritime:** connect to onshore power

- **FuelEU Maritime:** lower GHG intensity of fuels

Obligations from the Fit for 55 proposals
3. Proposed requirements for bunker fuels

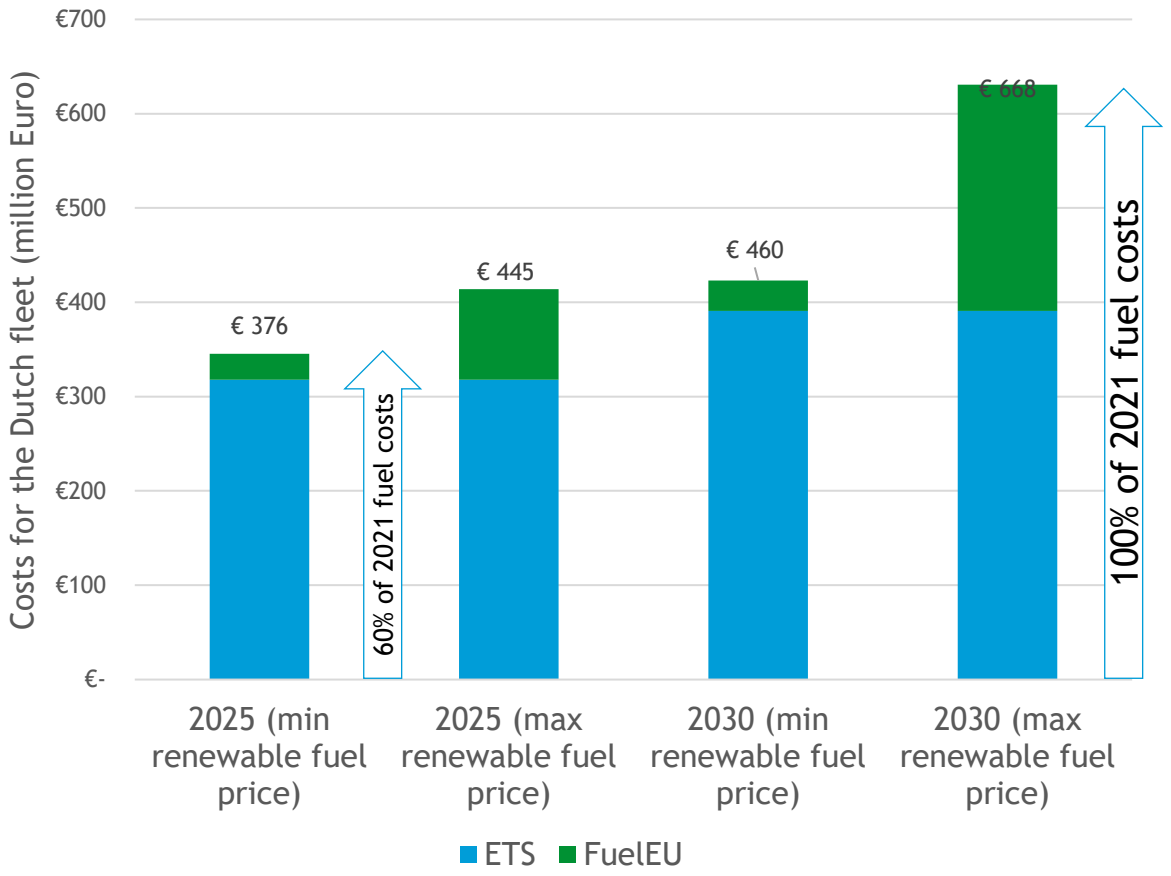
- **REDIII:**
  lower GHG intensity of fuels
- **ETD:**
  pay energy tax

Likely dates of implementation

FF55 proposal	Most important aspects	Position of council known?	Position of EP known?	Expectation
ETS	Tightening of existing ETS, tightening Market Stability Reserve (MSR), extension of ETS to maritime, ETS regulation for intra-EU aviation and CORSIA for extra-EU.	Yes (Environmental Council June 2022)	Yes (June 2022)	**Implementation from 2023 or 2024**
REDIII	Tightening of targets for renewable energy, introduction of targets for RFNBOs (particularly hydrogen)	Yes (Energy Council June 2022)	Yes (September 2022)	**Implementation in the relatively short term**
FuelEU Maritime	Mandatory targets for the reduction of carbon intensity of shipping fuels	Yes (Transport Council June 2022)	Yes (October 2022)	**Implementation 2025**
AFIR	Tightened targets for charging infrastructure for electric vehicles and hydrogen, etc.	Yes (Transport Council June 2022)	Yes	**Due to OPS, we expect AFIR to start at the same time as FuelEU Maritime.**
ETD	Establishing mutual relationships between tax rates on fuels and the introduction of kerosene tax	No	Does not apply	It will take a while before ETD comes into effect.

Cost impacts for ships and shipping companies

- CE Delft has built a database of the costs of the Fit for 55 proposals for all ships in EU ports in 2019-2021, assuming that they have the same activity level as in those years.
- Costs for ships in the Dutch Registry have been reported in CE Delft (2022)
  - ETS price increase from €80 per tonne CO_2 in 2025 to €90 in 2030
  - Renewable fuels 2-5 times price fossil fuels per unit of energy
- Fuel bill will go up by 60% - 100% in 2025-2030



Possible strategies for shipping companies

- Be aware of your current and future liabilities.
- Evaluate your compliance options.
- Develop a compliance strategy:
  - Who pays for cost increase – liaise with your clients
  - How to meet or exceed legal requirements – least costs, most sustainable, reactive, proactive, …
    - Greening existing fleet
    - New building programme
    - Pooling of obligations
    - Banking

Interested?

We will be happy to assist you in case you are interested or in case you have any questions.

You can contact us via the below contact details:

Jasper Faber

Director Shipping

faber@ce.nl

CE Delft

Oude Delft 180

2611 HH Delft

+31 (0)15-2150138

Anne Kleijn

Researcher/Consultant

kleijn@ce.nl

CE Delft

Oude Delft 180

2611 HH Delft

+31 (0)15-2150138


PLATFORM SCHONE
SCHEEPVAART

Energietransitie: stand van zaken technologie

Platform Schone Scheepvaart
22 november 2022

Klaas Visser

De technologische keten in de maritieme energietransitie

Energie direct:
Zon, wind, biologisch

Energie indirect:
-Elektrisch
-Moleculen (synthetisch: waterstof, ammonia, (m)ethanol, CH's, andere),
-nucleair

Opslag:
-Batterij
-gas
-vloeibaar
-vast

Omzetting aan boord:
-direct (wind (assist))
-verbranding (ICE)
-elektrochemisch (fuel cell)

Aandrijving:
-direct
-elektrisch

Curs. Alt. Subtit

Focus op:

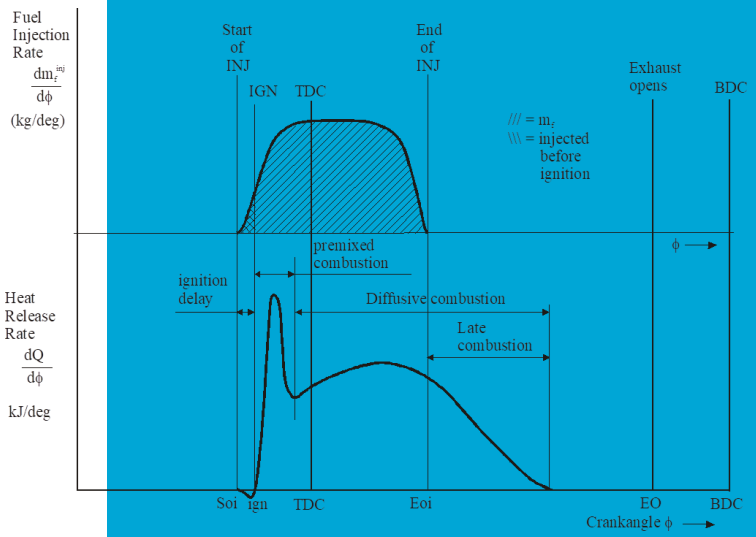
1. (M)ethanol
2. Waterstof
3. LNG (met carbon capture)
4. Ammonia
5. Nucleair
6. Overig

Alt. Subtit

Cursief

Methanol

1. Actuele projecten: Green Maritime Methanol, MENENS (R&D mobility project), Horizon Europe projecten
2. Voordelen: vloeibaar bij ambient conditions, goed toepasbaar in verbrandingsmotoren, dus snelle transitie
3. Technologisch onderzoek:
   -CO2-emissie, dus biologische of synthetische kringloop noodzakelijk
   -beheersing toxisch karakter
   -lagere energiedichtheid (opslagvolume, range)
   -verdampingswarmte
   -ontstekingsgedrag en verbrandingsrendement
   -koud start gedrag,
   alles onderzocht in MENENS
4. Toepassing: nieuwbouwproject van Oord (vanmiddag op de agenda), mogelijkheden Maritiem Masterplan (Groeifondsvoorstel 2023)



Alt. Subtit

Cursief

Waterstof

1. Actuele projecten: H2SHIPS (EU Interreg NW Europe),ISHY (Interreg Two Seas), SH2IPDRIVE (R&D Mobility), Horizon Europe projecten
2. Voordelen: emissieloos, en bij FC toepassing stil
3. Technologisch onderzoek:
   -veiligheid indien opgeslagen als gas of liquefied
   -lage volumetrische energiedichtheid, daarom onderzoek naar waterstofdragers (LOHC, boorhydride, Hydrosolid)
   -onderzoek naar opslagvormen: gas, liquefied, in olie, vast
   -nieuwbouw/retrofit, modulair/swappable of integraal
   -marinisering en levensduur brandstofcellen
   -alles onderzocht in SH2IPDRIVE
4. Toepassing: nieuwbouwproject van Dam (vanmiddag op de agenda), Havenbedrijf Amsterdam (Neo Orbis), binnenvaart Future Proof Shipping (retrofit),
   H2C-boat

Maritiem Kennis Centrum

Alt. Subtit

Cursief

TU Delft

LNG (met carbon capture)

1. Actuele projecten: LNG-Zero (R&D Mobility call), GasDRIVE (NWO project, afgerond), NAUTILUS (H2020 project, toepassing van LNG-omzetting in gecombineerde configuratie van dual fuel motoren (MAN) en SOFC's (Solid Power))
2. Voordelen: toepasbaar op huidige motortechnologie
3. Technologisch onderzoek:
   -technologie en ontwerp van CO2-capture uitlaatgassen
   -motorgedrag bij tegendruk in de afvoergassenleiding onderdeel van het LNG-zero project
   -opschaling maritieme SOFC"s op MW niveau, energie management tussen batterij, SOFC en motoren, opvolger van GasDrive
4. Toepassing: een offshore toepassing bij Heerema wordt onderzocht. Verder wordt toepassing verwacht in ontwerp cruise ships Meyer Werft en Chantiers l'Atlantique (NAUTILUS project)

Maritiem Kennis Centrum

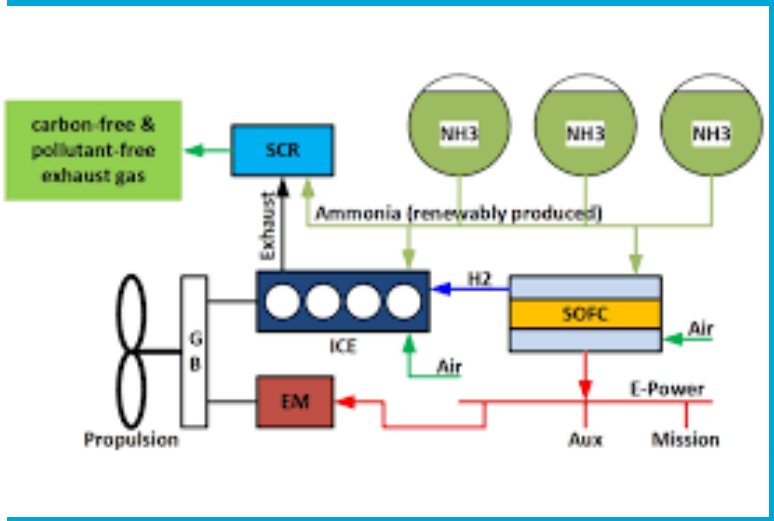
Alt. Subtit

Cursief

TU Delft

Ammonia

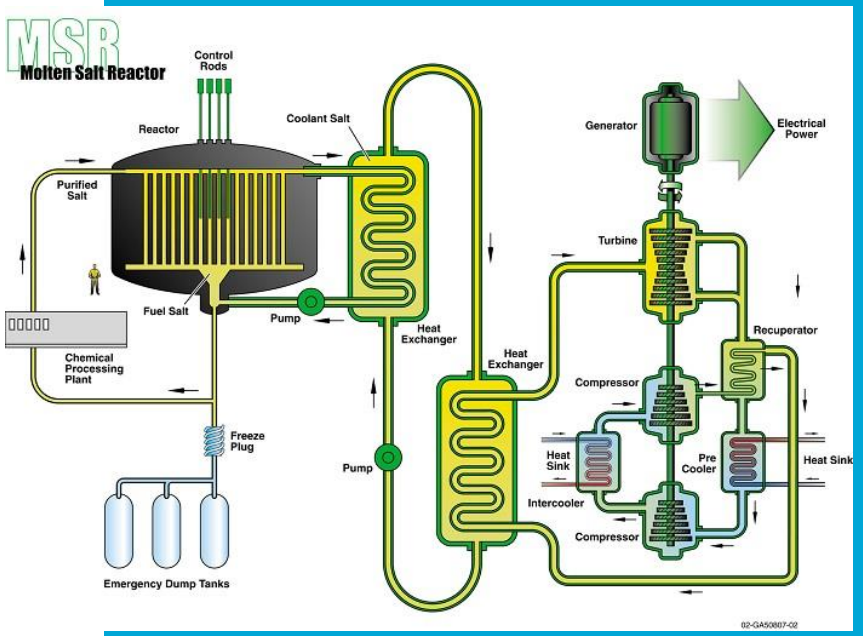
1. Actuele projecten: NWO perspectief programma AMMONIADRIVE
2. Voordelen: zero carbon molecuul, omzetbaar in verbrandingsmotoren (onderzoek vereist) en Solid Oxyde Fuel Cells, groot potentieel voor gecombineerde configuraties van ICE en SOFC's.
3. Technologisch onderzoek:
   -verbrandingsgedrag ammonia in maritieme motoren (challenge)
   -omzetting ammonia in SOFC"s
   -veiligheid en opschaling
   -de benefiits van de gecombineerde ICE/SOFC configuratie
4. Toepassing vooralsnog verwacht op grote zeegaande schepen.



Curs. Alt. Subtit

Nucleair

1. MKC MIIP project maritieme nucleaire voortstuwing
2. Zeer relevant onderwerp voor schepen met een grote behoefte aan operationele energie met hoge vermogens, grote ranges, strategische autonomie. Nieuwe ontwikkelingen in kleine modulaire reactoren, *molten salt* koeling, intrinsiek veilig gedrag, Thorium (lagere halfwaarde, hoge yield).
3. Technologisch onderzoek:
   -fundamenteel onderzoek om TRL-niveau te verhogen, maritieme aandachtspunten (partload gedrag, ook opereren met laag vermogen, dynamisch gedrag).
4. Donderdagmiddag 24 oktober 1300-1700 seminar maritieme nucleaire voortstuwing TU Delft. *Symposium "Nuclear Power for Marine Applications" - Nederland Maritiem Land*



Kloosterman, Sietsma: Thorium in MSR, presentation

Cursief Alt. Subtit

Overig zeer relevant onderzoek

1. verbetering batterijen (goedkopere materialen, hogere energiedichtheid) (NWO Maritime Batteries, granted uit de call Zero Emission and Circular Shipping).

2. data-analyse systeemintegratie: *Ship system expanded energy storage devices lifetime via AI-empowered control* (SEANERGETIC) , granted uit de call Zero Emission and Circular Shipping

3. Wind (assist) systemen

4. Verhoging van de efficiency/verlaging van de weerstand van schepen.

5. De digitalisering van scheepsontwerp, bouw van schepen en maritiem opereren.

6. De verbetering van voortstuwers (compososiet, ECOPROP).

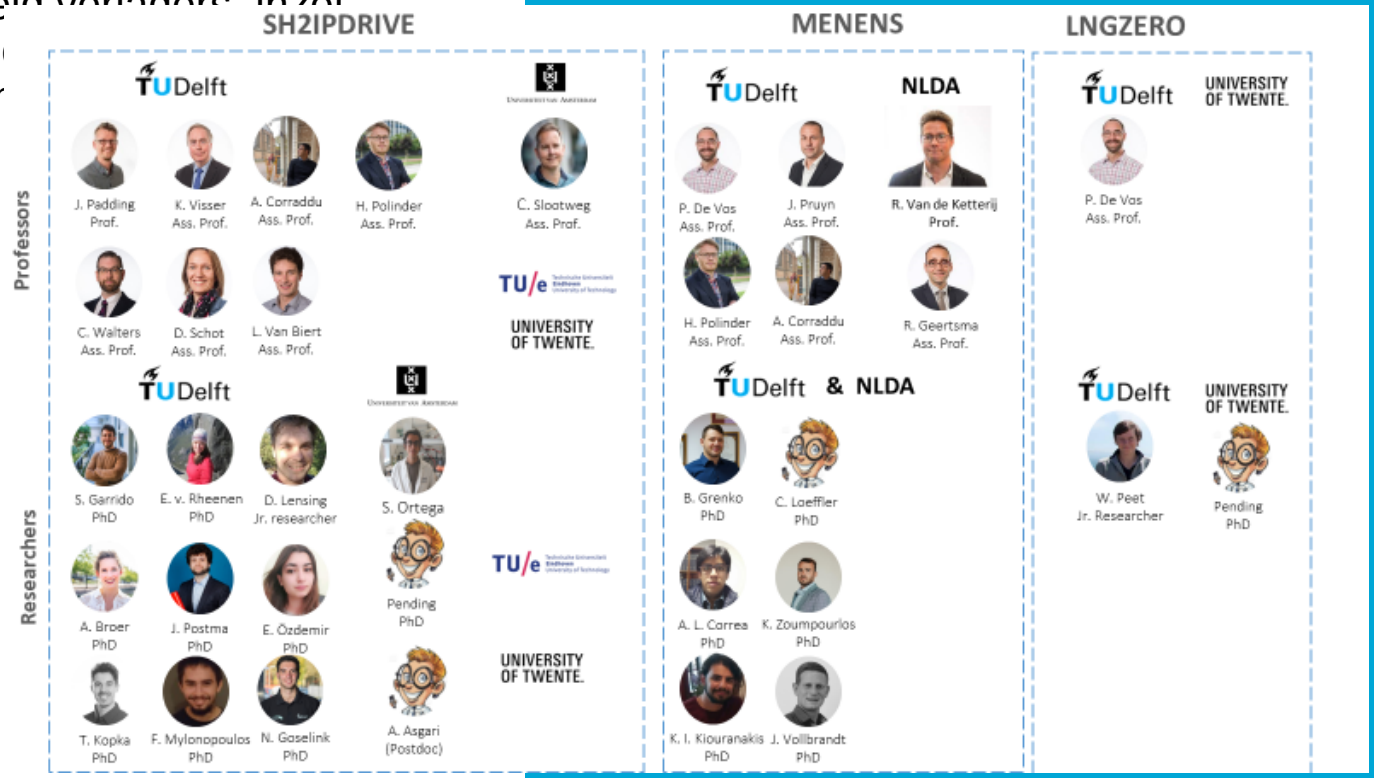
7. Hoog vermogen gelijkstroomsystemen en supergeleiding (High Tech Security Call)

8. PATH2ZERO: NL inland shipping corridors as a living lab

Alt. Subtit *Cursief*

Ten slotte

1. Grote inzet op onderzoek, veel technologische oplossingen bereikt of onderweg.
2. Energie-alternatieven relatief complementair en afhankelijk van operationeel profiel
3. Waardeketen nu van groot belang: betrokkenheid verladers, inzet maakindustrie op nieuwe materialen en technol reders, transitie en schaalvergroting (energie) ir
4. HUMAN CAPITAL!



Maritiem Kennis Centrum

Alt. Subtit

TU Delft

k.visser@ tudelft.nl,

TU Delft

Maritiem
Kennis
Centrum

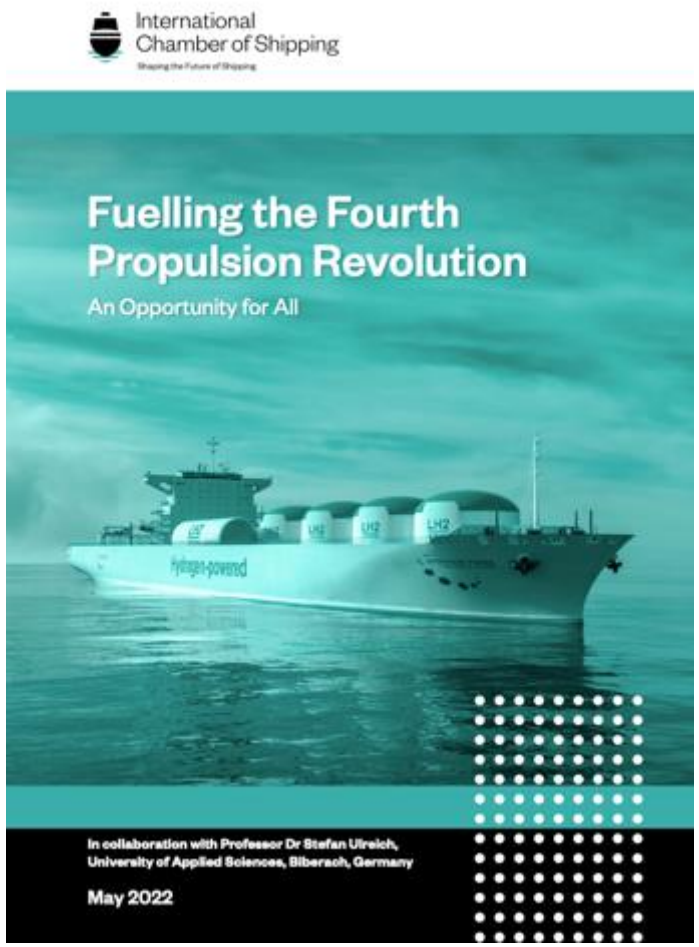

PLATFORM SCHONE
SCHEEPVAART

Als haven voorbereid zijn op nieuwe scheepsbrandstoffen

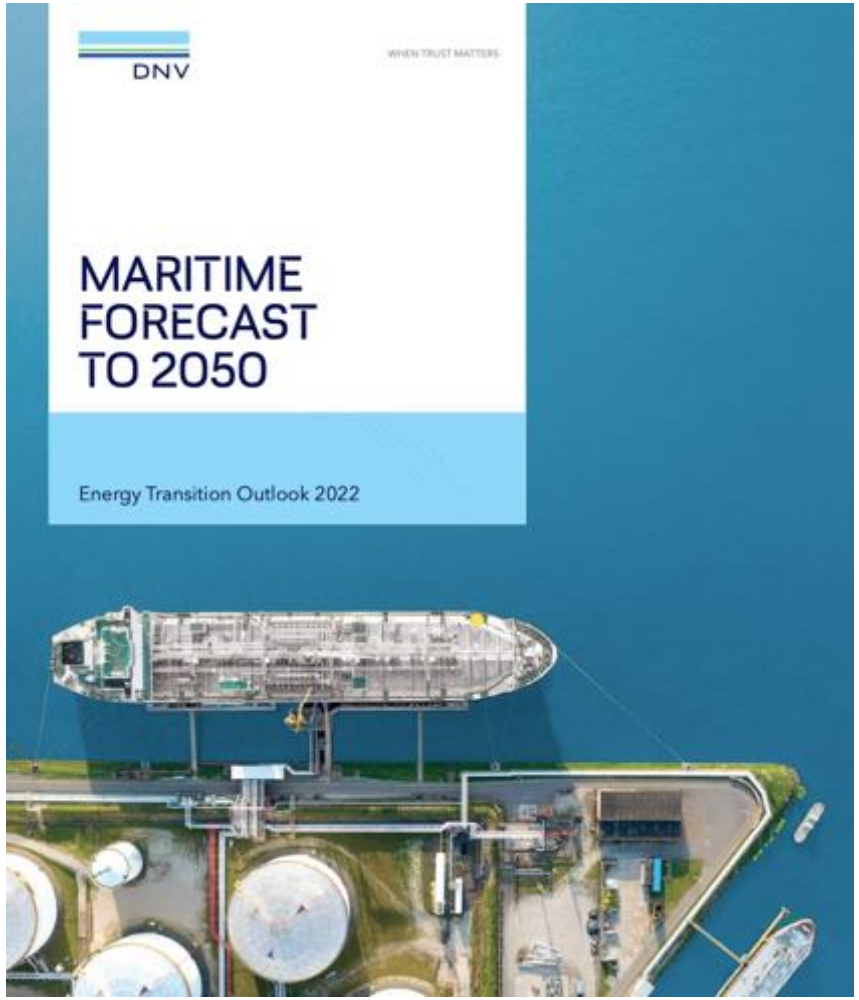
22 november 2022 – Peter Alkema

Port of Amsterdam

1. Stand van zaken nieuwe brandstoffen
2. Port Fuel Readiness
3. Veiligheid



- Producing net zero carbon marine fuels will create a significant opportunity for renewable electricity producers
- Shipping will have a multi-fuel future
- High demand for zero carbon fuels presents opportunities for the global south
- Renewable energy production of (net) zero carbon fuels provides economic opportunities for all
- Invest in infrastructure and research, development and demonstration now or economic gains will be minimised



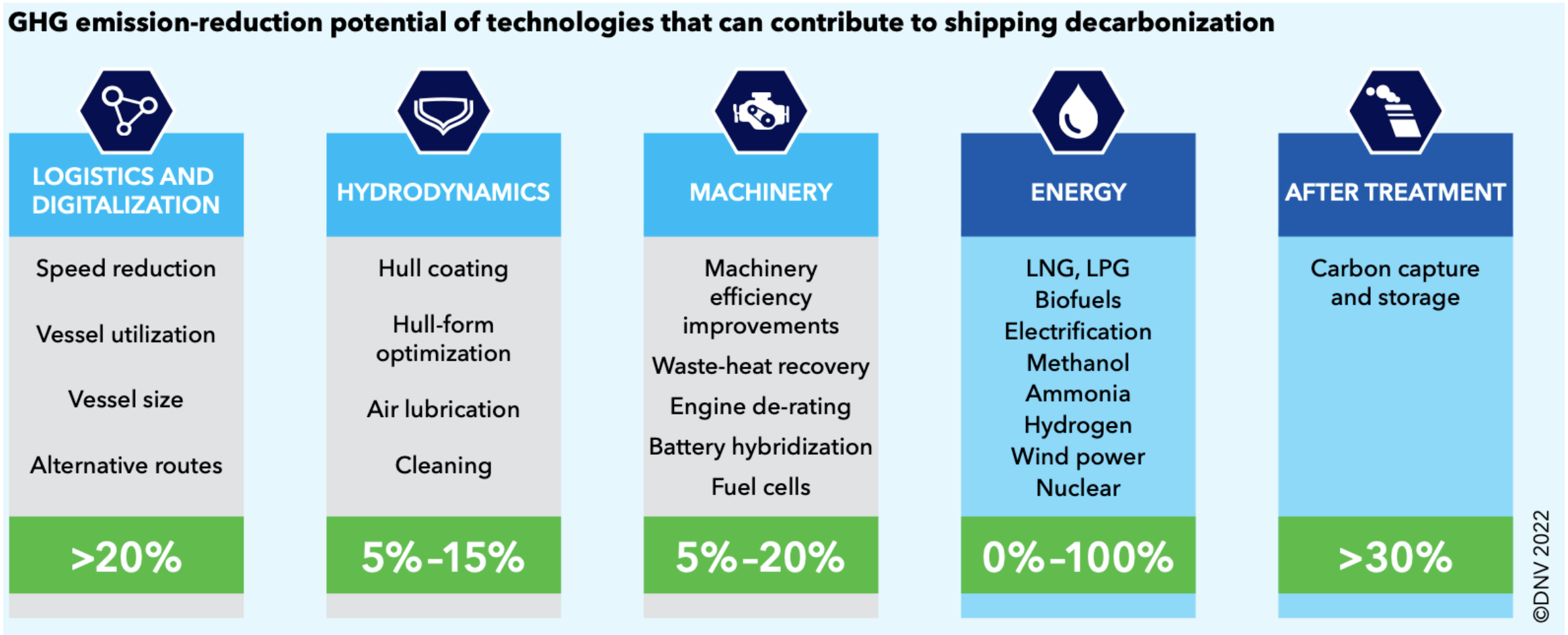
- Shipping's future fuel market will be more diverse, reliant on multiple energy sources, and more interconnected and integrated with regional energy markets, regional energy production, and regional industry.

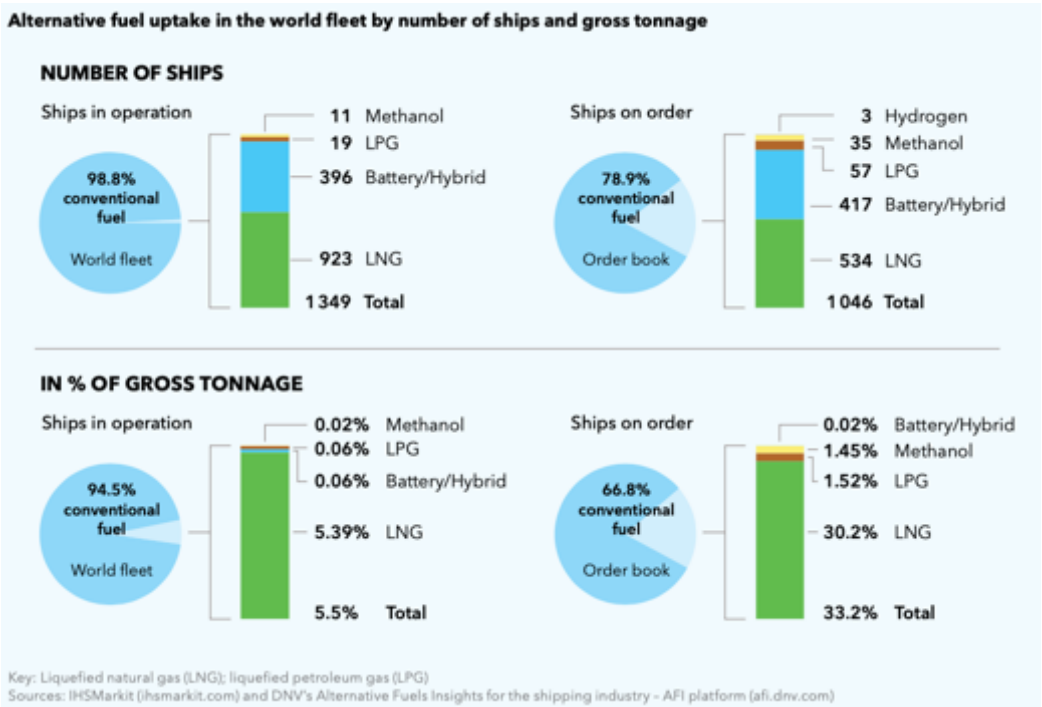
- Future fuel supply for shipping will rely on availability and price of the energy sources: renewable electricity, sustainable biomass, or fossil energy with CCS. Availability may constrain the coming energy transition in shipping.

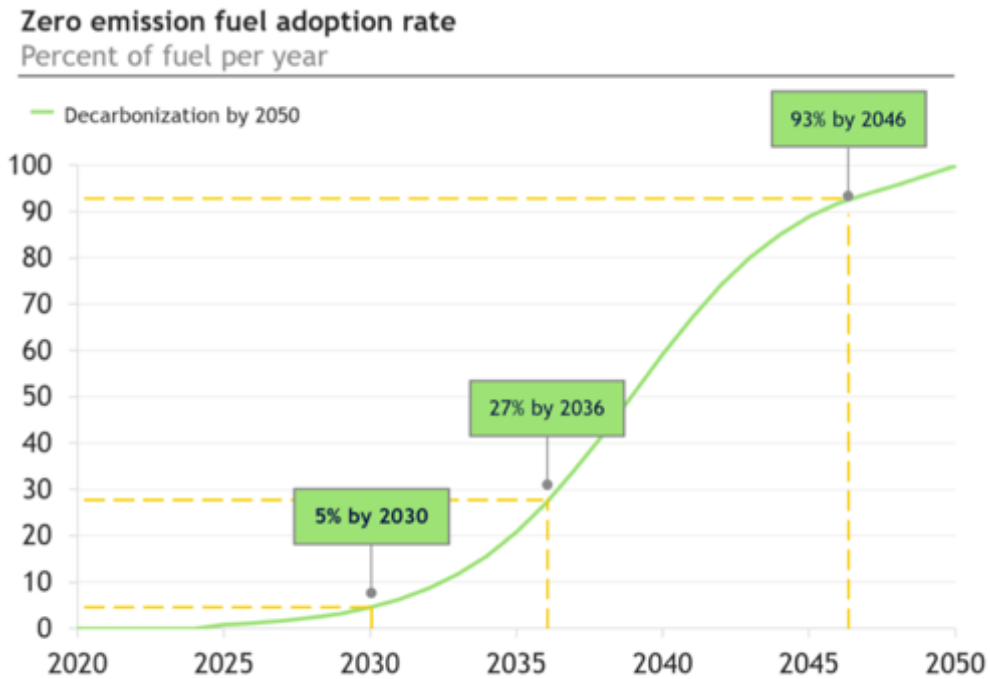
- Provided that energy can be made available, production capacity will be a barrier and must be scaled up to meet shipping's coming demand for carbon-neutral fuels. This will require massive investment.

- Co-operation with major energy and fuel providers will be important to supply the future fuels. Ports will play key roles in the green maritime transition by serving as energy hubs providing both shore-side electricity and infrastructure for storing and fuelling ships with future fuels, as well as supporting the first movers and establishing green energy corridors.

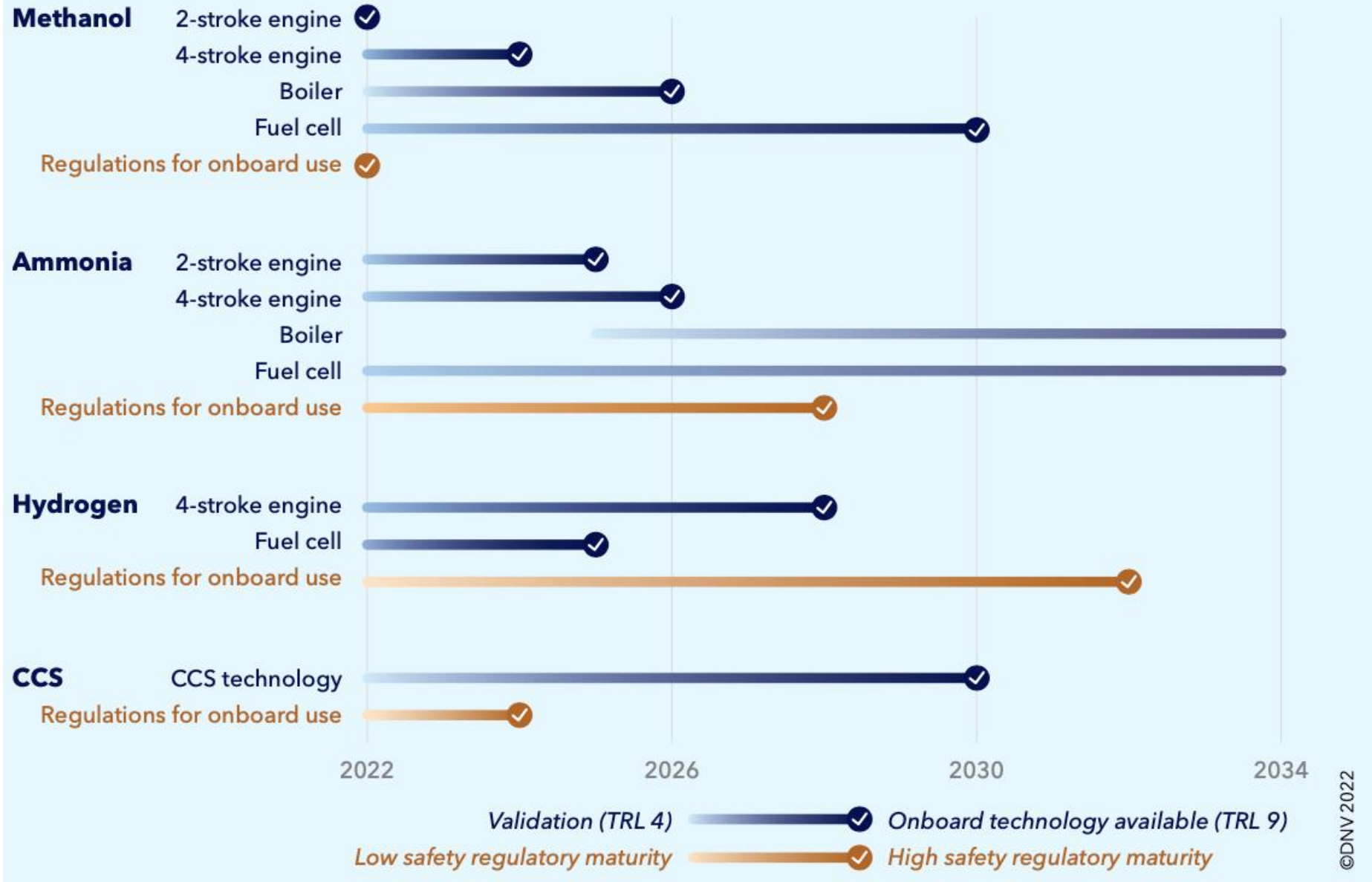
GHG emission-reduction potential of technologies that can contribute to shipping decarbonization




Alternative fuel uptake in the world fleet by number of ships and gross tonnage
NUMBER OF SHIPS
Ships in operation
98.8% conventional fuel
World fleet
11 Methanol
19 LPG
396 Battery/Hybrid
923 LNG
1 349 Total
Ships on order
78.9% conventional fuel
Order book
3 Hydrogen
35 Methanol
57 LPG
417 Battery/Hybrid
534 LNG
1 046 Total
IN % OF GROSS TONNAGE
Ships in operation
94.5% conventional fuel
World fleet
0.02% Methanol
0.06% LPG
0.06% Battery/Hybrid
5.39% LNG
5.5% Total
Ships on order
66.8% conventional fuel
Order book
0.02% Battery/Hybrid
1.45% Methanol
1.52% LPG
30.2% LNG
33.2% Total
Key: Liquefied natural gas (LNG); liquefied petroleum gas (LPG)
Sources: IHSMarkit (ihsmarkit.com) and DNV's Alternative Fuels Insights for the shipping industry – AFI platform (afi.dnv.com)


Zero emission fuel adoption rate
Percent of fuel per year
Decarbonization by 2050
93% by 2046
27% by 2036
5% by 2030
100
90
80
70
60
50
40
30
20
10
0
2020
2025
2030
2035
2040
2045
2050

Estimated maturation timelines for energy converters, onboard CCS technologies, and corresponding safety regulations for onboard use

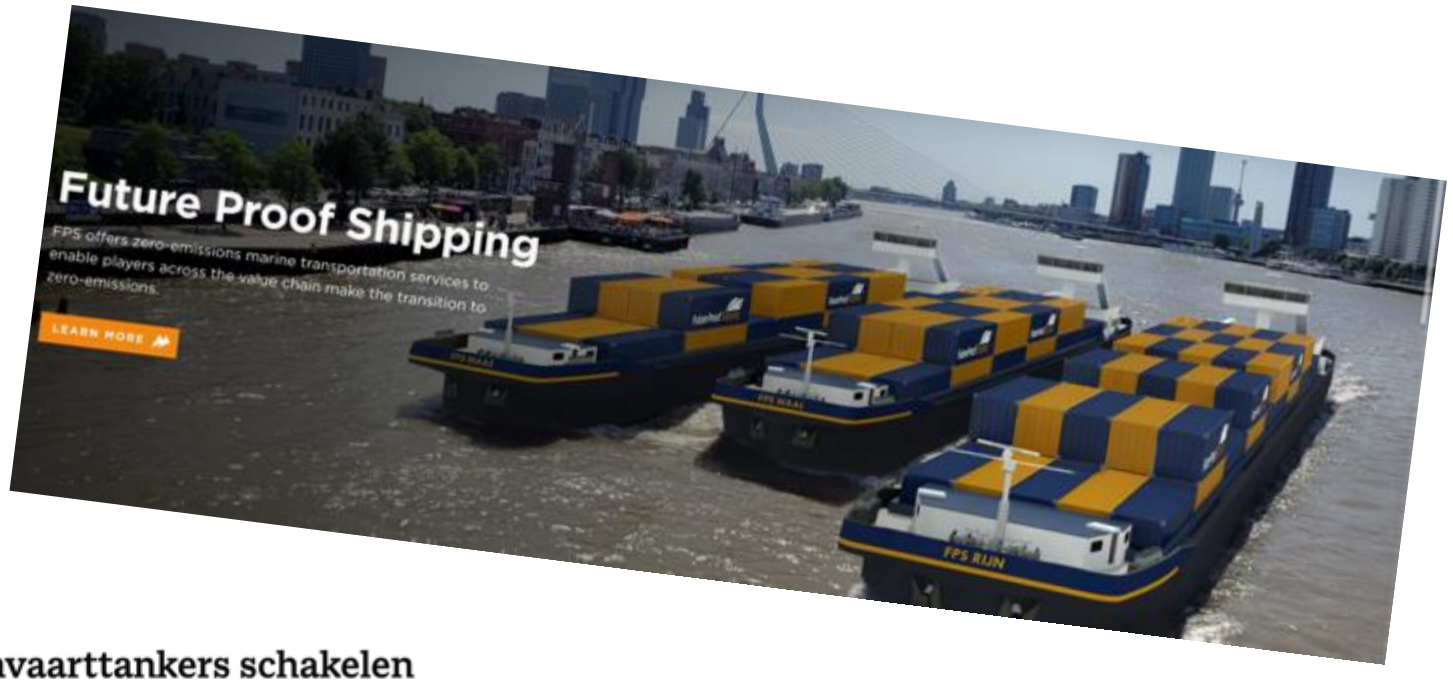


‘Wij kunnen met de lng-tankers bij laagwater relatief lang doorvaren’

INTERVIEW SHELL

Shell neemt de komende jaren een vloot van veertig binnenvaarttankers op lng in gebruik. Inmiddels heeft de eerste tanker zijn eerste reis gemaakt. De ‘Blue Marjan’ maakte een korte tocht van Europoort naar Shell Pernis. Een goed moment om met chartering manager Martin van Veen van Shell te praten over deze zogenoemde Parsifal-serie en de plannen van Shell.

JELMER BASTIAANS 10 februari 2022 09:49



ENERGIETRANSITIE

Eerste binnenvaarttankers schakelen over op methanol en waterstof

Mercurius Shipping brengt binnenkort de eerste type-C binnenvaarttanker met een methanolmotor in de vaart. De Verenigde Tankrederij (VT-Group) brengt in 2024 de eerste op waterstof varende type-C tanker in de vaart.

RH$_2$INE

Rhine Hydrogen Integration Network of Excellence

ZERO EMISSION SERVICES

Maritime Energy Carriers (MEC)

In samenwerking met onze partners bieden we duurzame scheepvaartbrandstoffen aan in de haven. Ook beïnvloeden we de scheepvaart om deze brandstoffen te gebruiken. Op die manier verbeteren we de lokale luchtkwaliteit en dringen we de broeikasgasuitstoot terug in de metropoolregio Amsterdam. We zijn een Multi Fuel Port voor schone brandstoffen. Daarom ontwikkelen we een veiligheidsraamwerk via wet- en regelgeving, faciliteren en stimuleren we green corridors en verbeteren we de bunkerinfrastructuur.

Port Emission Reduction Technologies (PERT)

Met de inzet van technologie reduceren we de emissies van schepen op hun ligplaats in de haven. Zo verbeteren we de lucht- en geluidskwaliteit en dragen we bij aan CO_2- en fijnstofreductie. In samenwerking met onze partners bieden we bijvoorbeeld walstroom aan en mobiele stroom met varende batterijen. Ook faciliteren we locaties voor ontgasinstallaties in de haven ter reductie van ladingemissies bij de schoonmaak van tankschepen. We realiseren een volledige dekkingsgraad van walstroomvoorzieningen voor openbare binnenvaartligplaatsen in de stad, voor cruiseligplaatsen en bij de cruiseterminal.

Port Call Optimization (PCO)

We reduceren de emissies door de scheepvaart efficiënt af te handelen. Zo optimaliseren we het plannings- en afhandelingsproces van scheepvaart in de haven. We zorgen daarnaast voor een ononderbroken scheepvaartpassage met minder wachttijden en manoeuvreerbewegingen. Dit leidt tot een kortere verblijfsduur in de haven en dus minder lokale emissies.

Visie Schone Scheepvaart

Op weg naar een emissievrije scheepvaart in 2050

Port of Amsterdam

Maritime Energy Carriers

Port of Amsterdam als Multi Fuel Port

Belangrijke acties:

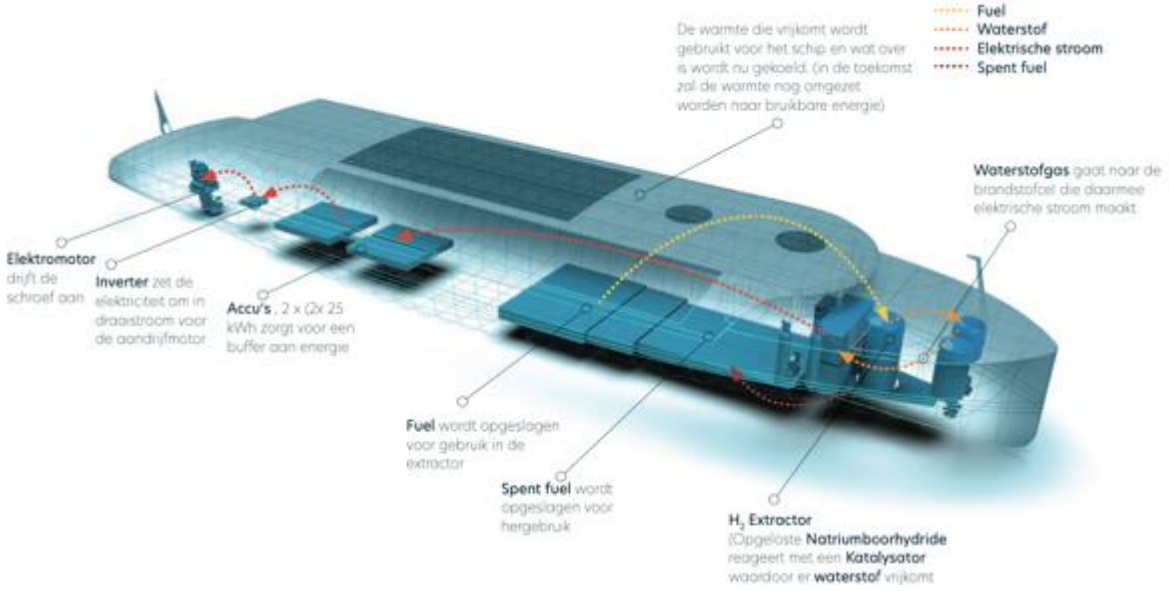
- Veiligheidsraamwerk via wet- en regelgeving verder ontwikkelen
- Bunkerinfrastructuur verbeteren
- Eigen vloot en service providers
- Green corridors faciliteren en stimuleren

Voorbeelden van inzet instrumenten:

- Faciliteren: nieuwe energiedragers, brandstofproductie en hernieuwbare elektriciteit waarborgen
- Stimuleren: early adapters en groene brandstoffen belonen, prijsdifferentiatie in havengeld
- Reguleren: op termijn schepen weigeren die minder duurzame brandstoffen gebruiken
- Beïnvloeden: gesprekken met klanten, co-creatie met lokaal netwerk, internationale samenwerking

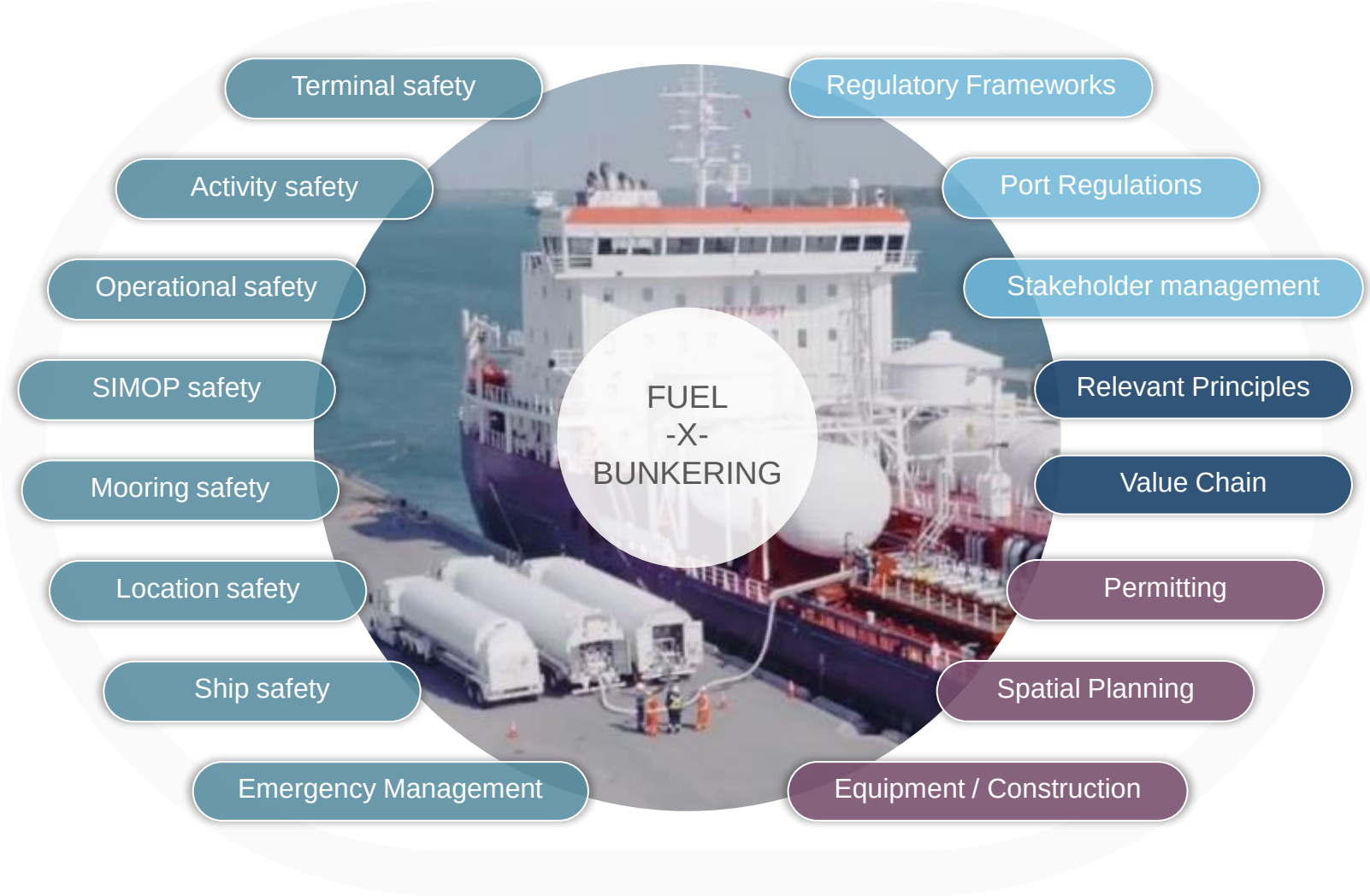
Port of Amsterdam


CORAL METHANE
ANTHONY VEDER
L N G


Fuel
Waterstof
Elektrische stroom
Spent fuel
De warmte die vrijkomt wordt gebruikt voor het schip en wat over is wordt nu gekoeld. (in de toekomst zal de warmte nog omgezet worden naar bruikbare energie)
Waterstofgas gaat naar de brandstofcel die daarmee elektrische stroom maakt
Elektromotor drijft de schroef aan
Inverter zet de elektriciteit om in draaistroom voor de aandrijfmotor
Accu's, 2 x (2x 25 kWh zorgt voor een buffer aan energie
Fuel wordt opgeslagen voor gebruik in de extractor
Spent fuel wordt opgeslagen voor hergebruik
H2 Extractor
(Opgeloste Natriumboorhydride reageert met een Katalysator waardoor er waterstof vrijkomt

Wanneer is een haven gereed voor een brandstof?

GOVERNANCE | INFRASTRUCTURE | SAFETY | FUEL AVAILABILITY



Port of Amsterdam

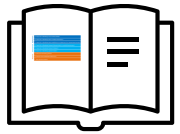
iaph

Port Readiness Level for alternative fuelled ships

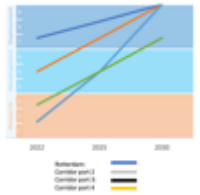
Level indicator

Self assessment tool

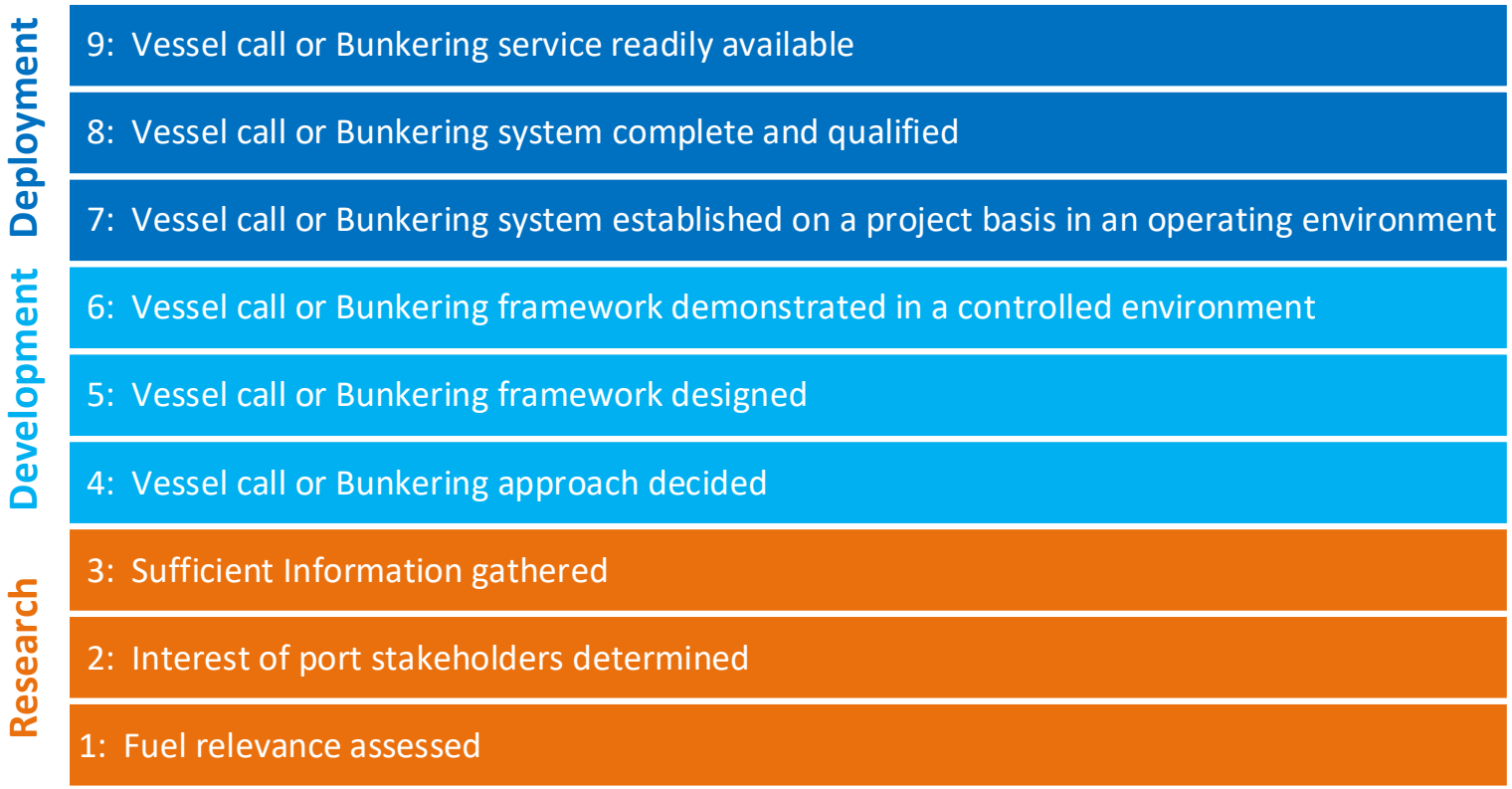
Best practice guidance



Green corridor profiler



Port Readiness Levels for Alternative Fuelled Ships

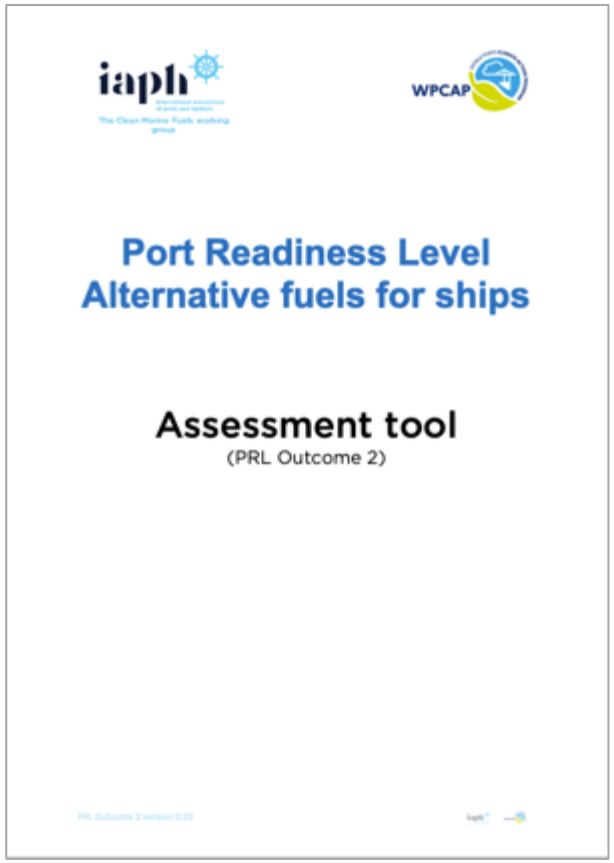


De PRL-AFS is een 9 niveau's indicator hulpmiddel om de voortgang van een haven in het faciliteren van bunker-services in kaart te brengen

PRL-AFS Example Port of Amsterdam

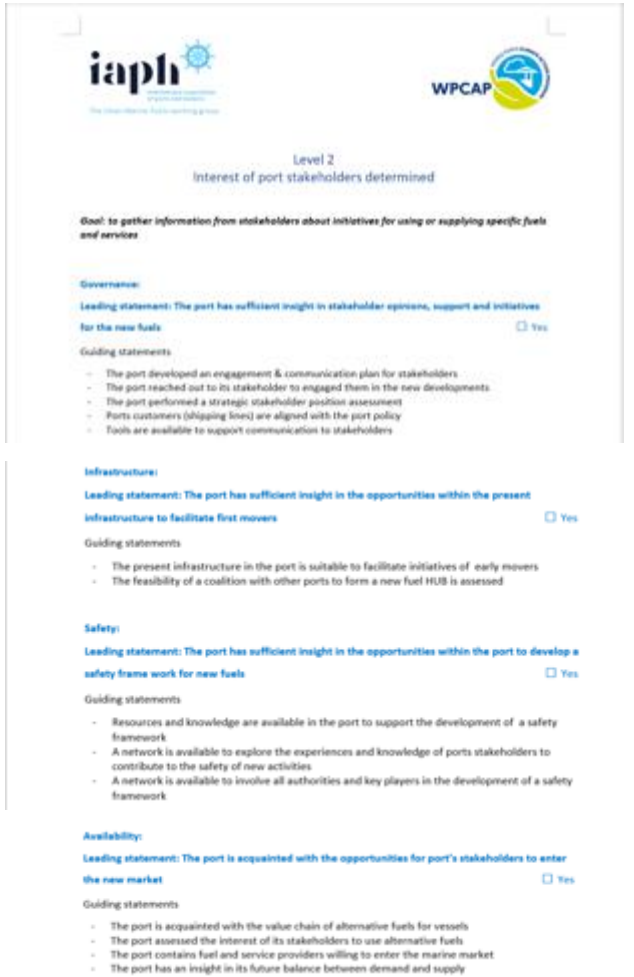
Fuel and bunkering	PRL 2022	PRL 2023 ambition	PRL 2024 ambition	PRL 2025 ambition
LNG	9	9	9	9
LBG	7	8	9	9
E-Methane	5	5	6	7
Methanol	6	8	9	9
B methanol	6	8	9	9
Ammonia	3	3	4	5
C Hydrogen (Inland vessels, contained)	4	6	7	8
L Hydrogen (Inland vessels, tank truck)	3	4	5	6
C Hydrogen (Sea going vessels)	8	8	9	9
L Hydrogen (Sea going vessels)	5	5	6	7

PRL-AFS Self assessment tool (checklist)



Port Readiness Level
Alternative fuels for ships

Assessment tool
(PRL Outcome 2)



Level 2
Interest of port stakeholders determined

Goal: to gather information from stakeholders about initiatives for using or supplying specific fuels and services

Governance:

Leading statement: The port has sufficient insight in stakeholder opinions, support and initiatives for the new fuels ☐ Yes

Guiding statements

- The port developed an engagement & communication plan for stakeholders
- The port reached out to its stakeholder to engaged them in the new developments
- The port performed a strategic stakeholder position assessment
- Ports customers (shipping lines) are aligned with the port policy
- Tools are available to support communication to stakeholders

Infrastructure:

Leading statement: The port has sufficient insight in the opportunities within the present infrastructure to facilitate first movers ☐ Yes

Guiding statements

- The present infrastructure in the port is suitable to facilitate initiatives of early movers
- The feasibility of a coalition with other ports to form a new fuel HUB is assessed

Safety:

Leading statement: The port has sufficient insight in the opportunities within the port to develop a safety frame work for new fuels ☐ Yes

Guiding statements

- Resources and knowledge are available in the port to support the development of a safety framework
- A network is available to explore the experiences and knowledge of ports stakeholders to contribute to the safety of new activities
- A network is available to involve all authorities and key players in the development of a safety framework

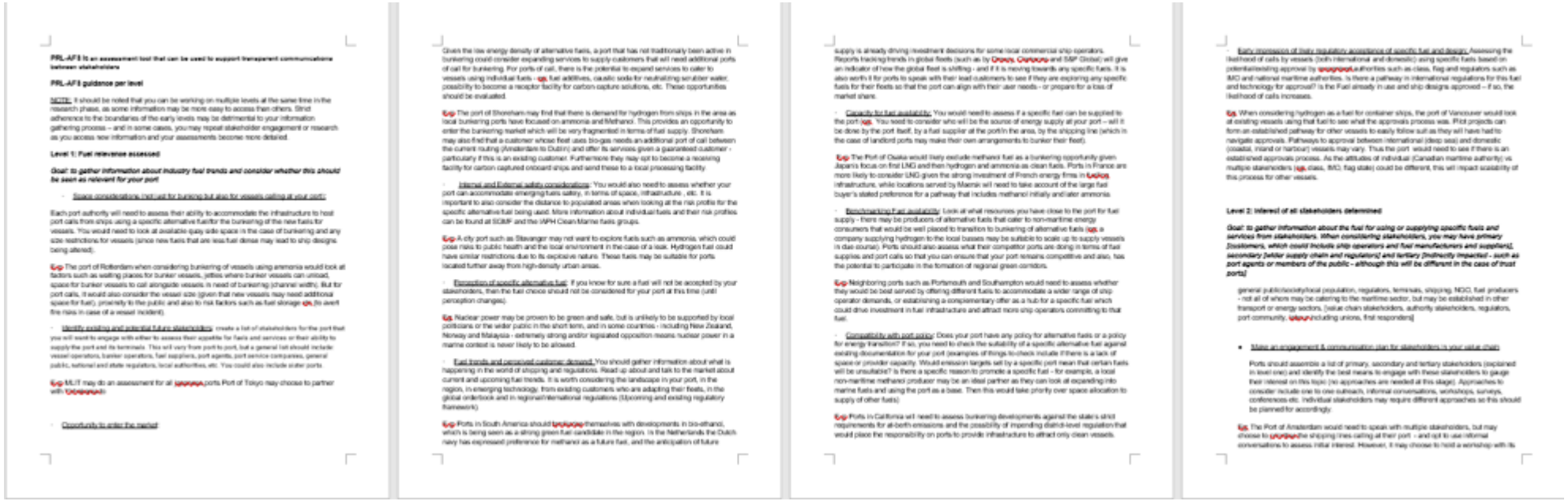
Availability:

Leading statement: The port is acquainted with the opportunities for port's stakeholders to enter the new market ☐ Yes

Guiding statements

- The port is acquainted with the value chain of alternative fuels for vessels
- The port assessed the interest of its stakeholders to use alternative fuels
- The port contains fuel and service providers willing to enter the marine market
- The port has an insight in its future balance between demand and supply

PRL-AFS Guidance



PRL-AFS is an assessment tool that can be used to support transparent communications between stakeholders

PRL-AFS guidance per level

NOTE: It should be noted that you can be working on multiple levels at the same time in the research phase, as some information may be more easy to access than others. Strict adherence to the boundaries of the early levels may be detrimental to your information gathering process – and in some cases, you may repeat stakeholder engagement or research as you access new information and your assessments become more detailed.

Level 1: Fuel relevance assessed

Goal: to gather information about industry fuel trends and consider whether this should be seen as relevant for your port

- Space considerations (not just for bunkering but also for vessels calling at your port)

Each port authority will need to assess their ability to accommodate the infrastructure to host port calls from ships using a specific alternative fuel for the bunkering of the new fuels for vessels. You would need to look at available quay side space in the case of bunkering and any size restrictions for vessels (since new fuels that are less fuel dense may lead to ship designs being altered).

E.g. The port of Rotterdam when considering bunkering of vessels using ammonia would look at factors such as waiting places for bunker vessels, jetties where bunker vessels can unload, space for bunker vessels to sail alongside vessels in need of bunkering (channel width), But for port calls, it would also consider the vessel size (given that new vessels may need additional space for fuel), proximity to the public and also to risk factors such as fuel storage e.g. (to avert fire risks in case of a vessel incident).

- Identify existing and potential future stakeholders: create a list of stakeholders for the port that you will want to engage with either to assess their appetite for fuels and services or their ability to supply the port and its terminals. This will vary from port to port, but a general list should include: vessel operators, bunker operators, fuel suppliers, port agents, port service companies, general public, national and state regulators, local authorities, etc. You could also include sister ports

E.g. MLIT may do an assessment for all [illegible] ports Port of Tokyo may choose to partner with [illegible]

- Opportunity to enter the market

Given the low energy density of alternative fuels, a port that has not traditionally been active in bunkering could consider expanding services to supply customers that will need additional ports of call for bunkering. For ports of call, there is the potential to expand services to cater to vessels using individual fuels - eg. fuel additives, caustic soda for neutralizing scrubber water, possibility to become a receptor facility for carbon capture solutions, etc. These opportunities should be evaluated.

E.g. The port of Shoreham may find that there is demand for hydrogen from ships in the area as local bunkering ports have focused on ammonia and Methanol. This provides an opportunity to enter the bunkering market which will be very fragmented in terms of fuel supply. Shoreham may also find that a customer whose fleet uses bio-gas needs an additional port of call between the current routing (Amsterdam to Dublin) and offer its services given a guaranteed customer - particularly if this is an existing customer. Furthermore they may opt to become a receiving facility for carbon captured onboard ships and send these to a local processing facility.

- Internal and External safety considerations: You would also need to assess whether your port can accommodate emerging fuels safety, in terms of space, infrastructure , etc. It is important to also consider the distance to populated areas when looking at the risk profile for the specific alternative fuel being used. More information about individual fuels and their risk profiles can be found at SGMF and the IAPH Clean Marine fuels groups.

E.g. A city port such as Stavanger may not want to explore fuels such as ammonia, which could pose risks to public health and the local environment in the case of a leak. Hydrogen fuel could have similar restrictions due to its explosive nature. These fuels may be suitable for ports located further away from high-density urban areas.

- Perception of specific alternative fuel: If you know for sure a fuel will not be accepted by your stakeholders, then the fuel choice should not be considered for your port at this time (until perception changes).

E.g. Nuclear power may be proven to be green and safe, but is unlikely to be supported by local politicians or the wider public in the short term, and in some countries - including New Zealand, Norway and Malaysia - extremely strong and/or legislated opposition means nuclear power in a marine context is never likely to be allowed.

- Fuel trends and perceived customer demand: You should gather information about what is happening in the world of shipping and regulations. Read up about and talk to the market about current and upcoming fuel trends. It is worth considering the landscape in your port, in the region, in emerging technology, from existing customers who are adapting their fleets, in the global orderbook and in regional/international regulations (Upcoming and existing regulatory framework)

E.g. Ports in South America should [illegible] themselves with developments in bio-ethanol, which is being seen as a strong green fuel candidate in the region. In the Netherlands the Dutch navy has expressed preference for methanol as a future fuel, and the anticipation of future supply is already driving investment decisions for some local commercial ship operators. Reports tracking trends in global fleets (such as by [illegible] and S&P Global) will give an indicator of how the global fleet is shifting - and if it is moving towards any specific fuels. It is also worth it for ports to speak with their lead customers to see if they are exploring any specific fuels for their fleets so that the port can align with their user needs – or prepare for a loss of market share.

- Capacity for fuel availability: You would need to assess if a specific fuel can be supplied to the port eg. You need to consider who will be the source of energy supply at your port – will it be done by the port itself, by a fuel supplier at the port in the area, by the shipping line (which in the case of landlord ports may make their own arrangements to bunker their fleet).

E.g. The Port of Osaka would likely exclude methanol fuel as a bunkering opportunity given Japan's focus on first LNG and then hydrogen and ammonia as clean fuels. Ports in France are more likely to consider LNG given the strong investment of French energy firms in [illegible] infrastructure, while locations served by Maersk will need to take account of the large fuel buyer's stated preference for a pathway that includes methanol initially and later ammonia.

- Benchmarking Fuel availability: Look at what resources you have close to the port for fuel supply - there may be producers of alternative fuels that cater to non-maritime energy consumers that would be well placed to transition to bunkering of alternative fuels (eg. a company supplying hydrogen to the local busses may be suitable to scale up to supply vessels in due course). Ports should also assess what their competitor ports are doing in terms of fuel supplies and port calls so that you can ensure that your port remains competitive and also, has the potential to participate in the formation of regional green corridors.

E.g. Neighboring ports such as Portsmouth and Southampton would need to assess whether they would be best served by offering different fuels to accommodate a wider range of ship operator demands, or establishing a complementary offer as a hub for a specific fuel which could drive investment in fuel infrastructure and attract more ship operators committing to that fuel.

- Compatibility with port policy: Does your port have any policy for alternative fuels or a policy for energy transition? If so, you need to check the suitability of a specific alternative fuel against existing documentation for your port (examples of things to check include if there is a lack of space or provider capacity. Would emission targets set by a specific port mean that certain fuels will be unsuitable? Is there a specific reason to promote a specific fuel - for example, a local non-maritime methanol producer may be an ideal partner as they can look at expanding into marine fuels and using the port as a base. Then this would take priority over space allocation to supply of other fuels)

E.g. Ports in California will need to assess bunkering developments against the state's strict requirements for all-berth emissions and the possibility of impending district-level regulation that would place the responsibility on ports to provide infrastructure to attract only clean vessels.

- Early impression of likely regulatory acceptance of specific fuel and designs: Assessing the likelihood of calls by vessels (both international and domestic) using specific fuels based on potential/existing approval by [illegible] authorities such as class, flag and regulators such as IMO and national maritime authorities. Is there a pathway in international regulations for this fuel and technology for approval? Is the Fuel already in use and ship designs approved – if so, the likelihood of calls increases.

E.g. When considering hydrogen as a fuel for container ships, the port of Vancouver would look at existing vessels using that fuel to see what the approvals process was. Pilot projects can form an established pathway for other vessels to easily follow suit as they will have had to navigate approvals. Pathways to approval between international (deep sea) and domestic (coastal, inland or harbour) vessels may vary. Thus the port would need to see if there is an established approvals process. As the attitudes of individual (Canadian maritime authority) vs multiple stakeholders (eg. class, IMO, flag state) could be different, this will impact scalability of this process for other vessels.

Level 2: Interest of all stakeholders determined

Goal: to gather information about the fuel for using or supplying specific fuels and services from stakeholders. When considering stakeholders, you may have primary (customers, which could include ship operators and fuel manufacturers and suppliers), secondary (wider supply chain and regulators) and tertiary (indirectly impacted - such as port agents or members of the public - although this will be different in the case of trust ports)

(general public/society/local population, regulators, terminals, shipping, NGO, fuel producers - not all of whom may be catering to the maritime sector, but may be established in other transport or energy sectors, [value chain stakeholders, authority stakeholders, regulators, port community, [illegible] including unions, first responders]

- Make an engagement & communication plan for stakeholders in your value chain

Ports should assemble a list of primary, secondary and tertiary stakeholders (explained in level one) and identify the best means to engage with these stakeholders to gauge their interest on this topic (no approaches are needed at this stage). Approaches to consider include one to one outreach, informal conversations, workshops, surveys, conferences etc. Individual stakeholders may require different approaches so this should be planned for accordingly.

E.g. The Port of Amsterdam would need to speak with multiple stakeholders, but may choose to [illegible] the shipping lines calling at their port - and opt to use informal conversations to assess initial interest. However, it may choose to hold a workshop with its

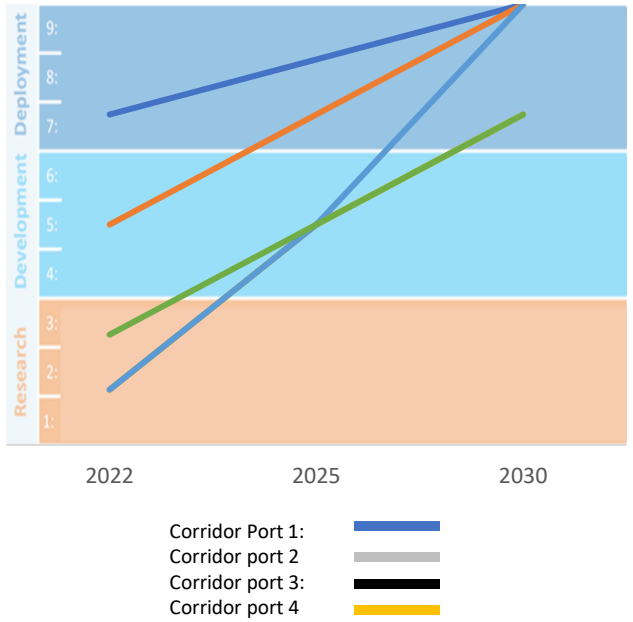
WPCAP

iaph international association of ports and harbors

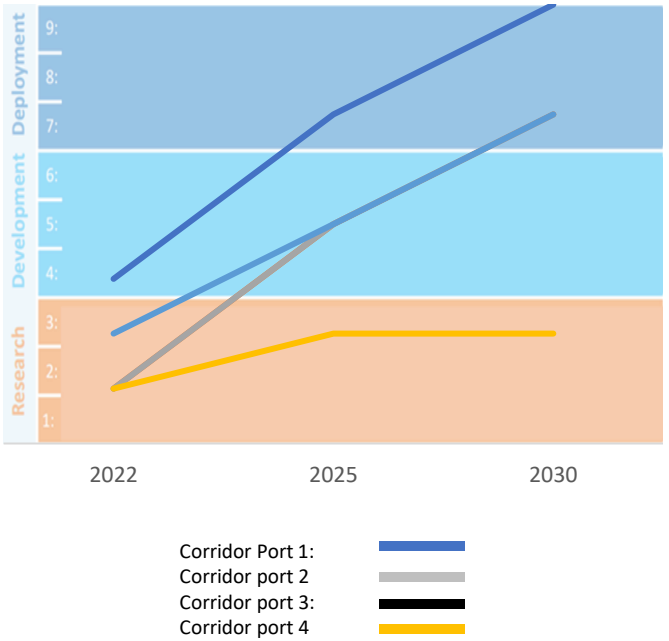
The Clean Marine Fuels working group

PRL-AFS Green Corridor Profiler

Bio-Methanol



Ammonia



Veiligheid

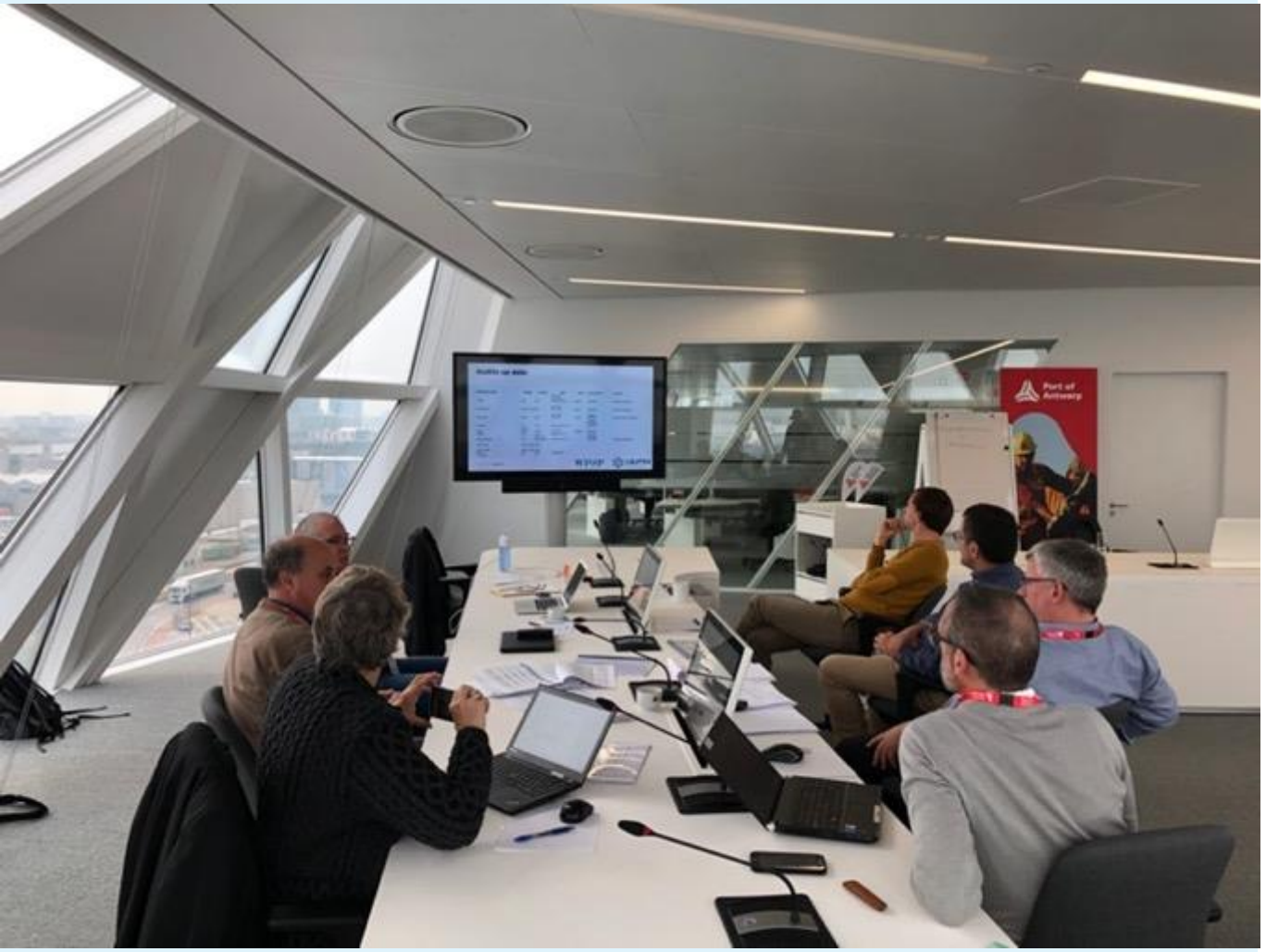
Conventioneel
Stookolie, MDO, MGO

- Water verontreiniging

Nieuwe brandstoffen
Gas, Alcohol, Ammoniak

- Laag vlampunt (brand / explosie)
- Hoge druk
- Cryogeen
- Giftig

IAPH Clean Marine Fuels working group



Empowering ports to facilitate, stimulate and regulate the supply of new clean marine fuels by providing expertise and guidance on safe and efficient bunker operations.

CMF goal

By 2030 the safe and efficient supply of new clean marine fuels in ports is to be common practice.

CMF support

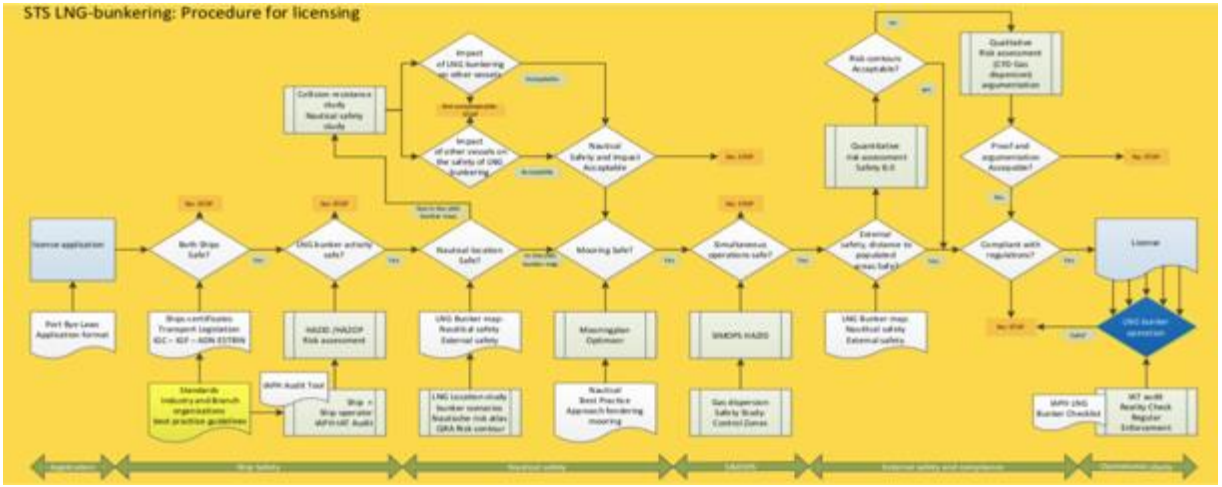
1. Port empowerment: Port Fuel Readiness
2. Safety Framework

iaph

Veiligheidsraamwerk

Vergunning verleningsproces bunker operator

- Havenverordening
- Bunker infrastructuur
- Systeem veiligheid (audits)
- Externe veiligheid (onderzoek)
- Operationele veiligheid (checklists)
- Incident response
- Havenmeester management systeem op orde
- Reality checks
- Toezicht en handhaving
- Training programma’s
- Stakeholders betrekken
- Communicatie naar het publiek



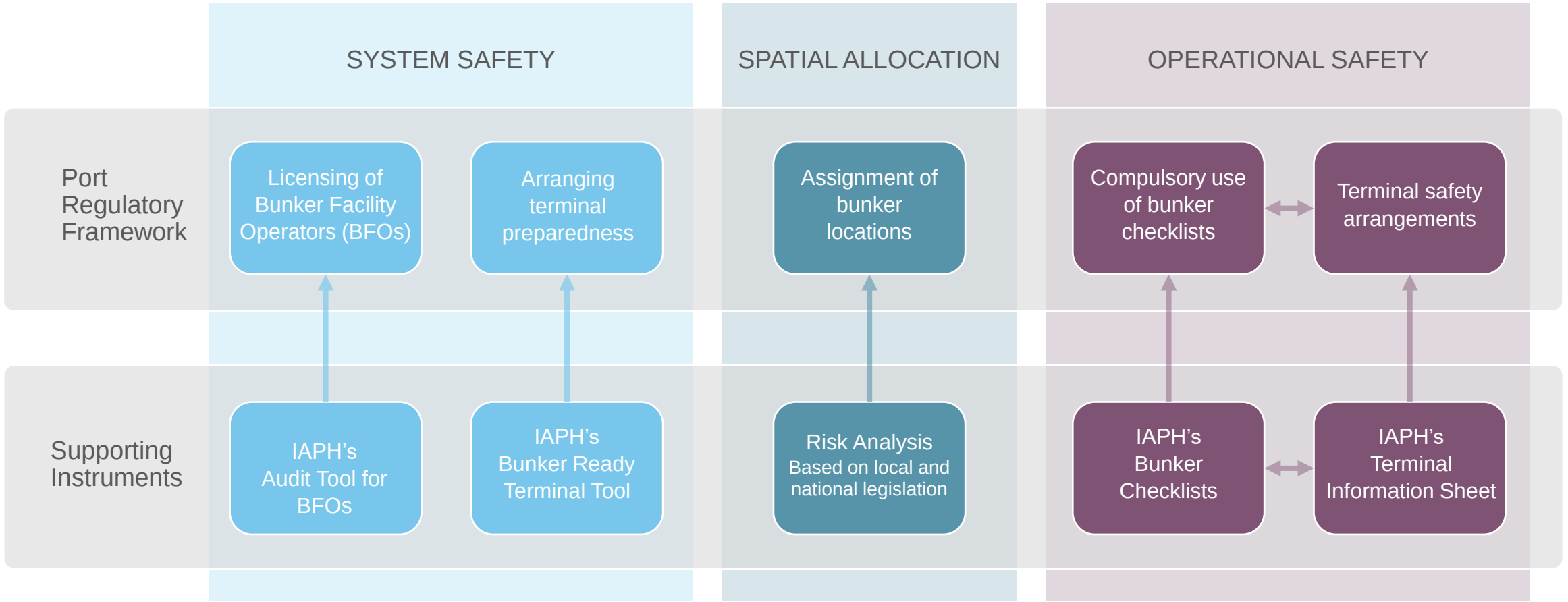
CMF Port Safety Management Framework

1. Harmoniseren van de systeem- en operationele veiligheid voor de schip - bunker faciliteit interface

2. Ervaringen en informatie delen t.b.v. allocatie veilige bunker locaties

3. Terminals voorbereiden

CMF PSM Framework



Available tools

System Safety

INSTRUMENT	ENERGY CARRIER	STATUS
LNG BFO Audit Tool	LNG	Completed
LNG Ready Terminal Tool	LNG	Completed

Operational Safety

INSTRUMENT	ENERGY CARRIER	STATUS
LG series checklist Truck to Ship	Liquefied gasses (LNG, LH2)	Completed
LG series checklist Ship to Ship	Liquefied gasses (LNG, LH2)	Completed
LG series checklist Ship to Ship Terminal Information Sheet	Liquefied gasses (LNG, LH2)	Completed

Roadmap: In progress and planned

System Safety

INSTRUMENT	ENERGY CARRIER	STATUS
Conversion of the LNG BFO Audit tool to a generic Audit Tool for BFO's of any marine fuel using any infrastructure	All	Running V1.42
Conversion of the LNG Ready Terminal Tool to a generic Bunker Ready Terminal tool for existing and new marine fuels	All	Started May 2022

Roadmap: In progress and planned

Operational Safety

INSTRUMENT	ENERGY CARRIER	STATUS
Ship to Ship checklists for Alcohol Based Fuels (AF) Based on ISGOTT 6 format	Methanol	Running, Industry consultation process
(Multiple) Truck to Ship checklists for Alcohol based Fuels (AF) Based on ISGOTT 6 format	Methanol	Running
Truck to Ship checklists for Compressed Gasses (CG) Based on ISGOTT 6 format	CH2	Running
Ship to Ship checklists for Toxic Gasses (TG) Based on ISGOTT 6 format	Ammonia	Starting soon
Shore to Ship checklists containerized energy carriers (CEC) Based on ISGOTT 6 format	Battery packs, Hydrogen racks	Start Q2 2023

Roadmap: In progress and planned

Port Empowerment

INSTRUMENT	ENERGY CARRIER	STATUS
Port Fuel Readiness Assessment and guidance tool for Fuel Ready Port, In cooperation with WPCAP, GIA, Mission Innovation Zero emission shipping mission (ZESM)	All	Phase 1 completed Phase 2 running
Green Fuel Corridors	All	To be investigated
Sharing knowledge from participating ports	All	Continuous

Externe veiligheid

Onderzoek externe veiligheid bunkeren van alternatieve brandstoffen voor de zeescheepvaart

Havenbedrijf Amsterdam N.V.

Rapport Nr.: 10246009-1, Rev. 1
Document Nr.: 11MYLEZF-2
Datum: 19-04-2021

Table 0-1: Location-specific individual risk distances (distance up to the 10^{-6} and 10^{-5} per year contour)

Bunkering scenario	Distance to 10^{-6}/year LSIR contour		Distance to 10^{-5}/year LSIR contour	
	Low flow rate (400 m³/h)[1]	High flow rate (1000 m³/h)[1]	Low flow rate (400 m³/h)[1]	High flow rate (1000 m³/h)[1]
	LSIR distance (m)	LSIR distance (m)	LSIR distance (m)	LSIR distance (m)
LNG (-146 °C)	321	- [2]	210	- [2]
LNG (-159 °C)	231	344	188	285
Methanol	68	98	56	85
Ammonia (refrigerated)	255	427	153	246
Ammonia (pressurized)	793	973	405	556
Hydrogen (liquid)	214	273	159	198
Hydrogen (gaseous) – (3 t/h)	87	- [2]	87[3]	- [2]
Hydrogen (gaseous) – 700 bar (60 g/s)	- [2]	- [2]	- [2]	- [2]
Hydrogen (gaseous) – 1000 bar (60 g/s)	- [2]	- [2]	- [2]	- [2]

[1] Bunkering flow rates apply to liquid fuels. The flow rate for gaseous fuels is shown in the scenario name
[2] An explanation of the table can be found under Table 7-1 in Section 7.1
[3] For bunkering of hydrogen with 3 tonnes per hour the calculation assumes a high annual bunker duration. This causes the location-specific individual risk contour of 10^{-5}/year to be of almost equal size to the 10^{-6}/year and the influence area (see also Appendix A).

Table 0-2: Maximum distance from bunker hose to focus area boundary

Fuel	Flow rate	Focus area distance (m)		
		Fire	Explosion	Toxic
LNG	400 m³/h (-146 °C)	249	274	- [1]
LNG	400 m³/h (-159 °C)	330	295	- [1]
Methanol	400 m³/h	102	- [1]	22
Ammonia (refrigerated)	400 m³/h	- [1]	- [1]	1446
Ammonia (pressurized)	400 m³/h	- [1]	- [1]	1478
Hydrogen (liquid)	400 m³/h	239	283	- [1]
Hydrogen (gaseous)	3 t/h	87	- [1]	- [1]
Hydrogen (gaseous)	700 bar (60 g/s)	55	- [1]	- [1]
Hydrogen (gaseous)	1000 bar (60 g/s)	55	- [1]	- [1]
LNG	1000 m³/h	448	229	- [1]
Methanol	1000 m³/h	154	- [1]	34
Ammonia (refrigerated)	1000 m³/h	- [1]	- [1]	2624
Ammonia (pressurized)	1000 m³/h	- [1]	- [1]	2060
Hydrogen (liquid)	1000 m³/h	324	338	- [1]

[1] The justification as to why no distances are calculated can be found under Table 7-3 in Section 7.2

Conclusies

1. Havens spelen een grote rol en hebben daarmee een grote uitdaging als het aankomt op het faciliteren van het bunkeren van nieuwe brandstoffen

2. Begin 2023 is een eerste versie van de PRL-AFS beschikbaar, die havens ondersteunt bij deze uitdaging

3. Daarnaast zijn er IAPH CMF veiligheids-hulpmiddelen beschikbaar om de veiligheid van het bunkeren in te regelen

Port of Amsterdam

Referenties

Peter Alkema

peter.alkema@portofamsterdam.com

https://www.portofamsterdam.com

https://sustainableworldports.org/clean-marine-fuels

https://sustainableworldports.org/wpcap/wg-4/


PLATFORM SCHONE
SCHEEPVAART

SHORE POWER ROTTERDAM

ROLE OF OPS IN THE ENERGY TRANSITION

Floor Schipper, programmamanager walstroom voor de zeevaart

Lelystad, 22 November 2022

Topics

Port of Rotterdam

- Shore Power Strategy Rotterdam
- Focus
- Studies & Investigations
- Terminal dilemmas
- Rotterdam Shore Power B.V.
- Next Steps

Shore power strategy rotterdam

ambition: 8-10 shore power projects in 2025 up and running

International collaboration between ports (World Port Climate Action Program]

Developing business models together with the market

Offering Shore Power as a service by Rotterdam Shore Power BV (JV: ENECO & PoR)

Speeding up development of standards for low voltage segment and for liquid bulk segment

Shore power strategy rotterdam

- **Focus PoR:**
- Be “Fit for 55” compliant (container, cruise Ro-Ro- vessels)
- Supporting other shipsegments (tankers, breakbulk, nautical service providers etc)
- Reduce shipping Nox, noise & CO2 in port
- dard e, ta

Some highlights so far

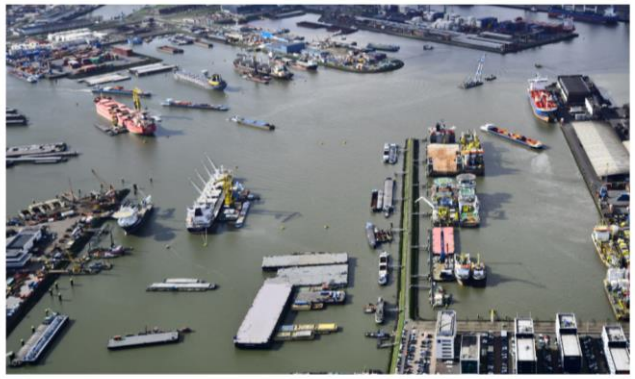
- Cruise Port Power bv – aiming for OPS in 2024
- Boskalis – Rotterdam Shore Power bv - 2nd project
- Inner-city quays – design studies advanced stage
- Demo/pilot with shore power for tankers
- Ministry of Transport project to encourage shore power roll-out
  - Technical (low voltage) standard for smaller vessels
  - Open source data communication for payment
  - Smart grid shore shore power innovations
  - Smart upgrade of OPS connections of vessels

Boskalis vessels to switch to shore power in the Port of Rotterdam

PORTS & LOGISTICS

June 27, 2022, by Naida Hakirevic Prevljak

The Dutch Port of Rotterdam Authority and energy company Eneco revealed plans to construct shore-based power facilities in the Waalhaven, Rotterdam, so that moored Boskalis vessels can run on green electricity instead of fossil fuels.



Courtesy of Port of Rotterdam/Boskalis

Stolt Tankers, Rotterdam Port, Vopak to explore shore power use for chemical tankers

BUSINESS DEVELOPMENTS & PROJECTS

May 5, 2022, by Naida Hakirevic Prevljak

Norwegian tanker operator Stolt Tankers, part of Stolt-Nielsen, has signed a memorandum of understanding (MOU) with the Dutch Port of Rotterdam Authority and Vopak terminal Botlek to conduct a six-month feasibility study for the use of shore-based power for chemical tankers calling at the terminal.

Boskalis vessels to switch to shore power in the Port of Rotterdam
1 day ago

Port of Gothenburg first to provide shore power for tankers
20 days ago

Port of Kiel turns to Siemens for additional shore power plants
about 1 month ago

Join the Energy Transition!

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Studies & investigations

- Done:
  - RHDHV Masterplan Maasvlakte Container Terminals (2020)
  - RHDHV Blue print study Maasvlakte (2022)
  - DNV Vessel mix study Container vessels (2022)
  - Pilot Mobile Shore Power Parkkade (2018)
  - Inventarisation Middenhavengebied (Waal/Eemhaven) (2022)
- To do:
  - Pilot Phase B (2023)
  - Case by case study with liners to define vessels energy demand
  - Grid capacity – Stedin (to be further investigated)
  - etc…….

APMT Maasvlakte 2

Euromax

RWG

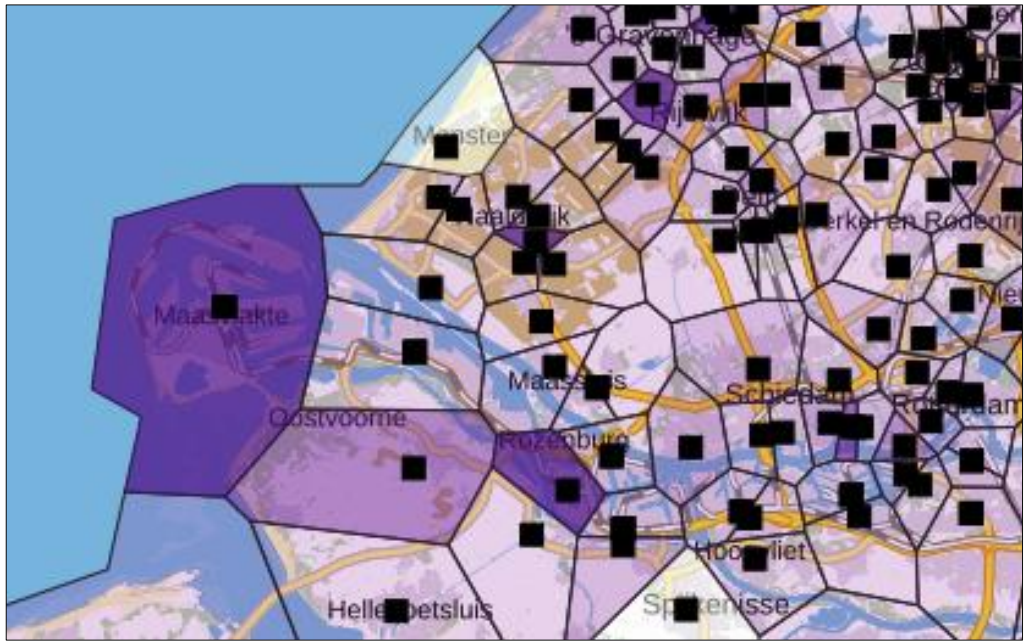
ECT Delta

ECT Delta 2

ECT DDN

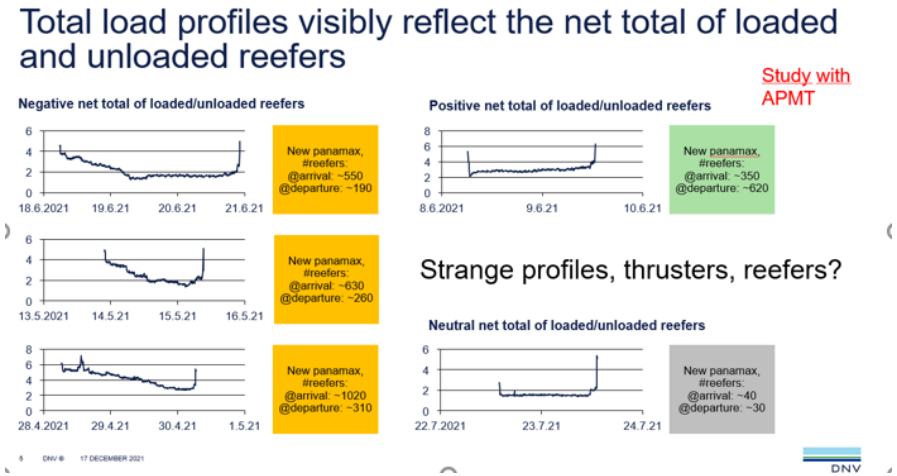
Studies & investigations

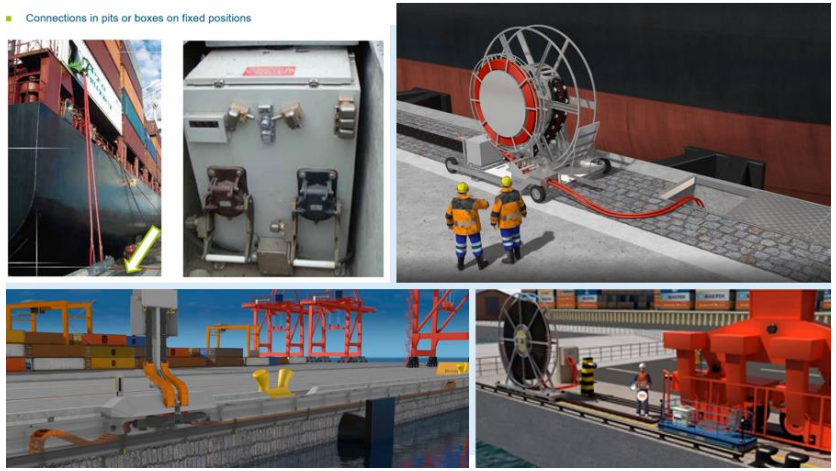
- **Capacity Stedin connections**
- The North part of the central port area has an available capacity of 61 – 100 MVA
- The South part of the central port area has an available capacity of 21 – 40 MVA
- Looking for possibilities of redu
  impact of power demand fluct
  on the grid



Terminal dileMmas

- **Terminal dilemmas:**
- Vessel connection → cable management system/ ship-shore interface
- Vessel power demand
- Transformer stations
- Integration in current quay wall
- Berth down time for installation





World Ports Climate Action Program

The WPCAP Power-to-Ship working group develops a paper for the IEC TC18 (draft distributed

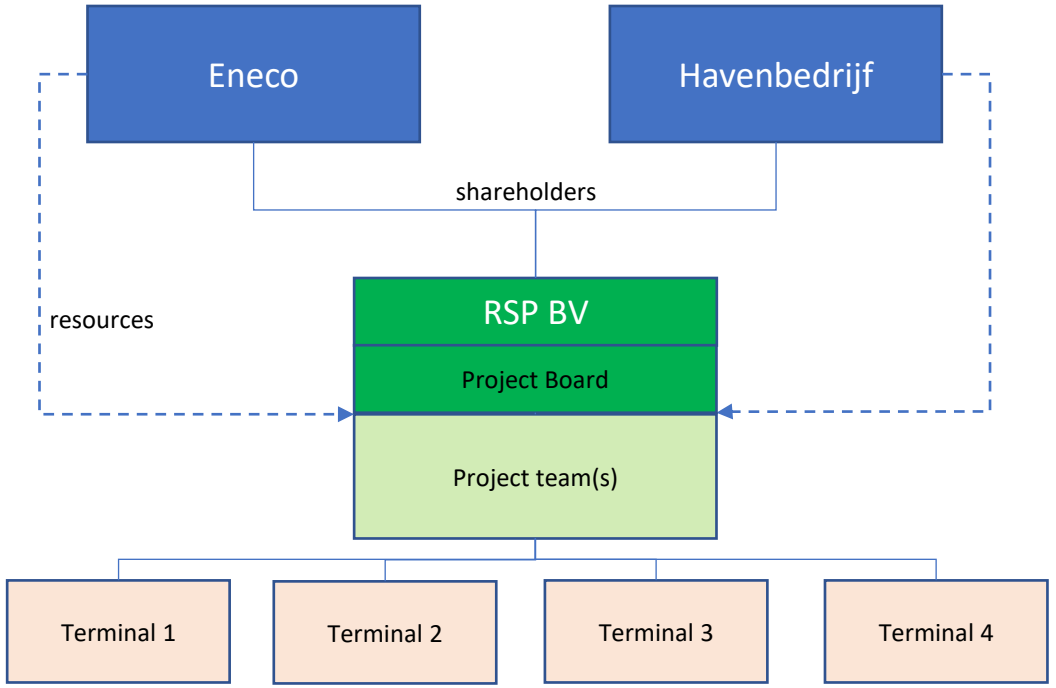
Key points:

- The IEC 80005 standard is instrumental to roll-out – but only formalised for container, cruise, RoRo 6.6/11kV
- The standard in its current form seems to lead to oversized and under-used installations
- Various technical details in terms of electrical requirements, cable management systems and operations have led to questions
- Investors (ports, terminals, power service providers) face uncertainties due to lack of actual vessel OPS capability and power demand
- Uncertainties in power demand complicates obtaining future e-grid capacity
- A standard for low voltage is urgently needed – conflicts foreseen with e.g. small container vessels – as well as multiple cable/plug types
- A standard for charging batteries on board is urgently needed as well as power demand forecasts for e-grid capacity and business cases
- Concerns about potential safety conflicts with ships on alternative fuels (LNG vessels with membrane tanks, ammonia, …)

ROTTERDAM SHORE POWER B.V.

"SHORE POWER AS A SERVICE"

- Rotterdam Shore Power B.V. (RSP): joint venture Eneco and Port of Rotterdam (founded 2019)
- Eneco is the most sustainable electricity provider in the Rotterdam area
- Combination of knowledge to increase project success rate and reduce risk profile
  - RSP **develops** the shore power facilities
  - RSP **finances** and **constructs** the facilities
  - RSP **operates** the facilities



ROTTERDAM SHORE POWER B.V.

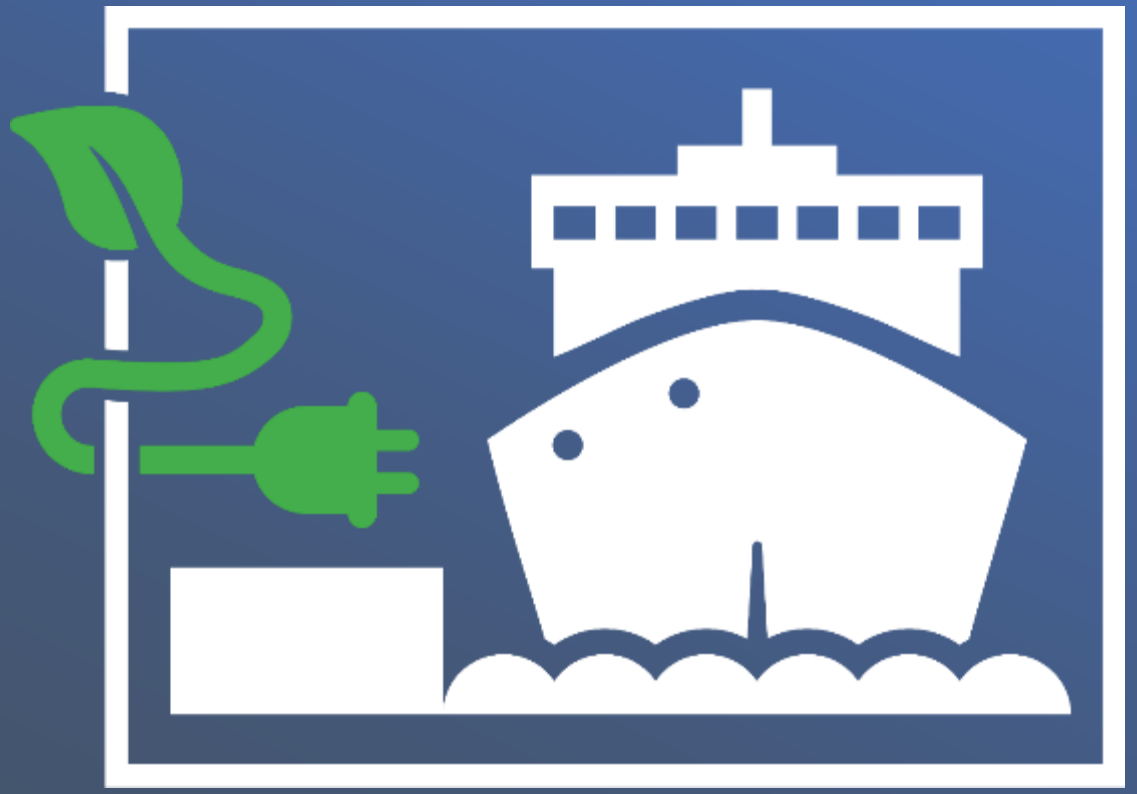
- 3 FID’s
  - Heerema (operational early 2022)
  - Boskalis (operational June 2023)
  - DFDS Seaways (operational late 2023)

NEXT STEPS

- User profile and power demand per vessel determine dimensioning shore power facility
- Verification of starting points with liners :
  - Vessel mix/ Energy demand per vessel
  - Shore power readyness fleet (shipbuilders)
  - Costs and use of MGO versus “new” fuels
  - Vessel connection (ship shore interface)
    - standardization – low voltage, tankers
  - Reefers (CV)
- Electricity measurement (monitoring power consumption)

KEY MESSAGES

- Shorepower (OPS) will be strongly driven by European legislation in the medium term with mandatory performance standards by 2030 for the Container sector, Ferries and Ro-Ro and Cruise
- For proactive players there will be subsidies available and incentives for OPS uptake, but once legislation is been become fully in force cost-pass-through will be through the value chain and without further subsidy
- Collaboration between ports is ongoing, for strengthening the business case from fleet owner perspective and to improve overall business case and shared ownership
- Active role of shipping lines (demand side) is critical for the acceleration of the OPS uptake and the justification to the subsidy providers, hence very much invited to be active partners



Thank you!

For further questions please contact Jarl Schoemaker or Floor Schipper

fh.schipper@portofrotterdam.com
jt.schoemaker@portofrotterdam.com

Port of Rotterdam


PLATFORM SCHONE
SCHEEPVAART

Boomsma Shipping

WASP, *Econowind on 'FRISIAN SEA'*

by Johan Boomsma Msc.

SHIPPING

"If you want to reach new destinations, you have to abandon old courses."

Landscape:

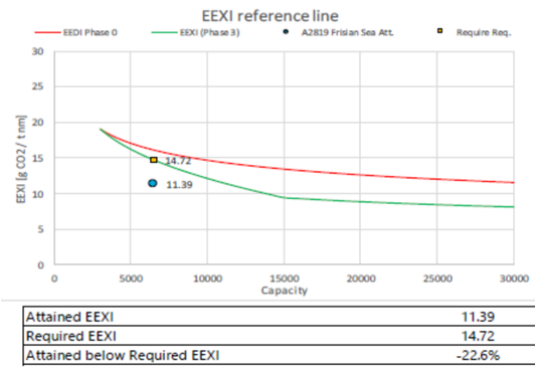
INTERNATIONAL MARITIME ORGANIZATION

POSEIDON PRINCIPLES

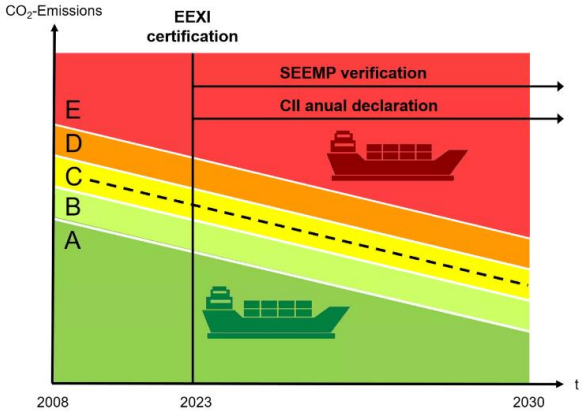
Europese Unie

SEA CARGO CHARTER

?



Attained EEXI	11.39
Required EEXI	14.72
Attained below Required EEXI	-22.6%



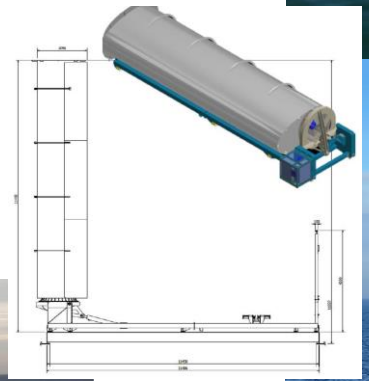
EMISSION REDUCTION IS KEY!

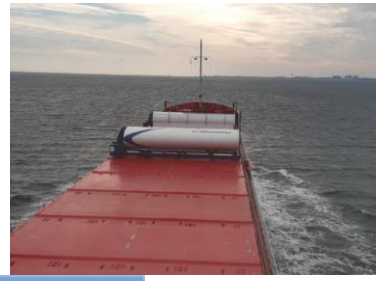
SHIPPING

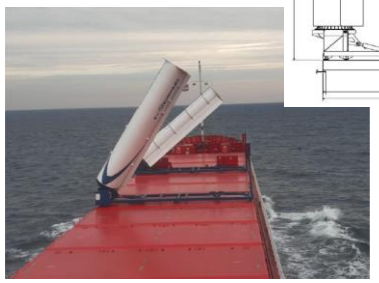
Why WASP?

Why Econowind?

- Our requirements:
  - No interference with cargo ops
  - Removeable / replaceable
  - Easy to use





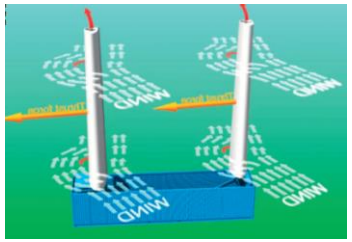


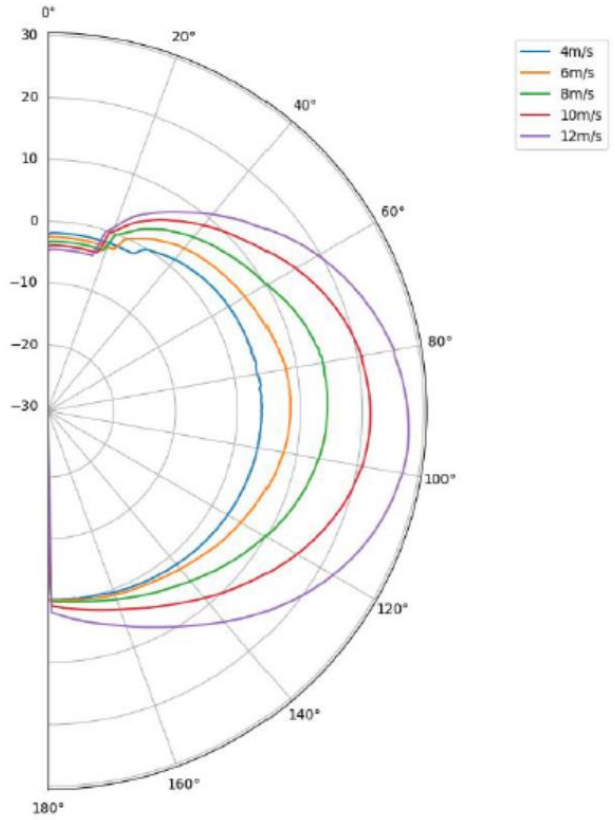
SHIPPING

"Proven past, future focus!!"

How does it work?

wind





Preparation / Installation:

- Concept design
- Class approval
- Modifications
  - Cable routing
  - Hatches
  - Storage position
  - Navigation lights
  - Angle of attack
- Crew

SHIPPING

"Proven past, future focus!!"

Interreg North Sea Region WASP European Regional Development Fund EUROPEAN UNION wasp Wind Assisted Ship Propulsion

Operations:

- Autonomous when opened
- Restrictions
- Used when possible

SHIPPING

"Proven past, future focus!!"

Positive outcomes WASP

- EEXI improvement
- Fuel savings (ánd less emissions)
- CII improvement ➔ Less CO_2
- ETS cost reduction

Questions?


PLATFORM SCHONE
SCHEEPVAART

Van Oord
Marine ingenuity

Building the Future Together

Job Voormolen, Innovation manager

22 November 2022

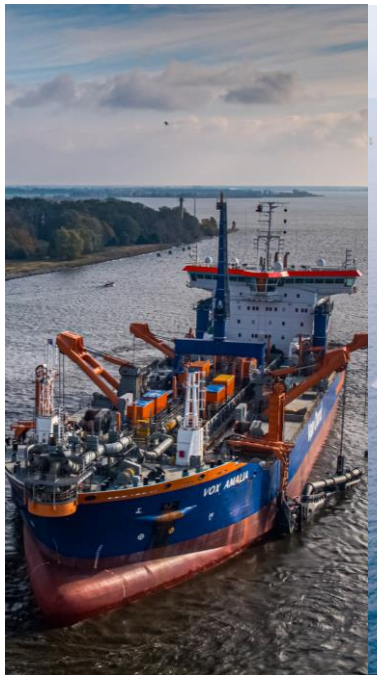
Company profile

Van Oord
Marine ingenuity

Profile

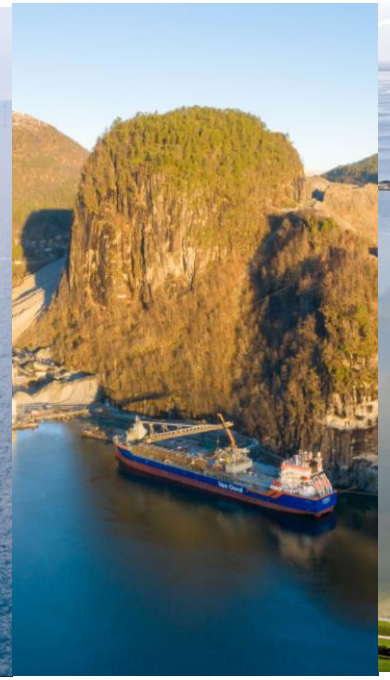
- Family owned company
- 4 different business units
- Asset heavy
- Working all over the world

Dredging



Offshore Wind

Offshore

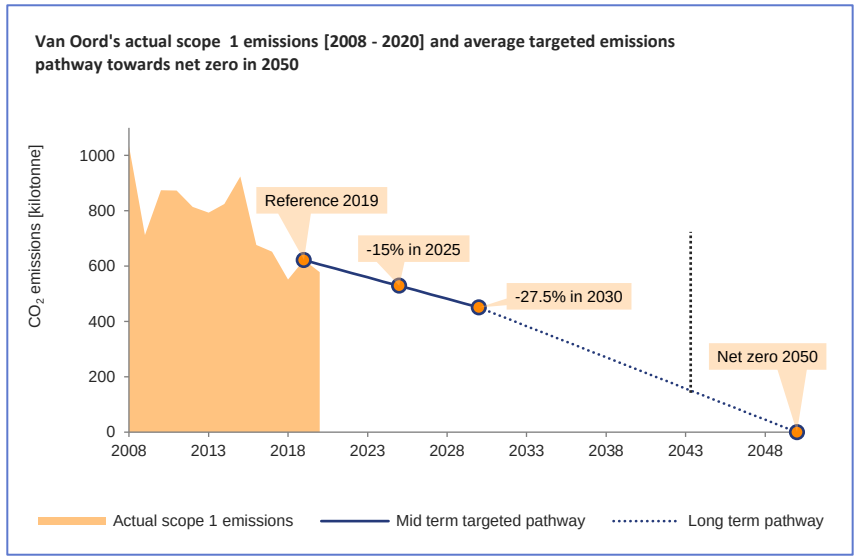


Netherlands

Getting your organization ready for the energy transition

Van Oord
Marine ingenuity

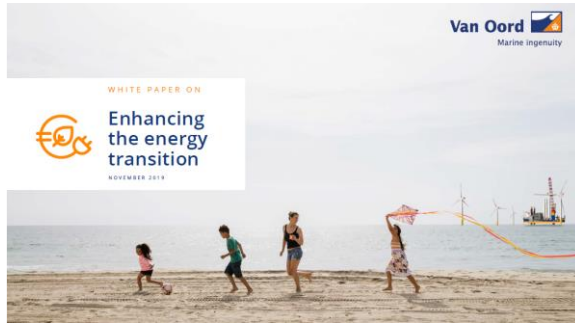
Clear targets, reference points, responsibilities and communication!



Scope 1
Direct emissions

Scope 2
Indirect Emissions from Energy

Scope 3
Indirect Emissions
Upstream ↑ and Downstream ↓



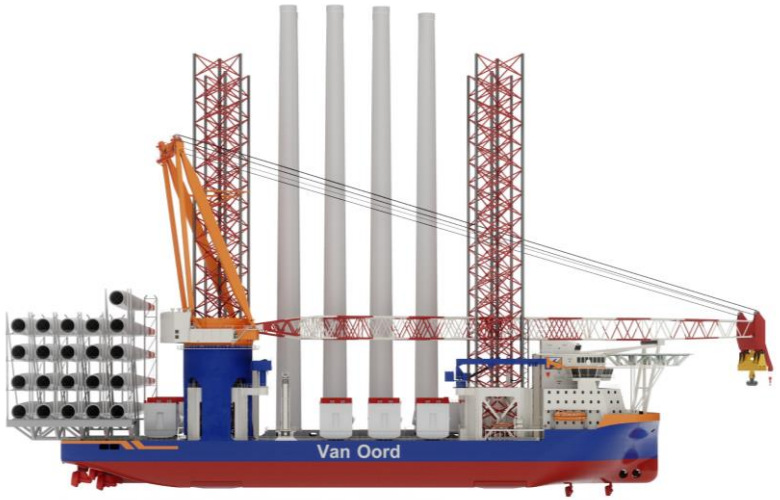
Energieflits | #1 2022

Energie als cruciale hulpbron in 2021 | *Hoeveel, van welk type en waarvoor?*

What to choose and more important: when?

Van Oord
Marine ingenuity

Ordered May 2018

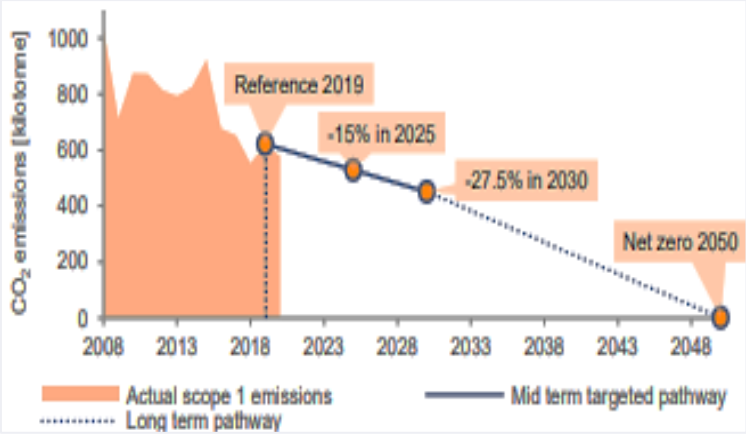


Ordered Sept 2021

Our key ingredients to achieve FID of our first Methanol vessel

Van Oord
Marine ingenuity

Clear corporate strategy



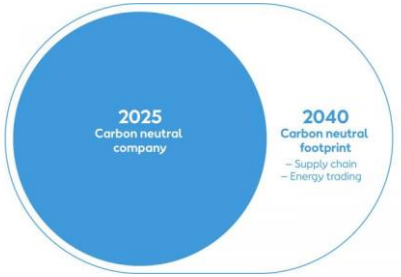
Clear department strategy

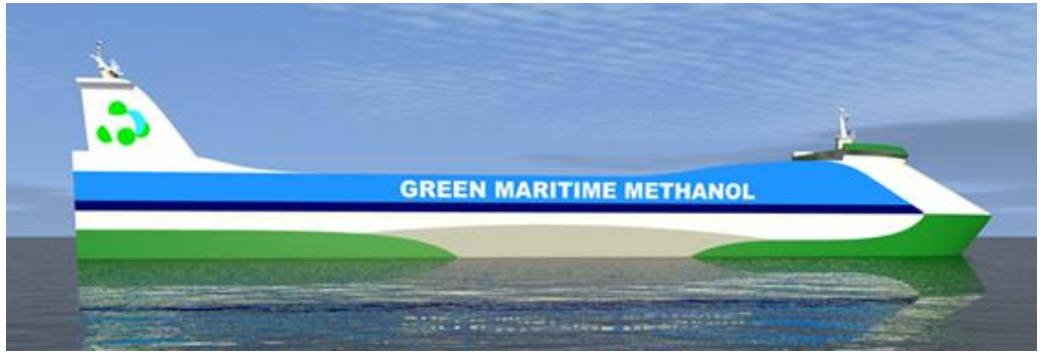
- Energy Efficiency
- Renewable Energy

Commitment & partnerships

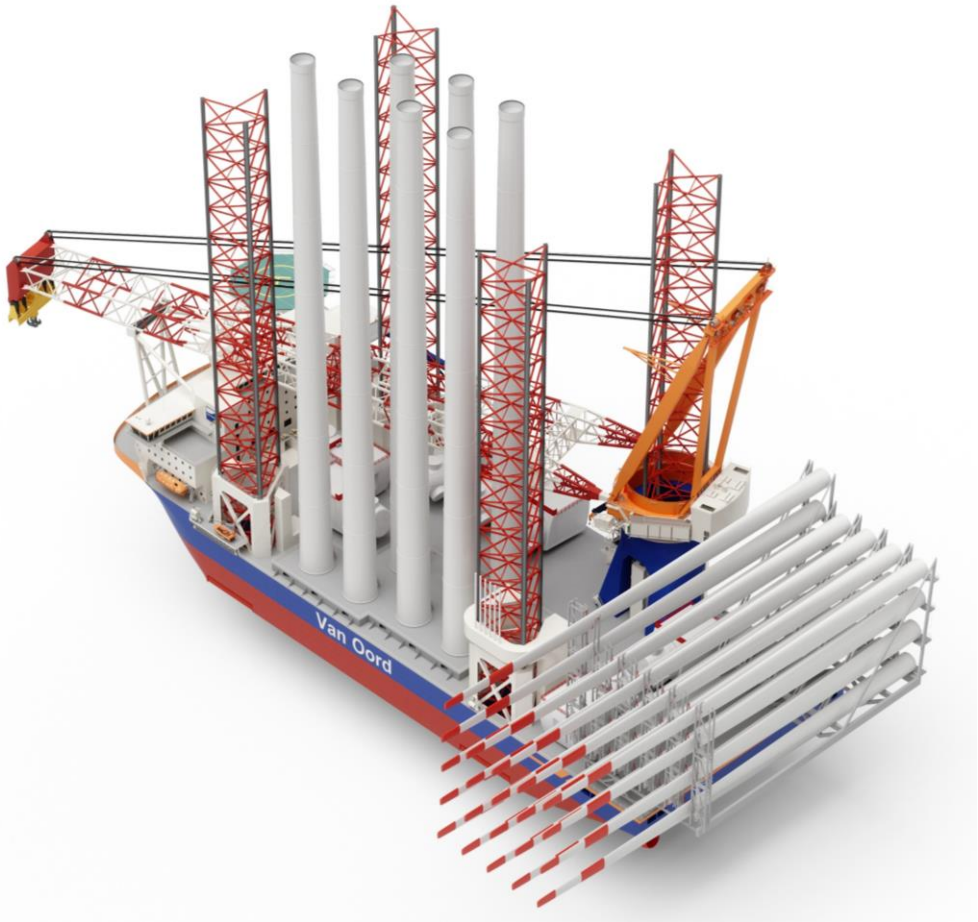
- Internal Promotion
- Technology Enablers

Growing market with typical clients like:





General particulars



Lpp:	169.5 mtr.
Breadth:	63 mtr.
Operating depth:	≈ 70 mtr.
Length of legs:	126 mtr.
Crane capacity:	+3.000 Tonnes.
Accommodation:	135 pax.

4 island redundant powerplant with 5 multi fuel engines (23 MW)

11 kV closed ring busbar AC system
1kV DC with 4x1200 kWh batteries + regeneration

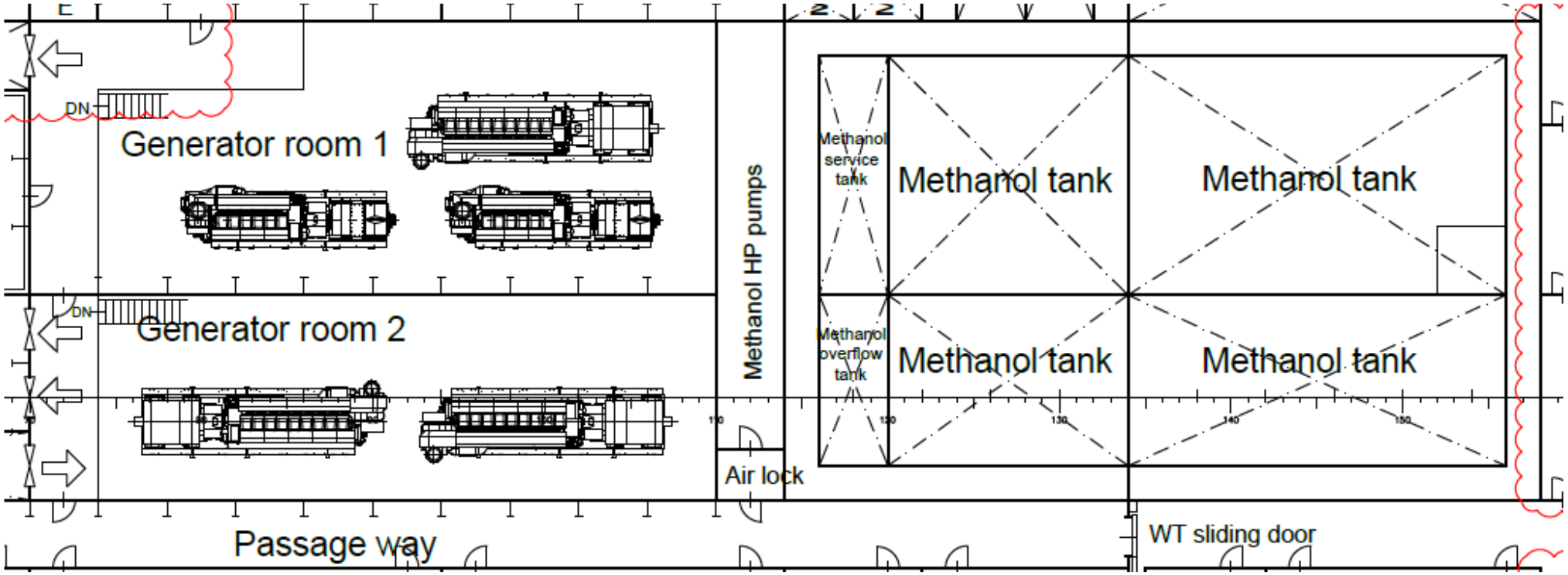
Engine configuration and HP fuel pump layout

Van Oord
Marine ingenuity

Original design with 8 engines reconfigured to 5 engines: 2x6 + 3x9 Wartsila 32.

Electric driven HP pumps in separate room, close to engines.

Bunker tanks: stainless, bunker manifold with vapour return line



Methanol “auxiliary” scope of supply

2.1 Methanol fuel supply system

Van Oord
Marine ingenuity

DEMARCATION LIST

Methanol fuel system – Full system supply

2.1.1 Methanol Fuel Pump Unit **5**

The Methanol Fuel Pump Unit (MFPU) regulates the pressure and flow of the methanol at the engine’s inlet, at high pressure. The unit coordinates with the engine automation system and is designed in accordance to the needs of each engine. One unit is needed per each engine.

2.1.2 Methanol transfer pump skid **1**

The Methanol transfer pump skid regulates the pressure of the methanol before the MFPU at the required value. The unit supplies methanol to all MFPUs and includes a recirculation line to the overflow and bunker tanks to send back excessive methanol to the main tank.

2.1.3 Low pressure methanol handling skid **1**

The low pressure methanol handling skid prepares and distribute the methanol from the low pressure skid to the MFPUs and is consisting of equipment such as valves, flowmeters, strainers and pulsation dampers (if needed).

2.1.4 Bunkering station **2**

The Bunker station is an assembly of valves and instruments, delivered as a skid mounted unit.

2.1.5 Automation system **1**

The control and automation system of the bunkering, transfer and low pressure systems is carried with a Process Control Cabinet (PCC) and with local control panels. The PCC is designed for the primary process & safety control functions of the methanol fuel system, including also all classification required alarms and indications.

2.1.6 Ship-to-shore link **1**

The ship-to-shore link consists of an electric connection to communicate with the bunkering facility on shore or with a bunkering barge.

Nitrogen generator
Nitrogen generator
Air compressor
Local control cabinet
Buffer tank
Foundation for cabinets and equipment

Conclusions

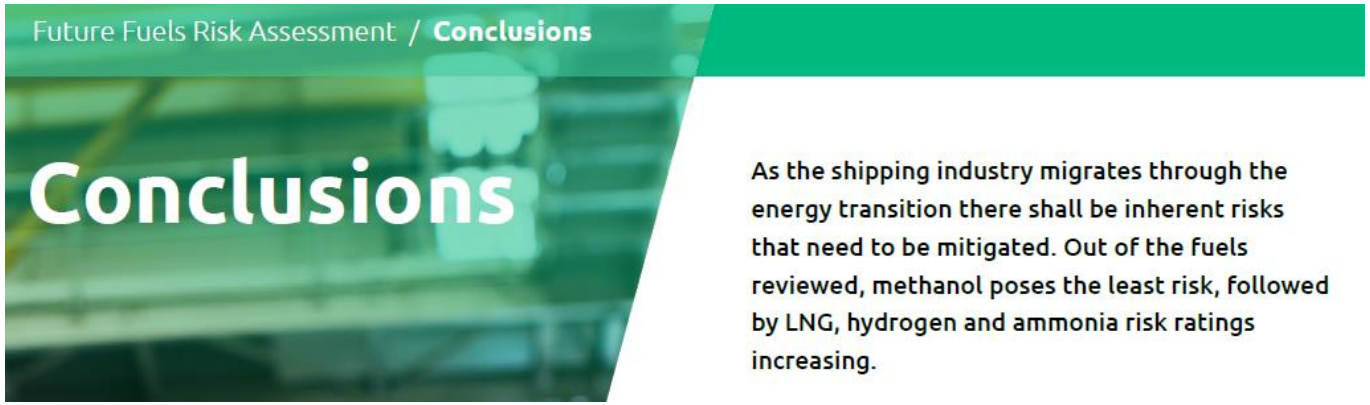
Van Oord
Marine ingenuity

Building a methanol fueled ship is getting along quite well.

All parties involved (DnV, Yard and Wartsila) have a positive attitude.

A lot of green methanol production initiatives are getting started or pending FID.

We are still happy and confident with our choice to go for Green Methanol and we are looking for more applications.




PLATFORM SCHONE
SCHEEPVAART

Van Dam Shipping

Companies Van Dam Shipping

Van Dam Shipping

8 eigen schepen:

- 3 Saimaa max type
- 3 Short sea vessels
- 2 Icerunner Type vessels

VD Innovation

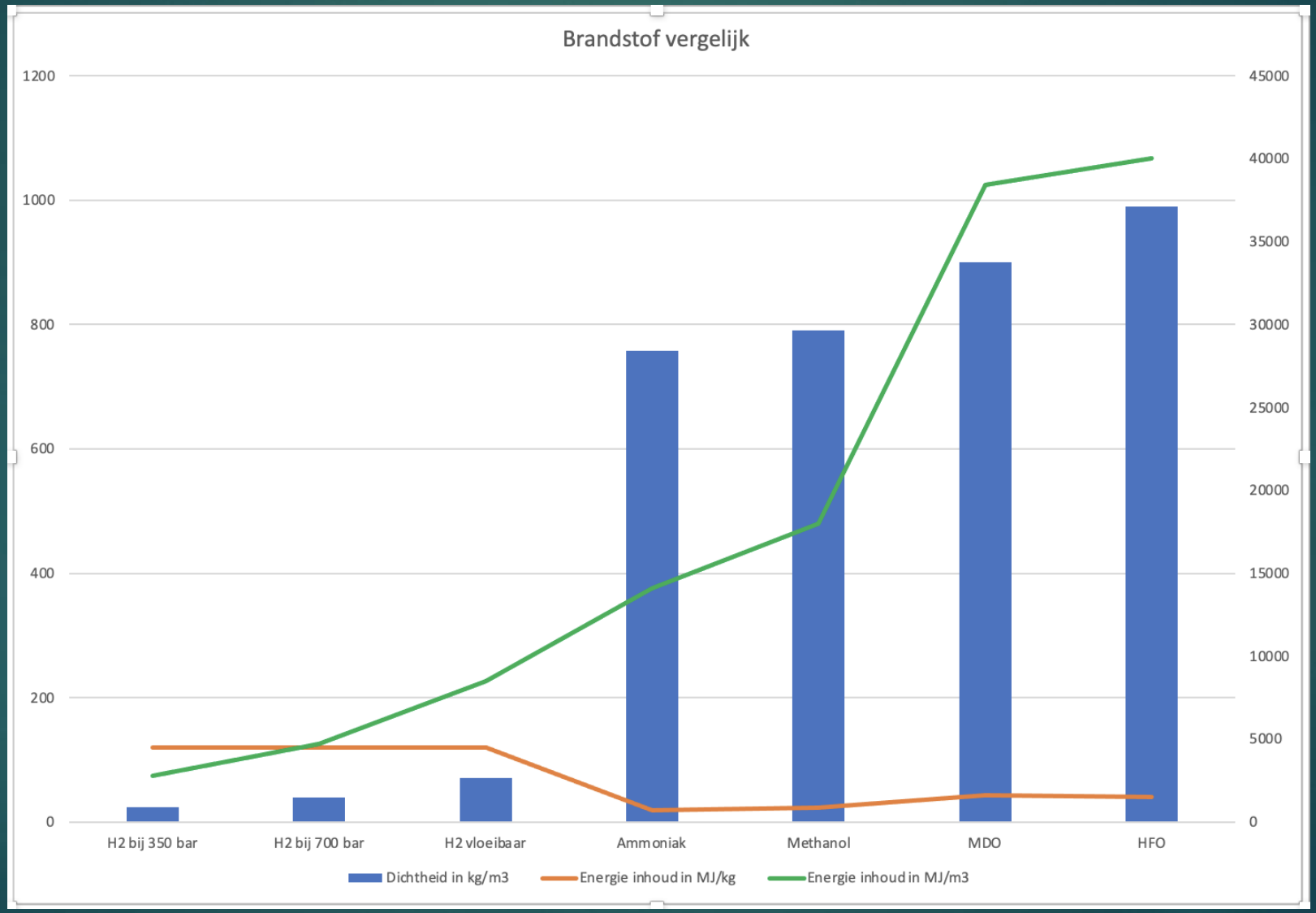
In management:

- 2 General Cargo vessels
- Nieuwe scheepsontwerpen naar zero emission

TOTAL CREW

- Crewing agency (European crew)

Brandstof vergelijk



Brandstof verbruik

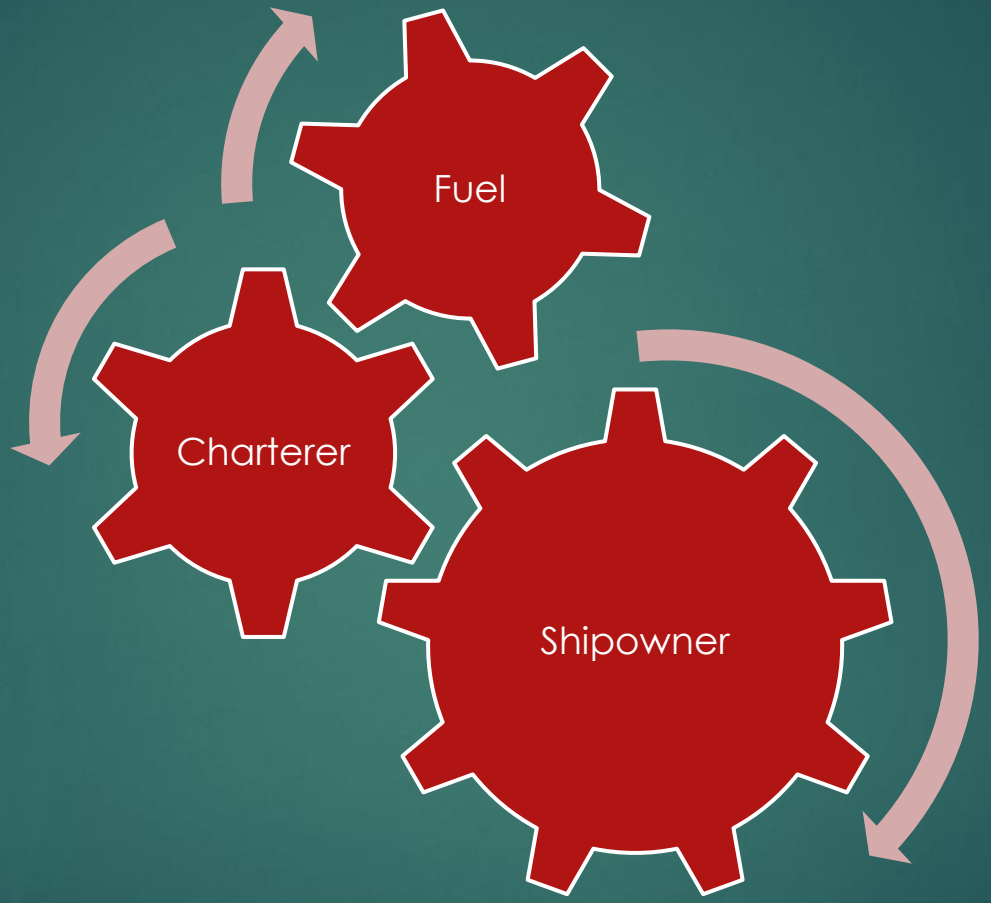
- Gemiddelde snelheid 10,4 knopen
- 900 kW gemiddeld vermogen voortstuwing
- Gemiddelde efficiency fuel cell 50%
  - 1260 kg LH2 per 24 uur varen
  - = 18 m3 LH2 per 24 uur varen

- Zware lading combineert goed
- Tata heeft interesse in samenwerking
- 10 + 10 jaar timecharter

Keuzes

- Zero emission 3500 – 5000 ton kustvaarder met brandstofcel op vloeibaar waterstof
- 100% groene waterstof
- Vaste route, rondje van ca. 8 – 12 dagen
  - 10 – 14 ton LH2
  - 140 – 200 m3 LH2
- Eén bunker locatie
- In gesprek met energiebedrijf voor plaatselijke productie van LH2
- Bunkerstation deel van het project

Keten integratie



- Keten integratie:
  - Lange termijn time charter met Tata Steel
  - Samenwerking met energiebedrijf om ter plaatse LH2 te produceren en leveren

Van Dam Shipping

Meer informatie:

H2@vandamshipping.com

Jan van Dam
Hans van Breugel
Jurrien Baretta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