

# ZERO

# Vägen till visionen

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# WALLENIUS MARINE



# Lasten



# Lasten



Image: Bruce Williams

# Lasten



# Lasten



# m/v FIDELIO

**Built: 2007**

**Length: 227.8**

**Yard: DSME**

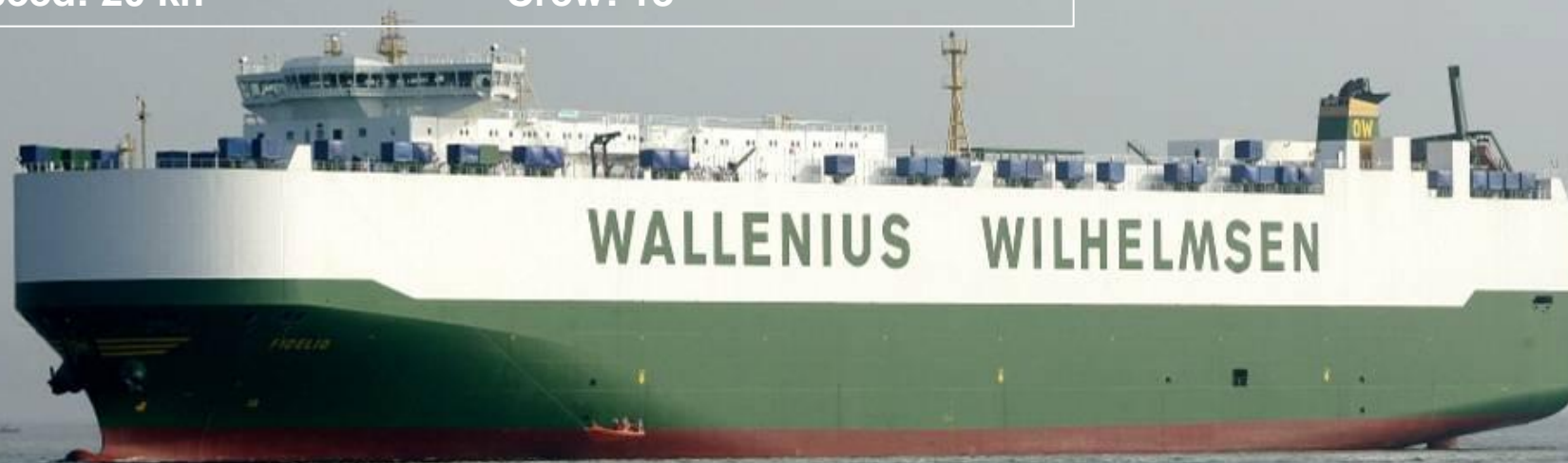
**Beam: 32.3**

**Engine power: 16 000 kw**

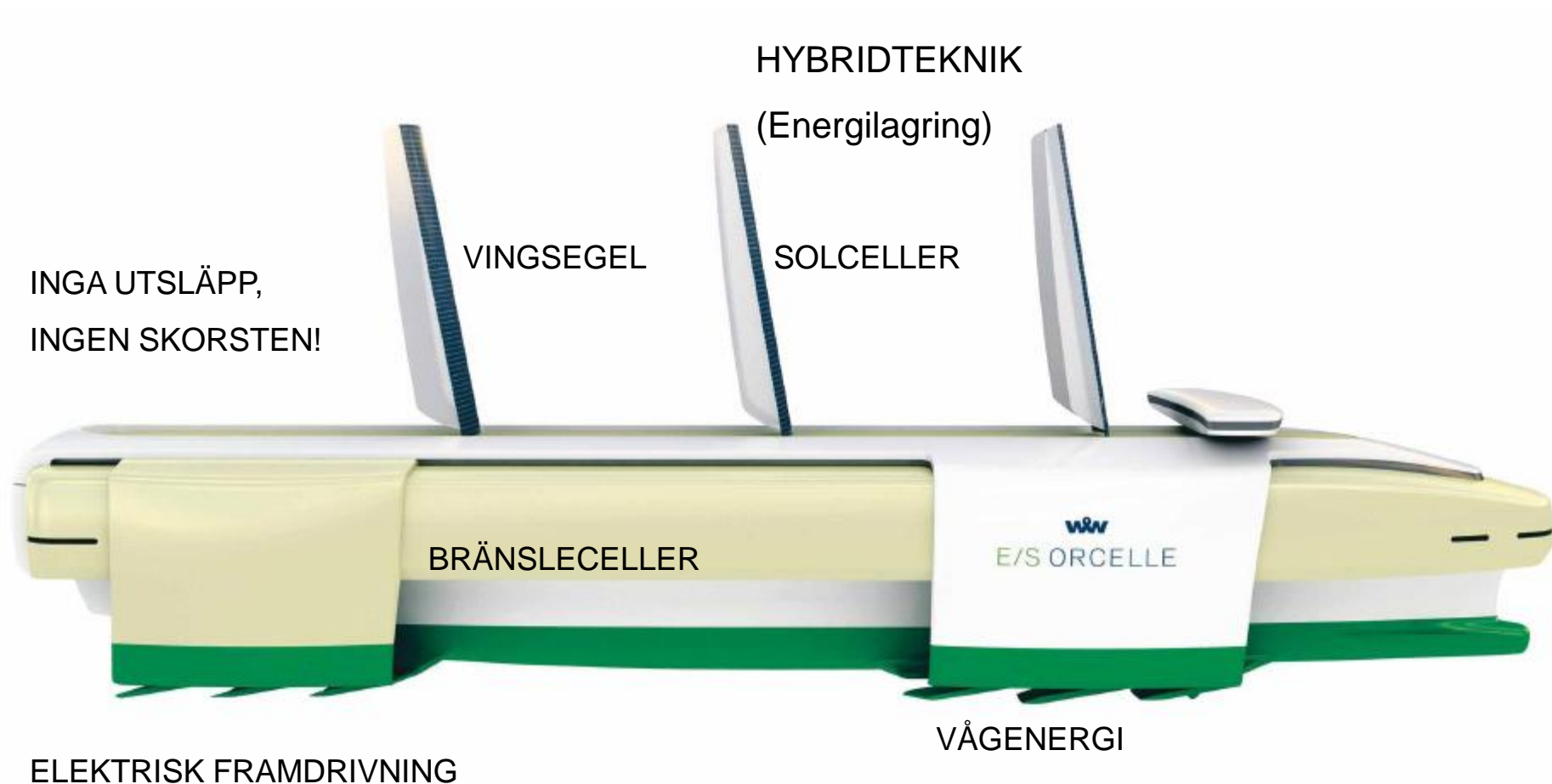
**Kapacity: 8,000 bilar**

**Speed: 20 kn**

**Crew: 18**



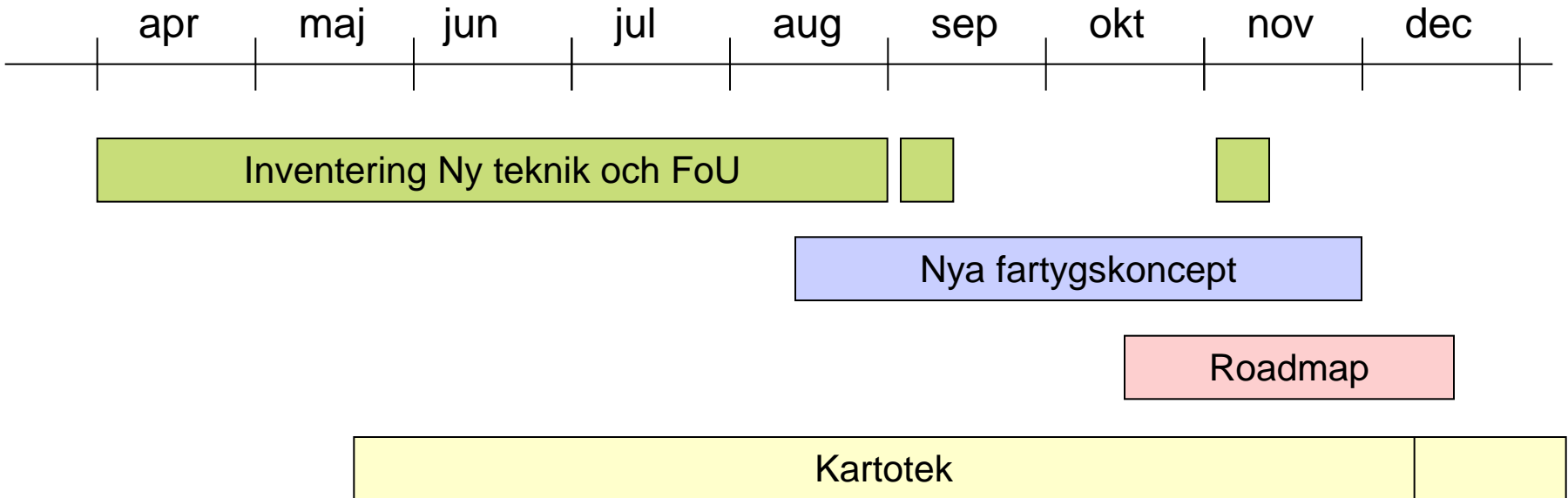
# E/S ORCELLE, vår framtidsvision



# Projekt ZERO - Målsättningar

- Roadmap
- Grund för planering av FoU
- 2 fartygskoncept
  
- Syfte: Att skapa bättre förutsättningar för att realisera Wallenius vision om emissionsfria fartyg.

# Projektplan (2009)



# Register of new technology and R&D

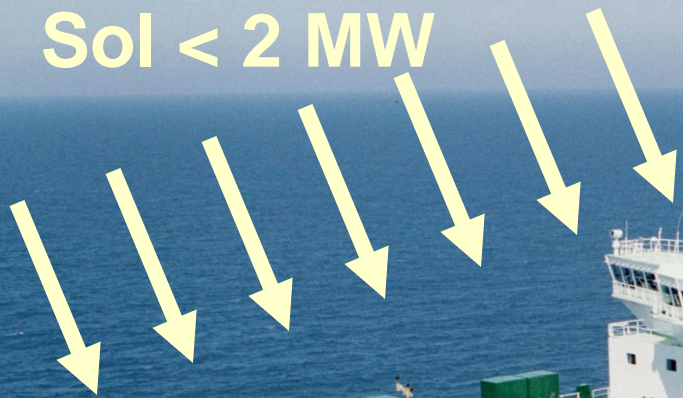
<b>Hull concepts</b>
Longer and narrower Vessel
Wider Vessel
Catamaran
Trimaran
Pentamaran
Air Cavity System
<b>Hull materials</b>
Aluminium
FRP
<b>Propulsors</b>
Fixed pitch propeller
Controllable pitch propeller
Foils
POD
Voith-Schneider
Contrarotating propellers
Pre-Swirl Stator
<b>Friction reduction</b>
Low-friction paint
Air bubbles

<b>Engines - combustion engines</b>
Dual-fuel engines
Gas engines
Heat recovery
Exhaust Gas Recirculation, EGR
Scavenger Air Moisturizing, SAM
Selective catalytic reduction , SCR
Scrubbers
<b>Engines - others</b>
Hybrid
Electric
Gas turbines
Steam turbines
Stirling engines
Fuel cells
<b>Equipment, interior fittings</b>
Energy saving technologies for the habitat
<b>Solar-, wind- and wave power</b>
Solar cells
Solar heat
Sails / wings
Flettner rotors
Kites

Windmills
Wave power
<b>Biofuels</b>
Methanol
Ethanol
Biodiesel
Biologic diesel
Biogas
Synthetic fuels
Hydrogene
Biochar
Pellets
<b>Fossile fuels</b>
Liquefied Natural Gas, LNG
<b>Energy storage</b>
Batteries
Flywheels
<b>Others</b>
Carbon hydrates cracking to hydrogen
Transformation of carbon dioxide into carbon-neutral liquid fuels
Skin friction elimination
IGBT Converter

# Gratis energi (tillgänglig)

Sol < 2 MW



Vind < 4 MW



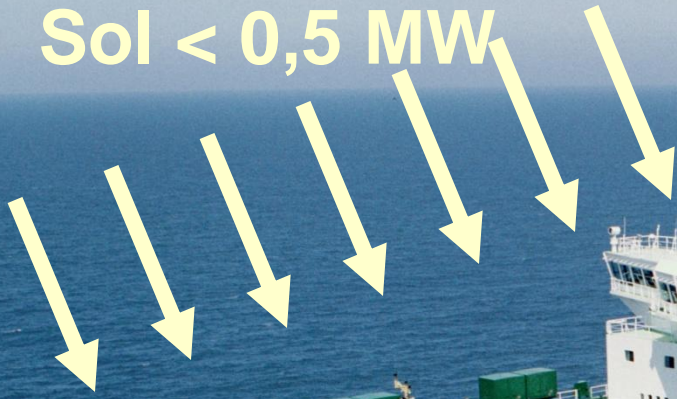
Vågor < 4 MW



$\Sigma \approx 10 \text{ MW}$

# Gratis energi ("utvinningsbar")

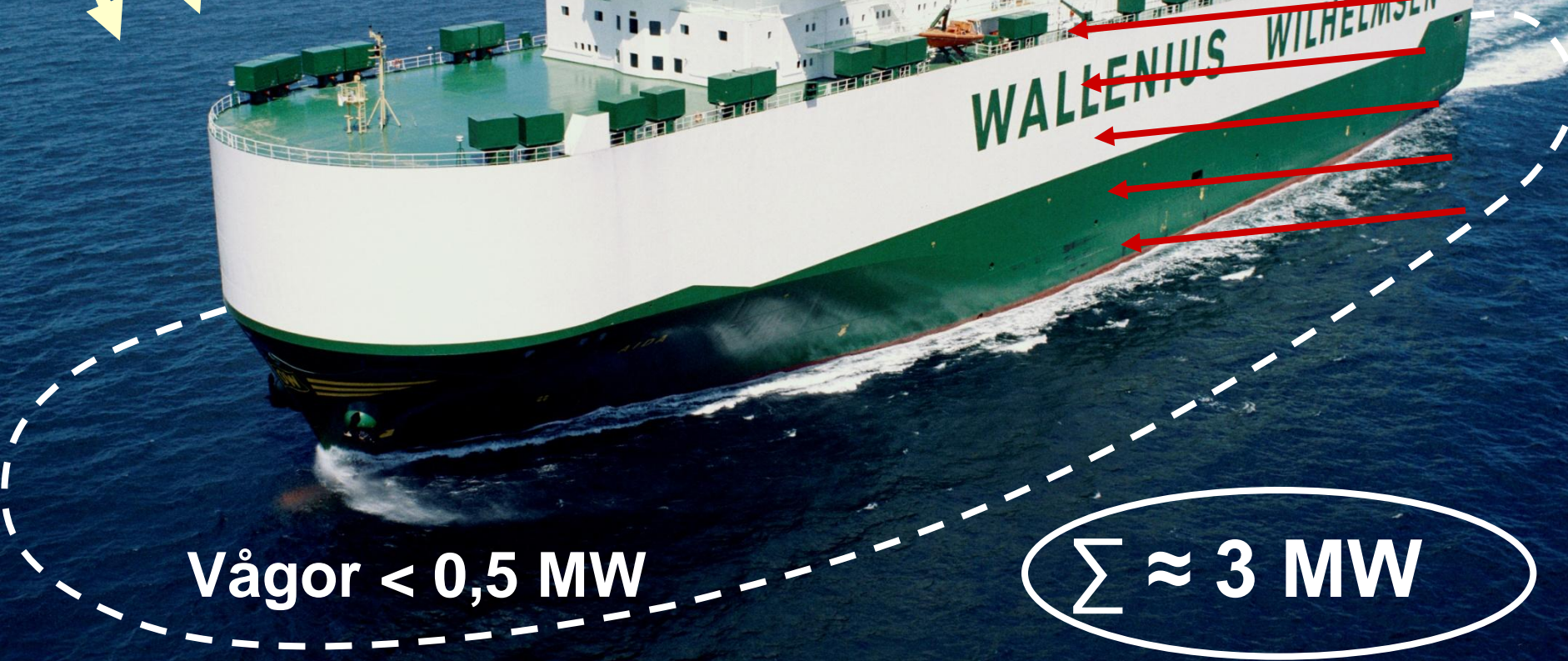
Sol < 0,5 MW



Vind < 2 MW



Vågor < 0,5 MW

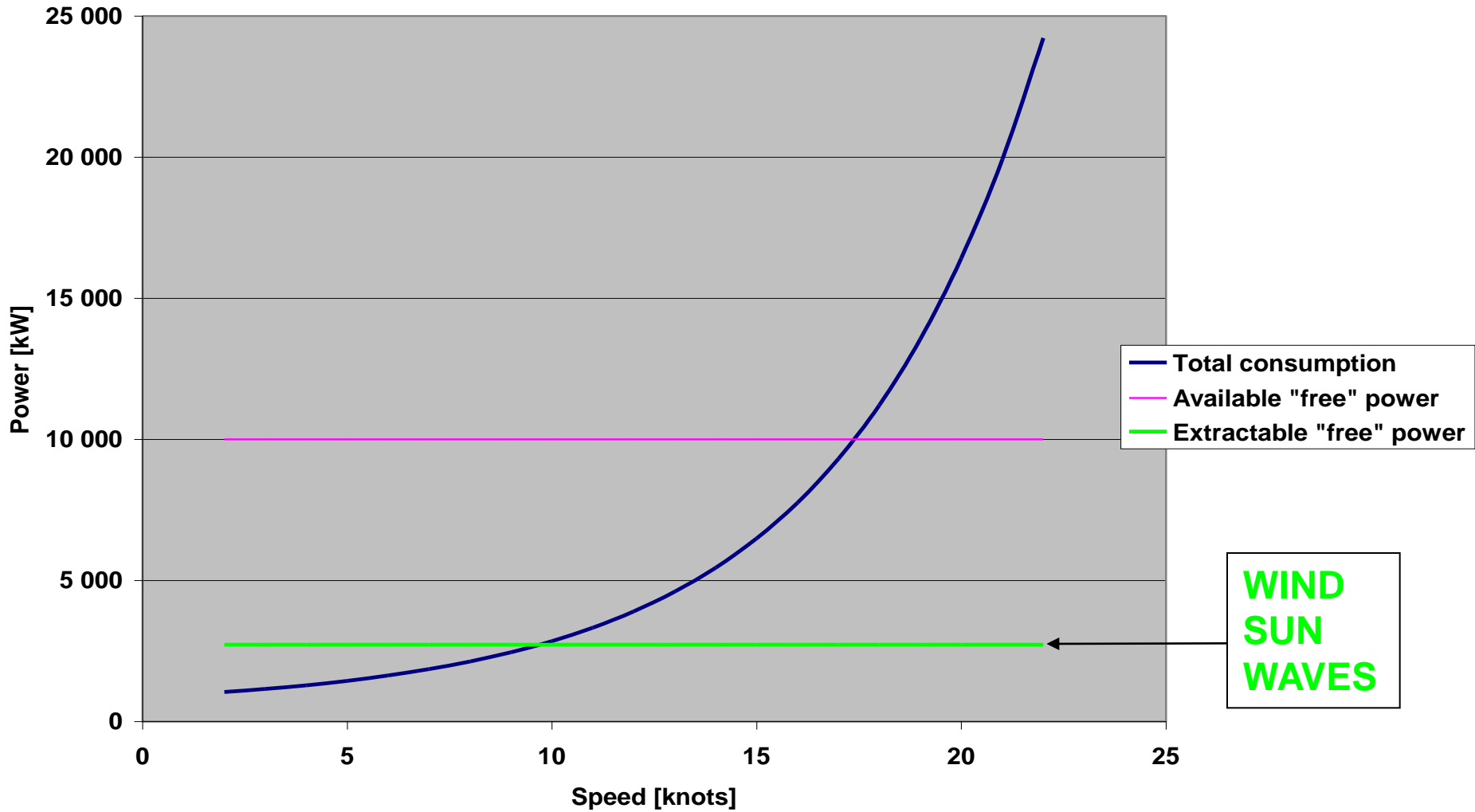


$\Sigma \approx 3 \text{ MW}$

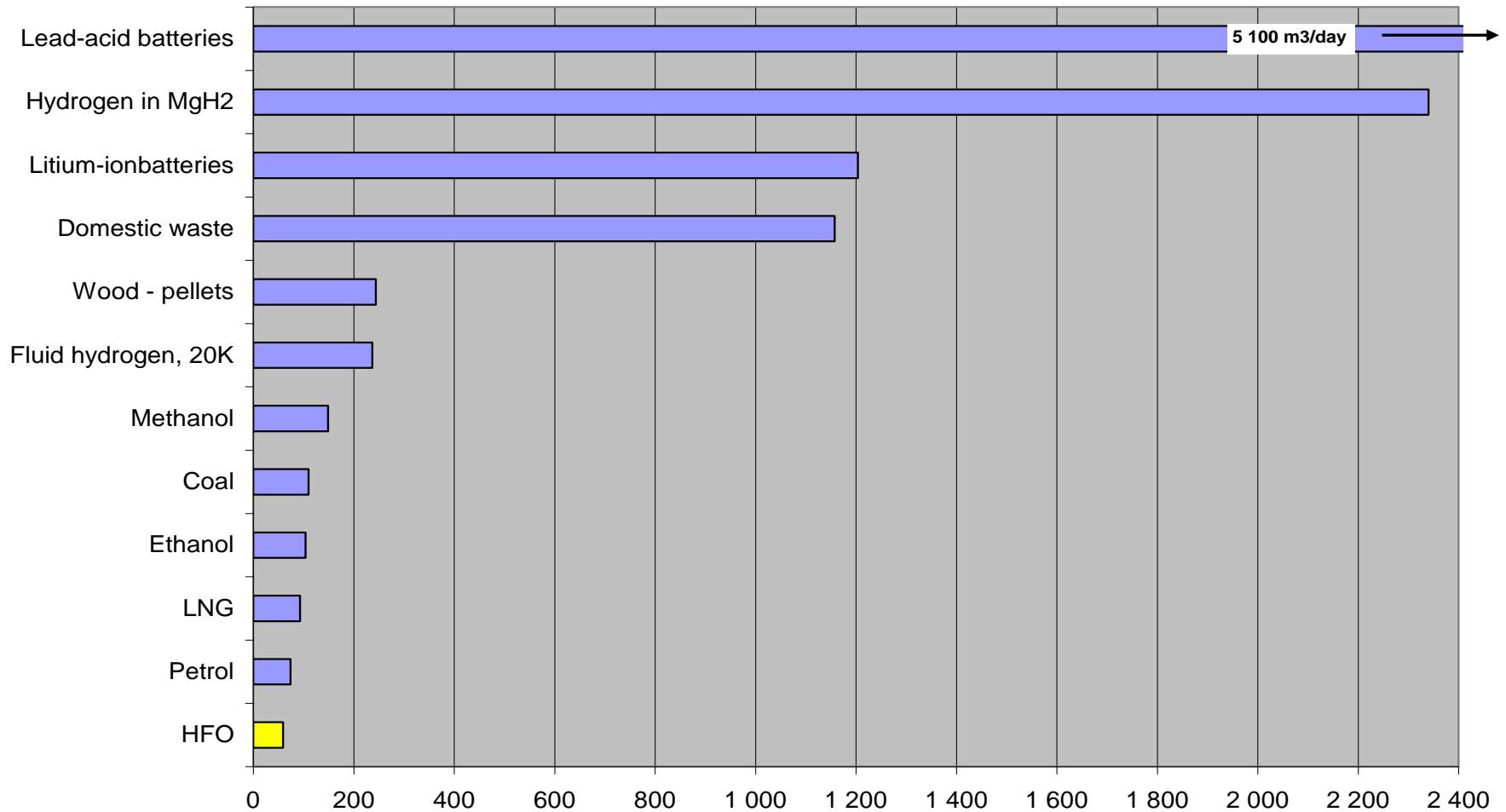




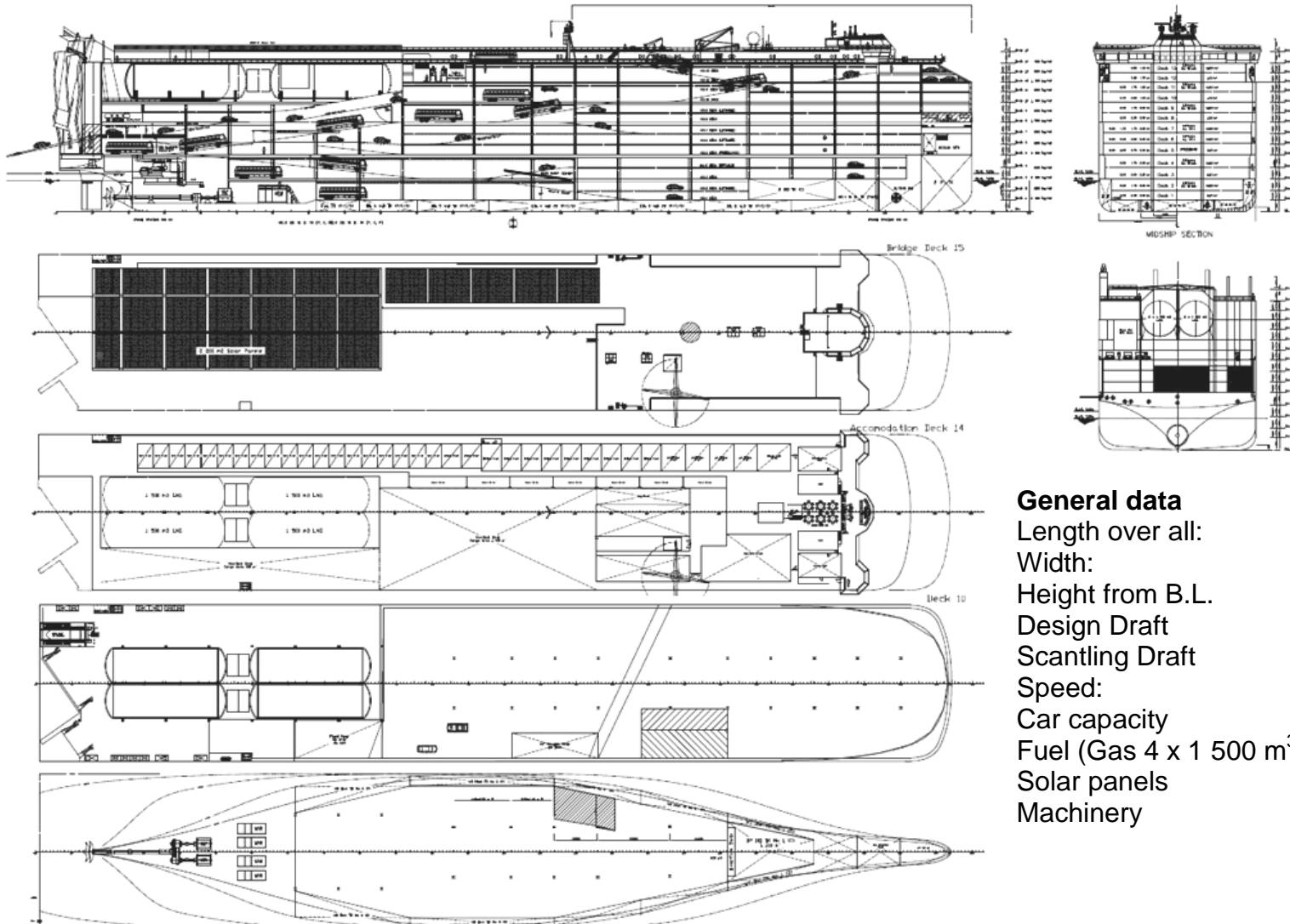
# Fart – effekt (Faust)



# Energilagring – behov/dygn [m<sup>3</sup>], Faust i 19 knop



# Solana – Emissionsneutral



## General data

Length over all:	230.00 m
Width:	39.00 m
Height from B.L.:	47.60 m
Design Draft	7.80 m
Scantling Draft	9.60 m
Speed:	16.00 knots
Car capacity	8 550 CEU
Fuel (Gas 4 x 1 500 m <sup>3</sup> )	3 000 ton
Solar panels	2 200 m <sup>2</sup>
Machinery	Hybrid electric CarboNext Fuel cells Electric engine

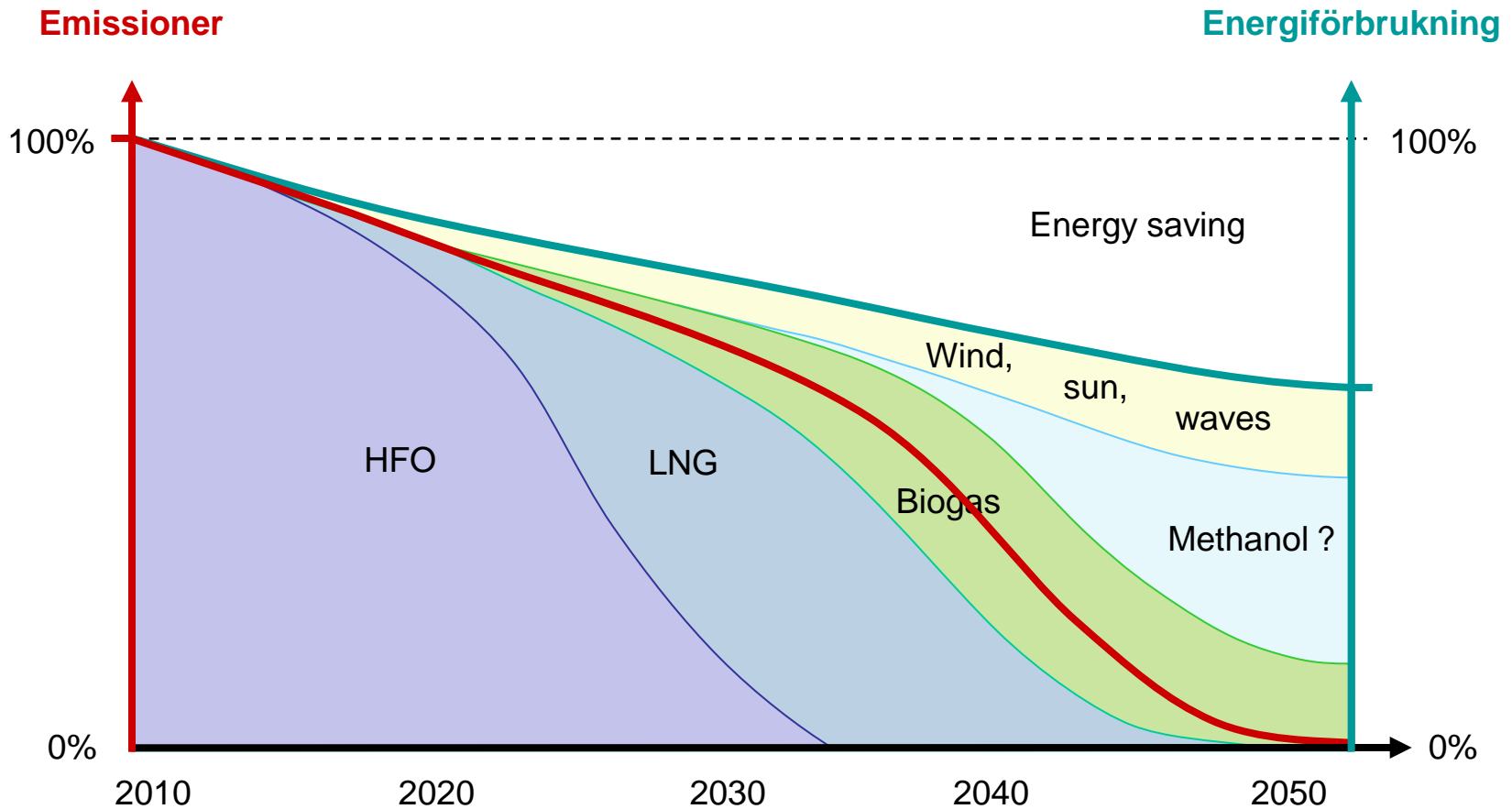
# Solway – Emissionsfri



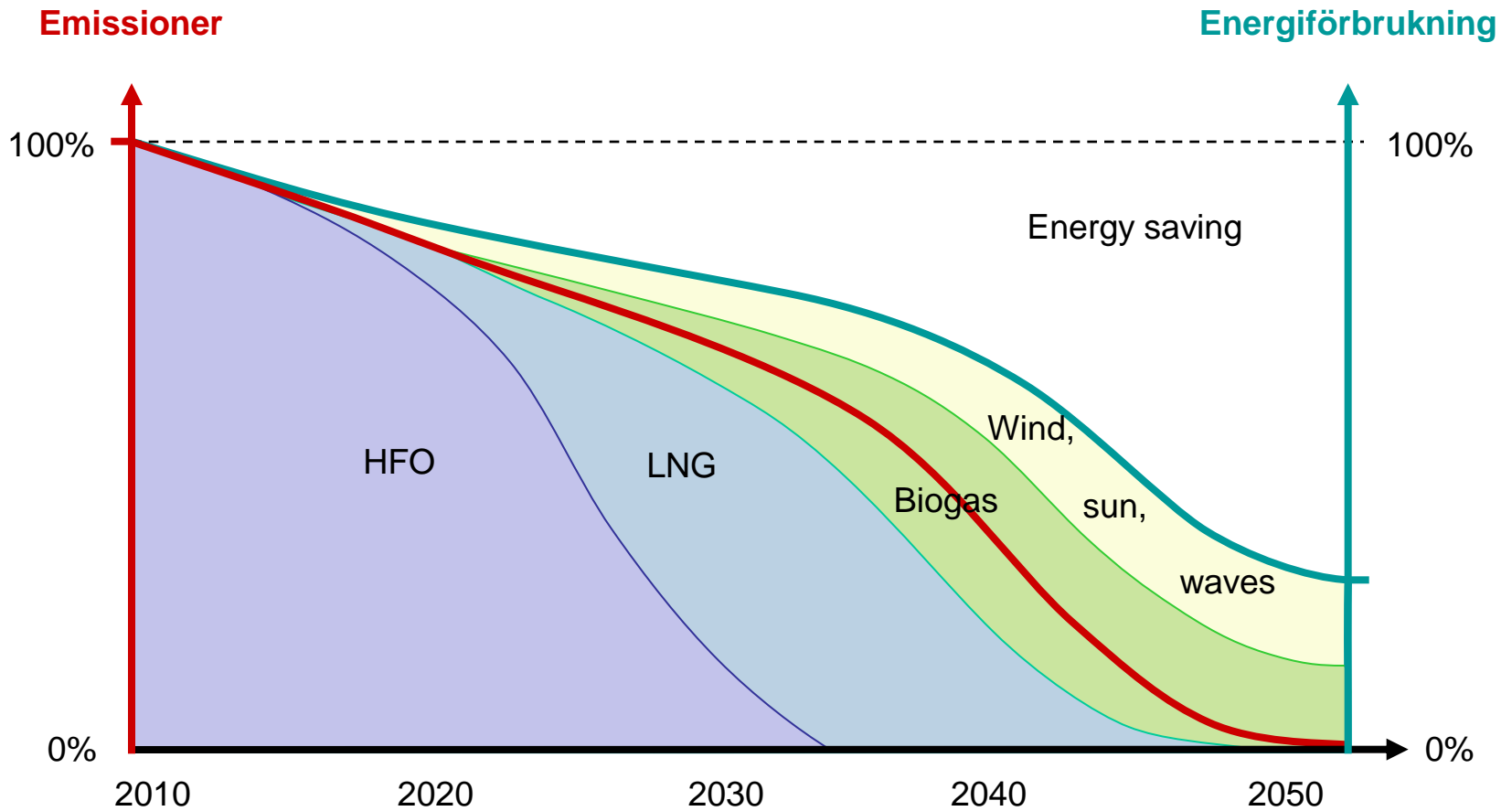
## General data

Length over all	160.00 m	Sail area	4 200 m <sup>2</sup>
Width	40.00 m	Solar panels	4 000 m <sup>2</sup>
Air Draft	56.00 m	Battery	300 MWh
Design Draft	6.00 m	Machinery	Electric (Fuel cells)
Scantling Draft	13.00 m		
Speed (average)	10.50 knots		
Car capacity	3 550 CEU		

# Roadmap för energiförbrukning, energibärare och emissioner (nya fartyg)



# Roadmap för energiförbrukning, energibärare och emissioner (nya fartyg)



## Roadmapen – slutsatser

- Visionen om framtida emissionsfria fartyg är realistisk
- Det går att bygga emissionsfria fartyg redan med dagens teknik
- När ett sådant fartyg kan bli lönsamt är dock osäkert och beror bl.a. på utvecklingen av:
  - Priset på drivmedel
  - Fraktmarknad
  - Lagar
  - Infrastruktur
  - ...

## Roadmapen – slutsatser

Det handlar inte bara om ny teknik!

- Minskad energikonsumtion – lägre fart
- Nyttja emissionsfri energi – flexibla tidtabeller, nya rutter
- Andra energibärare – biobränslen
- Se över gällande krav och restriktioner – optimerade fartygsp parametrar

# Roadmap

Road map for....:

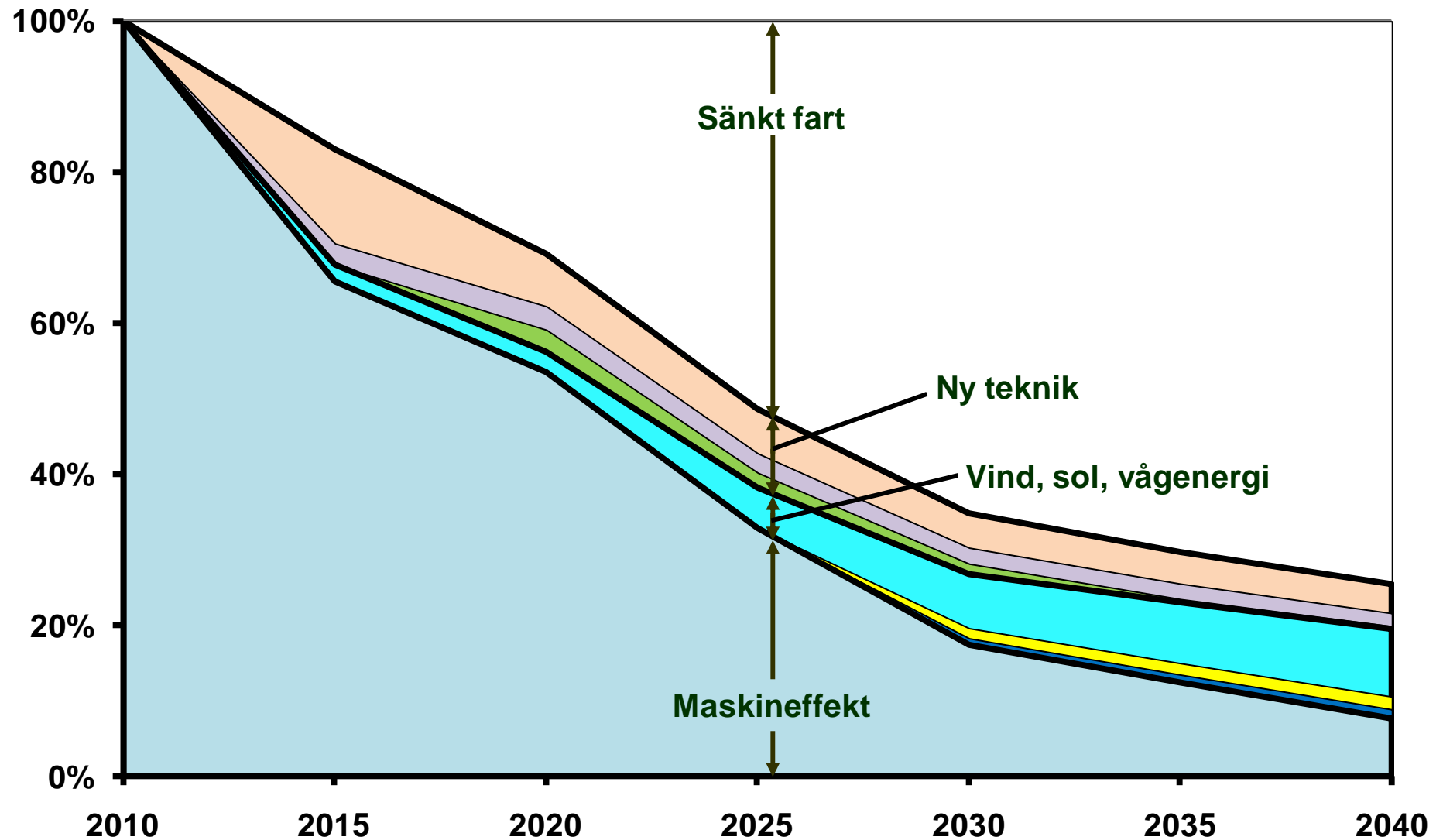
- operation
- energy carriers
- technology
- Wallenius ships
- energy consumption
- emissions
- Wallenius Marine competence



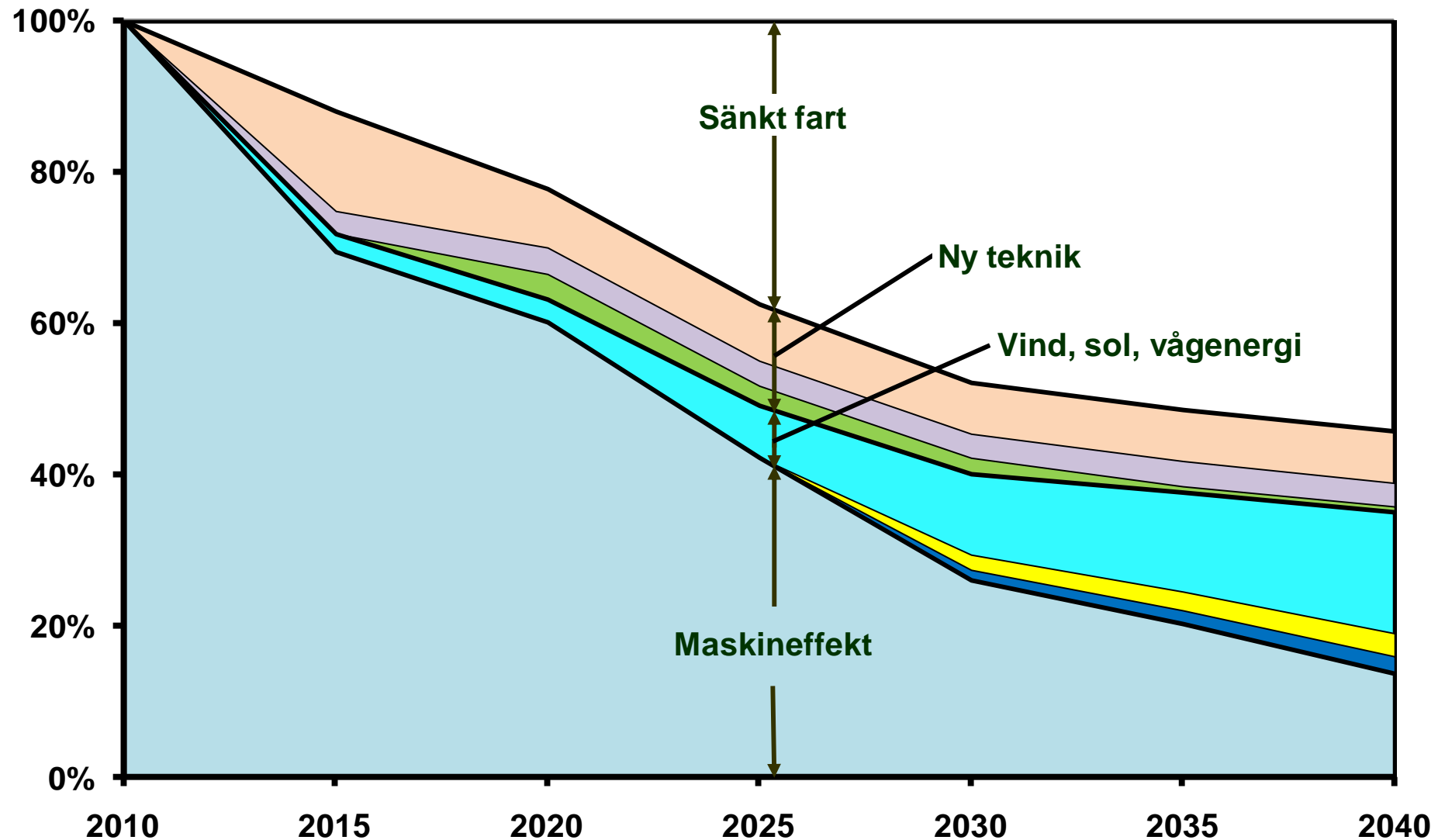
# Roadmap for Wallenius ships

	2010	2015	2020	2025	2030	2035	2040
Design speed [knots]	18	17	16	14	12	11	10
Primary energy carrier	LSFO	ULSFO	LNG	LNG	Biogas	Biogas	Methanol
Secondary energy carrier	MGO	LNG	Biogas	Biogas	Methanol	Methanol	Batteries
Machinery	Single shaft, direct drive, one engine	Single shaft, direct drive,	Single shaft, direct drive,	Hybrid, electric	Hybrid, electric	Hybrid, electric	Hybrid, electric
Primary driver	Two stroke diesel	Four stroke diesel	Gas engine	Electric motor	Electric motor	Sails	Sails
Secondary driver 1		Electric motor	Electric motor	Sails	Sails	Electric motor	Electric motor
Secondary driver 2		Wing sails at bow	Wing sails at bow		Foils	Foils	Foils
Auxiliary 1	Four stroke diesels	Combustion engine	Combustion engine	Combustion engine	Combustion engine	Combustion engine	Fuel cells
Auxiliary 2	Shaft generator	Shaft generator	Shaft generator	Solar heat gensets	Fuel cells	Fuel cells	Solar heat gensets
Auxiliary 3					Solar power	Solar power	Solar power
Propulsor	1 FPP	CRP	CRP	1 large FPP	1 large FPP	1 large FPP	1 large FPP

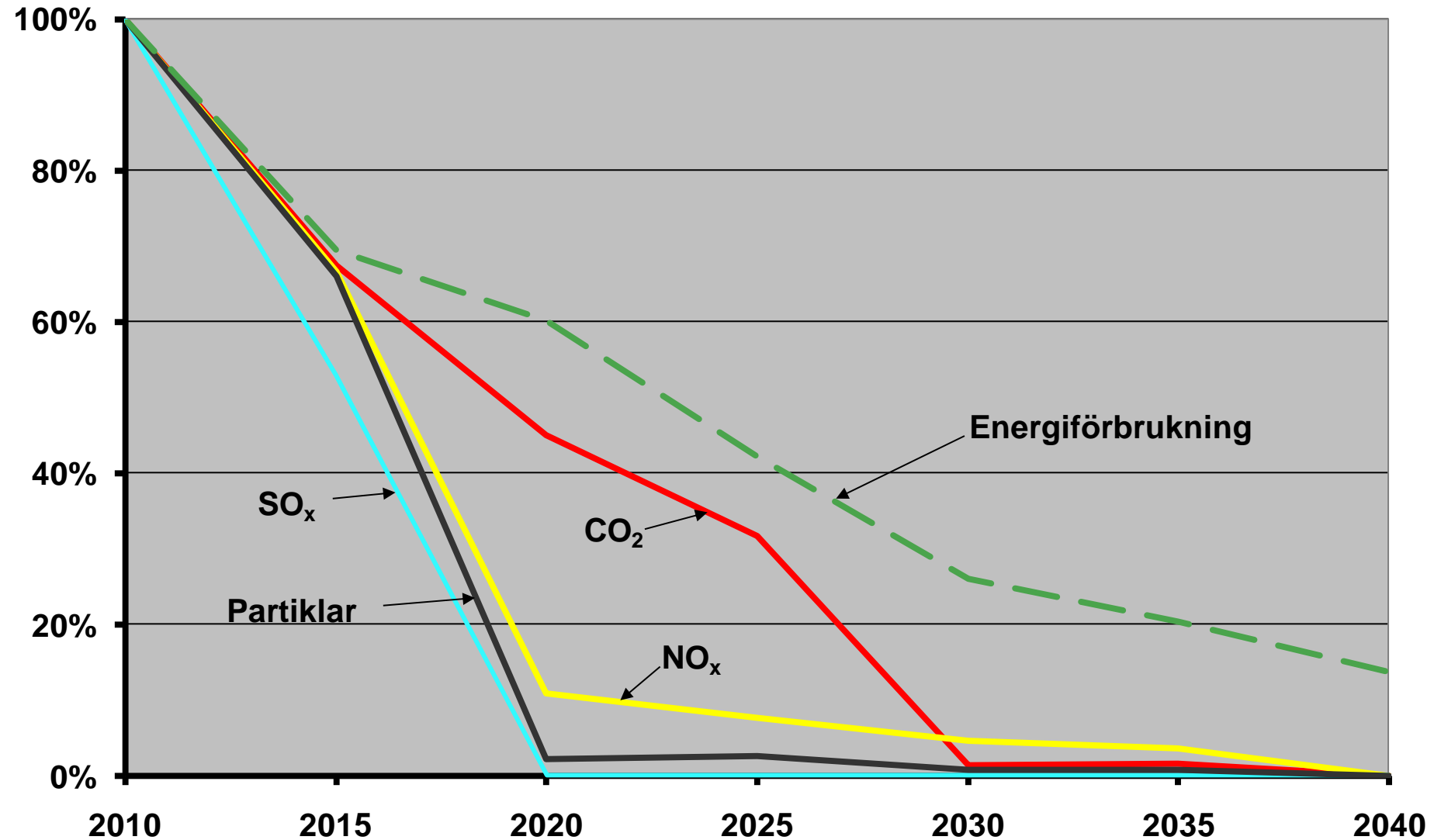
# Road map for energy consumption – ships



# Road map for energy consumption – fleet

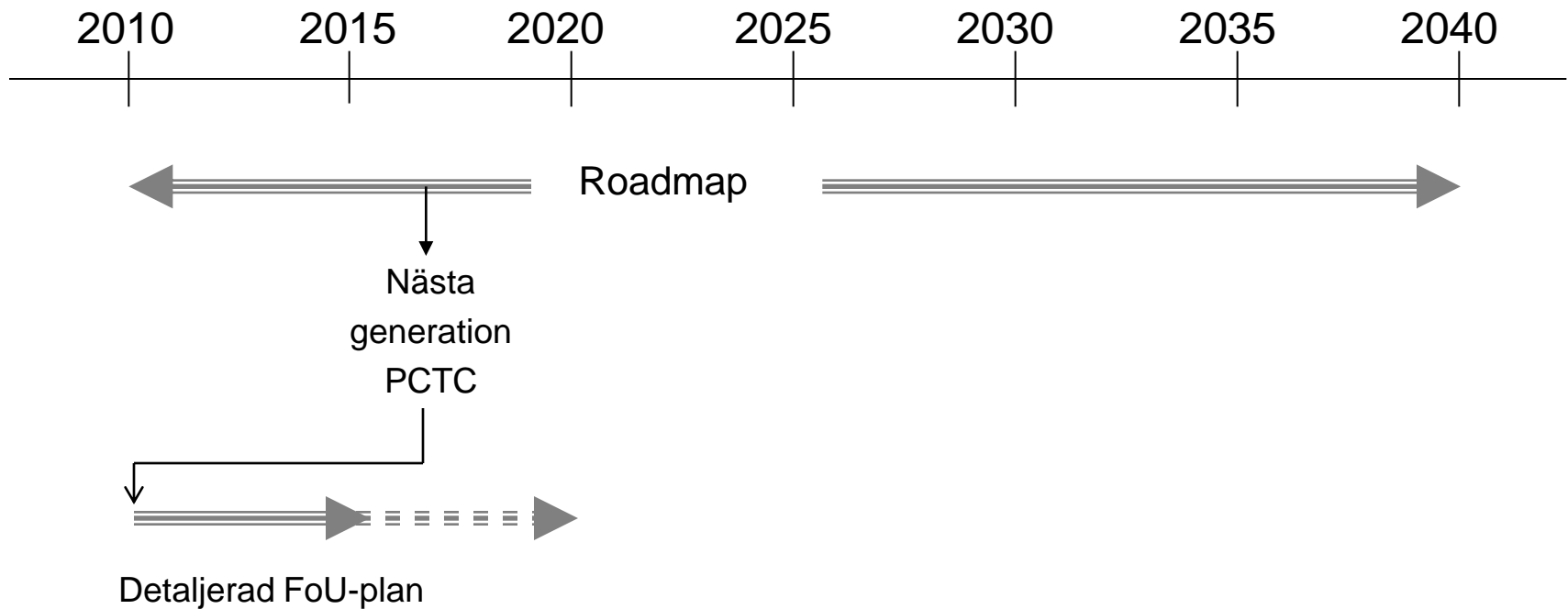


# Road map for emissions – fleet



# Roadmap – Status

- Scenario
- Grund för utveckling av nästa generation PCTC
- Grund för planering av FoU (5-10 år framåt)



# PROJEKT ZERO (Zero Emission ROro)

