

CCNR Workshop on Inland Navigation CO₂ Emissions

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Reduction of CO₂ emissions by diesel-electric propulsion system for an existing cargo vessel

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Cargo vessel “ENOK”

Test run I – before rebuilding*

Distance: Buelstringen – Rotterdam, December 2005
Cargo: 1 230 T wheat
Time: 7 days (67.25 hours)
Propulsion: 2 x 370 kW diesel engine and transmission
Power supply: 1 x 50 kVA generator
Consumption: 4 460 litres of diesel fuel



Cargo vessel “ENOK”

Test run II – after rebuilding*

Distance: Buelstringen – Wormerveer, September 2010
Cargo: 1 350 T wheat
Time: 7 days (69.5 hours)
Current: 1 - 3 230 kWe diesel-electric power trains
Propulsion: 2 x 2x 230 kWe electric torque propulsions
Power supply: 1 x 50 kVA converter
Consumption: 3 300 litres of diesel fuel



Considerable reduction in CO₂ emissions is possible!

Fuel saving:

1 160 l = 26 %

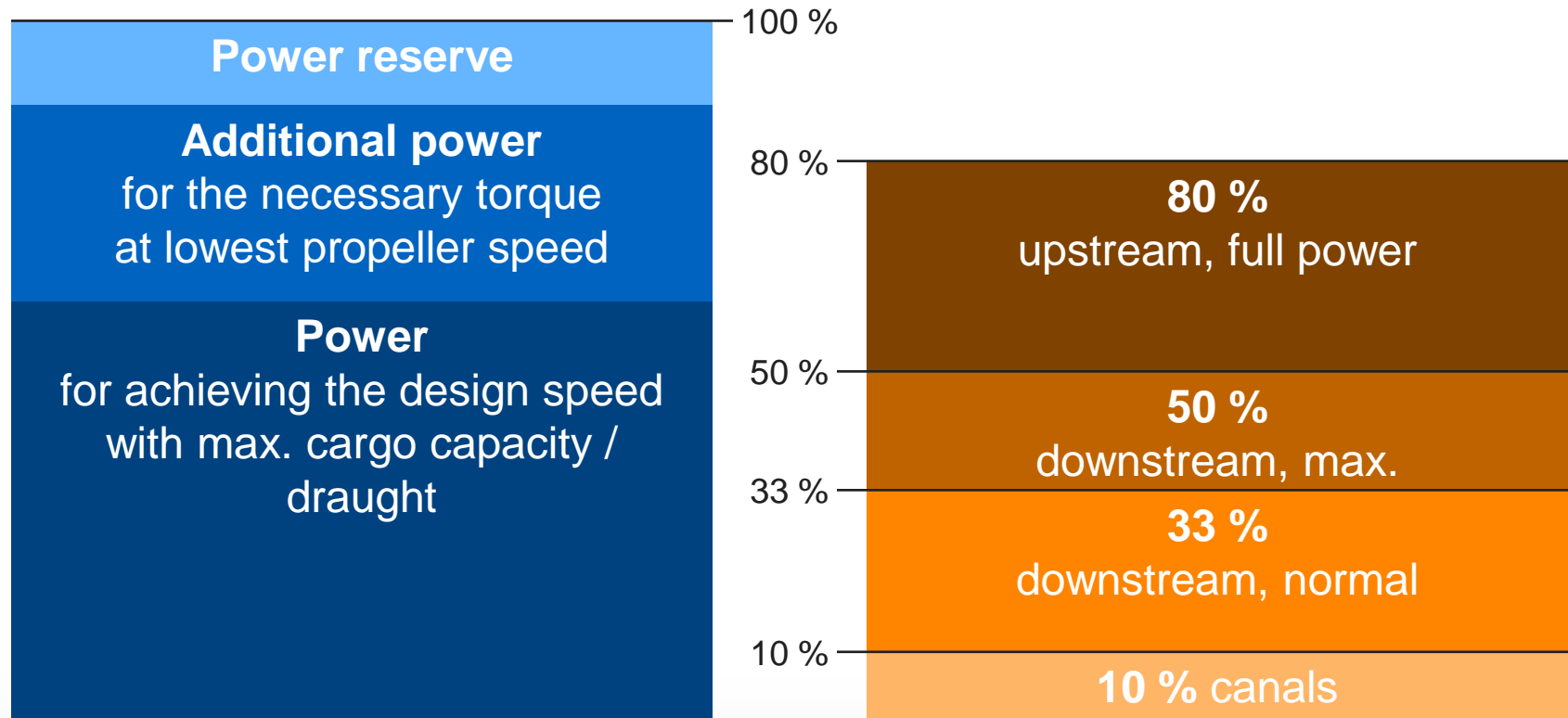
CO₂ saving:

3 082 kg

Conventionally powered inland water vessels are overpowered

Design criteria
for the propulsion system

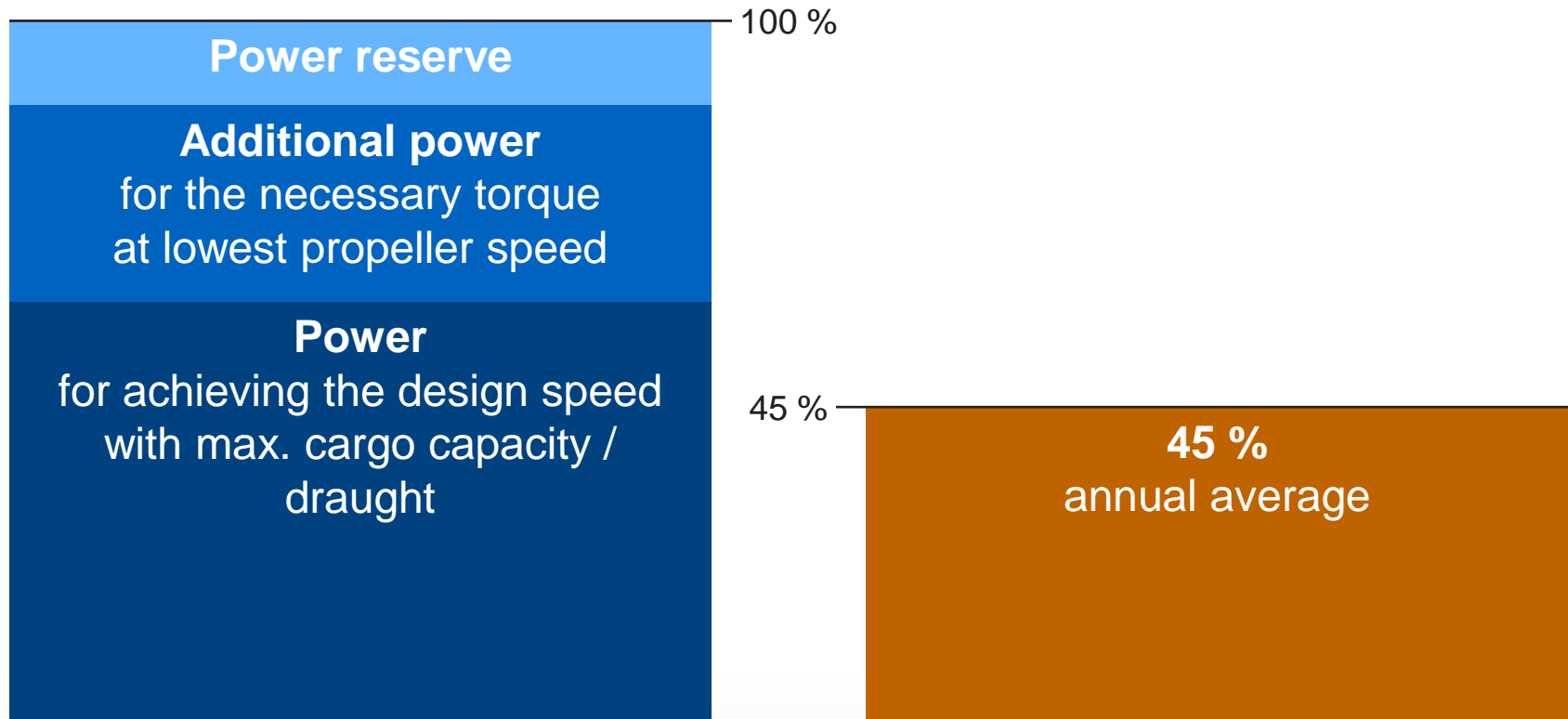
Use of
available power



In inland water transportation, 55 % of the available power is not used

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Use of
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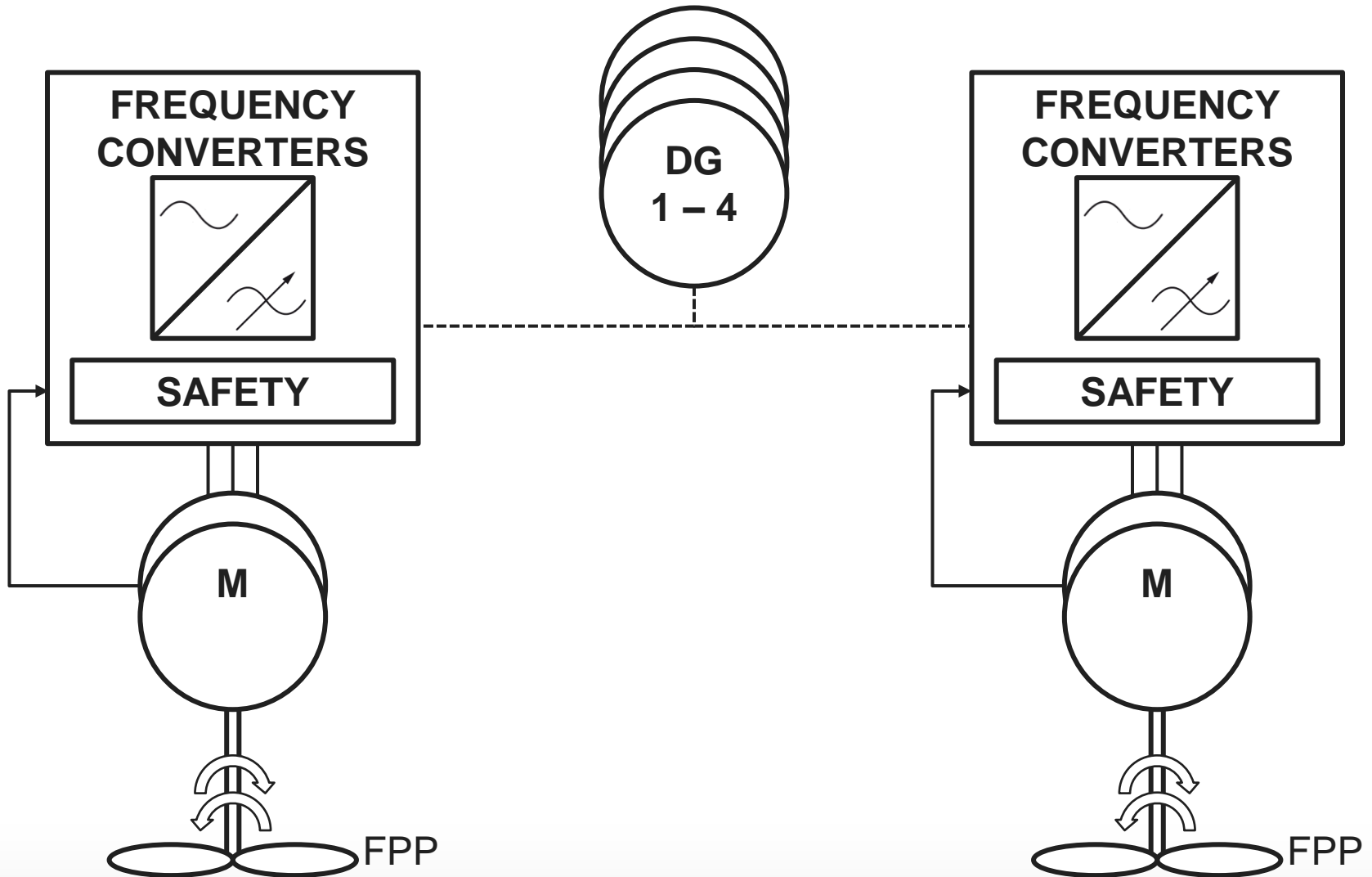


Approach: the modular diesel-electric propulsion system



- ▶ 3 - 4 power trains deliver the propulsion power
- ▶ Dynamically switching the power trains on and off provides enhanced energy efficiency
- ▶ One power train (230 kWe) delivers the torque required for manoeuvring

The modular diesel-electric propulsion system of the cargo vessel "ENOK"



Innovative aspects and other benefits

Energy efficiency and environmental protection

- ▶ Dynamic delivery of the energy actually required
- ▶ Diesel generators always operate in their ideal performance range
 - low consumption and reduced exhaust emissions

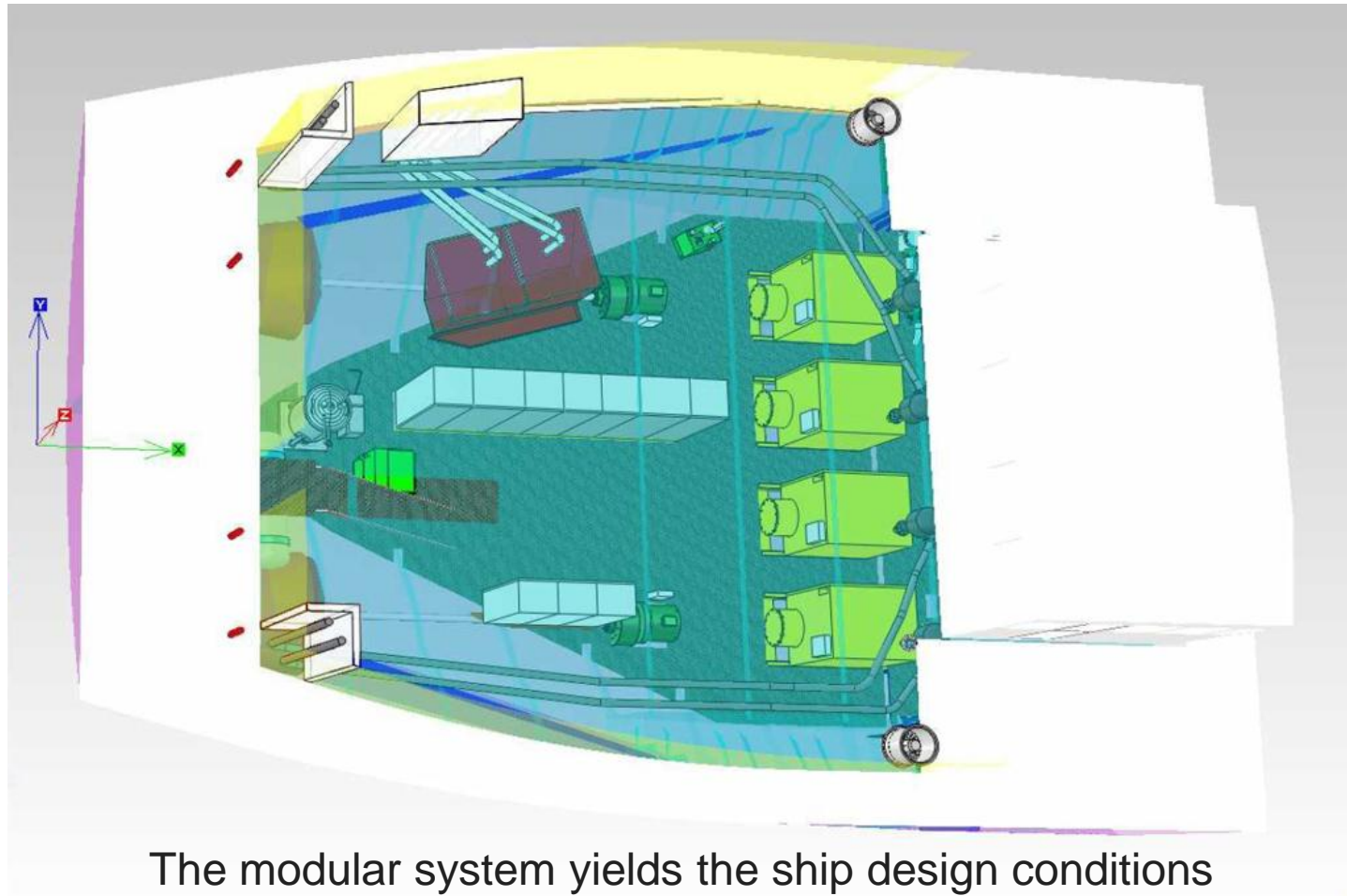
Safety

- ▶ Redundant system components ensure reliability
- ▶ Switching power trains on without synchronisation of diesel generators
- ▶ Full torque in the respective drive / speed range facilitates safe manoeuvring, rerouting and stopping

Convenience

- ▶ Low vibration, quiet operation
- ▶ Thanks to water cooling and less waste heat, the engine room ventilation is reduced significantly

When used in new ships, propulsions can be smaller by up to 25 %



The modular system yields the ship design conditions necessary for optimal propeller inflow

Modular diesel-electric propulsion system

Summary



- ▶ Fuel saving
(test run: 1 160 l = 26 %)
 - ▶ Reduction of CO₂ emissions
(test run: 3 082 kg)
 - ▶ High energy efficiency
 - ▶ Direct drive without transmission
 - ▶ Full torque from the first rotation
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- ▶ And many other advantages