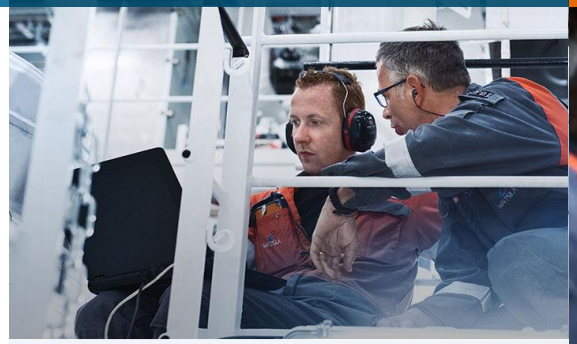
Wärtsilä Scrubber Retrofit

Wärtsilä Marine Solutions / Environmental Solutions

RETROFITTING ALTERNATIVES

EQUIPMENT ONLY

SITE ADVISORY



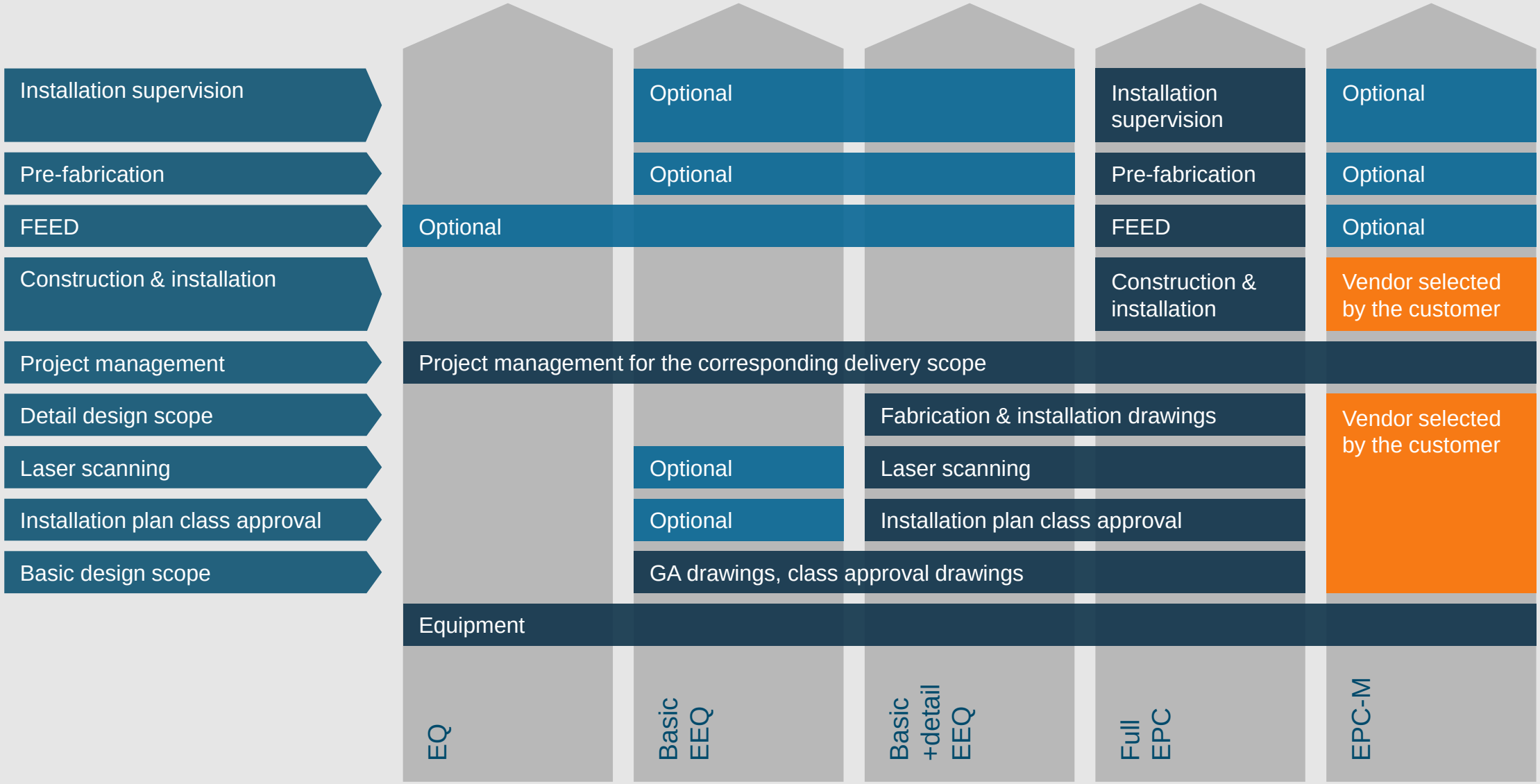
ENGINEERING

INSTALLATION

EPC

+ POSSIBILITY FOR SCRUBBER INVESTMENT FINANCING

RETROFITTING ALTERNATIVES – SCOPES OF SUPPLY



EPC (TURNKEY) PROJECT DESCRIPTION

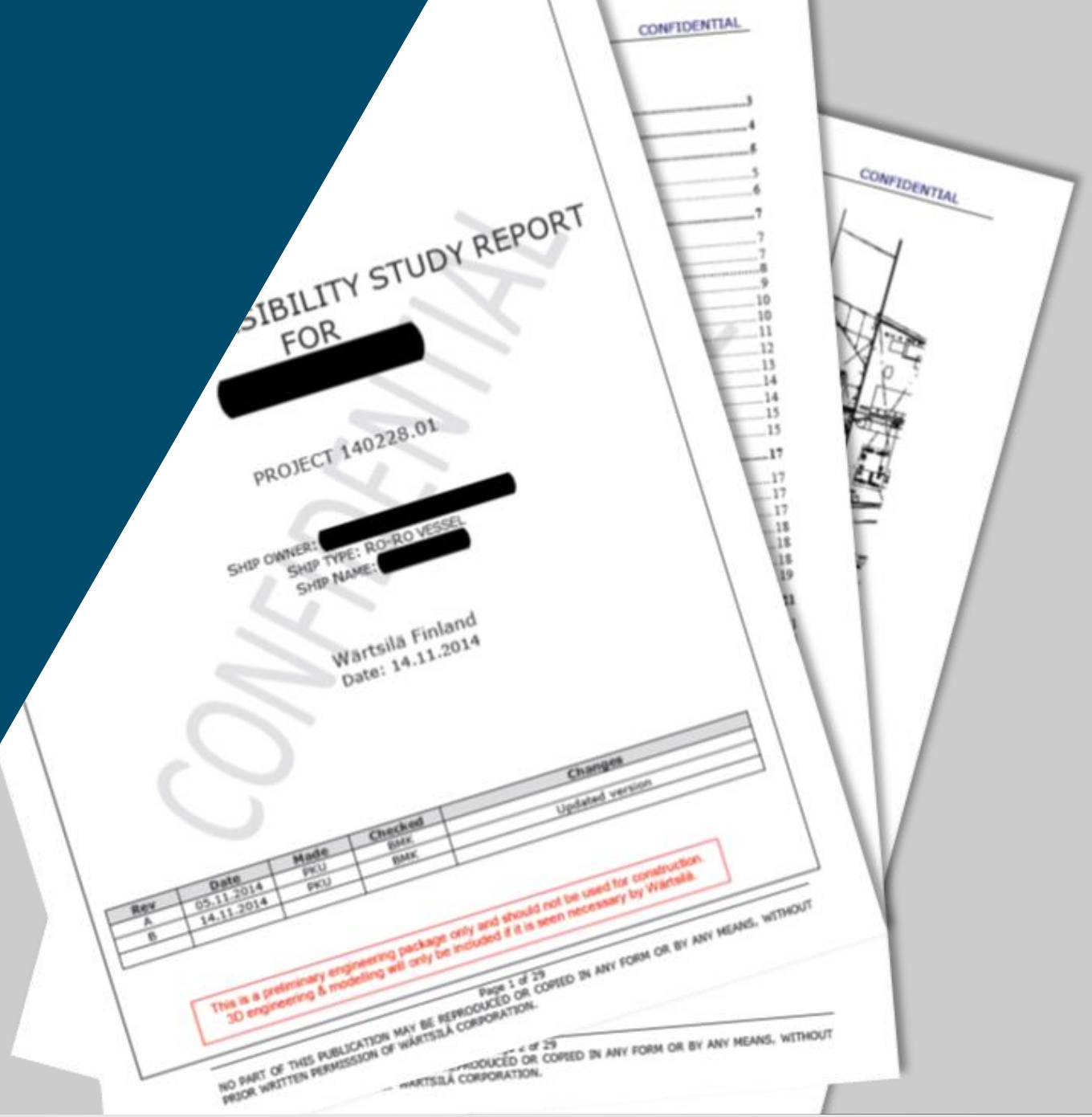
Benefits for the customer:

- Single point of contact
- Avoid sub-optimisations within suppliers
- Dedicated & experienced scrubber project team
- Minimized economic risks
- Time, cost & resource savings
- Optimised quality and schedule control

Review gate with the customer

Technical feasibility report

- Dozens of technical feasibility reports have been done already for various different vessel types
- That with several engineering packages delivered puts Wärtsilä in the forefront of integrating a scrubber system with an existing vessel



SCRUBBER RETROFIT STUDY SCOPES

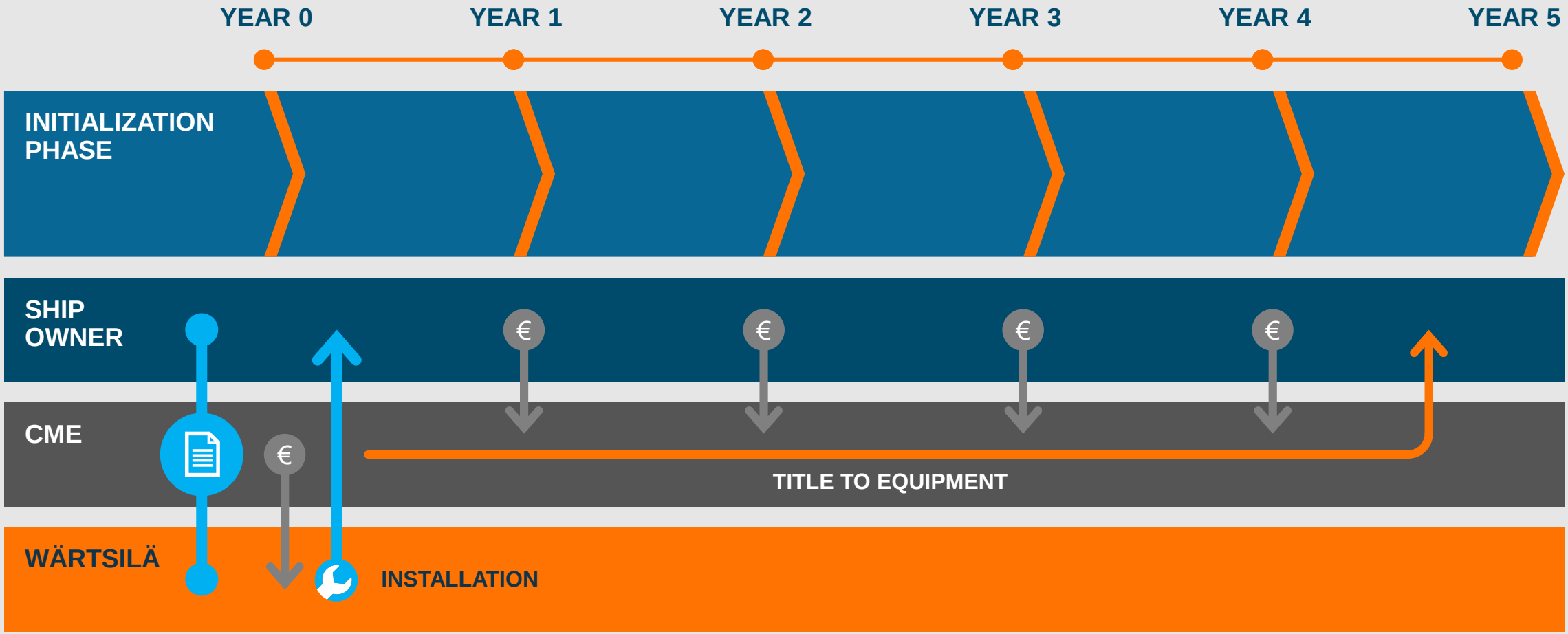
	Layout study	Extended Layout study	Technical feasibility study
Economical feasibility study	If desired	If desired	If desired
Technical Data sheet	●	●	●
Technical Specification	●	●	●
Layout arrangement	●	●	●
Ship visit	-	●	●
Report, including e.g.:	-	-	●
Ship data	-	-	●
Equipment arrangement and locations	-	-	●
Tank arrangement and locations	-	-	●
Modifications to existing ship	-	-	●
Pipe routing principles	-	-	●
Sea water capacity check	-	-	●
Electrical evaluation	-	-	●
Stability and weight evaluation	-	-	●
Conclusion and possible red flags	-	-	●
Process flow diagram	-	-	●

SCRUBBER FINANCING MODEL

STRATEGY TO MEET SECA REGULATIONS

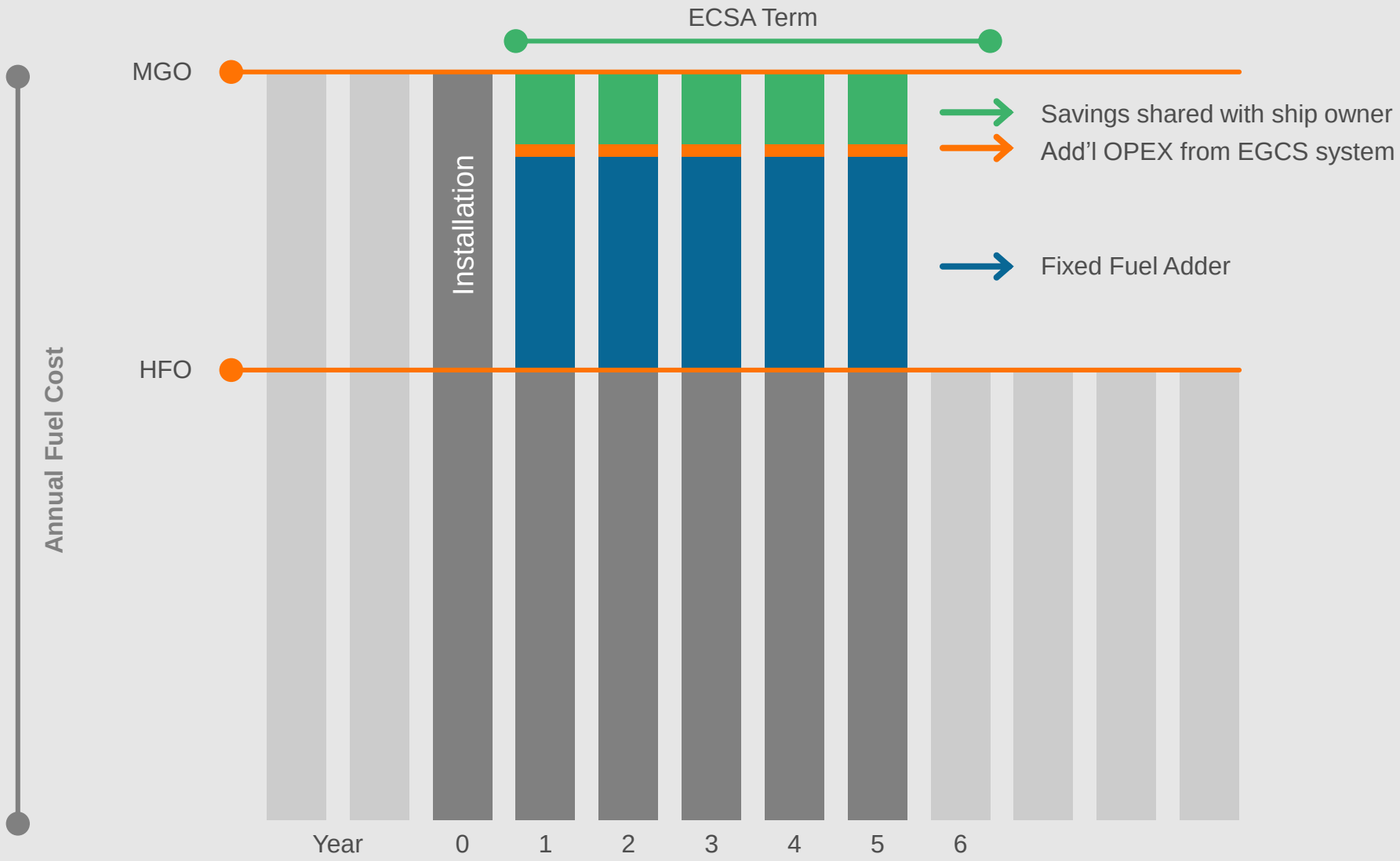
	HFO STRATEGY	CleanMarineEnergy® Tailored solutions for emissions compliance	MGO STRATEGY
FUEL	HFO 3.5% S	HFO 3.5% S	MGO 0.1 % S
EQUIPMENT	SCRUBBER	SCRUBBER	FUEL COOLER
CAPEX	HIGH (100%)	NO INVESTMENT	LOW (3-5%)
FUEL COST	LOW ($240/ton) From day one	SAVINGS TO MGO DURING CME FINACING LOW AFTER	HIGH ($450/ton) From day one

EXAMPLE CME FINANCING TIMELINE



SHARED SAVINGS MODEL: PRE AND DURING ECSA

- Ship-owner receives immediate fuel cost savings in Year 1, as well as ECA compliance
- Transition of capex to OPEX for the ship-owner; shared savings = annuity for investors



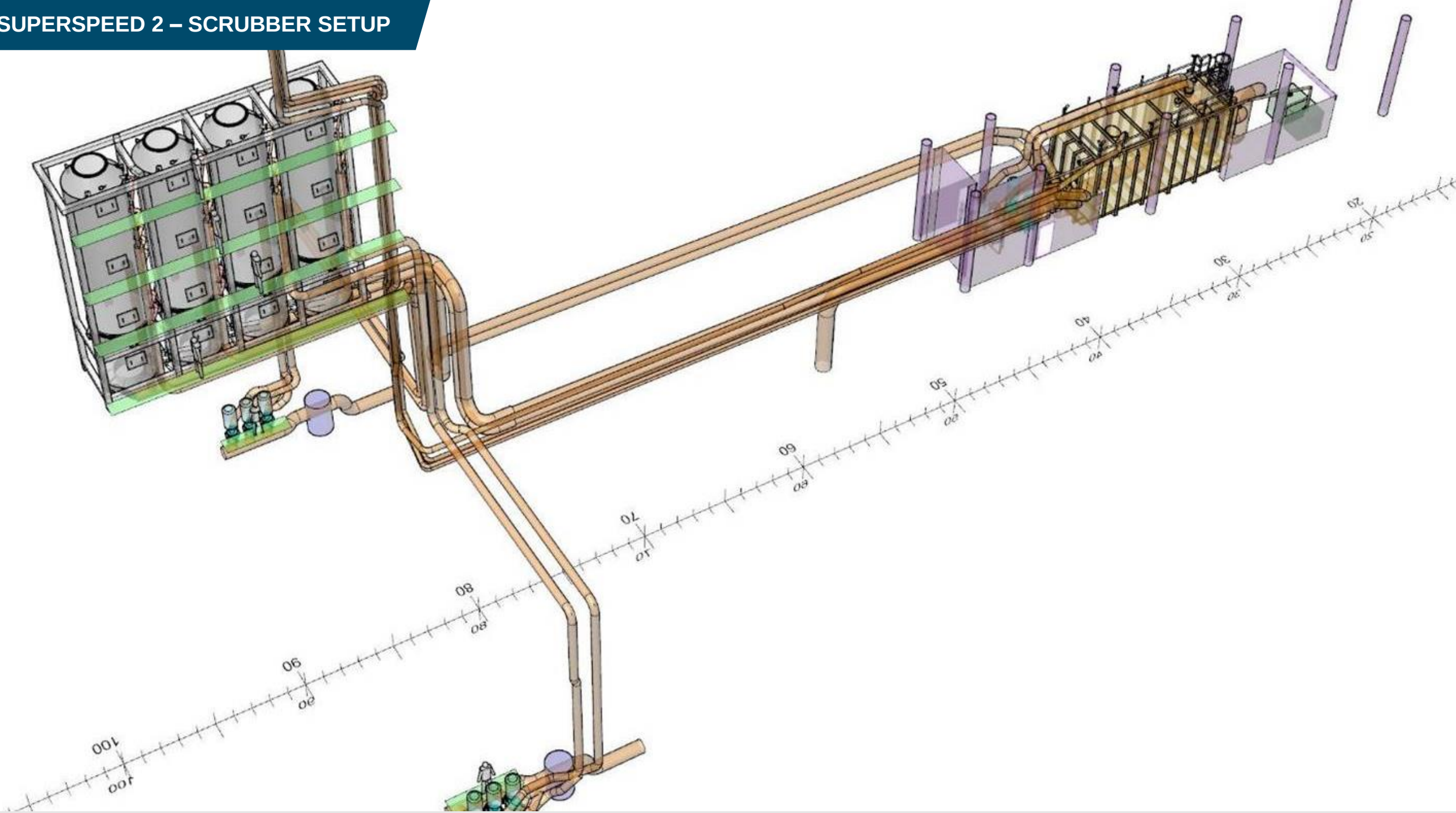
RETROFIT REFERENCE EXAMPLE

COLOR LINE: SUPERSPEED 2

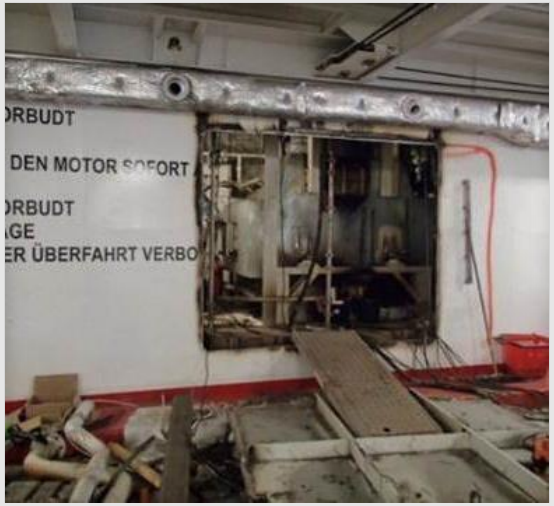
RoRo / passenger vessel operating 100% within SECA

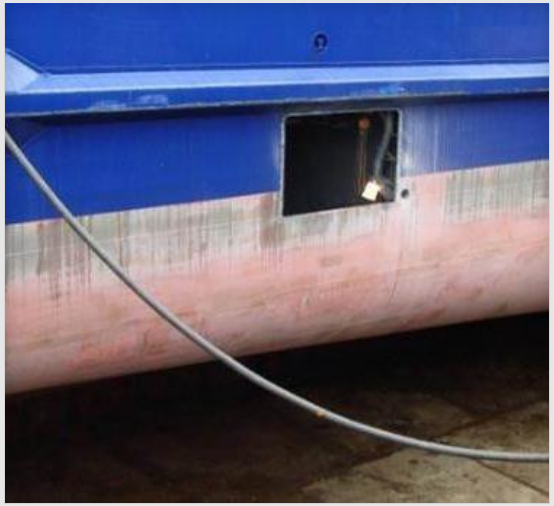
- 4 x 9.45MW Wärtsilä
- Retrofit: space limitations in funnel
- Wärtsilä inline scrubber installation in March 2014 at FaYard

SUPERSPEED 2 – SCRUBBER SETUP



SUPERSPEED 2 – DEMOLITION





SUPERSPEED 2 – INSTALLATION ON BOARD

SUMMARY

- Wärtsilä can provide different supply scopes from ”equipment only” (with or without engineering) to full ”retrofit EPC” delivery
- Vessel survey followed by a comprehensive technical feasibility study assures optimal scrubber system integration into the vessel
- Proven track record of successfully delivered turnkey projects guarantees peace of mind and one stop shop for the customer
  - Global manufacturing and support capabilities

THANK YOU