State-of-the-art sustainable energy efficiency technologies roadmap for waterborne transport towards the fit-for-55 guidance compliance

Project 101192661 - FLEETfor55

Executive Summary of Deliverable D2.3 - EETs preliminary economic feasibility analysis

Achilleas Spais - Senior Energy Consultant - Watermelon Consulting

Christina Angeletou - Energy Consultant - Watermelon Consulting

Co-funded by the European Union

Disclaimer

Co-funded by
the European Union
Project 101192661 — FLEETfor55 — HORIZON-CL5-2024-D5-01

Co-funded by the European Union (Horizon Europe, FLEETfor55, GA no. 101192661). Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union (EU) or the European Climate, Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.

The information presented in this document are confidential.

Document Info

Document	
Title	State-of-the-art sustainable energy efficiency technologies roadmap for waterborne transport towards the fit-for-55 guidance compliance
Acronym	FLEETfor55
Call	HORIZON-CL5-2024-D5-01
Type of Action	HORIZON Innovation Actions
Grant Number	101192661
Start date	01/01/2025
Duration	42 months
Document identifier	D2.3 - EETs preliminary economic feasibility analysis
Dissemination level	SEN - Sensitive
Delivery Type	R - Document, report
Work package	WP2
Related Tasks	T2.3
Lead Beneficiary	6 - WML

Version	Date	Editor	Summary of Modifications
v1.0	31/10/2025	Christina Angeletou, Achilleas Spais, Christos Papaleonidas (WML)	-

Acronyms and Abbreviations	Meaning
CAPEX	Capital Expenditure
EET	Energy Efficient Technology
FIRR	Financial Internal Rate of Return
FNPV	Financial Net Present Value
OPEX	Operational Expenditure
PBCF	Post-Swirl ESD Propeller Boss Cap Fin
PP	Payback Period

Executive Summary

In the framework of the FLEETfor55 project, Deliverable D2.3 presents a feasibility study assessing the financial viability of Energy Efficient Technologies (EETs) applicable to maritime transport. The objective is to determine whether these technologies are financially sustainable for retrofit applications on medium-sized short-sea and inland waterway vessels. This analysis serves as the baseline scenario of the study.

Specifically, the financial assessment included the estimation of capital and operational expenditures (CAPEX and OPEX), as well as energy and cost savings, leading to the calculation of key financial performance indicators: the Financial Net Present Value (FNPV), the Financial Internal Rate of Return (FIRR), and the Payback Period (PP) for each EET examined.

To ensure a coherent and consistent analytical framework, a structured methodology was developed. Initial consultations were conducted with project partners to identify technologies with sufficient and reliable data for inclusion in the analysis. The baseline scenario was established with this purpose in mind, to collect, as comprehensively as possible, complete datasets for selected EETs and to standardize vessel characteristics and operational parameters, ensuring comparability across evaluations.

Accordingly, all available technologies were classified into three categories:

1. Energy-efficient technologies, which provide measurable energy savings
2. Emission-efficient technologies, which contribute to GHG emission reductions, and
3. Energy-intensive technologies, which entail additional energy consumption or costs.

It is important to clarify that the term energy-intensive in this context refers to the use phase of alternative fuels rather than their production. Since alternative fuels generally have lower calorific values than conventional marine fuels, vessels must consume larger quantities to achieve equivalent energy output. Consequently, their operation requires higher energy input per unit of activity, making them energy-intensive from a consumption standpoint.

Alternative fuels and certain emission-focused technologies were therefore excluded from the financial comparison, as they do not offer direct cost savings.

Before conducting the financial evaluation, a set of assumptions was defined to shape the analysis and ensure methodological consistency. These include the baseline scenario assumptions, as well as financial, fuel price, and vessel-specific assumptions.

Out of the 67 EETs initially identified by project partners, 47 technologies with adequate data were shortlisted for preliminary assessment. Of these, 28 energy-efficient technologies were ultimately selected for detailed financial evaluation. These technologies cover both short-sea and inland waterway vessel applications, although they were not directly compared due to variations in engine types and fuel usage.

The results of the financial analysis demonstrate that most of the evaluated EETs exhibit strong investment potential, with positive FNPVs, high FIRRs, and reasonable payback periods. The technologies yielding the most promising financial performance (i.e., highest FNPVs) are:

- Suction Wings
- Pre-Swirl Energy Saving Device (ESD)
- Fins
- Hull Surface Coatings and Low-Drag Paints
- Trim and Draft Optimization
- Post-Swirl ESD Propeller Boss Cap Fin (PBCF)
- Main Engine Tuning and Optimization

For inland waterway transport, the variation of block coefficient or vessel lengthening emerged as the most promising option.

The remaining EETs were excluded from the final ranking either because they primarily offer emission reductions or because they incur additional operational costs.

Overall, the financial assessment provides a robust foundation for identifying promising EETs in maritime transport. While most technologies show clear financial feasibility, certain cases presented irregular cash flow patterns, highlighting the need for cautious interpretation. Some technologies displayed positive FNPVs but lacked valid FIRR or PP values due to non-conventional cash flow profiles, which render IRR calculations unreliable.

In conclusion, the outcomes of this analysis will inform strategic investment decisions and support the integration of financial and environmental considerations in the forthcoming phases of the FLEETfor55 project.