Zero Emission Marine

A leading company ecosystem programme

ZEM ECOSYSTEM

ZERO EMISSION MARINE 2030

What is ZEM?

- Zero Emission Marine (ZEM) is an ecosystem project led by Wärtsilä (2022-2025). We are creating an ecosystem aiming to decarbonise the maritime industry.
- ZEM develops technologies that will contribute to the emission reduction of different vessels and harbour operations.

The research and development in ZEM is divided into **four research themes**:

New technologies **Green fuels** **Optimised operations** **Business models**

We welcome organisations with knowledge in these areas to join us in building the ZEM ecosystem.

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VISION:

A Zero emission marine Future

MISSION:

Creating an economically compelling zero-emission marine ecosystem driving sustainable technology solutions and services

OBJECTIVES:

With the ecosystem's collective over 300 million euro increase in R&D spend over the coming years, we will develop new competitive skills, human capital and world-class services and solutions, enabling the creation of additional annual revenue to Finland of one billion euros per year by 2030.

This will enable us to reach 60% GHG reduction in the maritime industry by 2030 and 100% reduction by 2050 all the Wärtsilä Veturi ecosystem products are carbon-neutral or carbon-negative.

60% GHG reduction in the maritime industry by 2030

Wärtsilä roadmap for Veturi project Zero Emission Marine

Technologies enabling introduction of green fuels

Green fuel production

Automated and optimized operations – increased level of autonomy

Outcome based business models – OBBM

Technology transfer from Marine to Energy

Wärtsilä's effort Ecosystem effort

Technologies enabling introduction of green fuels

Main objective

Drive and develop operable engine technologies for engines running on green fuels like ammonia, hydrogen, and synthetic or biomethane. Explore and develop energy storage systems.

Wärtsilä is looking for organisations experienced especially in:

- Materials and components compliant to new fuels
- System integrators
- Control and automation experts
- Process and chemistry modelling

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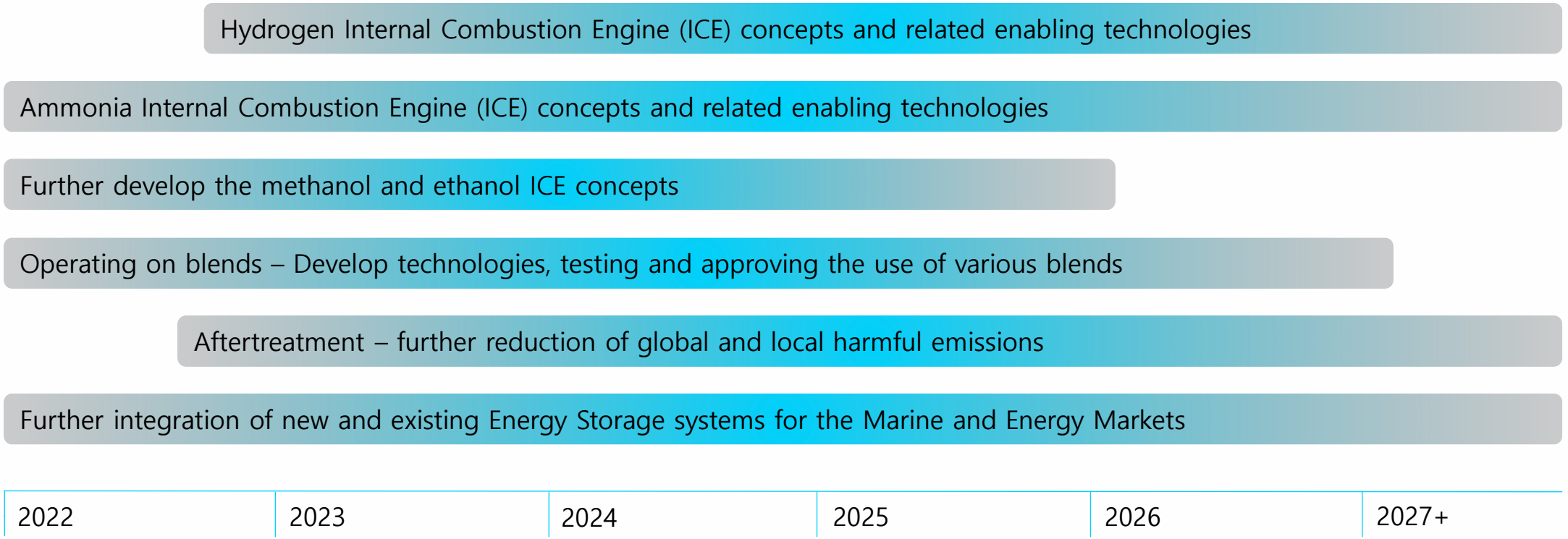
Technologies enabling introduction of green fuels



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Green fuel production

Main objective

Enable the production and infrastructure of new fuels. Securing economically viable transition.

Wärtsilä is looking for organisations experienced especially in:

- Biofuel, ammonia and hydrogen production
- Hydrogen storage and compression
- Process and chemistry modelling
- Levelised cost calculations

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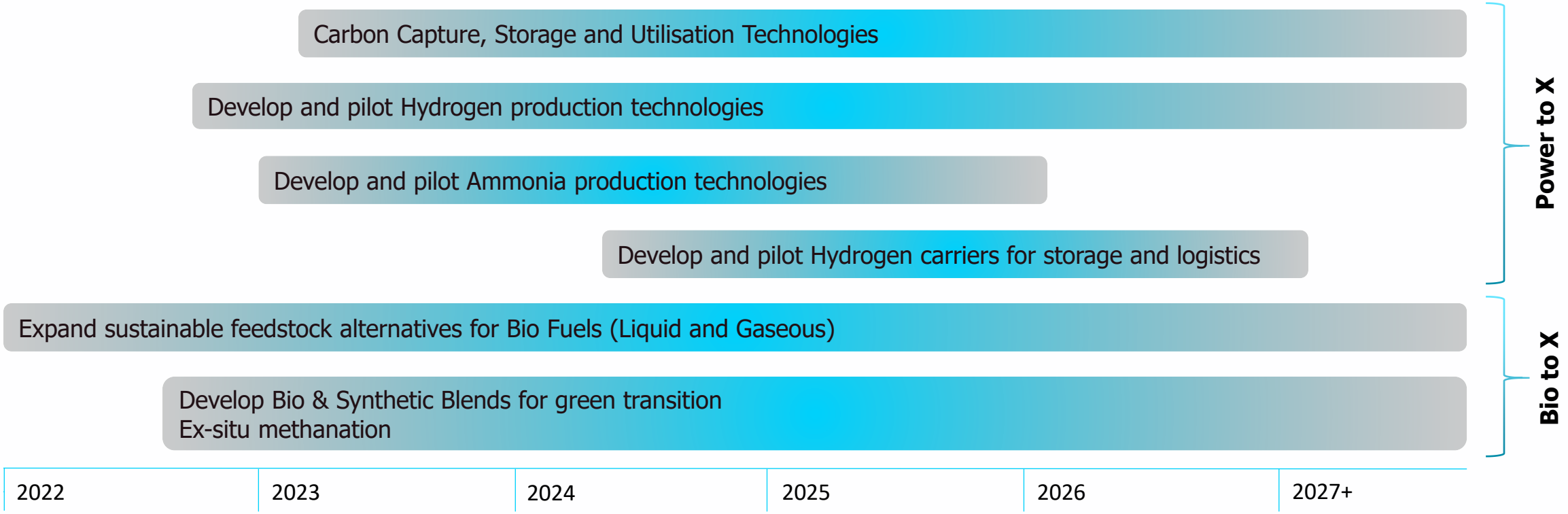
Green fuel production



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Automated and optimised operations – increased level of autonomy

Main objective

Develop and integrate systems to further optimize ship operations, including navigation and automation. Enable gradual transition from decision support to remote and autonomous operation.

Wärtsilä is looking for organisations experienced especially in:

- Situational awareness
- Data integration and connectivity between different marine stakeholders
- AI, machine learning and edge computing in the maritime context

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Automated and optimised operations – increased level of autonomy

Platform enabling cloud applications

Models & APIs - Development of optimization and "autonomous ready" models, APIs and libraries, helping to quantify vessel and ecosystem level energy usage and related emissions

Integrations and data sources – Open APIs for equipment integration onboard, enabling new data for model development as well as integration of new data sources

Applications for automated, connected and optimized operations

2022	2023	2024	2025	2026	2027+

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Outcome-based business models

Main objective

Develop new business models that enable commercially feasible adaptation of current and future decarbonization technologies across marine industry.

Wärtsilä is looking for organisations experienced especially in:

- Fuel efficiency technologies (e.g. hybrid power systems with batteries)
- Vessel energy management optimisation
- Emission compliance monitoring and optimisation
- Business modelling for shared benefits and incentives

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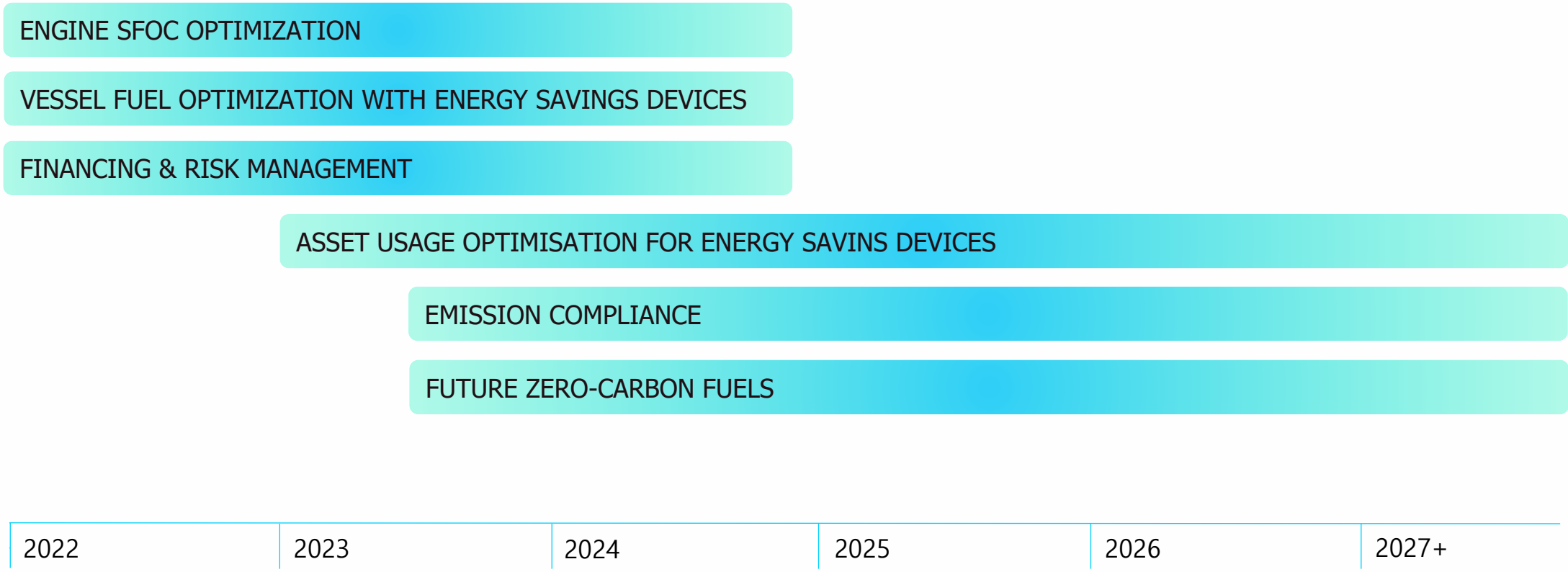
Outcome based business model – OBBM



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Funding

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ZERO EMISSION MARINE 2030

50
M€

WÄRTSILÄ

80
M€

20
M€
Business Finland

60
M€
Wärtsilä

Funding

Universities and Research Institutes			
	Decreased level [%]	Normal level [%]	Increased level for intense international co-operation [%]
Co-Research		60	70
Co-Innovation	60	70	80

Companies		
	Small & Medium [%]	Large companies [%]
Co-Innovation	50	40

Co-Research: Creating new knowledge to be utilized as basis for new business
Co-Innovation: Research projects and R&D projects of companies which are carried out simultaneously in close cooperation

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ZEM ecosystem projects

MASCOT

(Materials for CO2-neutral processes in resource-intensive industries)

Partners: VTT, University of Oulu, Andritz, Exote, Metso Outotec, Neste, Nordic Tank, Wärtsilä

Silent Engine

Partners: University of Vaasa, AGCO Power, KONE, Meyer Turku, Vibrol, Wärtsilä

CASEMATE

(Computer-Aided Systems Engineering for Marine Advanced Technology for the Environment)

Partners: University of Oulu, University of Vaasa, Aalto University, Tampere University, Åbo Akademi, AGCO Power, Meyer Turku, Global Boiler Works, InfiniSpring, Dassault Systemes, Wärtsilä

GECFD

(Green Engine CFD Simulation)

Partners: VTT, Wärtsilä, CFD Direct, AGCO Power, Vahterus

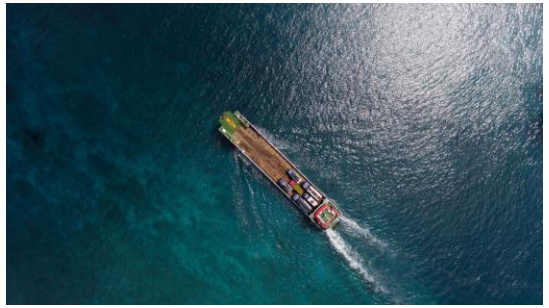
ZEM ecosystem projects

HENNES
(Hydrogen Combustion Simulation tools and experiments)

Partners: Aalto, University of Turku, Wärtsilä, AGCO Power, Vahterus, Oilon

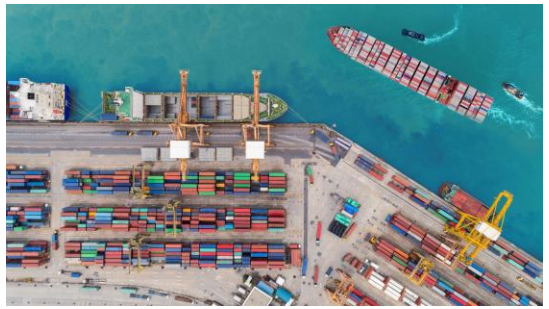
DAZE
(Data Analytics for Zero Emission Marine)

Partners: Åbo Akademi, Tampere University, University of Vaasa, University of Oulu, Aalto University, Wärtsilä, Wasaline, Wapice, SiloAI., Nextfour, Meriaura



FUSE
(Future Shipping Electrified)

Partners: RMC, Viking Line, Carinafour, Aalto, ÅA, DNV, Fortum Spring, Helen Electricity Network, Port of Helsinki



Green Connect

Partners: Turku School of Economics, SSAB, UPM, CMA/CGM, Finnlines, ESL Shipping, Ahola Transport, Gasum, P2X Solutions

HyWä
(Hycamite-Wärtsilä)
Thermo-catalytic Decomposition of methane
➔ H2 and lab quality carbon
Partners: Hycamite TCD Technologies Oy, Wärtsilä,

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Why join the ZEM ecosystem?

- Collaboration with partners on new innovative concepts
- New business opportunities
- End-to-end value chain cooperation
- Opportunity to initiate research projects on ZEM themes and apply for funding from Business Finland
- Sharing ideas with those who share the same vision of a Zero Emission Marine future
- Workshops, events, ideation and latest news from the ecosystem

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How to join?

1. Contact Zero Emission Marine to discuss about your ideas and align common interests
   - Contact via website form or send an email to zem.ecosystem@wartsila.com
2. If your idea suits ZEM, we will send you a link to an online form to provide more information about your organisation and project or we will set up a meeting with you.
3. Create a clear project plan and prepare your application.
4. Receive enhancement from Wärtsilä and apply for funding from Business Finland.

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zemecosystem.com

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