

NOVA and the Future of Inland Shipping

A floating testbed for safe, resilient
and zero-emission navigation

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Commercially operating ships slow innovation down



Automation must be tested where the constraints are real!

- **Limited access**

Commercial vessels are tied to transport operations.

- **Safety-critical trials**

Errors can affect people, infrastructure and the environment.

- **Rare-event evidence**

Critical scenarios are difficult to reproduce and compare.

- **Long assurance cycles**

Regulators need traceable, repeatable evidence—not one-off demos.



NOVA is shared research infrastructure

A floating, software-defined testbed

- **Always available**

Dedicated to research—not bound to a freight schedule.

- **Real operating context**

Rhine, ports, canals, locks, traffic and weather.

- **Modular by design**

Sensors, algorithms, communication and energy systems can be adapted quickly.

- **One evidence loop**

Simulation ↔ vessel ↔ data ↔ improved system.





Funding built the platform; projects create impact

€1.17m

NRW infrastructure investment

UDE + DST

Idea in 2020
Built and commissioned in 2025
Battery-electric research platform

Ministerium für Verkehr
des Landes Nordrhein-Westfalen



DemoBin 



National digital test-field programme | 2025–2028

Uses NOVA, ELLA and virtual test environments to develop, integrate and validate safe automation and remote-control functions.

WARRaNT 



Horizon Europe | 2025–2028 | GA 101202581

Uses the living lab to strengthen safety, cybersecurity and resilience of digital and autonomous ship systems.

One platform—complementary missions: performance, resilience and assurance.



A full-scale laboratory in a 15-metre vessel



Battery-electric catamaran

14.97 m

Length

7.10 m

Width

0.72 m

Draught

320 kWh

Battery capacity

2 × 50 kW

Electric propulsion

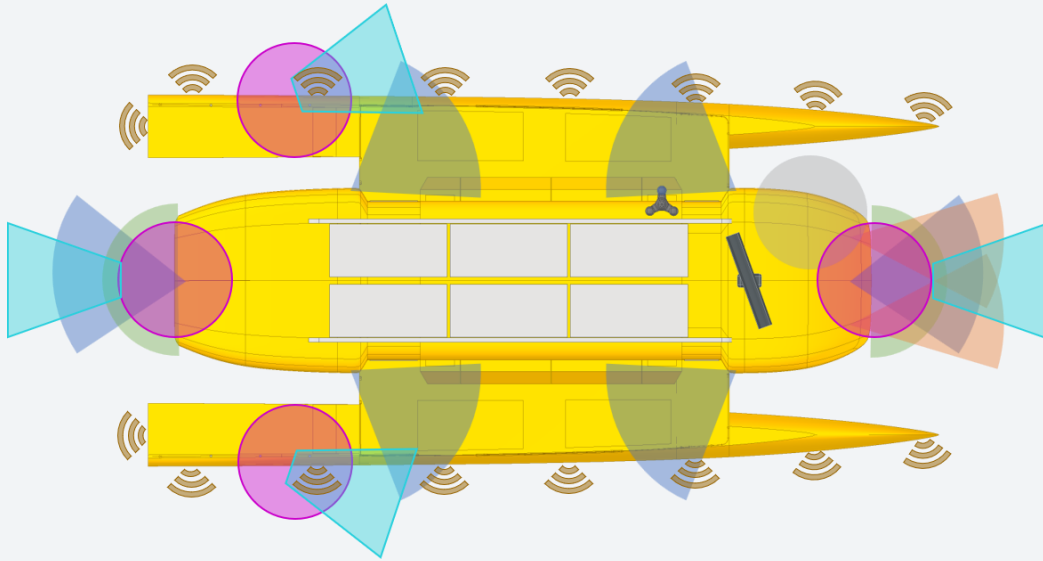
25 km/h

Maximum speed

Operational area: inland waterways and coastal waters



Complementary sensors build one world model



Overlapping fields of view reduce single-sensor blind spots.

- **Vision**

6 cameras · 2 × 180° cameras · stereo · swivelling VIS/IR

- **Active ranging**

4 LiDAR · 4 W-band near-field radars

- **Navigation**

X-band radar · GNSS compass · AIS · rate sensor · ECDIS overlay

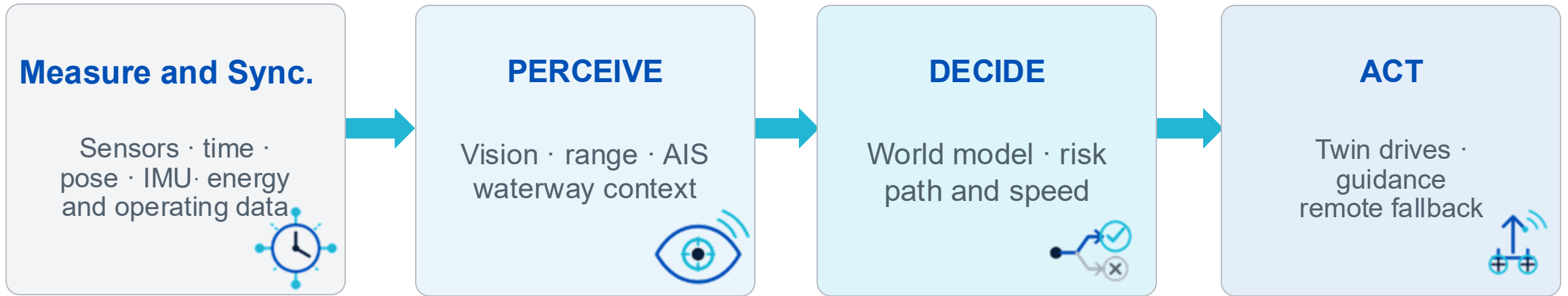
- **State and energy**

IMU plus synchronized propulsion, battery and operating data



From sensing to propulsion — one closed loop

The research value comes from the interfaces between the layers.



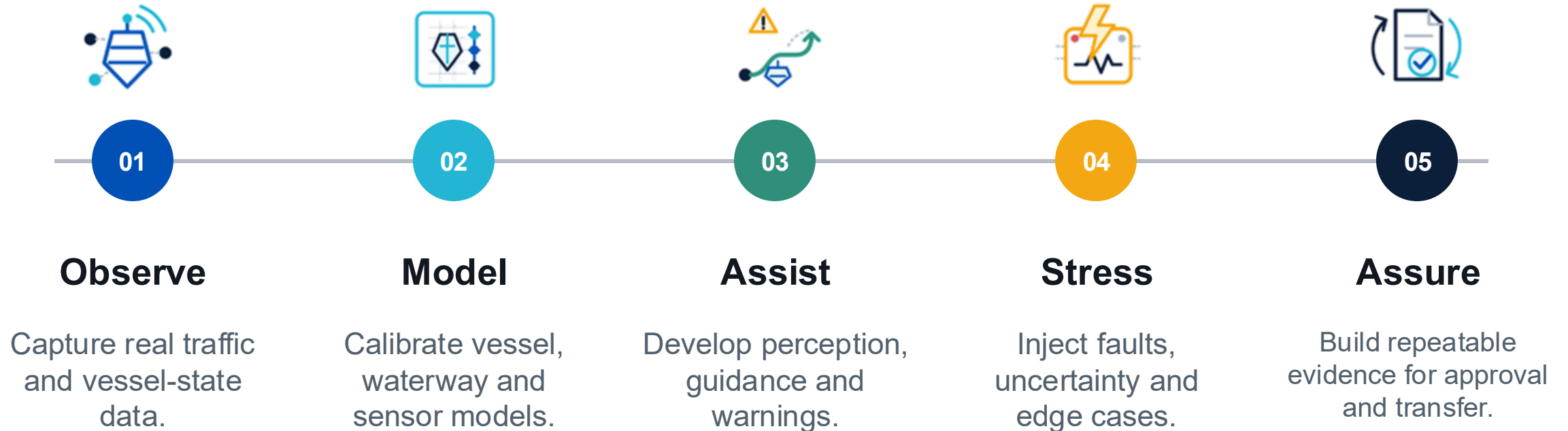
RECORD → REPLAY → UPDATE

Digital twin and on-board trials continuously improve the complete stack.



From data to dependable autonomy

Each step promotes the next — and iterations are possible to improve the systems



Target: Functions that remain safe when the river, sensors or connectivity are not ideal.



DemoBin connects virtual evidence to river trials

The same function moves through increasingly realistic environments.



SIMULATE

VeLABi simulator reproduces defined and safety-critical scenarios.

Virtual + human-in-the-loop



SCALE

NOVA/ELLA enable rapid trials of guidance, sensing and manoeuvring in a controllable real system.

Small-scale real vessel



TRANSFER

Integrates of the stack in full scale under real traffic, current and communication conditions.

Full-scale river evidence

Current focus: reference data · model sensitivity · adaptive guidance · ship–shore link · virtual assurance



WARRaNT stress-tests resilience

Living Labs

Performance is not enough: The system must detect degradation, understand risk and recover safely.

- **Detect degradation**

Sensor, connectivity and subsystem states are monitored continuously.

- **Estimate traffic risk**

Real inland-waterway scenarios support AI-based risk models.

- **Recover safely**

Fallback and resilience strategies are evaluated across the digital system.

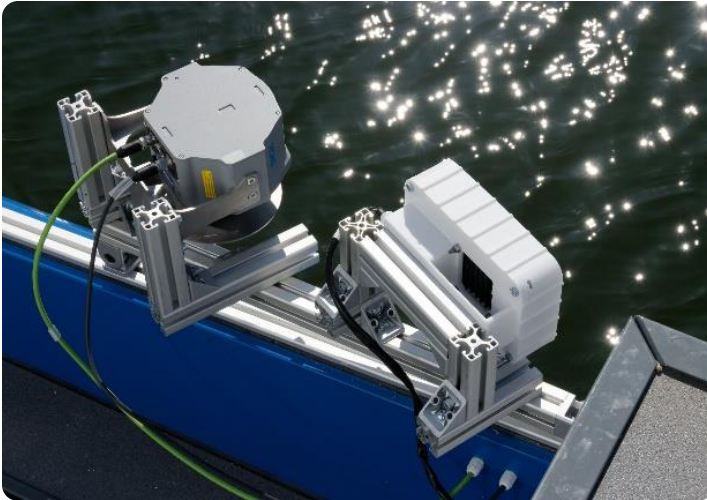


4 living labs | 12 + 2 partners | 2025–2028 | GA 101202581



River/Canal campaigns create evidence that labs cannot

The current work is deliberately operational: Synchronize, provoke, compare and replay.



Instrument

Integrate sensors, verify time alignment and log operating and energy data.



Challenge

Run close-quarters, bridge, berthing and traffic scenarios with measurable context.



Replay

Compare camera, LiDAR, GNSS, IMU and AIS data against models and risk estimates.



Rotterdam turns the Rhine into a living lab

≈ 555 km

outbound and return itinerary

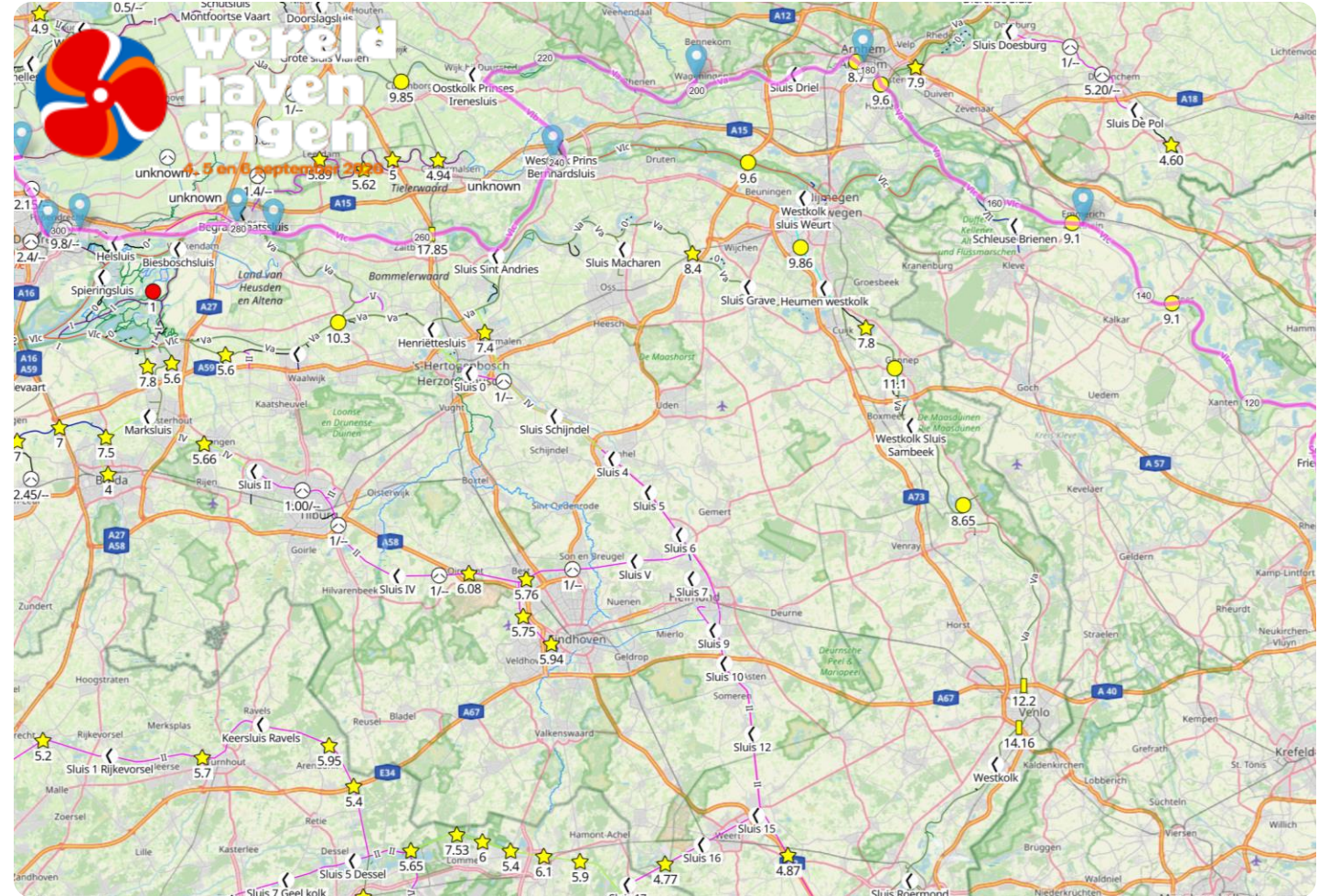
10 days 2

Operating campaign

Countries

Düsseldorf → Duisburg → Arnhem →
IJzendoorn → Dordrecht →
Rotterdam →
IJzendoorn → Rees → Duisburg

Real traffic · network coverage · charging ·
energy · partner workshops





The return journey makes the campaign repeatable

OUTBOUND

Establish the baseline

Map energy and connectivity.
Capture traffic and waterway contexts.
Meet Dutch partners along the corridor.

ROTTERDAM



Expose the platform

Present NOVA to the public.
Discuss requirements with stakeholders from research, industry and authorities.
Demonstrate a shared test asset.

RETURN

Repeat and compare

Reverse direction and current effects.
Revisit charging and network conditions.
Turn travel into comparative evidence.

27 AUG – 3 SEP

4 – 6 SEP

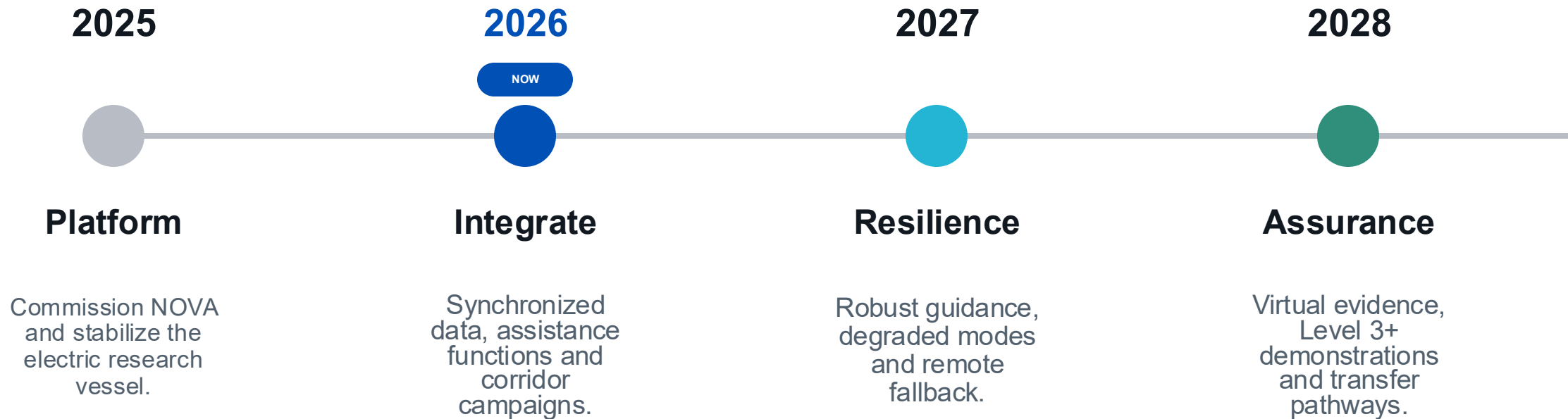
7 – 9 SEP

Comparison variables: flow direction · traffic density · network quality · energy use · operational logistics



The next milestone is trusted Level 3+ operation

Progress means broader operating conditions and stronger evidence — not autonomy for its own sake.



Longer term: Automated berthing, lock approaches and dependable operation across wider domains.



Match the question to the funding instrument

A strong consortium starts with the intended outcome — not the call name.

INTERREG DE-NL



Cross-border living labs

Lead German + Dutch partners

Best fit

Regional demonstrators, public-private pilots, infrastructure and visible cross-border benefit.

NOVA role

Rhine-corridor field trials and joint validation.

EUROSTARS



SME-led market R&D

Lead Innovative SME

Best fit

A commercialisable sensor, communication, autonomy or energy product with international partners.

NOVA role

De-risk components before productisation.

HORIZON EUROPE



System-level research

Lead Multi-country consortium

Best fit

Ambitious integration, standards, digital twins, resilience and large living-lab validation.

NOVA role

Full-scale evidence and transfer platform.

Direct bilateral R&D: start a focused test campaign without waiting for a call.



Start with one focused field campaign

You bring

- **A research question**

A failure mode, operational need or performance gap.

- **A technology**

Sensor, algorithm, communication link, energy system or interface.

- **A deployment case**

A route, ship type, port, lock, operator or authority perspective.

NOVA provides

- **A full-scale test vessel**

Professional navigation, electric propulsion and modular infrastructure.

- **A measurable evidence chain**

Synchronized sensors, operating data, digital twins and repeatable trials.

- **A path to transfer**

Test planning, safety analysis, partners and access to larger demonstrators.

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AISS
Autonomous Inland
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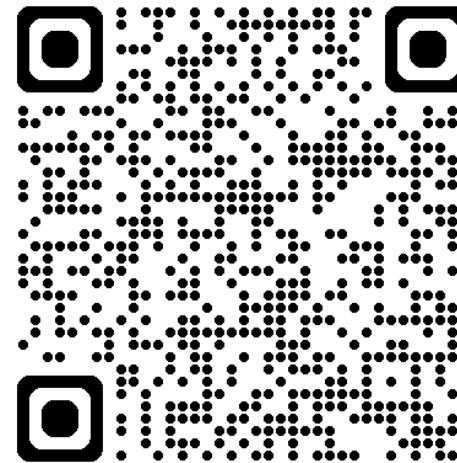
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SUBMIT BY 7 SEPTEMBER 2026

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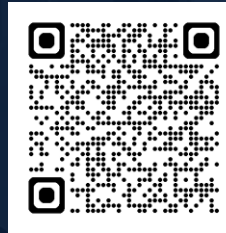
XPONENTIAL™
EUROPE

Let's test the future of inland shipping— together



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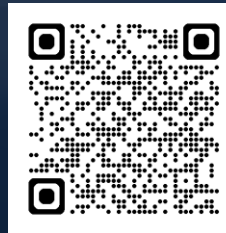
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