Blue Supply Chains – Supporting Port Authorities and Port Operators to Decarbonise Port Operations

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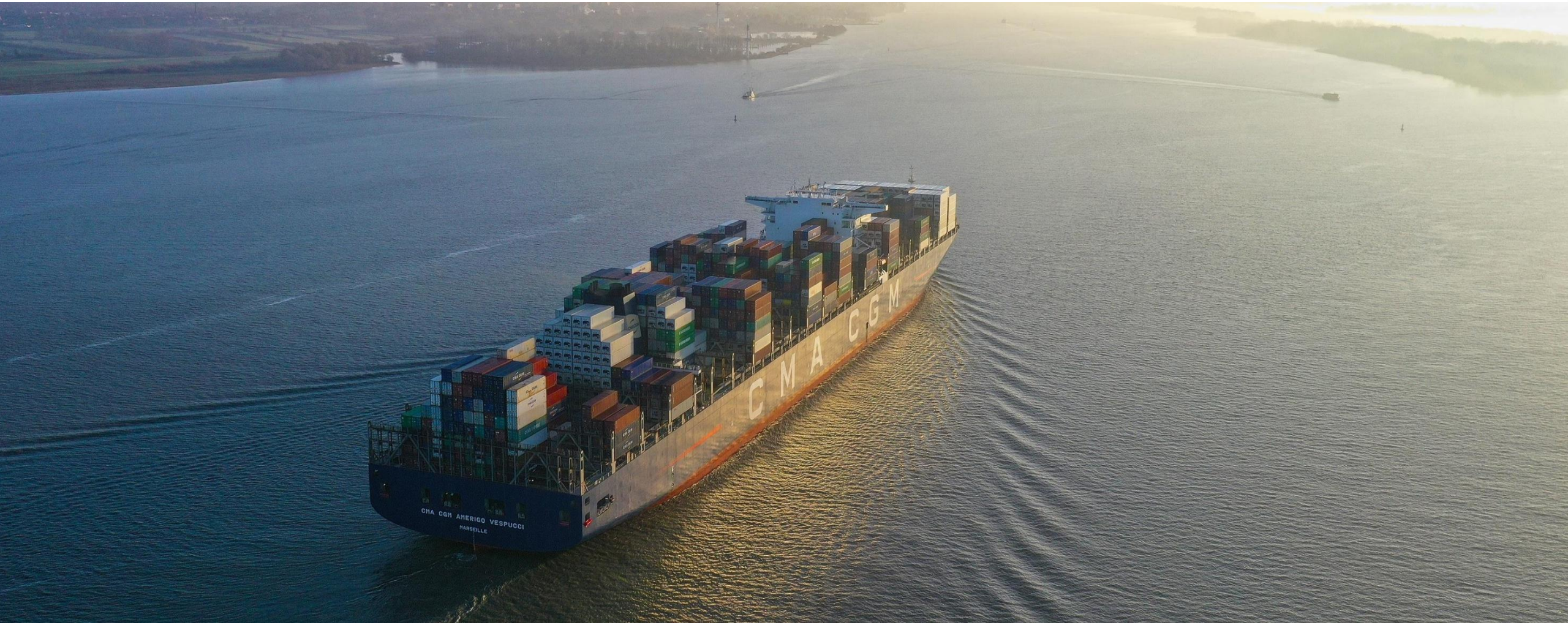

Stefan Breitenbach

Port of Hamburg Marketing | breitenbach@hafen-hamburg.de

#BlueSupplyChains

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Blue Supply Chains aims at fostering Port Authorities‘ role…

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…to support **greening of port operation** activities

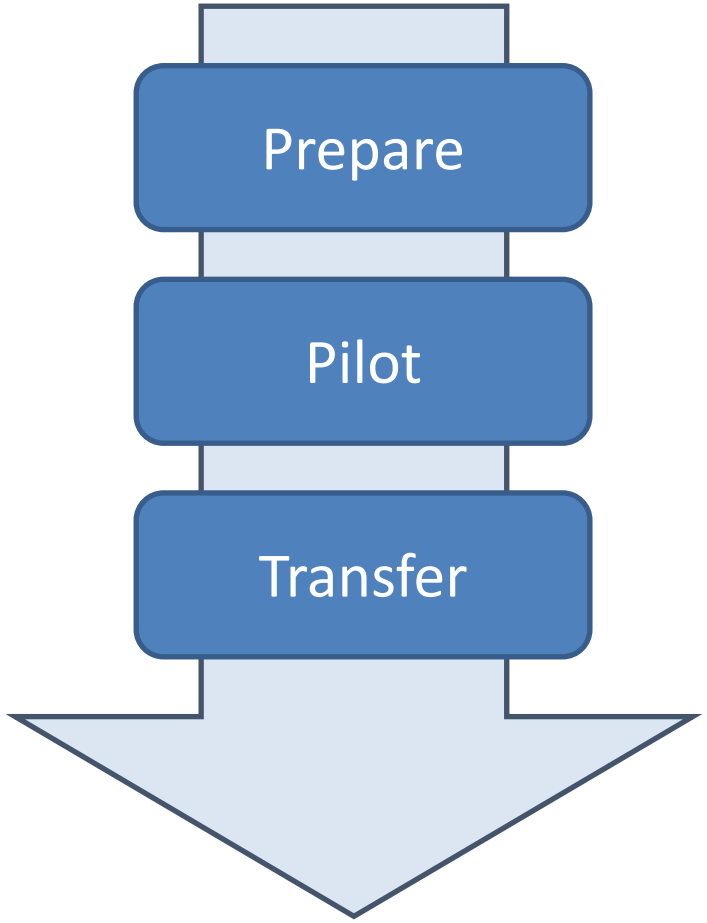
- Mobile on-shore power supply solution (DK)
- Retrofitting concept - diesel RTGs towards alternative fuel powered RTGs (PL)

…in **green energy supply** for transport chains

- Regional green energy supply concept for the port of Umeå (SE)
- Zero-emission inland waterway between Klaipeda and Kaunas (LT)

…in **the set-up of green transport chains** between BSR ports

- Proof-of-concept on cooperation pushing green combined transport solutions between Baltic ports leading to an improved rail ferry service and preparations for necessary adjustments in the ports of Rostock & Trelleborg (SE | DE)
- Start-up pitches to find new green transport solutions (LV)



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Project Partners & Associated Organisations

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CLOSER
ivl Swedish Environmental Research Institute
UMEÅ ENERGI
UMEÅ KOMMUN
Umeå Hamn
Trelleborgs Hamn AB -Port of Trelleborg-

DENMARK

PORT OF SKAGEN

LATVIA

VHTP VENTSPILS HIGH TECHNOLOGY PARK

NORWAY

Shipping Offshore NETWORK

POLAND

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UNIVERSITY OF GDANSK
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ESTONIA

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LITHUANIA

KLAIPĖDA SCIENCE AND TECHNOLOGY PARK
VĮ VIDAUS VANDENS KELIŲ DIREKCIJA

GERMANY

INTERMODAL COMPETENCE SGKV
Stena Line
ROSTOCK PORT
Port of Hamburg

Associated Organization (selection)

Hamburg | Behörde für Wirtschaft und Innovation
GDYNIA moje miasto
TRAFIKVERKET SWEDISH TRANSPORT ADMINISTRATION
DH DANSKE HAVNE
Bundesministerium für Verkehr und digitale Infrastruktur
TRAFICOM Finnish Transport and Communications Agency
VASAB VISION & STRATEGIES AROUND THE BALTIC SEA
LAND BRANDENBURG — be Berlin — Gemeinsame Landesplanungsabteilung
EUSBSR EU STRATEGY FOR THE BALTIC SEA REGION — POLICY AREA 'TRANSPORT'
EUSBSR EU STRATEGY FOR THE BALTIC SEA REGION — POLICY AREA 'SHIP'

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Retrofitted Rubber Tyre Gantry Cranes – GCT

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Goal

Retrofitted electrified gantry crane at the Gdynia Container Terminal and the process documentation for the technical retrofitting as well as adaptation of existing infrastructure.

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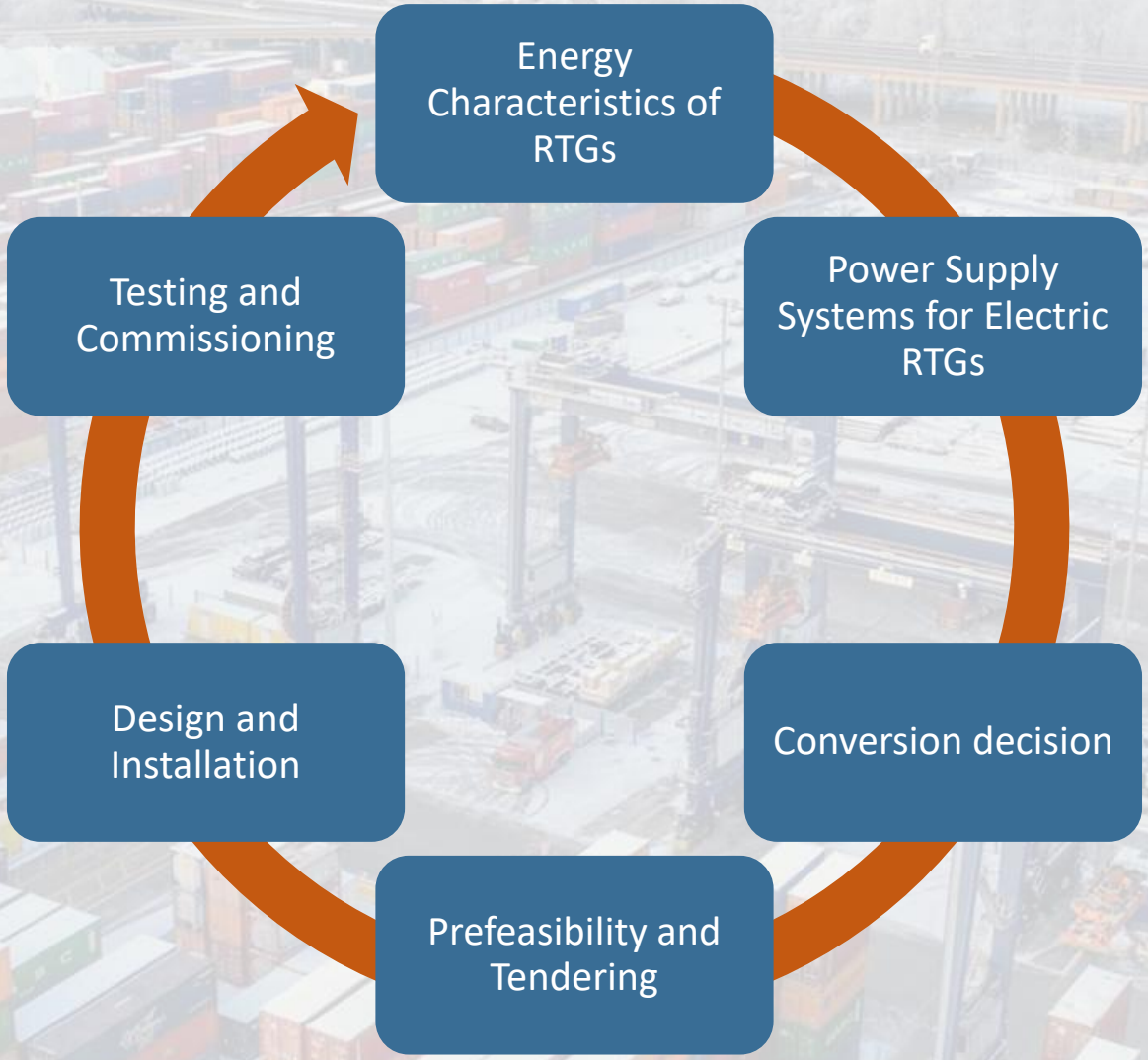
Retrofitted Rubber Tyre Gantry Cranes – GCT

Methodology



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Strategies to Reduce RTG Crane Energy Use

- **Electrification:** Switch to eRTGs/hybrids, retrofit diesel units
- **Efficiency Upgrades:** Downsize engines/generators, optimize components, save fuel without performance loss
- **Smart Operations:** Energy-aware scheduling, reduced idle times, optimized lift/stack operations
- **Energy Recovery:** Capture/regenerate hoist energy (70–80% recoverable), store for reuse

Composition of RTG power supply system

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Energy Characteristics of RTG Cranes

Operating profile
- Active ~50% of time
- Idle time also consumes energy

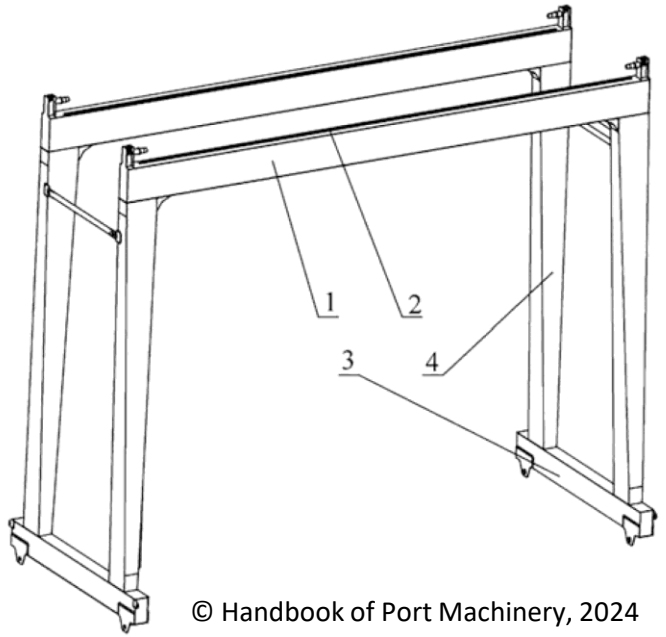
Power consumers
- Hoist motor (~60% of working energy)
- Gantry (~30%)
- Trolley & losses (~10%)

Peak demand
- Hoist lifts up to 52 tons
- Peak power ~400 kW
- Lift durations up to 65s

Energy recovery potential
- ~50% of total energy recoverable
- 70–80% from hoist lowering
- ~3–5% from gantry braking

Efficiency opportunities
- ~313 kWh/day recoverable per crane
- Cut peak demand when stored in batteries/super-capacitors/flywheels

RTG Structure: 1-Main beam, 2-Trolley track, 3-Saddle beam, 4-Door leg



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Comparison of power supply systems for RTG cranes

System	Emissions	Flexibility	Eco-Friendly	Infrastructure Cost	Operating Cost
Diesel RTG	High	Very High	❌	Low	High
Cable Reel RTG	Zero (local)	Low	✅ ✅	Medium	Low
Busbar RTG	Zero (local)	Medium	✅ ✅	High	Very Low
Battery RTG	Zero (local)	High	✅ ✅	Medium	Low
Hybrid RTG	Low	High	✅	Low	Medium

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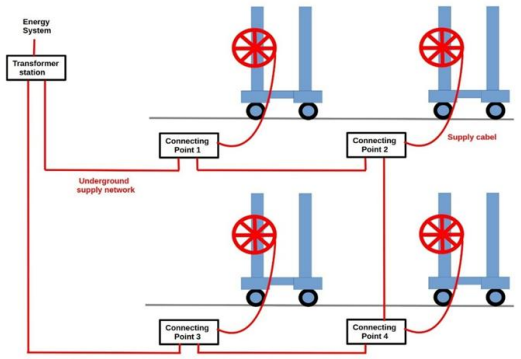
Conversion process of the RTG power supply in the port of Gdynia

Assess power requirements → Upgrade grid connection → Design electrical infrastructure → Upgrade transformer station → Install power lines and cables → Construction works → Personnel training



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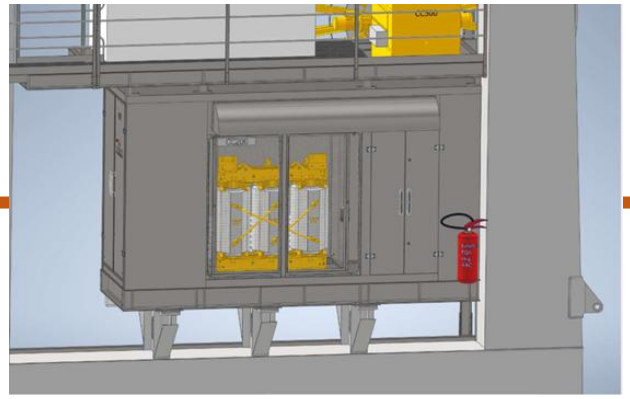

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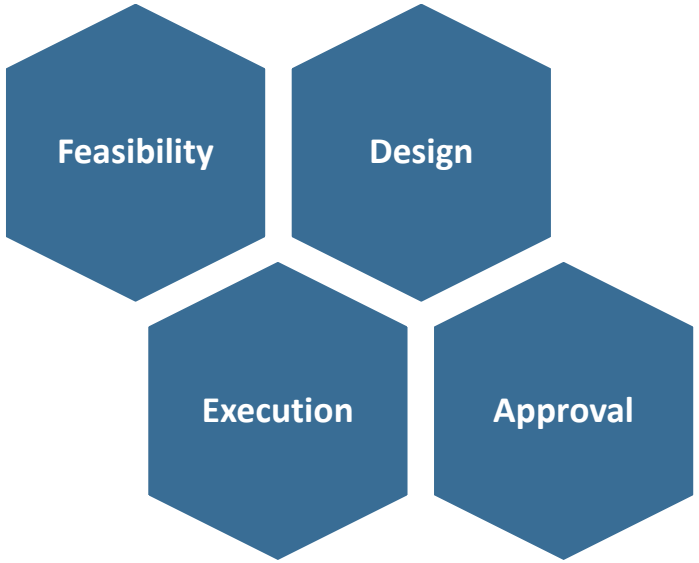
Main elements impacted during conversion

- Replacement of Diesel Generator System
- High voltage Cable Reel System
- Medium Voltage (MV) Transformers
- Backup Generator
- New AC Distribution Panel



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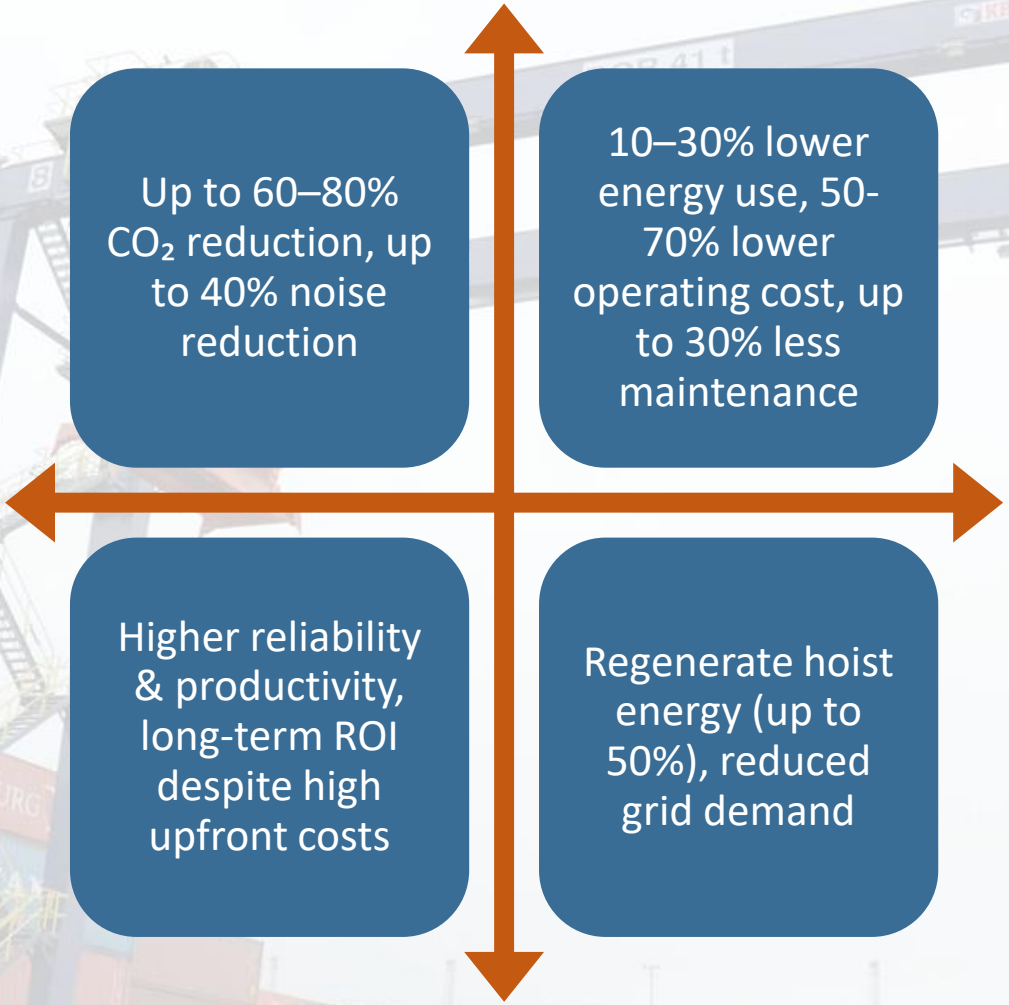
Benefits of RTG Electrification (Retrofitting)



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Lessons Learnt

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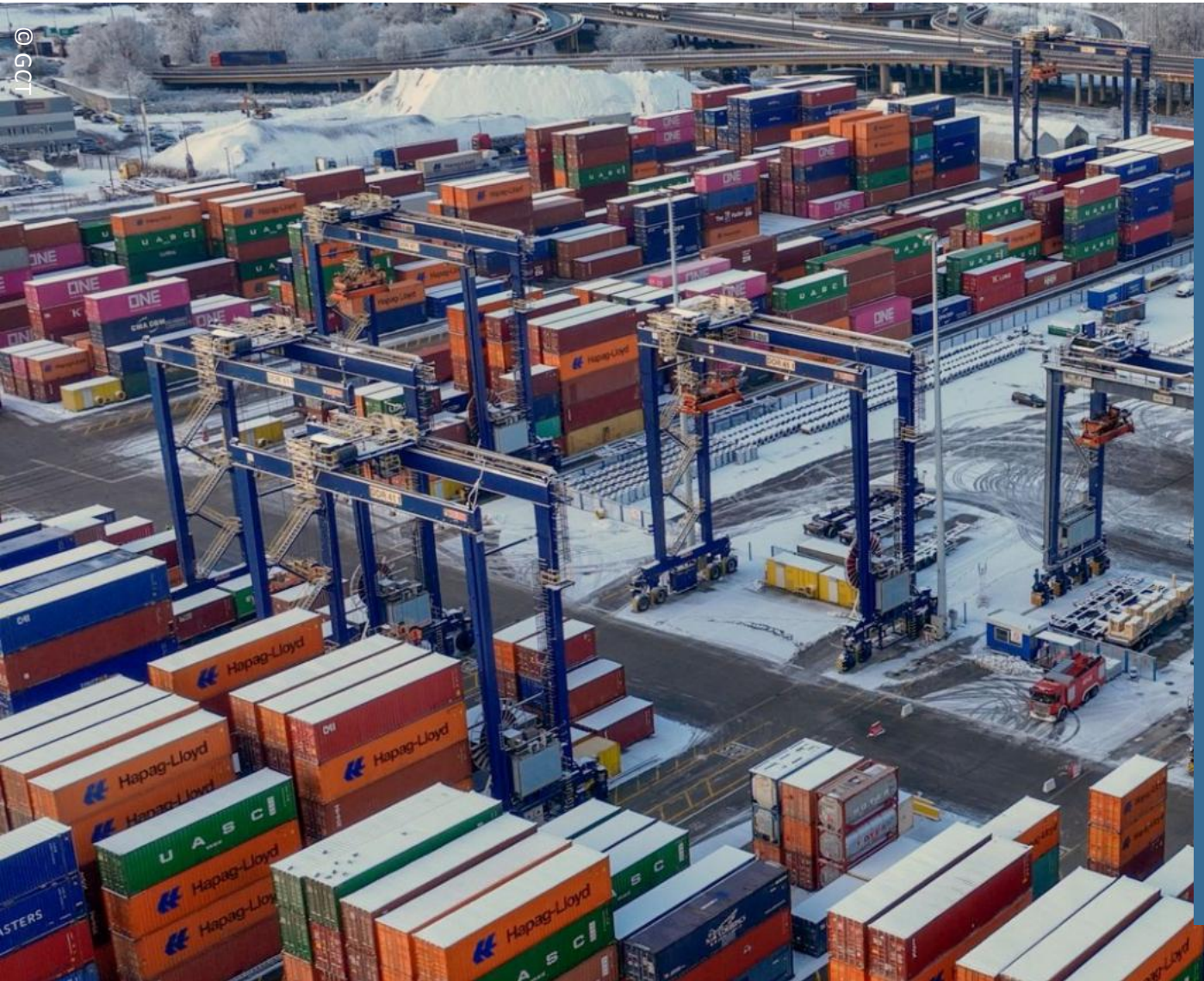

- High Upfront Costs – Significant investment in retrofits, new cranes, and infrastructure upgrades
- Power & Tech Challenges – Grid compatibility, control system integration, grounding/safety, HMI/software issues
- Design & Execution Hurdles – Structural checks for older cranes, space limits in E-room panels, weatherproofing needs
- Planning is Key – Careful financial, operational, and energy analysis required; regulatory delays add complexity
- Success depends on supportive policies and sustainable energy sourcing

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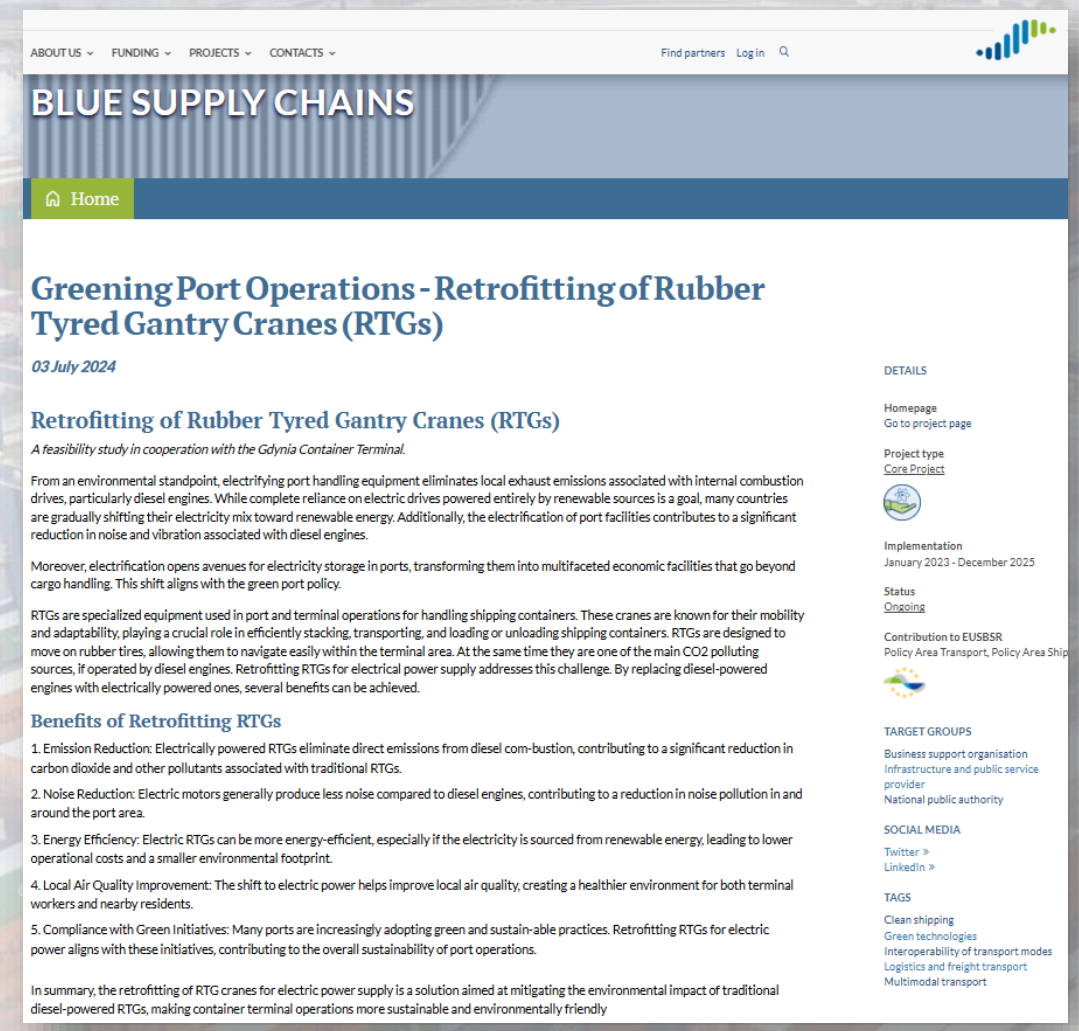
Outputs



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Greening Port Operations - Retrofitting of Rubber Tyred Gantry Cranes (RTGs)

03 July 2024

Retrofitting of Rubber Tyred Gantry Cranes (RTGs)

A feasibility study in cooperation with the Gdynia Container Terminal.

From an environmental standpoint, electrifying port handling equipment eliminates local exhaust emissions associated with internal combustion drives, particularly diesel engines. While complete reliance on electric drives powered entirely by renewable sources is a goal, many countries are gradually shifting their electricity mix toward renewable energy. Additionally, the electrification of port facilities contributes to a significant reduction in noise and vibration associated with diesel engines.

Moreover, electrification opens avenues for electricity storage in ports, transforming them into multifaceted economic facilities that go beyond cargo handling. This shift aligns with the green port policy.

RTGs are specialized equipment used in port and terminal operations for handling shipping containers. These cranes are known for their mobility and adaptability, playing a crucial role in efficiently stacking, transporting, and loading or unloading shipping containers. RTGs are designed to move on rubber tires, allowing them to navigate easily within the terminal area. At the same time they are one of the main CO2 polluting sources, if operated by diesel engines. Retrofitting RTGs for electrical power supply addresses this challenge. By replacing diesel-powered engines with electrically powered ones, several benefits can be achieved.

Benefits of Retrofitting RTGs

1. Emission Reduction: Electrically powered RTGs eliminate direct emissions from diesel com-bustion, contributing to a significant reduction in carbon dioxide and other pollutants associated with traditional RTGs.

2. Noise Reduction: Electric motors generally produce less noise compared to diesel engines, contributing to a reduction in noise pollution in and around the port area.

3. Energy Efficiency: Electric RTGs can be more energy-efficient, especially if the electricity is sourced from renewable energy, leading to lower operational costs and a smaller environmental footprint.

4. Local Air Quality Improvement: The shift to electric power helps improve local air quality, creating a healthier environment for both terminal workers and nearby residents.

5. Compliance with Green Initiatives: Many ports are increasingly adopting green and sustain-able practices. Retrofitting RTGs for electric power aligns with these initiatives, contributing to the overall sustainability of port operations.

In summary, the retrofitting of RTG cranes for electric power supply is a solution aimed at mitigating the environmental impact of traditional diesel-powered RTGs, making container terminal operations more sustainable and environmentally friendly

DETAILS

Homepage
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Project type
Core Project

Implementation
January 2023 - December 2025

Status
Ongoing

Contribution to EUSBSR
Policy Area Transport, Policy Area Ship

TARGET GROUPS

Business support organisation
Infrastructure and public service provider
National public authority

SOCIAL MEDIA

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TAGS

Clean shipping
Green technologies
Interoperability of transport modes
Logistics and freight transport
Multimodal transport

- Overview
- Pictures
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Onshore Power Supply for Small & Medium Ports
Best Practice from Port of Skagen

Retrofitted Rubber Tyre Gantry Cranes
Best Practice from Gdynia Container Terminal

Greening Supply Chains – Emission Free Inland Waterways
Best Practice from Lithuania

Green Bunkering and Charging Strategy for Ports
Best Practice from Umeå Region

Stakeholder Engagement to set-up Green Transport Corridors
Experiences from the Rostock-Trelleborg Rail Ferry Link

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