NEVOMO

Der nächste Schritt? Magnetschwebetechnik im KV

Into the future

INTERMODAL COMPETENCE SGKV

Terminaltag - November 2023

World of mobility is at a turning point

Railways are the hope – but hope needs to be enabled by radical innovations

Mobility challenges

Huge congestions in all modes	Tremendous greenhouse gases emissions	Poor customer experience






Changing travel behavior after COVID

The hope is in rail:

sustainable, comfortable, mass transport...

but rail has to be enabled by innovations.

Railway industry faces four major challenges

Issues with full digitalization of legacy infrastructure prohibit railways from meeting the growing demand

	Capacity limit	Limited speed**	High cost & lengthy implementation	Increasing competition
	Internal			External
				
Impact	Inefficient legacy analog propulsion interface* resulting in long breaking distance	Inability to operate with reasonable OPEX at speeds above 350 kph	High CAPEX to add new capacity*** combined with overall high OPEX	Competitive inroads from road and air transport (getting greener and more autonomous)

European Green Deal 2030 target is at risk – railways are unable to adapt their networks to increase freight market share to 25% and double the number of transported passengers

78m ton CO_2 reduction at risk

* steel-on-steel wheel-rail interface is inefficient for traction (acceleration & braking)
** not allowing railways to compete with aviation
*** due to high resources intensity & long planning and design

Products: upgrade from legacy towards frictionless future

MagRail allows a stepwise upgrade of legacy railways with components bringing automation, electrification & full digitization

Nevomo's digital bridge systems:

(possible as cargo & passenger versions)

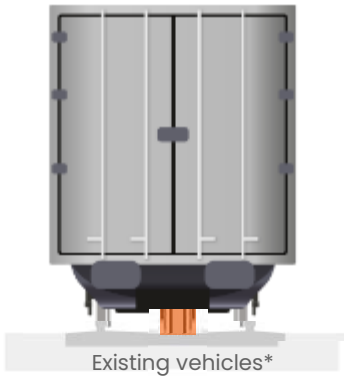
Legacy

Cargo: 120kph | 75mph

Passenger: 330kph | 205mph

Analog & hard to fully digitalize

MagRail Booster



Existing vehicles*

120kph | 75mph

330kph | 205mph***

MagRail

New vehicles

160kph | 100mph

550kph | 340mph

Linear motor

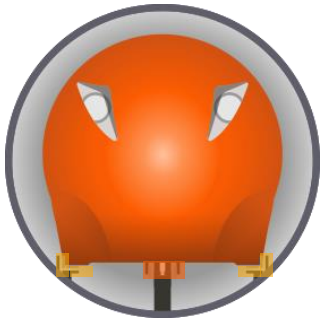
Magnetic levitation

New digital components quickly implementable to upgrade legacy tracks

compatible**

with:

Hyperloop



600kph | 375mph

1200kph | 745mph

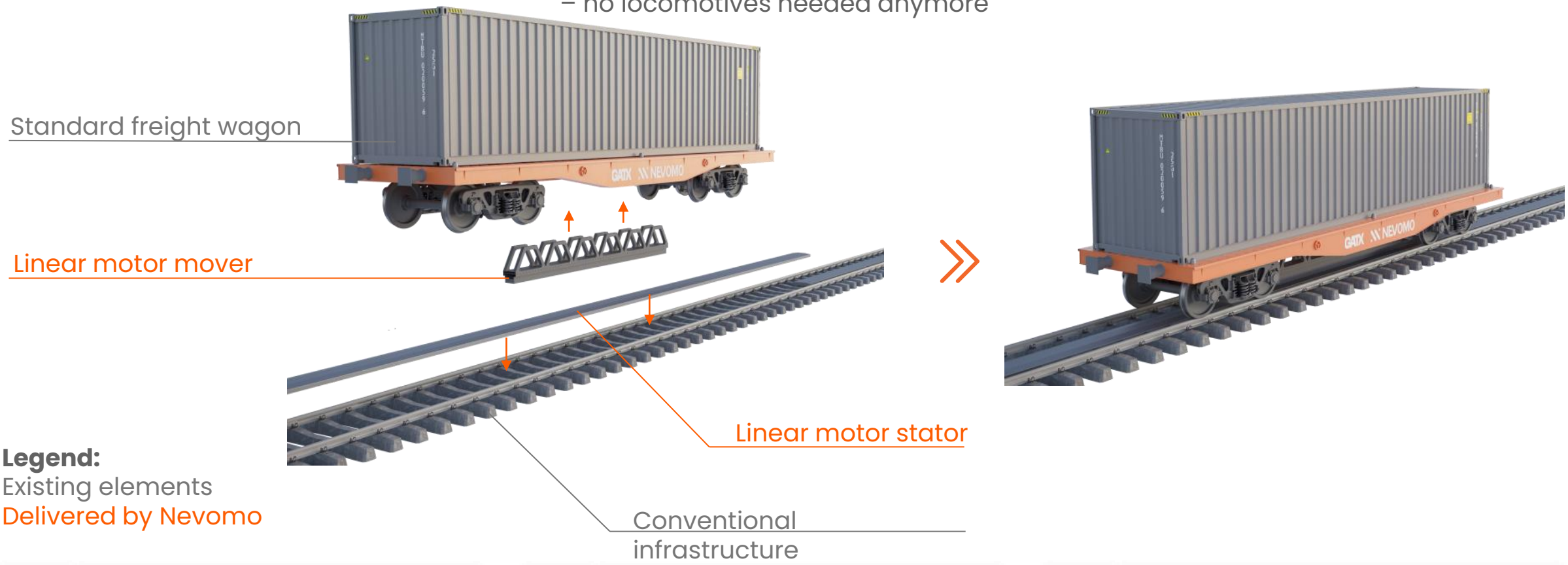
Vacuum rail of the future

** interoperable

*** or even 360 kph | 225 mph, which is currently planned on the fastest High-Speed Rail lines in Europe

Cargo MagRail Booster

An immediate improvement of efficiency & elimination of bottlenecks by digital and precise acceleration & braking – no locomotives needed anymore



Legend:
Existing elements
Delivered by Nevomo

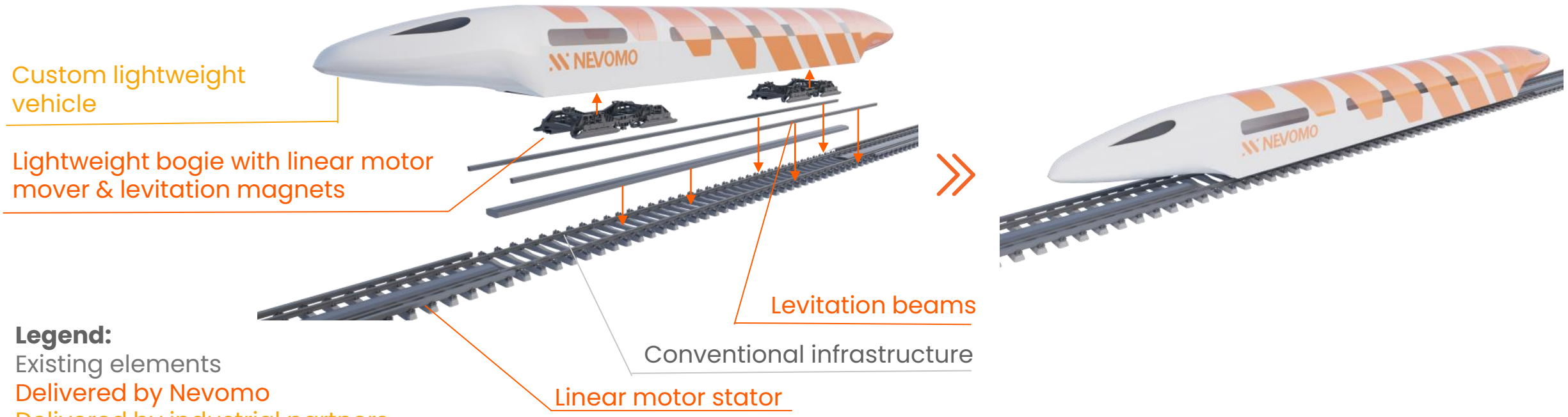
1 Quick **retrofit of existing cars** with **linear motor propulsion**

2 **Enhancement of capabilities of rail:** higher loads, better train dynamics, easy electrification

3 **Use cases**:
- more capacity & flexibility in terminals
- extra capacity on inclines
- electrification of tunnels & ports

Passenger MagRail with speeds of up to 550 kph

HSR or MagLev speed & lower OPEX on existing infrastructure at a fraction of the cost of building new lines – solution for gaining passengers from air



Legend:
Existing elements
Delivered by Nevomo
Delivered by industrial partners

1 **Specialized MagRail pods***: lighter and dedicated to the MagRail system

2 **Enhancement of capabilities**: high frequency, flexible, automated pod system – enabling on-demand high-speed travel

3 **Use cases**:
- 'on-demand', direct, fast intercity services due to smaller pods
- next generation of ultra-high-speed services

* MagRail pods are newly designed levitating vehicles

Nevomo's MagRail will enable railways by adding needed features

Solving railways' challenges with a portfolio of MagRail solutions

MagRail features:

VIDEO >>

Automation & electrification	More power & better dynamics	Flexibility	Velocity

Applications:

- Automated, flexible shunting
- Shuttling of wagon-groups
- Electrification of terminals

- Higher loading limits on inclines
- Faster acceleration out of passing tracks

- Dedicated pods operating with high frequency and high flexibility
- No locomotives needed – easy adaptation to demand fluctuations

- High-Speed cargo transport (250 – 300 kph) could be floating withinethe existing HSR-traffic to allow for better capacity usage

Benefits:

Capacity ↑ **Flexibility ↑** **TCO* ↓**

* TCO – Total Cost of Ownership, comprising, i.a., CAPEX and OPEX

MagRail Booster technology for cargo-retrofitted wagons

Example of an equipped Container wagon from GATX – tests successfully started

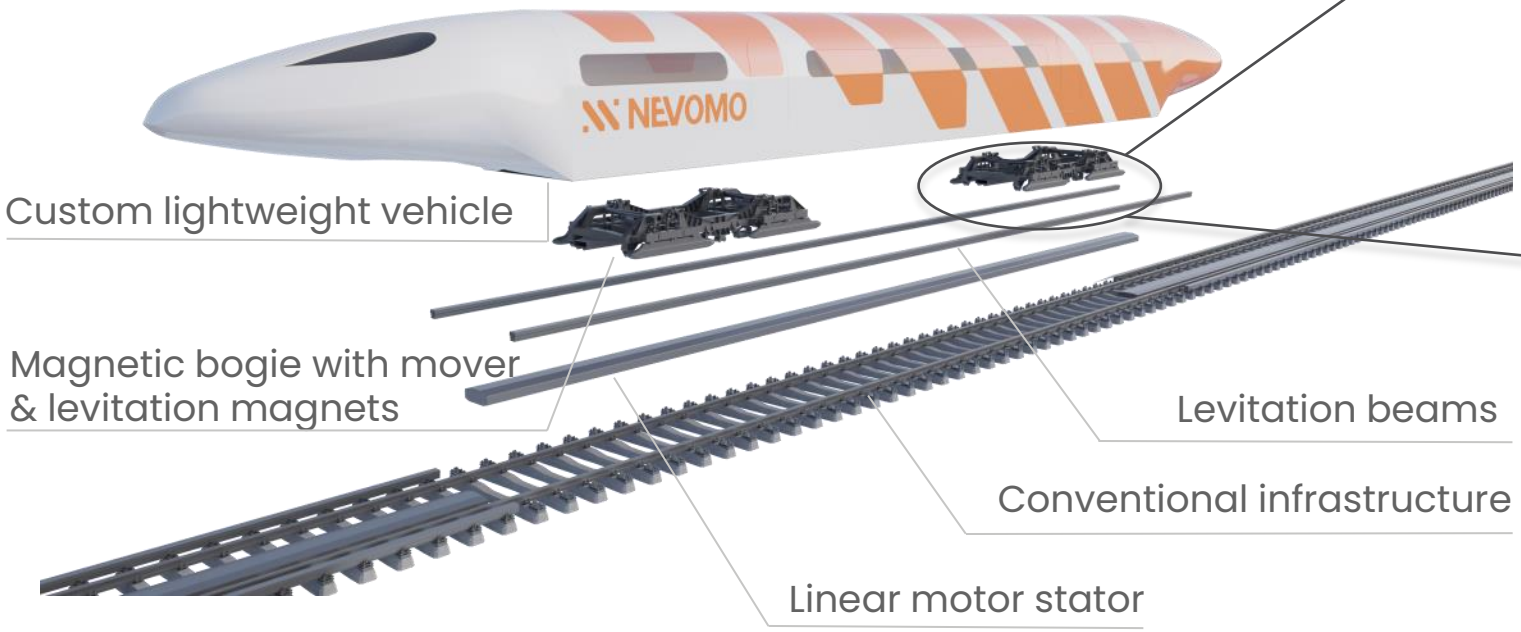
GATX

VIDEO >>

Mover on the wagon

MagRail: The test-site is Europe's longest passive levitation track – 750 m

Nevomo tested a levitation BOGIE – 6 m long, 2 tons heavy



VIDEO >>

MagRail Booster & MagRail tests were performed

What’s next?

Nevomo will continue to enable the railway system and achieve the MagRail stage around 2030

Booster industrialization (H1’24)

- Enhance the test-track to achieve complete system functionality
- Achieve readiness for pilot implementations and start of homologation

Commercial launch of Booster

- Pilots to start 2024/25
- Show the working tech in commercial railway environment
- Adding additional capabilities over time until full MagRail stage

Homologation Center

- Bigger test facility for high-speed and durability tests
- More than 10km test-circuit to achieve speeds of 500 kph
- Homologation & certification to achieve full MagRail readiness by 2030

Become part of this (r)evolution!

Support in making the shift happen

- **BECOME** our **CLIENT** and be among the first to deploy MagRail
- **BECOME** our **PARTNER** and support us in making it happen
- **BECOME** our **INVESTOR** and participate in this new market opportunity
- **BECOME** our **SUPPORTER** and help with regulation, homologation & certification
- **PREPARE** the railway **FUNDING** for future deployments & include MagRail in TEN-T plans

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