NEVOMO

Linking hyperloop vision with railway infrastructure

International Conference on European Hyperloop Technology

February 23rd, 2021

Introduction

A European deep-tech company providing key components to modernize the railway industry – developing next generation of high-speed railways all the way to application of hyperloop.

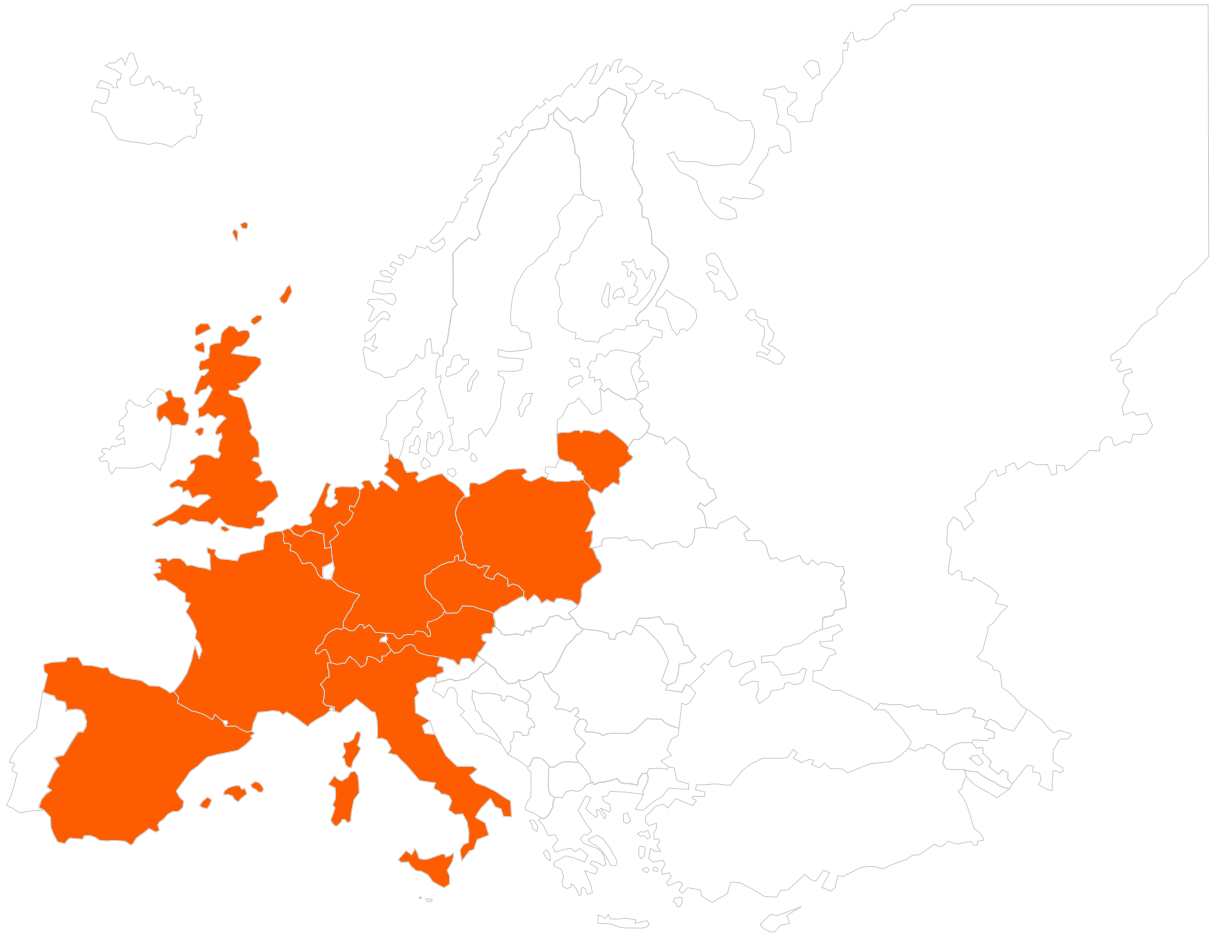
Our mission

Creating a bridge between conventional railways and the hyperloop through **higher efficiency & interoperability**

Key strategic directions

- **Digitalization** of conventional railways infrastructure
- **Innovative technologies** for the next generation of high-speed railways – propulsion, suspension and power electronics
- **Modal shift** from road & air through restoring existing railway lines
- **Transfer** of **current transportation system** into a ”zero-emission” one

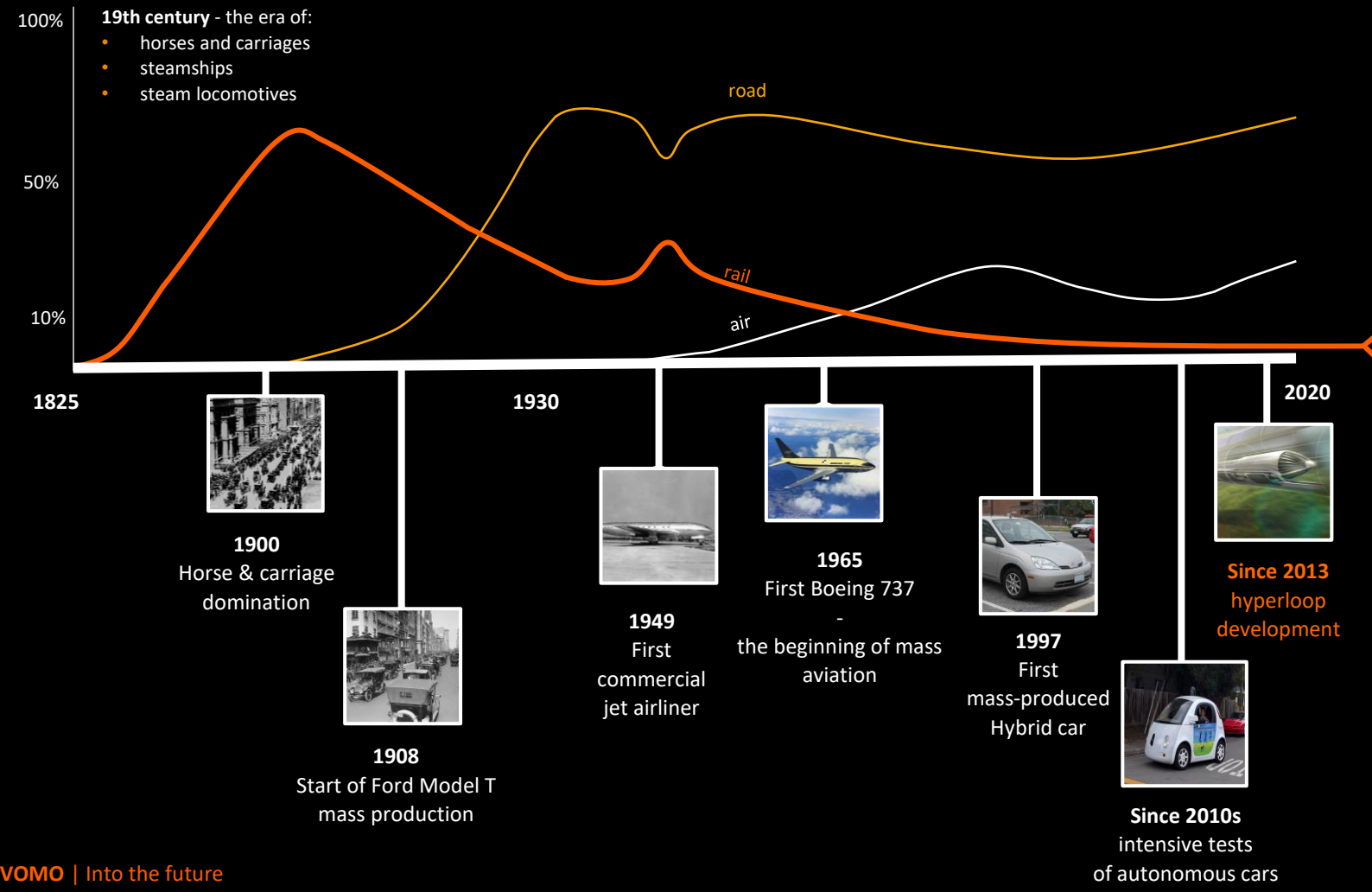
Our presence



The big picture

The guided transportation industry has widely depleted the potential of system optimization based on simple reserves and it is now at the most important crossroads in history that will define its fate.

Share in the passenger market (USA)



Reinvention

- adaptation of the existing infrastructure
- digitalization
- integration with hyperloop

Drivers of change:

1. environmental regulations & post-covid recovery
2. new technologies (e.g. energy & propulsion)
3. increasing mobility demand

Marginalization

- displacement by new technologies
- further loss of share in modal split

Our solution

Technology & IP

Main focus, core products and competencies.

Market segments[1]

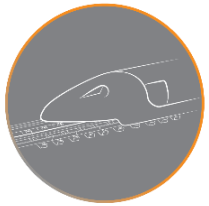
urban maglev

local

150 kph (93 mph)

Magnetic levitation monorail with unique architectural design

Phase 1: magrail

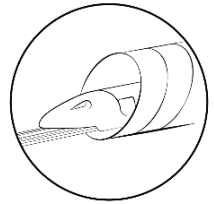


short-medium haul

300-550 kph (186-342 mph)

Magnetic train combined with a conventional train (interchangeable) within the existing railway corridor

Phase 2: hyperloop



long haul

600-1200 kph (373-746 mph)

Vacuum train in a tube within an existing transportation corridor upgraded from magrail and/or a brand new transportation corridor

Core products[2]

Linear Motion	Power Electronics	Internet of Things (IoT)

Core competencies

Integration:	**Electromagnetism & electrical engineering**	**Mechanical & civil engineering**	**Sensors, electronics & data analytics**

[1] Other potential market segments include CRI – improving the efficiency of particular sections of conventional railway lines or applications outside the guided transportation industry.
[2] All core products are useable in each of the market segments.

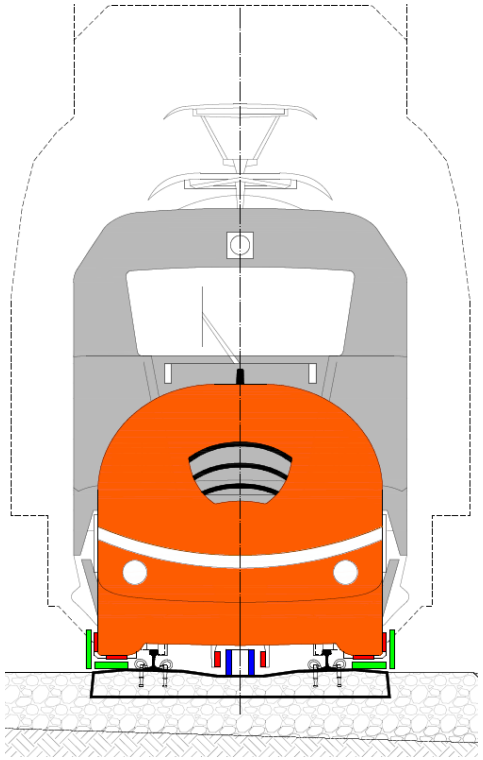
Key features

Innovative upgrade of conventional infrastructure introducing a new mode of propulsion and interface between vehicles & infrastructure.

Infrastructure

- **Standard-gauge** ground-level track
- **Linear motor** in between the rails („third rail")
- **Levitation and guidance „rails"** at the edges of sleepers
- **Single track** sufficient for **two-way operations** (for most local/regional lines)

Applying **railway norms** and **standards** to facilitate **homologation** process



Integration of a **new layer** over **existing infrastructure**

Vehicle

- Single car, 2 bogies
- Possible **virtual coupling**
- **Capacity**: 10-70 passengers
- **Weight**: 5-20 tons gross
- **Speed**: up to 30-50 kph on wheels, levitation beyond

Main advantages to conventional railways

Magrail technology provides attractive parameters for local and regional lines.

Operational

- Shorter **headway distance**
- Higher **acceleration on inclines** (up to 10%)
- Better **dynamics** at the same **geometry & curve radius**

Customer-oriented

- Higher **frequency** (i.e. small pods every 10 minutes)
- Increased **flexibility**

Environmental

- Lower **energy consumption** per passenger-km at the same speed
- **Noise** reduction (key in dense urban areas)

Alternatives and competitive landscape

Magrail offers a well-balanced combination of operational, customer-oriented and OPEX advantages at a reasonable CAPEX.

Line renewal (conventional EMUs)

- ✓ **Proven** and mature technology
- ● **Moderate** CAPEX
- ✗ **High** OPEX
- ✗ Operational and customer-oriented **limitations**

Line renewal (magrail)

- ✓ **Increased** performance and efficiency of asset use
- ✓ **Low** OPEX (-25-40% vs. conventional)
- ✗ **Additional** infrastructure CAPEX (EUR 3.5m; alternative configuration approx. EUR 1-1.5m)

Electric buses on road

- ✓ **No** infrastructure CAPEX
- ❑ Vehicle CAPEX and OPEX to be compared
- ✗ **Dependence** on road congestion

LEGEND: ✓ Strength ● Neutral ❑ To be evaluated ✗ Weakness

Technological progress

Infrastructure and vehicle development financed with EU funds.

2019: Proof of Concept (PoC)

- Aim: to prove that the pod can **accelerate, levitate** and **brake**
- **1:5 scale** pod, first generation of linear motor (1:1 scale)

2020: Mid-scale tests

- Aim: to verify **configuration** of second-generation **linear motor**
- Length: **50m** (to be exteneded to 100m to improve control), gauge: **1,000mm**

2021-2022: Full-scale test track

- Aim: full-scale tests of bogie and infrastructure (incl. levitation) at **up to 150 kph**
- Length: **700m**, gauge: **1,435mm** (standard)
- Construction: H1.2021, **tests: H2.2021-H1.2022** (to be extended in 2022: curve and switch)

2023-2024: Pilot implementation

- **Test** of the complete system (incl. entire vehicle)
- **Certification** (preliminary)

Contact:

Milan CHROMIK
Business Development Director

+420 720 043 223
m.chromik@nevomo.tech