

SwissMetro-NG

***New Generation
Swiss Intercity Transportation***

26th April 2021.

The aim is a modern, CO2-Neutral, Ultra-Fast Transportation System based on the technology developed in Switzerland (EPFL, ETHZ, CH-Companies) and which fits into our beautiful Swiss Landscapes and historic Cities.

Slide 2. Introduction: The Origins of SwissMetro-NG.

The Vision of Rodolphe Nieth, 1974

The goal was a modern ultra-fast transportation system to complement the rail and highway networks and to fulfil the requirements of the 21st Century (CO2, Efficiency, Energy, Sustainability, etc.)

The feasibility was confirmed by the Swiss Federal Institutes of Technology (EPFL und ETHZ) under the Leadership of Professor Marcel Jufer and by the SwissMetro AG under Dr. Sergio Salvioni

A pilot project between Geneva and Lausanne was planned.

The Swiss Federal Government, was however absorbed with large infrastructure projects (Rail 2000, Gotthard-Alptransit, etc.). The Federal Office of Transportation also had some reservations (switch and capacity, etc. see Fachbericht Konzessionsgesuch).

Slide 3. Introduction: The Philosophy of SwissMetro-NG.

The Age of Sustainability

SwissMetro-NG eliminates the impediments to movement and speed instead of burning more and more fuel to fight them.

Ultra-Fast (Supersonic) speeds become possible, sustainable and economically feasible.

SwissMetro-NG integrates the newest technological developments. It is ultra-fast, but also friendly to the Climate and Environment. The conditions are now very favourable. Our great Infrastructure projects (Rail 2000, Gotthard-Alptransit, etc.) are nearing completion and conditions favour Investments in Infrastructure and sustainability (Low interest rates, Covid recovery, CO2 reduction, Energy, etc.)

Slide 4. Introduction: The Re-Activation in Bern and the continuation by Swiss Stakeholders.

SwissMetro-NG

*The Next Generation Version of the SwissMetro Project of Switzerland
(parliamentary decision 17.3262)*

*The objective is to connect Swiss urban centres with a
sustainable ultra-fast transportation system.*

*The demanding Swiss requirements relating to CO₂ Emissions,
landscape, sustainability, tourism, capacity, safety, costs,
networks, economic benefits, etc. are fulfilled.*

The project can now be revived as SwissMetro-NG with the participation of the Swiss Federal Institutes of Technology (EPFL, ETHZ, EMPA), Swiss Universities, Universities of Applied Science, Swiss Transportation Research Institute und Swiss Engineering und Industrial companies.

**Slide 5. Quantum Leaps and Technological Limits:
High Speed Rail (HSR): In Transportation, Speed is the key to Success.**



Shinkansen of Japan

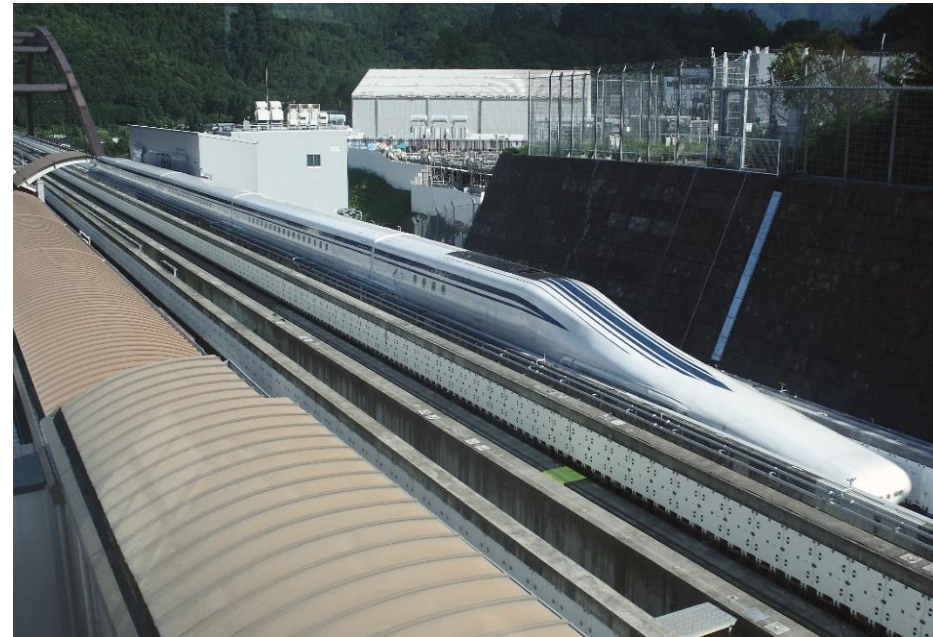
Introduced the Era of High-Speed Rail (HSR) 1964

An improved wheel design reduces the possibility of derailments at operational speeds of up to 350 km/h. The limits of the wheel-rail system are reached, and faster speeds become dangerous (Eschede accident of the ICE in Germany).

**Slide 6. Quantum Leaps and Technological Limits:
Maglev success with World Speed Record of 603 km/h.**



Transrapid of Germany



SC-Maglev of Japan

**Rolling Resistance is eliminated with magnetic levitation (Maglev) but
*Air resistance prevents faster speeds.***

Maglevs will remain inefficient (physics of air resistance). Operational speeds of 600 km/h will remain practically impossible.

**Slide 7. Quantum Leaps and Technological Limits:
The Laws of Physics makes SwissMetro-NG Ultra-Fast but also Sustainable.**



SwissMetro-NG of Switzerland

**Rolling Resistance as well as Air Resistance are eliminated.
Ultra-Fast Speeds become possible and economically feasible.**

*SwissMetro-NG is a Maglev running in a vacuum tunnel.
It integrates the recent technical developments by the EPFL, ETHZ and Swiss Transportation Research Institute.
It has no speed limits and will easily outperform all competitors. A new World Speed Record can be expected.*

Slide 8. New Key Components for SwissMetro-NG

Universal Vacuum-Train Switch

**This is analogous to the switch of the railway.
It allows a drive-through operation with ultra-fast speeds
and enables the guidance of vehicles in complex networks.**

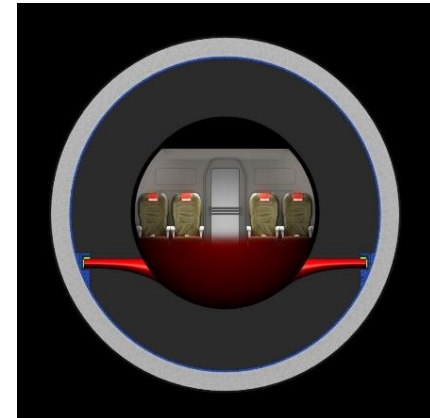
***It permits networks for whole countries or continents
and accommodates long Vehicle-Compositions
(over 1'200 passengers).***

Slide 9. New Key Components for SwissMetro-NG

Vacuum-Tight Airlocks

They allow passengers to cross the vacuum gap between the vehicle and the wall of the pipes / tunnels quickly and safely at stations.

Necessary for Boarding



**Cross Section
showing Vacuum-Gap**

All vacuum-trains require a “vacuum filled” gap between the vehicle and the walls of the pipes / tunnels. Passengers must cross it to board the vehicle at stations. The new Airlocks are quick and safe (see also Report BAV-EVED 1998).

Slide 10. New Key Components for SwissMetro-NG

Vacuum-tight Pipes and Tunnels

Reinforced concrete construction.

**Bi-metal lining guarantees vacuum tightness of Pipes/Tunnels.
Joints permit expansion and contraction due to temperature changes.**

Cost-effective Construction

Slide 11. New Key Components for SwissMetro-NG

Pneumatic Cross Section Seals

**Closes off cross-sections of the track in emergencies to avert danger (earthquake, etc.) and for maintenance.
Allow quick re-pressurisation of the pipes / tunnels and safe evacuations of the passengers.**

Averts danger in emergencies

The seals make quick and safe evacuations possible (see also Report BAV-EVED 1998).

They are large flexible non-flammable balloons, which can be inflated to seal off tunnel cross-sections as needed.

They can be pierced by vehicles without endangering passengers. The pipes / tunnels can be accessed after re-pressurisations.

Slide 12. Safety.

SwissMetro-NG is Safe

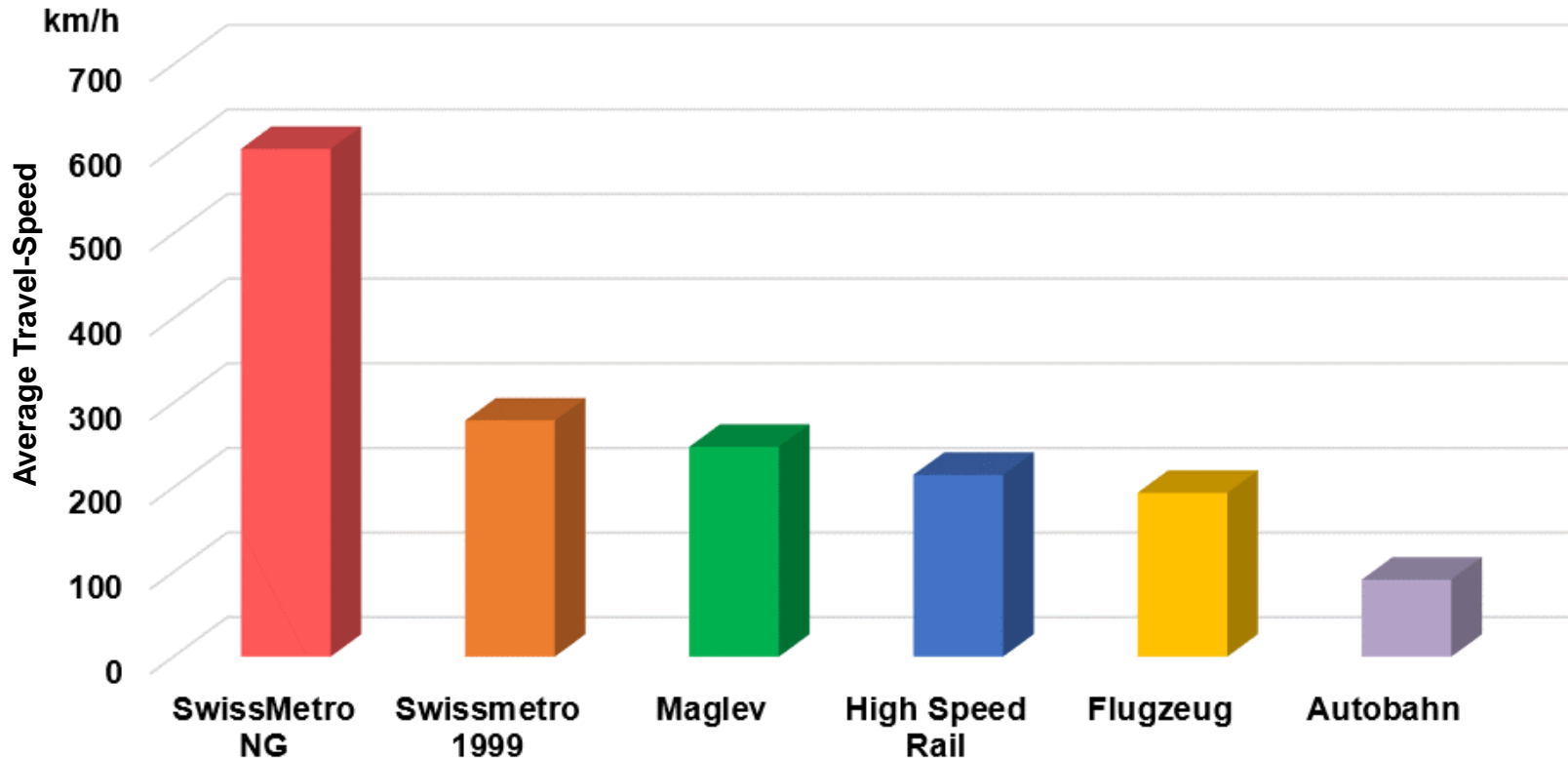
**It is isolated from external factors (weather, bird strike, etc.).
Dangers are minimised (no fuel on board, no wheels, no wings, etc.).
The safety concept includes counter-measures for all possible scenarios
(earthquakes, loss of cabin pressure, rupture of a pipe, etc.).**

Prevention is better than Cure

Slide 13. Performance.

SwissMetro-NG is Ultra-fast

3 X faster than Aviation and High-Speed Rail



*The average travel speed between city centres (total travel time) is the deciding factor for travellers and operators (eg. SBB, SNCF).
SwissMetro-NG is many times faster than all competitors (here on a relation of 500 km).*

Slide 14. Capacity

SwissMetro-NG has a very high Capacity

Vehicle Compositions with over 1'200 Seats are possible.

They can be adopted to match Demand.

The capacity of the Network is higher than the Railway.

It is more than enough for Switzerland

Slide 15. Comfort

SwissMetro-NG is Comfortable

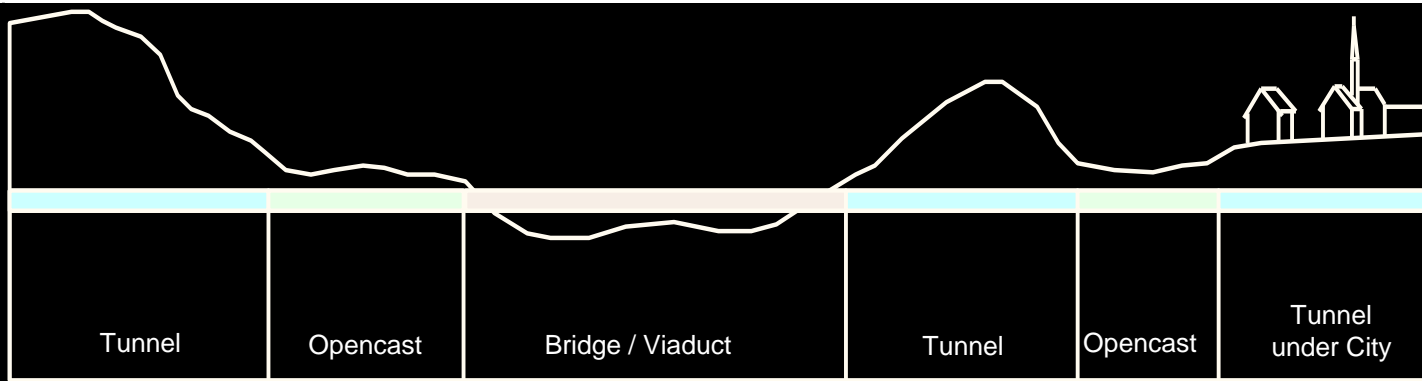
All passengers are seated.

The System is designed for public transportation and caters for the elderly. It is not a roller coaster !

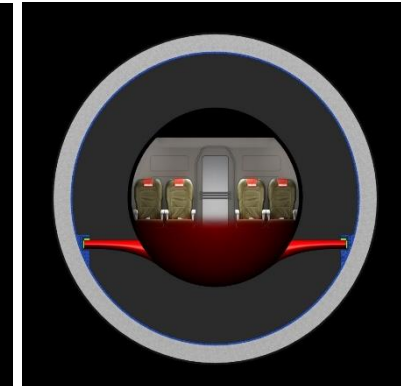
The ride is smooth and pleasant

Slide 16. Protecting our picturesque Landscapes, historic Cities and Alpine Ecosystems.

Tracks fit smoothly into all Landscapes



Longitudinal Section of Track



Cross Section with Vehicle

It can go Underground with thin and inexpensive Tunnels (slide 18).

Slide 17. Protecting our picturesque Landscapes, historic Cities and Alpine Ecosystems.

High-speed rail and Maglev (viaducts)



***SwissMetro-NG is less objectionable
no Expropriations, no Noise, no impact on the Landscape, etc.***

The realization of SwissMetro-NG (in tunnels) is simpler and less expensive than with High-speed rail and Maglevs.

Slide 18. Costs of Projects

Affordable Costs

Costs are reduced in comparison to 1999.

They are now generally lower than High-Speed Rail and Maglevs.

The costs of elevated tracks are in a similar Magnitude, but

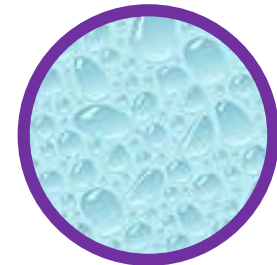
SwissMetro-NG tunnels are thin and inexpensive.

(d = 4-5 m / A << 20 m²)



High-Speed Rail and Maglev tunnels are about 6 x in cross section and very expensive.

(d = 12-13 m / A ≈ 120 m²)



Slide 19. SwissMetro-NG in Comparison to Competitors.

***High-Speed Rail and Maglevs
do not fit into the beautiful Swiss Landscapes and Cities.***

**Paradoxically, they also lack the high speeds needed to compete
as distances increase.**

***SwissMetro-NG does not impact our Landscapes and Cities.
It is also many times faster and costs less.***

*Presently it takes over 3 hours to traverse Switzerland, independent of the mode of travel and despite the small size of the country.
The Swiss people and economy continue to suffer because of the limited capacity of the Highways and Railways (delays / traffic jams).*

Slide 20. SwissMetro-NG in Comparison to Competitors.

Aviation

Unsuitable for City to City Relations in Switzerland.

**Airports are outside the City (trips with taxi, bus, train, etc.)
Needs transfers between systems (hated by passengers).
Environmentally not friendly (CO₂, noise, pollution, etc.).**

***It has no alternative for the combustion engine and oil.
Competitive only on long relations (intercontinental).***

Slide 21. SwissMetro-NG in Comparison to Competitors

Hyperloop & Co.

***Re-popularised the idea of the Vacuum-Train in 2013
but failed to develop the critical Solutions and Components.***

**No Switch, unable to build networks.
No Airlocks to get passengers on board (vacuum gap!).
Inadequate capacity.**

***SwissMetro-NG is technologically one lap ahead.
We have the key solutions.***

*The fanfare and publicity around Hyperloop only covers up its shortcomings.
The “Hyperloop Pods”, for example, can only take 28 passengers. SwissMetro-NG compositions have over 1'200 seats.
The Swiss have a more modest, discreet and realistic approach.*

Slide 22. Environment, Climate and Sustainability: Paris Climate Accord (UN-FCCC).

Environmentally Compatible, Climate neutral and fully Sustainable

Electrical System (Clean Energy).

No Pollutants, No CO₂, No noise (vacuum).

No negative impact on the Biosphere (local / global).

No land expropriations (Tunnels).

SwissMetro-NG is the best System for Switzerland

The resistances are eliminated instead of burning fuel to fight them (Slide 3).

The kinetic energy in the motion of the vehicles is recuperated during braking. Energy is not wasted.

Slide 23. Environment, Climate and Sustainability: Paris Climate Accord (UN-FCCC).

Swiss Exports

We can sell it abroad if we build it at home.

Switzerland can make an exceptional contribution to the Paris Agreement on Climate Change by exporting the technology the world over.

SwissMetro-NG and projects abroad can draw Traffic away from Short-Haul Aviation, Intercity Highways and Railways

It can reduce the Carbon Footprint of Transportation in Switzerland and on a Global Scale.

Switzerland is very limited by its size (0.01 % of earth's surface area, 0.1 % of global population, 1.0 % of global GDP), It can, however, make a significant impact through the export of this technology (Concepts, Systems and Components). This will also benefit the Swiss Economy and its numerous small Businesses.

Slide 24. The Time for SwissMetro-NG has arrived.

SwissMetro-NG is on Pole Position

**The Swiss Highway and Railway Networks are already over-crowded.
SwissMetro-NG is the only reasonable Solution.
It is a Swiss product at an affordable price.**

***The economic, political and other conditions are now favourable
and the Swiss Government is getting into gear.
(parliamentary decision 17.3262)***

With increasing demand on our intercity travel relations, as well as the great economic, social, environmental and other benefits which it can provide, the construction and operation of SwissMetro-NG is not only necessary. It is also urgent.