SwissMetro-NG

New Generation
Swiss Intercity Transportation

12th October 2021

SwissMetro-NG is a Maglev analogue the Transrapid (Magnetically Levitated Train) running in a Vacuum Tunnel. The aim is a modern, CO_2-Neutral, Ultra-Fast Transportation Network based on the VacTrain® of the Swiss Transportation Research Institute and on Swissmetro by the Swiss Federal Institutes of Technology.

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 (CO_2, Efficiency, Energy, Sustainability, etc.)

The feasibility was confirmed by the Swiss Federal Institutes of Technology (EPFL und ETHZ) in an assignment of Swissmetro Ltd. under the leadership of senator Dr. Sergio Salvioni (TI)

A pilot project between Geneva and Lausanne was planned.
The Swiss Federal Government, was however absorbed with national infrastructure projects (Rail 2000, Gotthard-Alptransit, etc.).
The Federal Office of Transportation also had some reservations (switch and capacity, etc.).

Slide 3. Introduction: The Philosophy behind the VacTrain®.

We live in a Time and Age of Sustainability

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

Ultra-Fast (Supersonic) Speeds become possible, sustainable and economically feasible. We offer a better Service instead of CO_2-Taxes.

SwissMetro-NG is ultra-fast, but friendly to the Climate and Environment.
Our great Infrastructure projects (Rail 2000, Gotthard-Alptransit, etc.) are nearing completion.
Conditions favour SwissMetro-NG and projects in Infrastructure and Sustainability (interest rates, Covid recovery, CO_2, 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 decisions 17.3262 and 18.087)

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

The demanding Swiss requirements relating to CO_2-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.

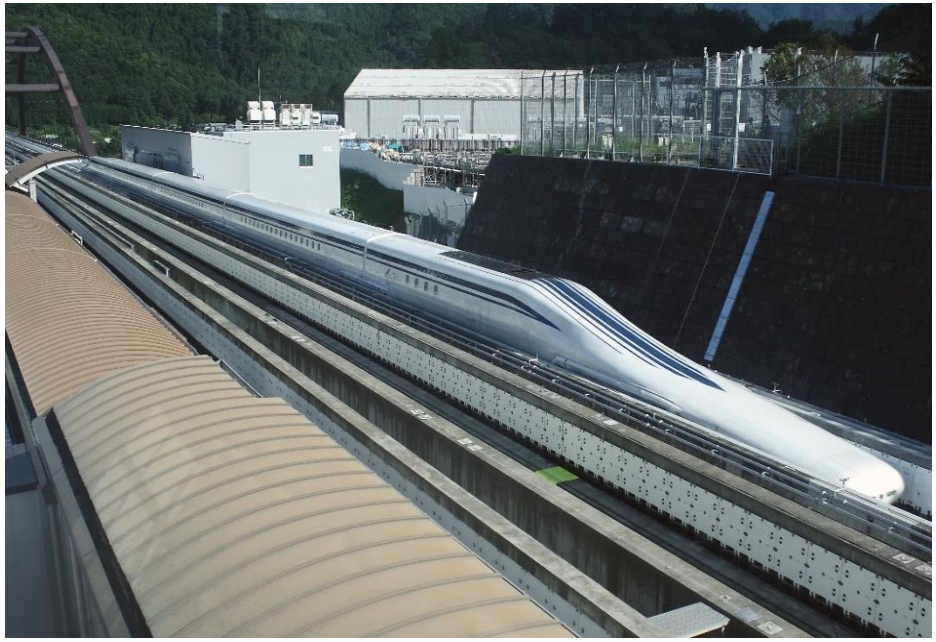
Slide 5. Quantum Leaps in Transportation: Speed is the key to Success.

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 in Transportation: Maglevs reach the next limit.



Transrapid of Germany ***SC-Maglev of Japan***

Rolling Resistance is eliminated with magnetic levitation (Maglev) but

Air resistance prevents faster speeds

The SC-Maglev of Japan has established a new World Speed Record with 603 km/h.
However, Maglevs will remain inefficient (physics of air resistance). Operational speeds of 500 km/h can become possible.

Slide 7. ***Quantum Leaps in Transportation: SwissMetro-NG eliminates all resistances. The physics permits Ultra-Fast Speeds (Supersonic) and Sustainability at the same time.***

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 is based on new concepts and patents of the Swiss Transportation Research Institute and the ETHZ and EPFL.
It has no speed limits and will outperform all competitors.

Slide 8. *New Key Components for SwissMetro-NG*

Universal Vacuum Train Switch

This is analogue the switch of the railway
It allows a drive-through operation with ultra-fast speeds (no stop)
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)

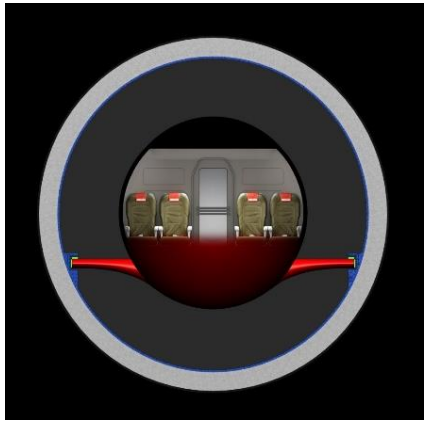
The universal Vacuum Train Switch replaces the complicated "revolver-barrels" of Swissmetro 1999.
This only allowed a "stop and go" operation and limited the length and capacity of individual compositions and of the whole Network.

Slide 9. *New Key Components for SwissMetro-NG*

VacTrain Airlocks

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

Vacuum-compatible Boarding System



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. VacTrain Airlocks are quick and safe.

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

The Pipes and Tunnels can retain the vacuum indefinitely.

Slide 11. New Key Components for SwissMetro-NG

Pneumatic Cross Section Seals

**Closes off 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.
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. Attributes: 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.).

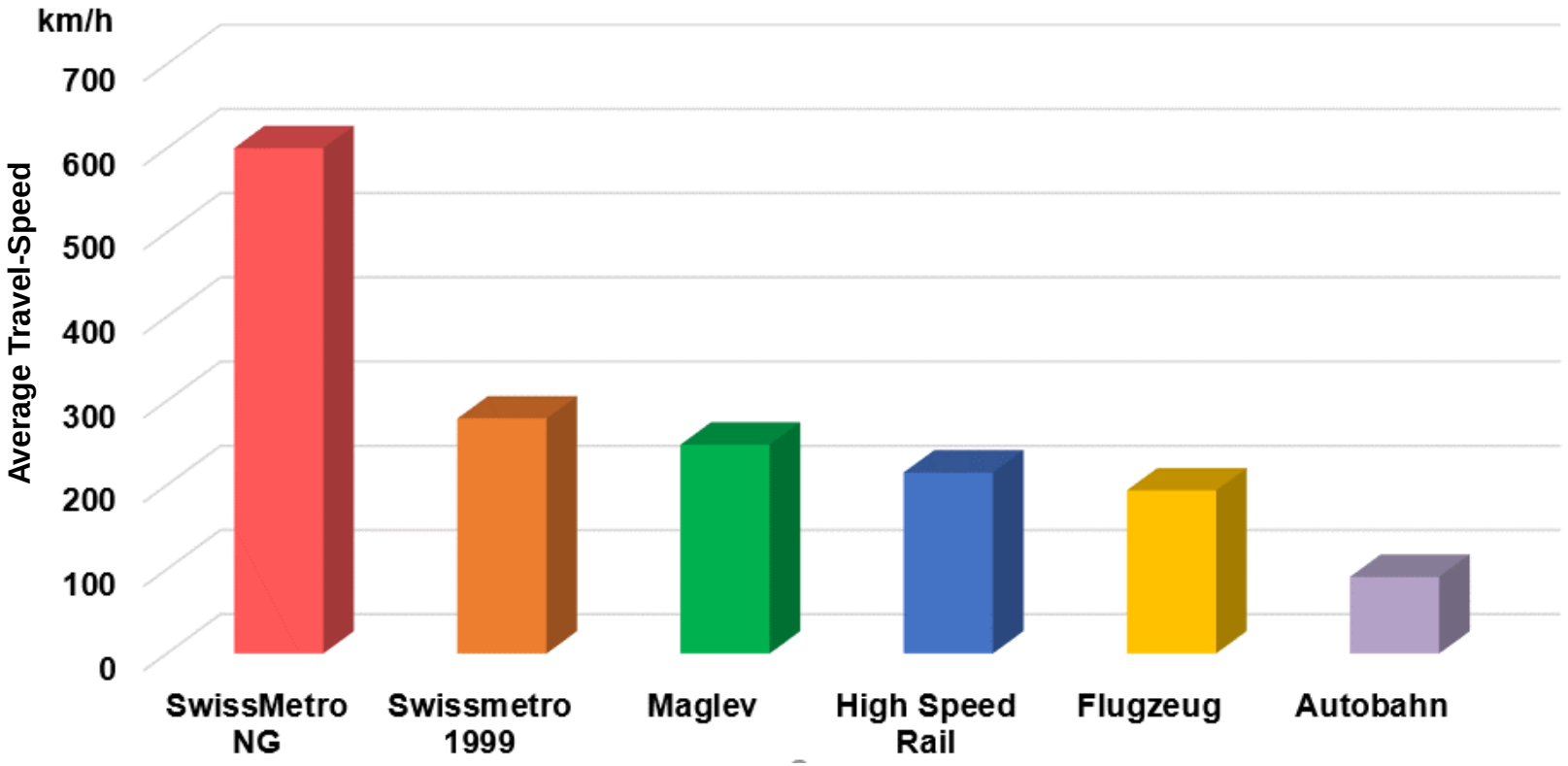
Prevention is better than Cure

Emergency stations and other systems contribute to the highest possible safety.
SwissMetro-NG has adopted the safety concept of the Shinkansen (safest transportation system in the world).

Slide 13. Attributes: 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. (eg. Zurich - Paris).

Slide 14. Attributes: Capacity

SwissMetro-NG has a very high Capacity

Vehicle Compositions with over 1’200 Seats are possible.
The Network capacity is comparable to the Railway.
Both can be adapted to match Demand.

It is more than enough for Switzerland

The capacity is over 6 x that of SwissMetro 1999 and 40 x that of Hyperloop.
The reservations of the BAV-EVED about capacity are no longer valid.

Slide 15. Attributes: Comfort

SwissMetro-NG is Comfortable

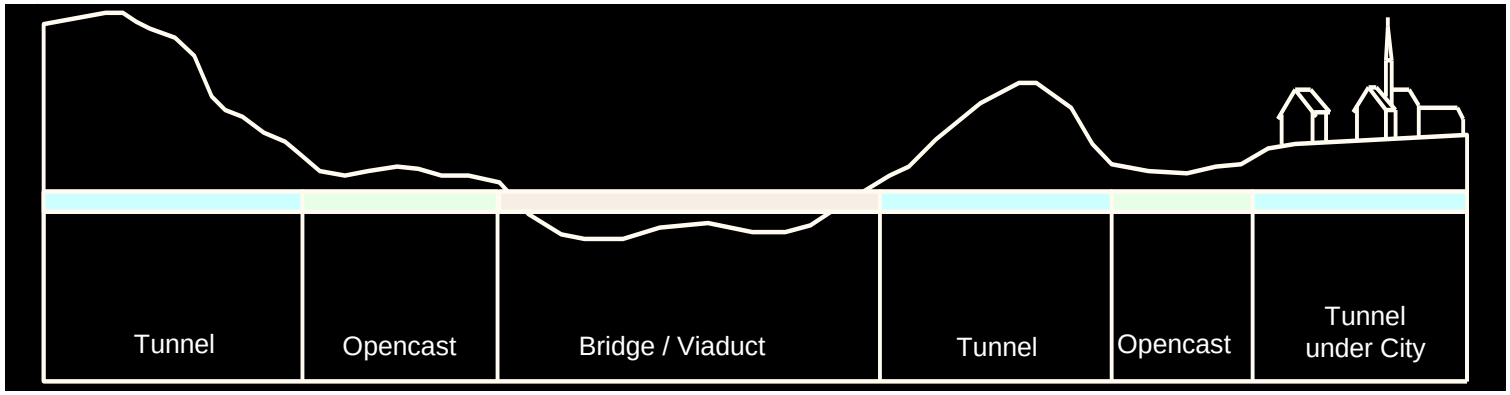
All passengers are seated.
The System is designed for public transportation and caters for the elderly. It is not a roller coaster !

The ride is smooth and pleasant

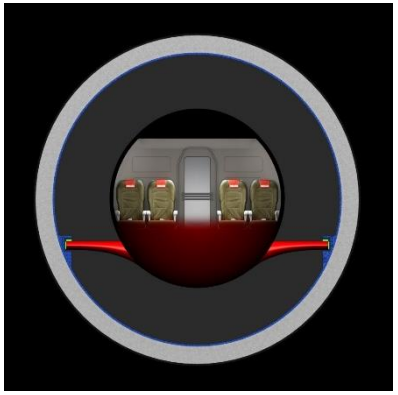
SwissMetro-NG offers the best possible comfort (wide and step-free entrances and corridors, comfortable seats and adequate leg-room, etc.). The ride is smooth and comfortable (acceleration, centripetal forces in curves, etc.).

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 goes Underground with thin and inexpensive Tunnels (slide 18).

The design parameters (curves, gradient, diameter of tunnels, etc.) permit economical tracks in all topographic and urban conditions.

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

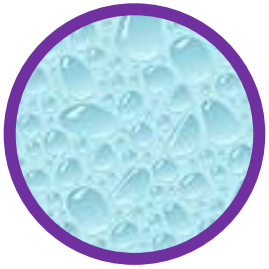
Affordable Costs

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)



SwissMetro-NG tracks also offer significantly faster speeds, higher capacity and lower costs .

Slide 19. SwissMetro-NG in Comparison to Competitors.

High-Speed Rail and Maglevs

do not fit into the 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 Intercity Relations in Switzerland.

Airports are outside the City (trips with taxi, bus, train, etc.)
Needs transfers between systems (hated by passengers).
Environmentally not friendly (CO_2, noise, pollution, etc.).

It has no alternative for the combustion engine and Oil.
Suitable only for intercontinental relations.

Bio Fuels are not sustainable (deforestation, CO_2-Balance, Bio diversity, etc.).
They conflict especially with the World Food Program of the UN (UN-WFP) and with the growing World Population.

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.

The safety concept is analogue that of Highways (inadequate).
Like multilane Highways it will need numerous pipes in the Landscape.
It has no Airlocks to get passengers on board (vacuum gap!).

SwissMetro-NG is technologically two laps ahead.

The "Hyperloop Pods" can only take 28 passengers and analogue Swissmetro 1999 (200 seats), dual pipes cannot satisfy demand.
SwissMetro-NG compositions have over 1'200 seats and dual underground tunnels can already satisfy heavy demand.
Hyperloop has a safety concept analogue road transportation (85'000 Deaths in Europe alone).
SwissMetro-NG has the safety concept of the Shinkansen (highest safety standard in the world).

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 CO_2, No noise (vacuum).
No negative impact on the Biosphere (local / global).
No land expropriations (Tunnels).

SwissMetro-NG is the best System for Switzerland

The tracks are underground. Resistances are eliminated instead of burning fuel to fight them (Slide 2).
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).

Export

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

Our System is sustainable but also competitive

(ultra-fast, affordable, high capacity, CO_2 neutral, etc.)

It is a competitive alternative to projects with Short-Haul Aviation, Intercity Highways and Railways

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

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 the world over.

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 and 18.087)

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.