

HYPERLOOP
TRANSPORTATION TECHNOLOGIES



Transportation Engineering and Safety Conference
Penn State College of Engineering | December 2019

Chuck Michael, P.E.
Head of US Feasibility Studies,
HyperloopTT

HyperloopTT System



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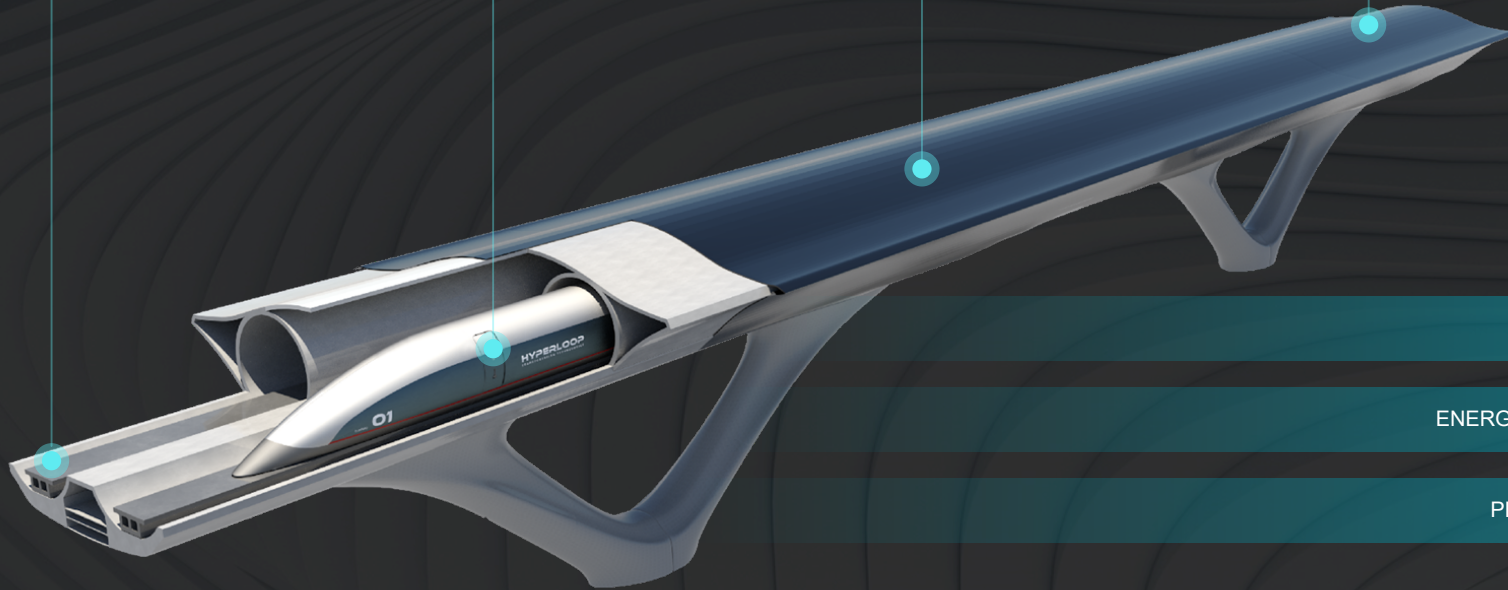
HyperloopTT System


Electromagnetic propulsion enables emission-free transport

Levitated capsule reduces friction, increases efficiency

Fully enclosed environment protects from weather and traffic crossing

Alternative energy and system automation minimizes operational costs



EFFICIENT 

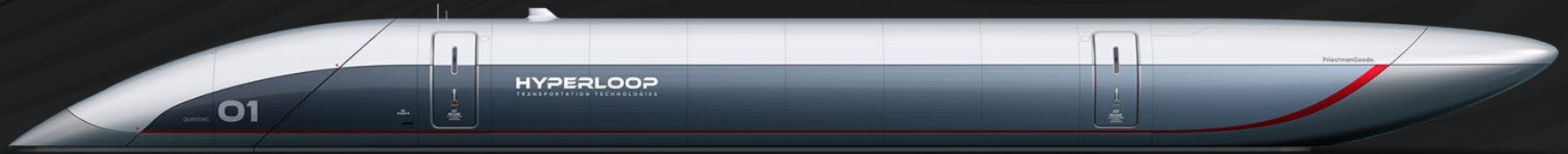
ENERGY POSITIVE 

PROFITABLE 

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HyperloopTT Capsule

← 98 foot length | 20 ton weight
9 foot diameter →



Passive Magnetic Levitation

Electromagnetic Propulsion



760

mph
Levitation at 80 mph



28-50

Passenger
capacity



160,000+

Passengers
daily



4,000+

Cargo shipments
daily



Built with today's technology

HyperloopTT Station



> 15,608 SQ FT

Size



328 - 5,249 FT

Minimum Turn Radius



0.1 - 0.5 G

Acceleration

Integrated Or Newly
Built Stations

Adaptive 40 Second
Departure Rate

Design credit: ANONYMOUS Architects

HyperloopTT System Development Milestones



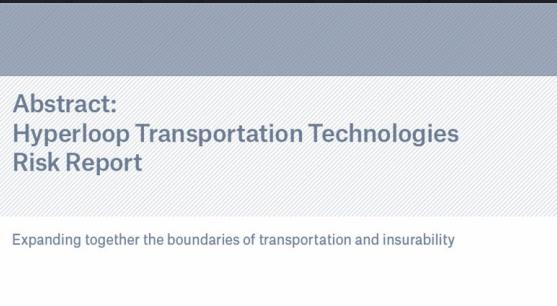
Vibranium™ Capsule



Full-scale Test Track



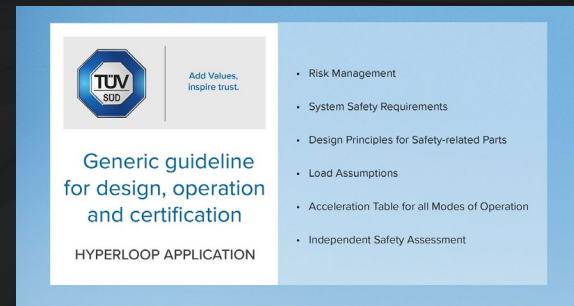
Vacuum by Leybold



Insurance by Munich Re



Inductrack™ by LLNL

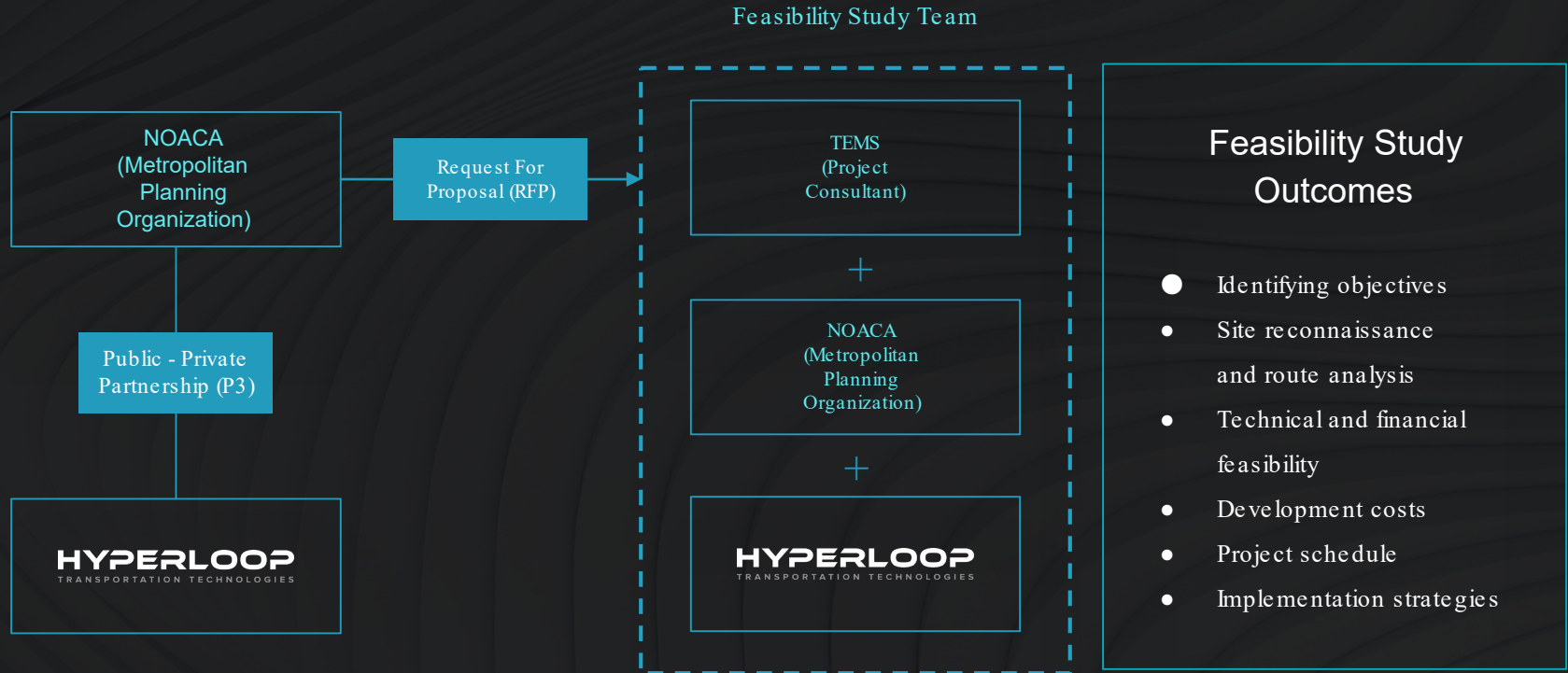


Certification by TÜV SÜD



Great Lakes Hyperloop Feasibility Study

Public-Private Partnership Structure



Great Lakes Hyperloop Consortium

26+

Regional Partners

10+

Regional Stakeholders

45+

Technical Advisory Committee Members

Utilizing local expertise and resources to bring hyperloop to the Great Lakes Megaregion



Regional Stakeholders



Great Lakes Hyperloop Regional Effort

26+ Regional Partners

10+ Regional Stakeholders

45+ Technical Advisory
Committee Members

Utilizing local expertise and resources to bring
hyperloop to the Great Lakes Megaregion

NETT Council



Pittsburgh Technical Advisor Committee



Chicago Technical Advisory Committee



Cleveland Technical Advisory Committee





Secretary Elaine Chao at SXSW

“New technologies increasingly straddle more than one mode of transportation, so I’ve signed an order creating a new internal department council to better coordinate the review of innovation that have multi-modal applications.”

Secretary Elaine Chao

2019 SXSW in Austin, Texas

USDOT NETT Council

Non-Traditional and Emerging Transportation Technology Council



SAFETY
OVERSIGHT



ENVIRONMENTAL
REVIEW

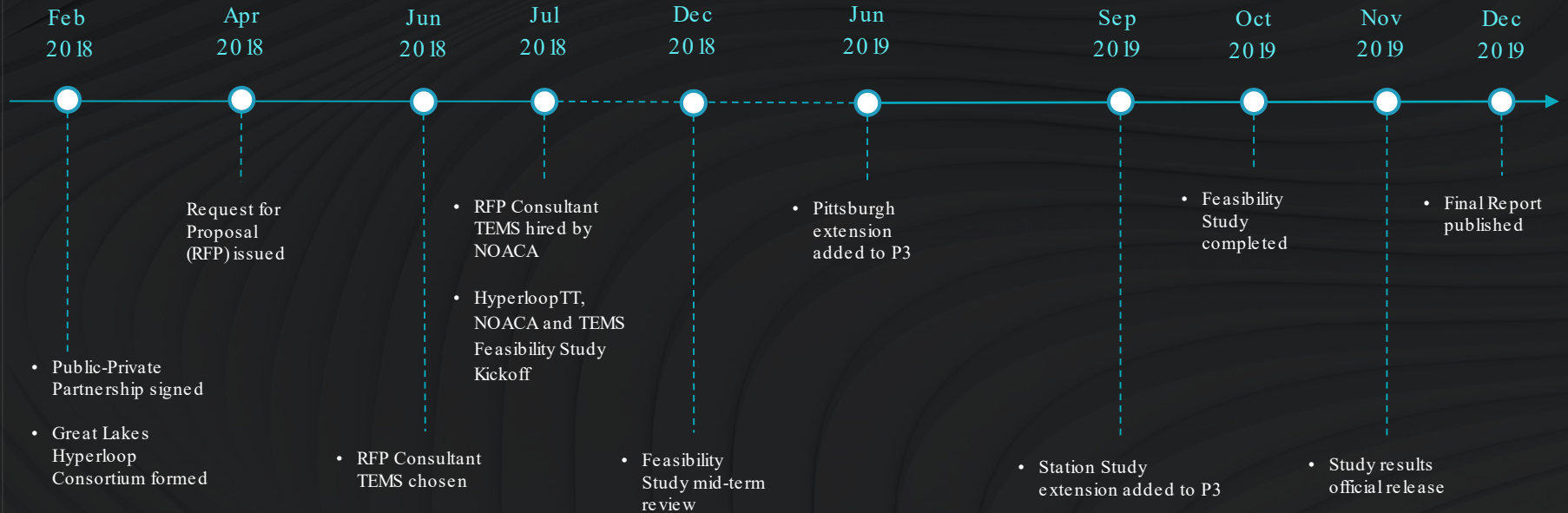


FUNDING
ISSUES

- [FAA](#) | Federal Aviation Administration
- [FHWA](#) | Federal Highway Administration
- [FRA](#) | Federal Railroad Administration
- [FTA](#) | Federal Transit Administration
- [FMCSA](#) | Federal Motor Carrier Safety Administration
- [MARAD](#) | Maritime Administration
- [NHTSA](#) | National Highway Traffic Safety Administration
- [PHMSA](#) | Pipeline and Hazardous Materials Safety Administration

Great Lakes Hyperloop | Phase 1

Feasibility Study Time line

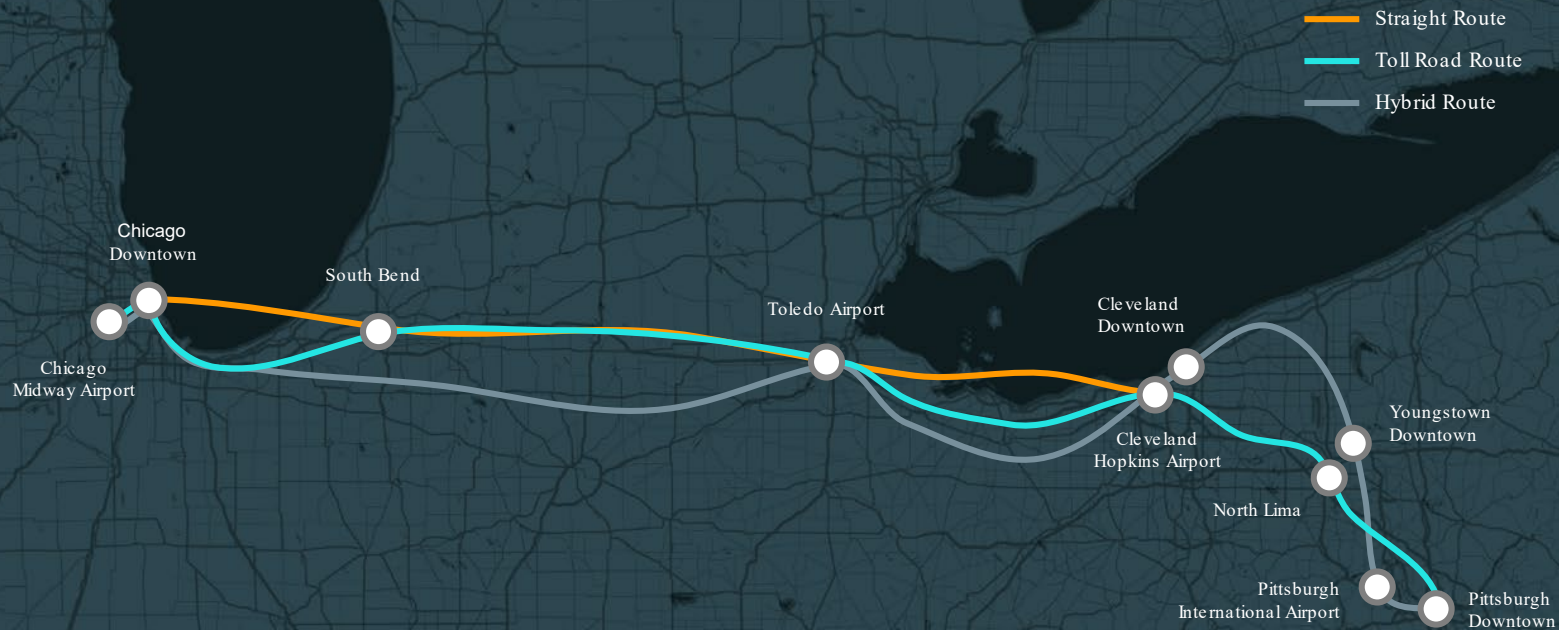


Great Lakes Hyperloop | Phase 1 Feasibility Study Task Summary

- ✓ Route Study Between Chicago and Pittsburgh | Complete
- ✓ Ridership and Revenue | Complete for both Passenger and Freight
- ✓ Independent Capital Cost Estimate | Complete
- ✓ Operating Cost Estimate | Complete
- ✓ Revenue Projections and Forecasts | Complete
- ✓ Cost-Benefit Analysis | Complete
- ✓ Supply-Side Economic Analysis | Complete
- ✓ Transportation Oriented Development (TOD) Estimate | Complete

Great Lakes Hyperloop | Phase 1 Route Map

Chicago - Cleveland - Pittsburgh Feasibility Study



Source: TEMS

Chicago - Cleveland - Pittsburgh Corridor

Capital Costs Assumptions

Cost Components

- Infrastructure
- Systems
- Vehicles + Station
- Right of Way / Easement

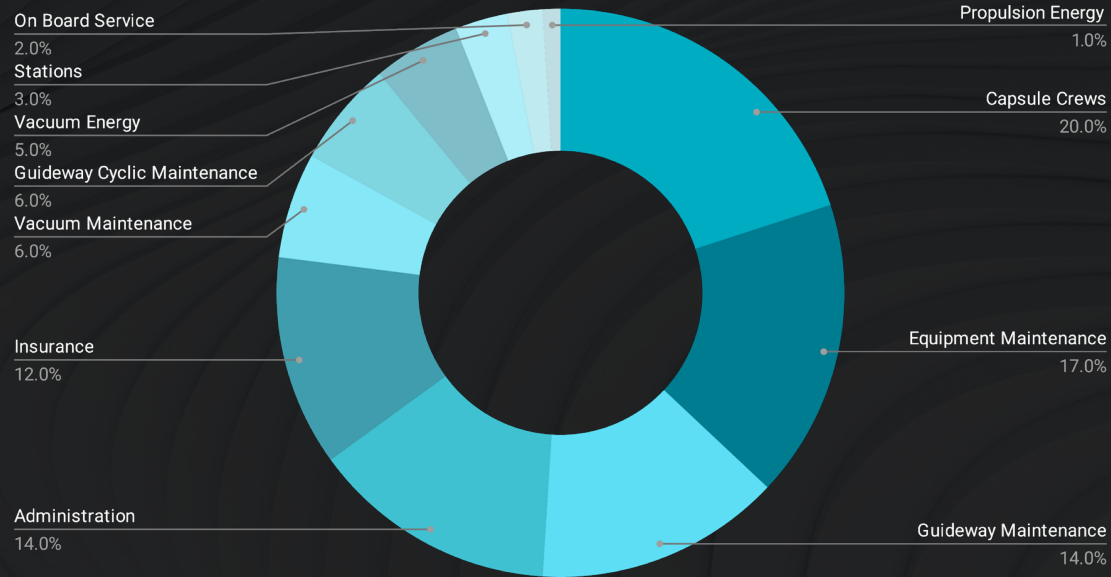
Assumptions

- 30% “Contingency” on *Everything*
- Plus 28% “Soft Cost” on Infrastructure + Stations
- All Unit Costs are expressed as “Fully Loaded” costs for simplicity
- Inclusive of Easement and Right of Way costs

Source: TEMS

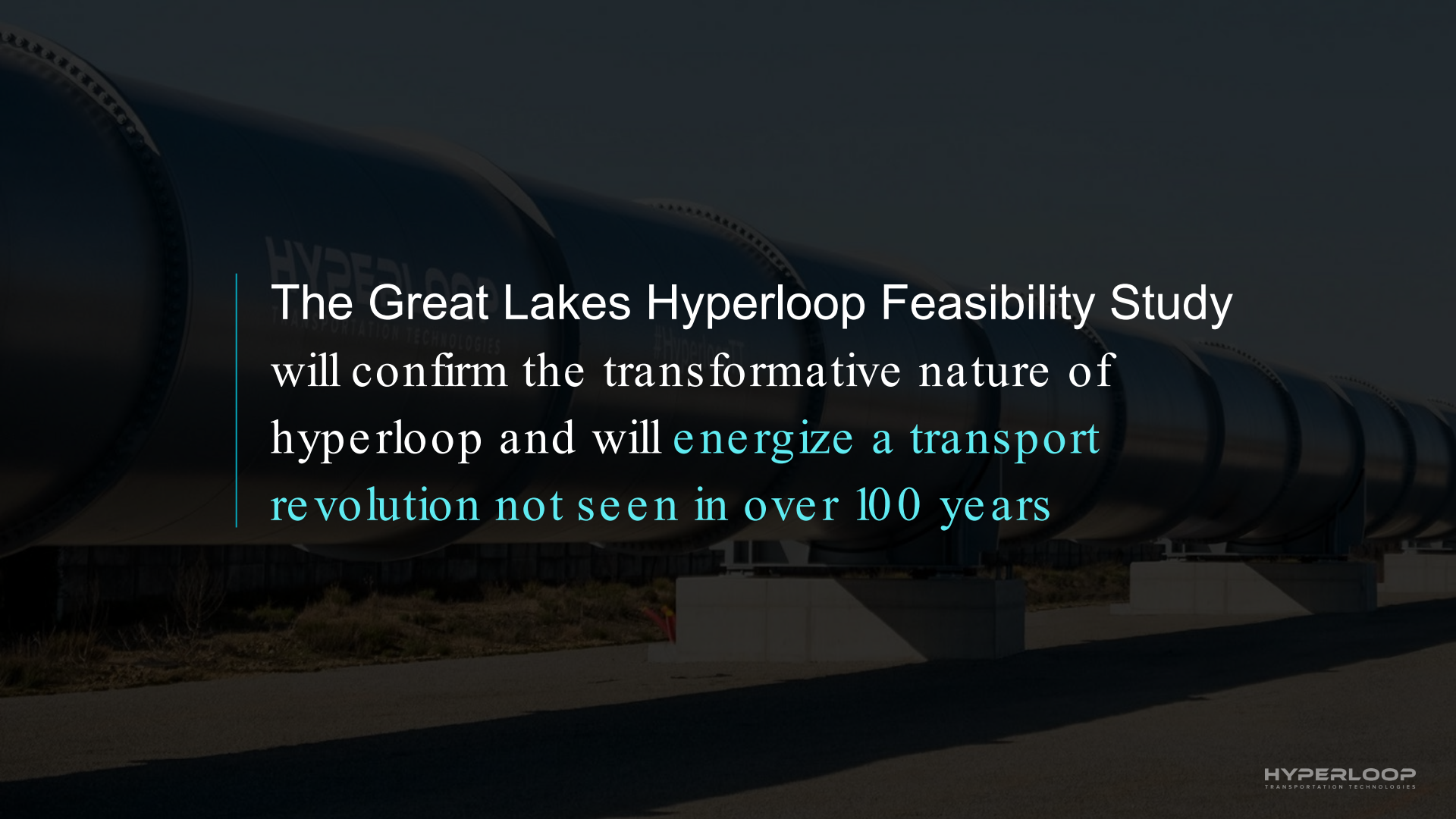
Capital cost estimates were independently validated by third parties.

Chicago - Cleveland - Pittsburgh Corridor Hyperloop Passenger | Operating Cost



*No overnight trips. Assumes one crew per capsule until passengers are familiar with system.
Also includes additional station crew until passengers are familiar with stations.*

Source: TEMS



The Great Lakes Hyperloop Feasibility Study
will confirm the transformative nature of
hyperloop and will energize a transport
revolution not seen in over 100 years

“

This project far exceeds Federal funding standards for benefit-cost analysis and enables a return on investment for Private Public Partnership development, which is unheard of in transportation.

*Grace Gallucci, Executive Director
Northeast Ohio Areawide Coordinating Agency*

”

“

Clearly the project shows very good merit and is in fact the first intercity passenger ground transportation system to show a positive rate of return that TEMS has assessed in the last 30 years.

*Alexander E. Metcalf, PhD, President
Transportation Economics & Management Systems, Inc.*

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An aerial rendering of a Hyperloop station and surrounding cityscape. The station is a large, white, curved structure with a central circular opening, situated on a raised platform. It is connected to a network of tracks that curve through a modern city with various buildings, green spaces, and palm trees. The background shows a vast urban area extending to the horizon under a hazy sky.

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