FASTRANSIT

DOCKET	
08-ALT-1	
DATE	FEB 27 2009
RECD.	FEB 27 2009

California Energy Commission
Dockets Office, MS-4
Re: Docket # 08-ALT-1
1516 Ninth Street
Sacramento, CA 95814-5512
February 27, 2009

Re: Advisory Committee Meeting

Dear Sirs and Madams:

I would like to introduce you to the next-generation transportation technology. The Fastransit system, utilizing linear motors and permanent no-power levitation, will provide the most energy-efficient, low-emission solution for multiple transportation needs, including:

- Long-Distance Freight
- Port Offloading and Drayage
- Long-Distance Passenger Transportation
- Urban and Commuter Passenger Transportation

The Fastransit system will incorporate permanent magnets, linear motors, instantaneous on-board switching and a unique "virtual zero power" lateral stabilization system enabling interoperability with existing rail and highway rights of way. Its permanent levitation system will result in minimal power consumption; for example, a 68,000 pound freight container at 50 mph would consume approximately 0.4 kWh of power (for about four cents) per mile.

For long-distance freight, Fastransit would enable shippers to replace long-distance trucking with faster, more reliable just-in-time deliveries to pickup locations with multiple off-line yard load/unload points close to customers, at a cost comparable to long-distance trucking.

Port operators will be able to move goods more efficiently as a result of Fastransit's shorter headways, enabling them to increase throughput and reduce the size of their railyards.

Long-distance passengers, whether riding in Fastransit vehicles or in their cars aboard a flatbed, will benefit from dynamic routing configurations as travel will shift from trains to individual vehicles using existing rail and highway rights of way.

21st Century Transportation®
1 Rockefeller Plaza, Suite 1005, New York, NY 10020
Tel. (212) 554-3125 Fax (212) 554-3121
www.fastransitinc.com

Urban and commuter travelers will enjoy quicker trips as a result of shorter headways and the ability to eliminate unnecessary station stops, while those living along rights of way will benefit from Fastransit's quiet emission-free movement.

Fastransit has been working with Applied Levitation, an affiliate of LaunchPoint Technologies in Goleta, to develop the system. A full-scale laboratory vehicle and short track have been built and a small-scale vehicle with dual pivoting bogies and an on-board switch has been successfully tested.

I believe that the Fastransit system has the potential to provide the most effective solution to the issues that your program seeks to address, because of its compatibility with electric cars and trucks and its ability to serve as the foundation for significantly improved mass transit.

I have enclosed a copy of our presentation for your review. I also invite you to visit our website at www.fastransitinc.com for more information.

Sincerely,

Andrew W. Hayes
Chief Executive Officer
ahayes@fastransitinc.com

A New Transportation Paradigm

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California Energy Commission Presentation: Overview

- The problem
- Our solution
- Background
- Development status
- Unique advantages
- Potential projects
- Financial feasibility
- Long-term vision
- Next steps

Small-scale Fastransit prototype

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How Best to Build Sustainable, Efficient New Transportation Capacity?

- Reduce carbon, diesel
- Increase capacity
- New rights of way are *very* expensive
- Ideal: a solution for multiple needs, not just port freight, on existing ROWs

The Alameda Corridor

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Solution: Permanent Maglev Retrofit for Existing Rails, Roads

- A solution for freight, passenger, local, long-distance
- Permanent levitation with *no power, no wheels*
- Inter-operable with conventional rail tracks
- Key: *instant, electronic switching*

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Maglev Design Engineers: LaunchPoint Technologies

- Established tech incubator focusing on electromagnetic systems
  - Founded by UCSB Professor
  - 12 year track record
- Permanent-levitation heart pump
  - Centrifugal VAD (ventricular assist device) for children up to 24 months
  - Magnetically-levitated impeller never touches the side of the chamber – increases pump life span and blood flow, reduces blood damage
  - University consortium, NIH funded

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Background: LaunchPoint Technologies (2)

- Maglev Power Ring
  - Magnetically-levitated flywheel for energy and power storage
  - Third generation design using new class of magnetic bearing may enable storage capacities exceeding 5 mWh/unit
  - Closed on second funding round
- Other research projects funded by DOE, NSF, US Navy, and NYSERDA

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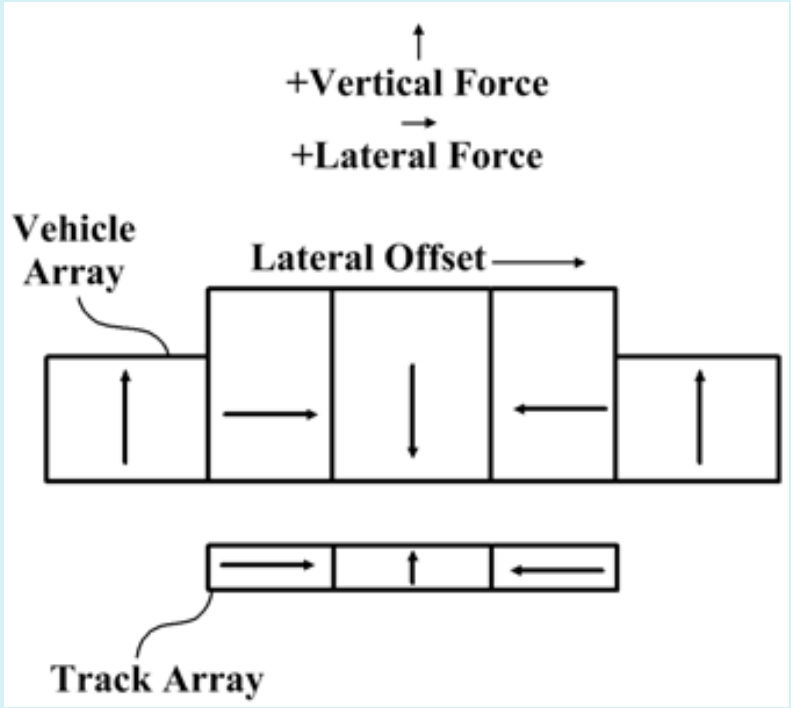
Stabilized Permanent Magnets: Permanent Levitation with No Power

- Permanent magnets use neodymium-iron-boron alloy ("NIB")
- "Halbach Array" increases magnetic field between arrays
- Levitation gap of 3-8 cm at all speeds



Early maglev plans proposed using permanent magnets, but until NIB magnets and Halbach arrays were developed the magnets did not provide enough levitation

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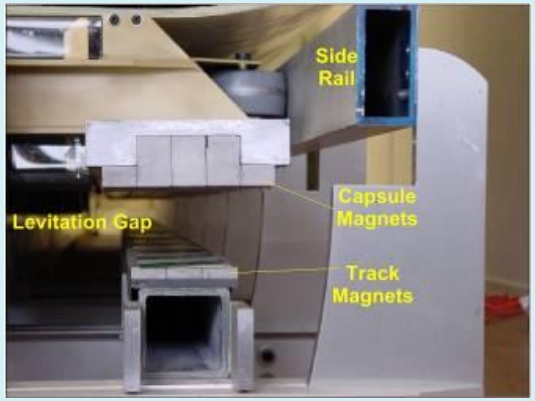
Initial VC Funding Created Successful Large Levitation Prototype

- Full-scale vehicle has been levitating over a track in Santa Barbara for six years – again, using *no power*
- Validates levitation design
- Magnet cost: $1M/mi for PRT people-mover; $3M/mi for full freight container



Capsule is 4 feet high

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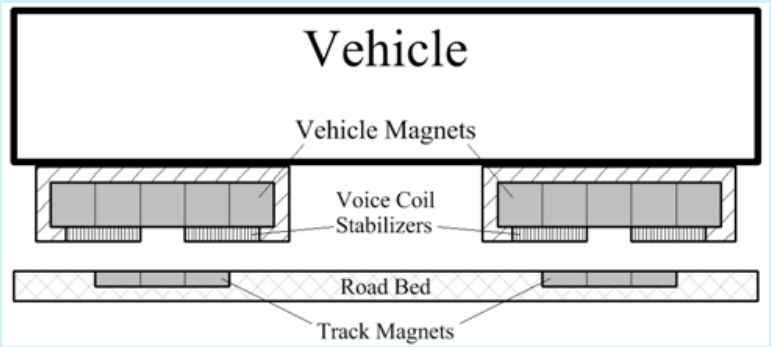
Low-Power Electronic Stabilization and Switching

- Vehicle-mounted stabilizers
  - Centers vehicle over rails
  - Constant feedback control
  - "Virtual zero power" system



- Instant switching
  - Vehicle follows either right or left set of rails at the switch – *nothing opens or closes in the roadbed or rails*
- Low-power, individually-routed vehicles
  - *E.g.*: moving 68,000 lb. freight container at 50 mph uses about 0.4 kWh of power/mile, or about 4 cents/mi.

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Successful Small-Scale Prototype Validates Switch, Stabilization Design

- Vehicle switches between inner or outer loop
- Pivoting bogies on vehicle allow sharp turns – 40’ vehicle can turn on city street corners

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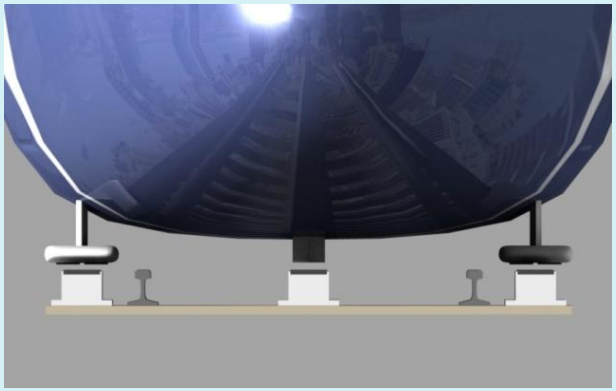
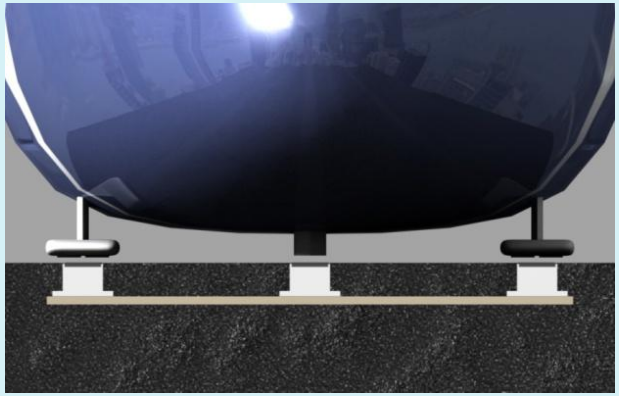
Guideway: Interoperable with Conventional Rails or Highways

- Overlays existing rail infrastructure
- 2-meter gauge spans standard rail gauge
- Can also be embedded in pavement surface
- Linear motor in center – no 3rd rail, no catenary
- Can easily fit inside existing rail tunnels





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Large Contact Patch and Levitation Gap Reduce Guideway, Vehicle Costs

- Permanent levitation = true “railbed” design
- Huge contact patch = lighter guideway = lower construction cost
- Large levitation gap = simpler suspension

60-ton house moving across a frozen lake, on many wheels

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Development Status: How Close to Realization Is It?

- Simpler design = much easier full-scale demo
- Levitation is a simple function of the volume of magnets in rail, vehicle
- Cost of magnets is known (supplier quotes)
- Linear motor propulsion is an established technology with multiple suppliers

Vehicle magnets can vary based on different types of payloads

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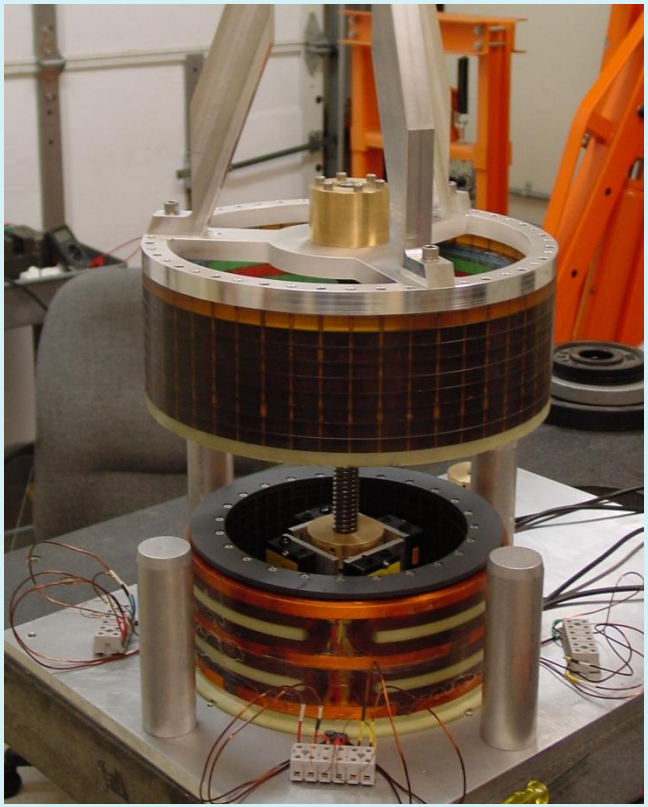
How Close to Realization (2): Lateral Stabilization and Switching

- Stabilizer is already used in heart pump and power ring
  - Balancing a tiny rotor in a viscous fluid is much harder than balancing a heavy railcar
  - Power usage: est. 100 w/ton
- Switch builds on stabilizer system; proven in demo
- Engineering, not invention, to scale up to full size



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How Close to Realization (3): Linear Motor Technology Is Commercially Available Now

- Linear synchronous motor (LSM) system and instant switching enable very short headways
- LSM and power systems are the main cost components, but require no invention --
- *An LSM system that moves double-bogie vehicles through switches at very short headways is already commercially available*
- LaunchPoint also has a demo of a hybrid LSM/LIM motor for long distance networks

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Permanent Magnet Design Avoids Limitations of Other Maglev Systems

- *"Wrap-around" guideway designs*:
  - Mechanical switches limit capacity
  - Guideways cannot inter-operate with conventional rails
- *EMS (electromagnetic suspension) systems:*
  - Tiny levitation gap limits flexibility, increases costs
- *EDS (electrodynamic suspension) systems*:
  - Vehicles use wheels at low speed => higher vehicle and guideway costs, complicates switching
- *Supercooled EDS:* requires large carriages

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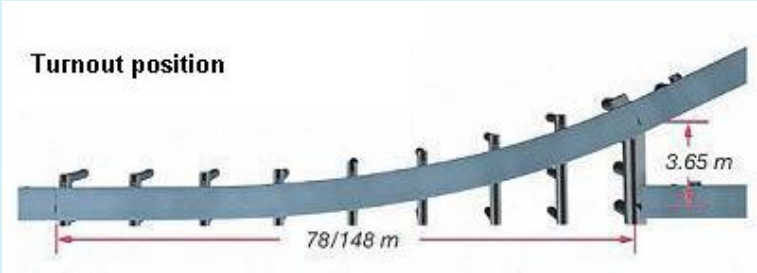
Other Maglev Systems Offer Limited, Train-Like Solutions

- Technology-driven, not market-driven
- “Building a better train” vs. “Building a better transportation network”
- Fastransit was designed to be *a packet-switching network of individually guided vehicles*

Inductrack levitation system



Transrapid switch

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Unique Combination of Features Defines a New Transportation Paradigm

- The most energy-efficient system
- Simple guideway, large gap = low capital cost
- Packet switching, small cars = highest capacity, most flexible routing
- Variety of payloads, from typical railcars to passenger cars/PRT

Fastransit flatcar with truck trailer

PRT module

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Wide Range of Cost-Effective Potential Applications

- Drayage/on-dock rail
- Agile port/STRACNET
- Mass transit, regional rail, long-distance passenger transit
- PRT/local circulator
- Intermodal/long-distance freight
- New personal vehicle transportation service

Sample “group rapid transit” sized vehicles using offline stations for skip-stop, express service

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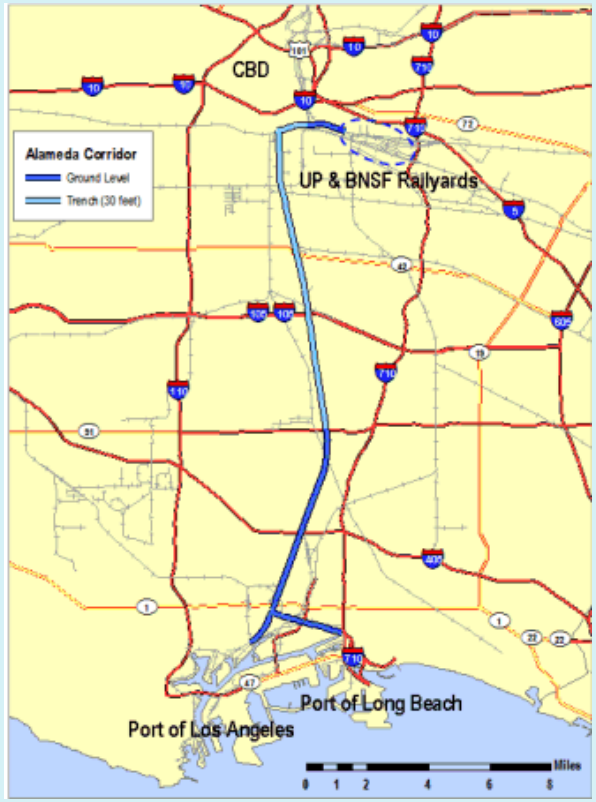
Sample Application: San Pedro Bay On-Dock Rail/Conveyor System

- Proposed electric conveyor for freight drayage to ICTF
  - Potential extension inland
  - On-dock rail retrofit – ideal for Fastransit
- Goal: Replace 2M diesel truck moves/year
  - Fastransit can easily handle all moves on dual-track guideway
- Proposed start in 2009



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Sample Application: Stryker Brigade Movement

- Located at Port Hueneme/Navy Base Ventura County
- Strategic priority for DOD
- Can start very quickly – port's rails on Navy base
- Validates port drayage application

Military equipment is often driven short distances from a railyard onto Navy ships, wasting time, money, and diesel

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Pro Forma Costs: On-Dock Rail/ Freight Movement System

- Capital Cost: $14M/mi
  - Magnets: $3M/mi
  - Vehicles: $125K each
- Operating Cost (avg. 60 mph): $0.03/mile
- Capacity: 1 second headway per 2-TEU sleds = 7200 TEUs/hr = >60M TEUs/year/track

Can easily retrofit existing on-dock rail

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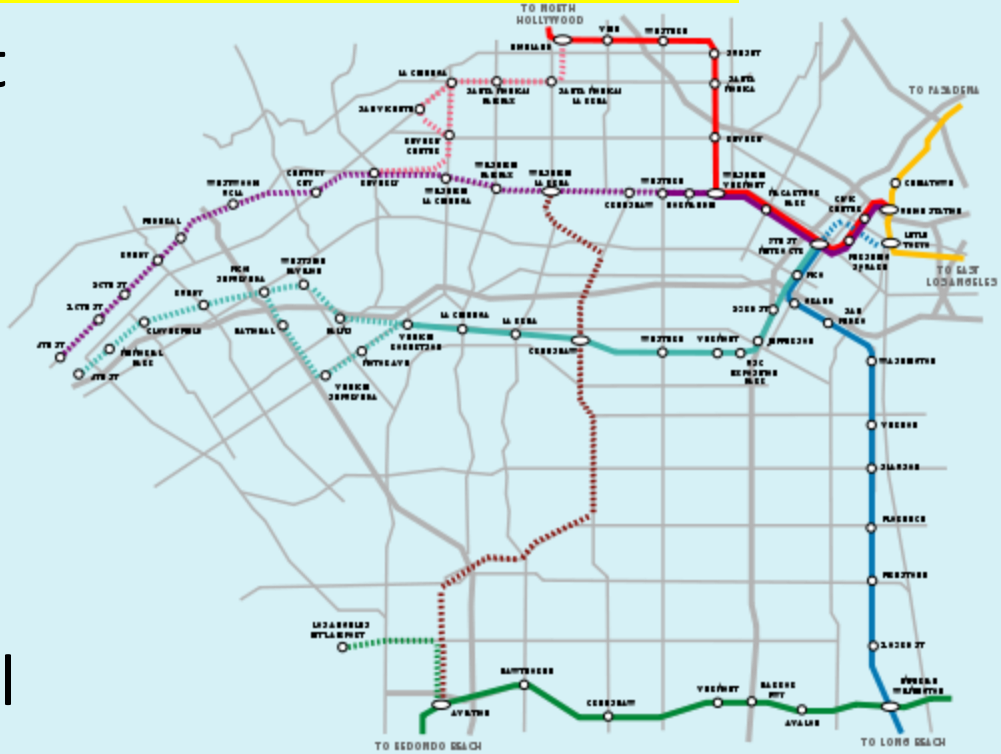
Sample Application: New/Retrofitted Metro Lines

- Incremental retrofit of existing steel-wheel routes
- Light or heavy rail
- Lighter guideway better for elevated grade crossings
- Validates freight rail retrofit design



A retrofit project that other maglev systems cannot do

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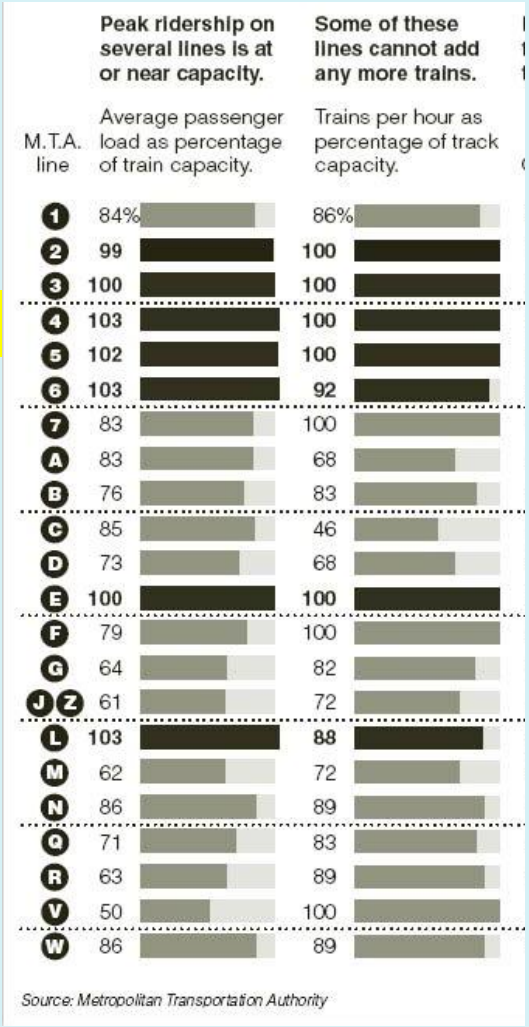
Pro Forma Costs: Mass Transit Retrofit

- Capital Cost: $10-12M/mi
  - Magnets: $3M/mi
  - Lower power costs from using existing distribution
  - Vehicles: $1.5M each (current size)
- Operating Cost: $0.03/veh. mi.
- Capacity: peak >40,000 passengers/hr each direction
- On-demand off-hour service



Many subway lines in New York are at capacity

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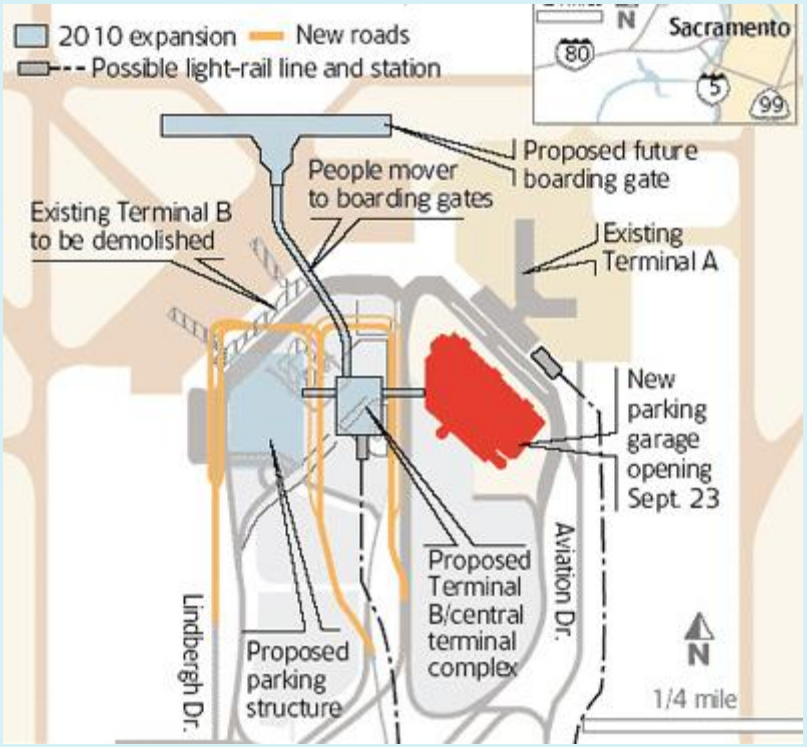
Sample Application: Airport Parking/Circulator Services

- Sacramento, LAX planning new airport parking and people-movers
- We are uniquely suited to offer integrated solution
  - Airport parking is ideal application for SyncPark automated garages
- Many other opportunities
  - Oakland airport connector



Sacramento Airport

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Pro Forma Costs: PRT/Airport/Personal Car System

- Capital Cost: $12-$17M/mi
  - Magnets: $1M/mi
  - Elev. guideways: $5-$10M
- Vehicles: $100k
- Operating Cost: $0.01/mi
- Capacity: 14,400 passengers/track/hour
  - 60 mph, 1 car/sec., 4 passengers/vehicle

PRT magnets cost less because they are sized to carry light passenger pods; they can also run on narrower-gauge tracks

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Pro Forma Costs: Linear-Motor Automated Garages

- Most space-efficient parking system
- Low power: .5 kWh to store and retrieve
- $18,000 per space
  - Less than self-parking garage
- Ideal complement to people-movers

SyncPark garage motor system licensed from MagneMotion, Inc.

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Sample Application: I-710 Highway Congestion Mitigation

- Currently being studied by Gateway Cities COG
- Key: reducing diesel truck emissions
- Dual guideway can move *all* trucks on flatcars
- Alternative => more lanes => *much* more expensive
- Future car-sled capability – the “Electric Highway”

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“Electric Highway” Freight Service: Faster, Cheaper, Greener

- Automated conveyor system for trailers/local or long-distance trucks
- Uses existing trucking equipment, 5th wheel
- “Feathered” tracks allows multiple off-line load/unload points near origin/destination

Aerodynamic fiberglass caps reduce drag

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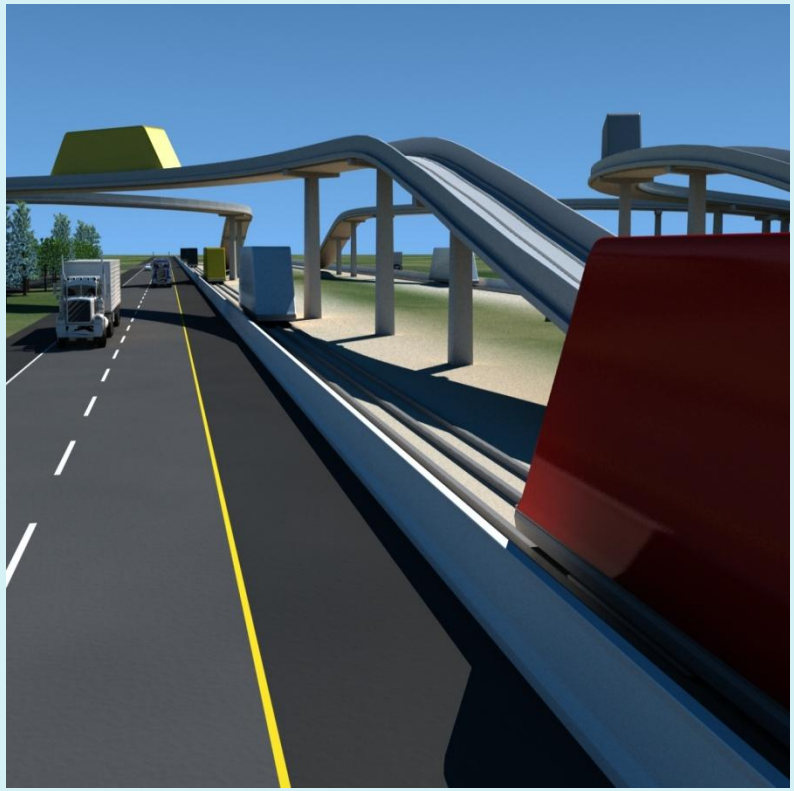
Major Benefits for All Stakeholders Makes Electric Highway Possible

- Replace diesel trucks = less pollution, less highway congestion
- Lower shipping cost = better for trucking cos.
- Just-in-time deliveries = better for customers
- Much lower highway maintenance costs



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Pro Forma Costs: The Electric Highway

- Cap Cost: $14M/mi
- Op Cost (90 mph): $0.06/mile
- Capacity: >90M TEUs/yr./lane
  - Dual-track guideway will usually suffice
  - Plenty of capacity for passenger vehicles

On/off areas can be at rest stations, truck stops, and on-ramps

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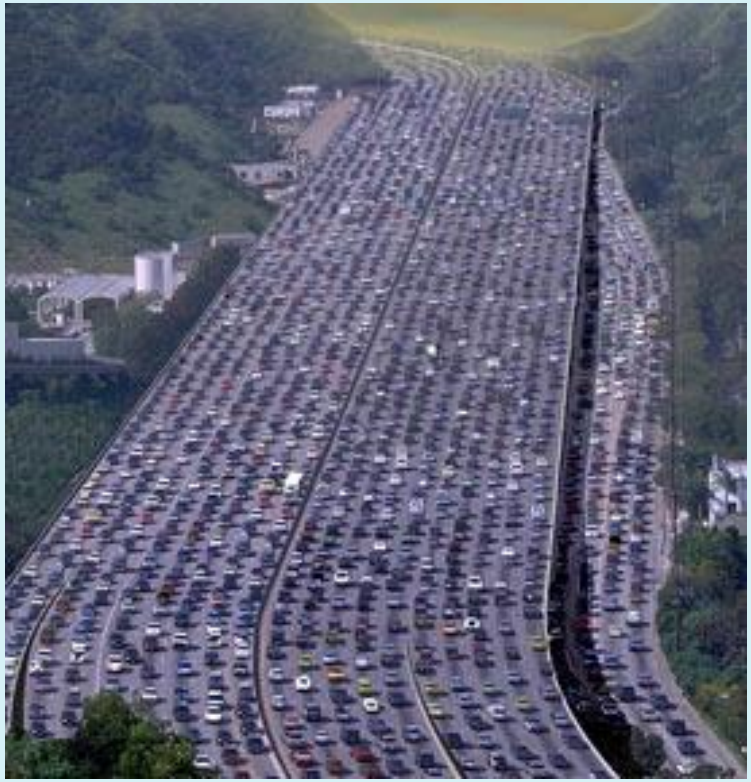
Viable Business Model for Carbon-Free National Transportation Network

- *Carrying individual vehicles is a game-changer*, makes large-scale network feasible
- Price travel at avoided cost of gasoline driving
  - $1.50/mile for trucks
  - $.20/mile for cars
- Solves “battery problem”
  - Power pickup in ROW



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Single System Clearly Preferable to Multiple, Conflicting Modes

- New high-speed passenger rail is incompatible with conventional rail freight and will only slow the growth of car vehicle miles
- New rail freight capacity will only slow the growth of truck miles
- Electric cars will still get stuck in traffic, and need to recharge
- No long-distance electric trucks

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Examples of How The Electric Highway Can Transform Transportation

- *Los Angeles to Napa*: couple drives to nearby freeway onramp, takes car-sled 400 miles to off-ramp 5 minutes from hotel (3 hrs door-to-door/$80 per person round-trip)
- *New York to Orlando*: family of 4 takes high-speed car-train 1100 miles, drives to automated parking garage at resort, no need to rent car (7 hrs door-to-door/$110 pp rt)
- *Central Valley to the East:* Fresh produce shipped from Fresno at noon arrives in Chicago at 2 am next day (12 hrs), New York at 6 am (16 hrs); *at a lower cost per pound than conventional, multi-day trucking*

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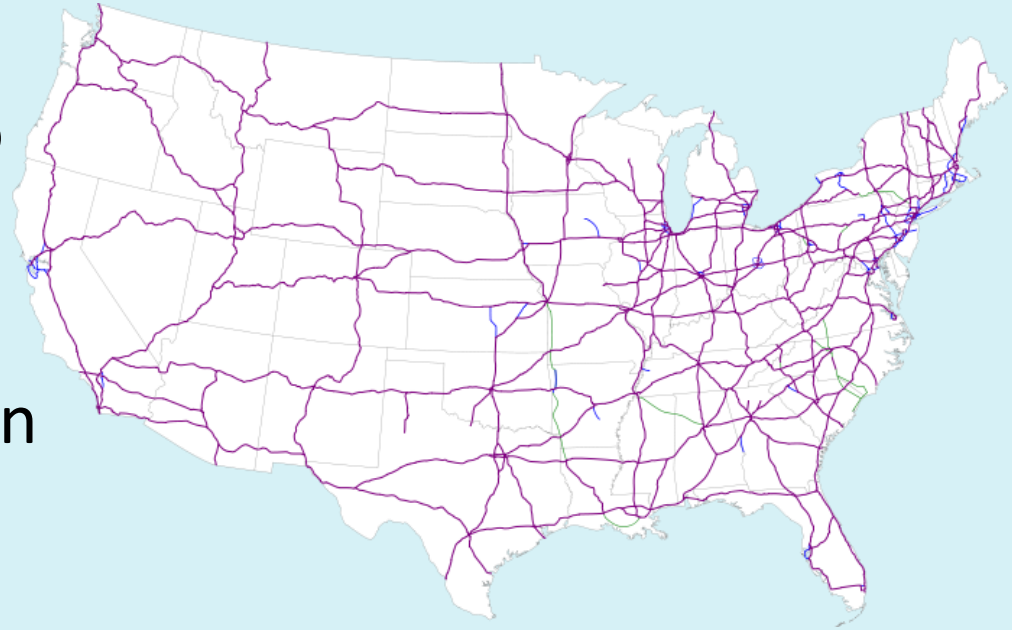
Vision: A Fast, Clean, Community-Friendly Network for Local and Long-Distance Transportation

- Local rail networks link town centers to electric highway
- One-seat ride from suburb to downtown or another suburb
- Freight, car services cross-subsidize new public transit



The best way to significantly reduce car and truck miles is to offer a better alternative to gasoline vehicle driving

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Recap: Maximizing the Value of Transportation Infrastructure

- The most energy-efficient system
- Highest capacity
  - Instant switching
- Safest controls
  - Synchronized motors
- Zero emissions
- Can be built out as incremental retrofit, for lower cost
- On-dock rail, drayage
- New mass transit, regional networks
- New freight service on “Electric Highway”
- Long distance service for passenger cars
- Faster than flying for most trips

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Thank You

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