DOCKET
09-ALT-1
DATE
RECD. JUL 13 2010

State of California Personal Rapid Transit Pilot Demonstration Program

The undersigned urge the State of California to provide funding for a Personal Rapid Transit Pilot Demonstration Project to assess greenhouse gas mitigation effectiveness, the viability of expanded deployments to improve public transit service, and the potential for congestion reduction.

Personal rapid transit is a transformational technology that offers a quantum leap in service and performance. In contrast, hybrids and fuel cell vehicles represent derivative solutions that will result in marginal improvements at best. Personal rapid transit (PRT) is not a straight replacement of automobiles, buses or light rail. PRT can operate without streets and highways. PRT alignments need only limited grading and can be built on the sides of mountains using poles of unequal height. From a service perspective, the versatility of PRT is unmatched by either automobiles or public transit as it combines the best features of each mode. In this respect, PRT provides an attractive public transit alternative to automobiles as it offers the same on-demand connectivity and non-stop, point-to-point service characteristics. Compared to other transportation solutions, PRT has the greatest potential to mitigate greenhouse gases (GHG) and other pollutant (NOx) impacts through a combination of super energy efficiency and the reduction of auto vehicle miles traveled (VMT).

The commercial development of high performance PRT has the potential to deliver high-speed, solar-powered surface transportation at lower costs and with higher efficiency than existing automobile or public transit technologies. PRT is unique among all other transportation solutions in that it offers a broad and sustainable path to the rapid attainment of key goals that are both a state and national priority: 1) the reduction of greenhouse gas emissions and other pollutants, 2) the elimination of urban congestion, and 3) achieving energy independence.

Because of its flexibility, PRT has the potential to serve all of California as a high-speed intercity surface transportation system moving passengers and packetized freight more efficiently and at lower cost than existing modes. The growth of the PRT industry in California could serve as a jobs and manufacturing engine and develop into a major export industry for the state and the nation. The development of the State of California Personal Rapid Transit Pilot Demonstration Program ("CPRT") serves the mandate of the

Economic Technology Advancement Advisory Committee (ETAAC) formed as directed by the California Global Warming Solutions Act of 2006 to:

> *"advise (ARB) on activities that will facilitate investment in and implementation of technological research and development opportunities including, but not limited to, identifying new technologies, research, [and] demonstration projects..."*

In this regard, the funding of a CPRT demonstration project is consistent with ETAAC's policy of establishing a "level playing field" where government policy should not attempt to pick technology winners but rather, performance-based programs should be the norm. In this process ETAAC makes a number of recommendations based on the need to help emerging technologies move through demonstration phases to achieve full commercial viability. In this case, the proposed CPRT program would build and demonstrate a commercial PRT system to obtain critical evaluation data and provide the basis for a comparative analysis in a market structure characterized by performance standards and carbon prices. It should be noted that other low and zero carbon transportation options including light, medium and heavy duty plug-in hybrids, dedicated electric vehicles, hydrogen and other advanced fuels have all benefited from significant public and private investment and have all enjoyed a level of demonstration in the United States that PRT has lacked. The ETAAC report acknowledges the problem of overlooked solutions when it states:

> *"The absence of funding for project demonstrations is a significant impediment to the maturation of new technologies..."*

Demonstrating new approaches like PRT should be considered when the degree of uncertainty associated with better-demonstrated technologies is taken into account. Specifically, plug-in hybrids, dedicated electric vehicles, hydrogen and other advanced fuels have technical and speed of adoption issues that remain unresolved as stated in the ETAAC report:

> *...the turnover of the automobile fleet is very slow (about 14 years), so introduction [PHEV, etc.] would have to occur quite soon to make a significant difference by 2020. By that time, liquid fuels with much lower carbon intensity than gasoline are also likely to be introduced and the prospects for battery electric vehicles (BEVs) fuel cell electric vehicles (FCEVs)[12] cars are also likely to be better than they are today. It is not clear what combination of all-electric, hydrogen, and advanced liquid fuels will best serve our transportation needs to meet the dramatic reductions in GHG emission by 2050.*

The likelihood of the anticipated technical breakthroughs and performance improvements stated in the report remains, however, a judgment supported by reasonable extrapolation but little empirical data. In contrast, the key technology underlying PRT is well understood and proven in other transportation systems. The main challenge for rapid and broad deployment of PRT is the integration of these technologies into scalable systems.

At the very least, the mission of the CPRT project would be to elevate an under-demonstrated technology to a level sufficient for comparative evaluation with other well-demonstrate d GHG mitigation technical solutions of uncertain effectiveness. In fact, the technical weakness of various demonstrated alternatives highlights the urgent need to proceed with a CPRT program to ascertain the potential of PRT and provide critical empirical data for near-term and longer range strategic planning.

PRT History

Personal rapid transit technology has been under development for over thirty years. The federal Urban Mass Transit Administration deployed the first and only commercial demonstration system in the United States at West Virginia University in Morgantown, WV in the 1970s. Similar pilot systems were developed in Europe during this period as well. However, with recent European Union support, second generation PRT development has surged with the deployment of demonstration systems at Heathrow Airport in the United Kingdom and Uppsala, Sweden. Despite the success of the Morgantown system in all areas of performance, the federal government provided no further PRT R&D funding and continues to show no inclination to support PRT programs. As a result, the technology of this legacy system has failed to evolve and remains antiquated. However, privately funded next generation, high performance PRT technology is being developed in the United States and continues to make rapid progress. Several university programs are researching PRT power electronics systems that capture solar and wind energy and use today's stationary batteries and fuel cells for storage.

Technology Evaluation

The CPRT process would establish a protocol for critical evaluation and selection of a state-of-the-art PRT technology to be commercially demonstrated in the pilot project.

Conclusion

PRT, unlike all other surface transportation options under consideration, has the highest likelihood of achieving two vital goals of California public policy, the reduction of congestion and greenhouse gases.

First and second generation PRT technologies are proven and demonstrated technical solutions. Next generation systems under development promise substantial performance breakthroughs. PRT is more energy efficient and therefore potentially more effective in reducing GHG than **mobile applications** of battery, fuel cell, hydrogen and other technologies with even more limited histories of commercial deployment. PRT, by contrast, requires only a pilot commercial deployment to integrate proven technologies in an effort to confirm effectiveness and speed the rate of adoption. However, **stationary applications** of today's battery, fuel cell, and other energy storage

technologies should be incorporated into the CPRT to demonstrate a viable off-peak PRT power source.

The demonstration system should test the social aspects of integrating other forms of transportation, including neighborhood electric vehicles, plug-in hybrids and bicycles into their daily commute. Due to its many social benefits, PRT has the highest potential to reduce auto VMT and encourage transit-oriented development by reclaiming unused parking spaces to reverse urban sprawl.

Of all the surface transportation technology options available for consideration, PRT has the fewest number of technological and financial hurdles in meeting CARB goals for GHG reduction in the shortest amount of time.

The state of California has a unique opportunity to jumpstart this critical technology in the United States and become a world leader in advanced transportation solutions.

Signed,

S David Freeman
President, Los Angeles Board of Harbor Commissioners

Richard Hunt
President, Advanced Transit Vehicle Consortium
Los Angeles County Metropolitan Transportation Authority

Yvonne B. Burke
Supervisor, Los Angeles County Board of Supervisors
Board Member, Los Angeles County Metropolitan Transportation Authority

Barbara Goodwin
Executive Director, Fresno County Council of Government

Judy Arnold
Supervisor, Marin County

Gus Ayer
Mayor, City of Fountain Valley

Debbie Cook
Mayor, City of Fountain Valley

Sarah Catz
Director, Center for Urban Infrastructure
Institute of Transportation Studies University of California, Irvine

Dennis Manning
Chairman, Advanced Transit Association

Christopher Perkins
Chief Executive Officer, Unimodal Systems

UNIMODAL
SYSTEMS

June 21, 2010

Commissioner James Boyd
California Energy Commission
Dockets Office, MS-4
Re: Docket No. 09-ALT-1
1516 Ninth Street
Sacramento, CA 95814-5512

Re: Personal Rapid Transit Pilot Demonstration Program

Dear Commissioner Boyd,

Personal rapid transit (PRT) is a game changing personal mobility technology that has the potential to get people out of their cars and increase public transit use. PRT offers California a timely and sustainable path to the rapid attainment of key goals, including AB 32 and SB 375.

The commercial development of PRT has the potential to deliver high-speed, solar-powered urban transportation at lower costs and with higher efficiency than existing automobile or public transit technologies. From a service perspective, the versatility of PRT is unmatched by either automobiles or public transit as it combines the best features of each mode. In this respect, PRT provides an attractive public transit alternative to automobiles as it offers the same on-demand connectivity and non-stop, point-to-point service convenience. Compared to other transportation solutions, PRT is the most energy efficient per passenger mile traveled and has the greatest potential to reduce auto vehicle miles traveled (VMT) resulting in decreased greenhouse gases (GHG) and other pollutant (NOx) impacts.

Unimodal Systems in collaboration with NASA has successfully demonstrated a prototype of magnetic levitation PRT technology at the NASA Ames Research Center in Mountain View, CA. http://www.nasa.gov/topics/nasalife/features/unimodal.html

NASA Ames Research Center
Building 14, Room 101 MS19-100
Moffett Field, CA 94035-1000
www.unimodal.com

Corporate Office
179 Via Colinas
Westlake Village, CA 91362
Phone 805-374-8454

Unimodal Systems urges the Alternative and Renewable Fuel and Vehicle Technology Program to fund a Personal Rapid Transit Pilot Demonstration Project to assess this promising technology's ultra energy efficiency, greenhouse gas mitigation effectiveness, and potential for congestion reduction.

Private infrastructure investment funding is available, pending successful completion of the demonstration phase. This technology heralds a new era of public transit public private partnerships that will bring relief to the State budget and meet the goals of reduced auto use and expanded personal mobility.

The California Energy Commission's Alternative and Renewable Fuel and Vehicle Technology Program has a unique opportunity to bring jobs and manufacturing to the State by jumpstarting this critical technology and positioning California as a world leader in this emerging global industry.

Best regards,

Christopher Perkins
Chairman

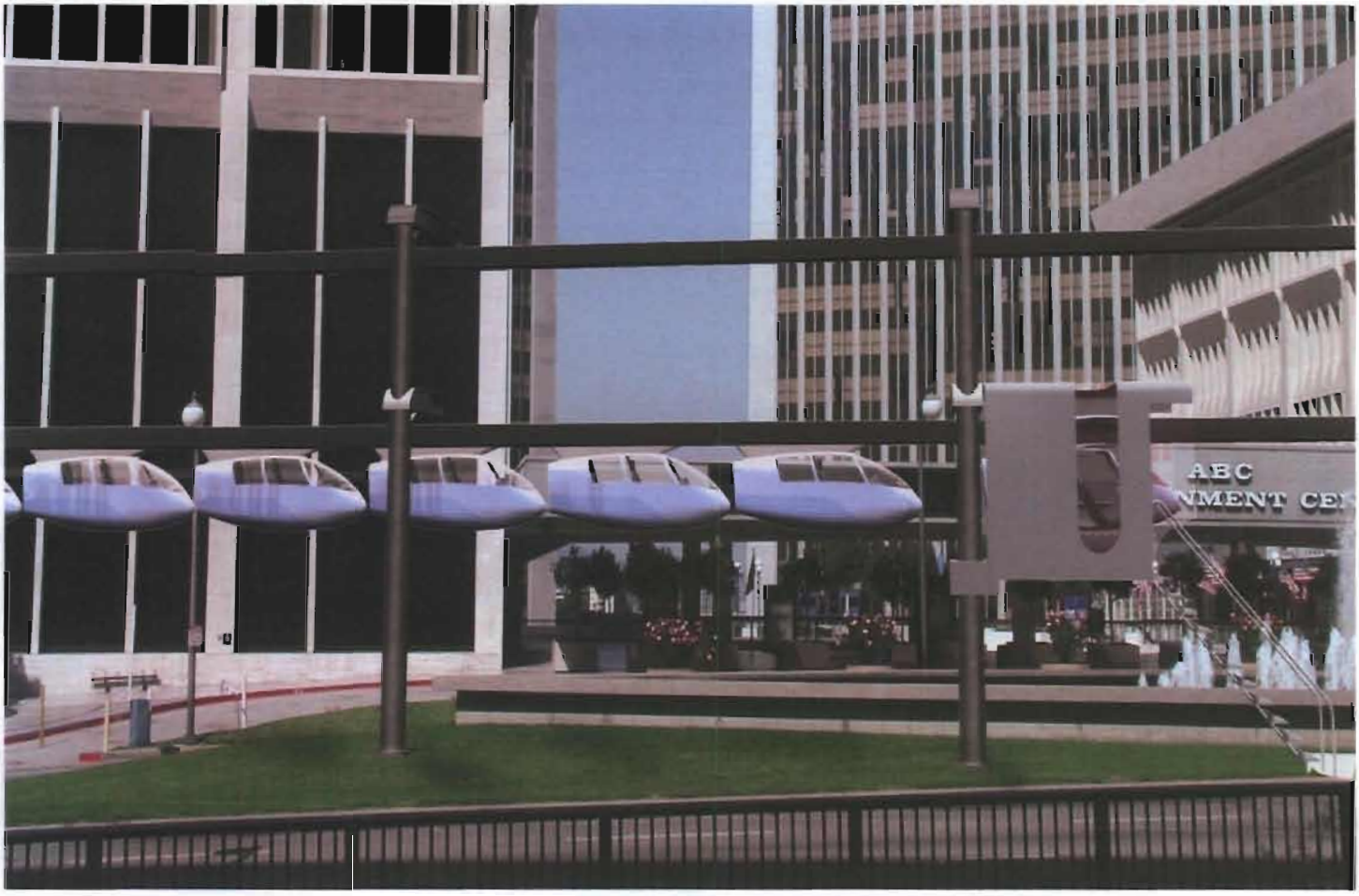
NASA Ames Research Center
Building 14, Room 101 MS19-100
Moffett Field, CA 94035-1000
www.unimodal.com

Corporate Office
179 Via Colinas
Westlake Village, CA 91362
Phone 805-374-8454

unimodal

Transport Solutions for People, Products and Data

Unimodal Systems LLC



Unimodal Systems LLC
14962 Merced Circle
Irvine, CA 92604 USA
Phone: +1-805-374-8454

www.unimodal.com
info@unimodal.com

unimodal

Transport Solutions for People, Products and Data

SkyTran In Review

Specifications & Benefits

CONVENIENCE: SkyTran is on-demand—no fixed routes or timetables. It's just like your automobile. Vehicles are waiting for you whenever you need one and they take you straight to your destination without wasting time stopping at each and every station. A passenger keys in a desired destination address into a terminal at the originating portal.

EASE OF USE: No need to drive, vehicles are automatic. Safer and more affordable than driving. Much faster than auto, bus or light rail. Ideal for getting people out of their cars in transit-oriented developments (TOD). Expands TOD from rail corridors to broad networks where high performance personal mobility is always only a short walk anywhere in the community.

VEHICLE CAPACITY: SkyTran vehicles can accommodate up to two people, or one person with a luggage capacity equal to airline travel. Vehicle designs can accommodate special ADA needs.

SYSTEM CAPACITY: A single guideway is equivalent to three lanes of freeway traffic running at peak capacity. Maximum capacity for a single guideway is 14,400 passengers per hour. SkyTran carries passengers in a continuous stream on a non-stop mainline unlike light rail, which carries passengers in bursts with stops at every station on the route. A stopping SkyTran vehicle does not cause other vehicles to stop; the vehicle branches off from the mainline and decelerates at an off-line line portal stop where passengers disembark.

SPEED: 35-100 miles per hour cruise speed non-stop in a city, 150 miles per hour non-stop between cities.

SAFETY: Elevated guideways ensure there is no possibility of collisions with cars, trucks, pedestrians, children, animals or road debris. SkyTran vehicles move on a single guideway going only one direction—there is no risk of head-on collisions. Computers and sensors monitor vehicle spacing and speed for collision avoidance, and each vehicle is enabled with safe high-g emergency braking. Compared to auto travel, there are no intersections where accidents can occur (75% of auto accidents happen at intersections), no dangerous passing or arbitrary lane changing. SkyTran is all-weather and unlike cars cannot slide out of control in rain, ice or snow. SkyTran can safely stop 10 times faster than a car. Derailments are impossible as the motor/maglev vehicle assembly is physically "captured" by the guideway.

COST: $15 million per unidirectional mile including vehicles ($25 million per bi-directional mile). 3-4 times less than light rail.

ENERGY EFFICIENCY: The electric-powered vehicle gets the equivalent of 500 miles per gallon at 35 mph using no-contact, no-friction magnetic levitation bearings, a light weight, aerodynamic vehicle profile and regenerative braking technologies.

MAINTENANCE: A SkyTran vehicle has a mechanically simple, solid state design. Maglev means there's only one moving part—the vehicle levitating down the guideway. There are no wheels, bearings, hydraulics, pistons, valves, tires, or linkages to fail. Using maglev instead of wheels results in very low maintenance.

ENVIRONMENTAL IMPACT: SkyTran has minimal environmental impact. Because there are no wheels, the vehicles travel almost silently and without vibration. Compared to an equivalent capacity three lane highway or a lower capacity light rail system, SkyTran has minimum noise and visual impact .

LAND USE: Of all transportation options, SkyTran has the least intrusive right-of-way requirements. No expensive, destructive right-of-way acquisitions required, just easements on existing sidewalks. The installation footprint is only as large as the size necessary for the placement of standard utility poles that support the guideway.

INSTALLATION: No heavy digging, disruption or relocation of utilities and roads for installation. SkyTran's lightweight design enables installation on sidewalks, attachment to buildings, routing through shopping mall interiors even direct access to gates at airports.

ACCESSIBILITY: A mature 3-D network of SkyTran stops in a city would enable easy access to the system requiring a short walk. Stops are spaced approximately 1/8 to 1/4 mile apart. SkyTran has no large "stations" like those used with light rail. SkyTran is accessed by way of small portals or "stops" like a bus stop, that are conveniently sited through neighborhoods, cities and regions. The system can be accessed inside office buildings, hotels, malls, schools and airports.

PERSONAL CHOICE: SkyTran passengers always have the option to veto a particular vehicle due to sanitation or other issues.

SECURITY: SkyTran empowers the passenger to have the personal freedom to select time of departure and destination. You never have to share your vehicle with anyone. Should problems arise, the system allows for the user to summon immediate emergency intervention. SkyTran provides privacy, safety and personal freedom.

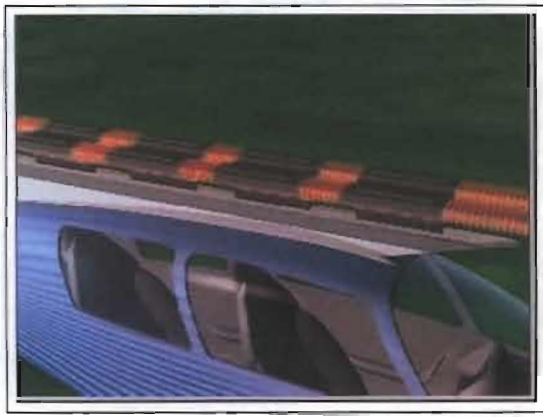
COMFORT: Vehicles are air conditioned and have entertainment and vehicle-to-vehicle communication options. In normal operations vehicles never accelerate/ decelerate at more than ½ g —well within the human body's comfort zone.

unimodal

Transport Solutions for People, Products and Data

Maglev Technology

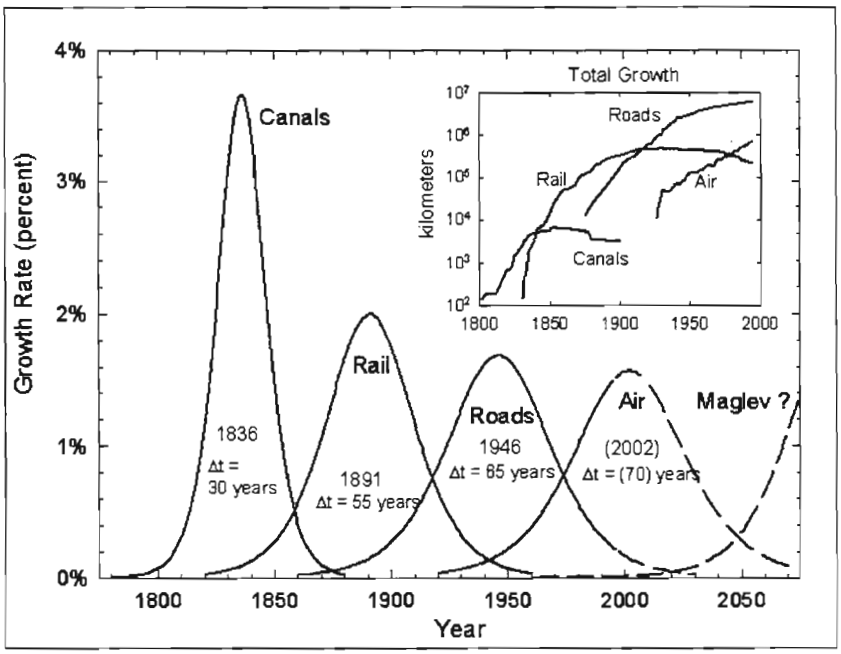
The "Wheel" of the 21st Century



SkyTran's PRT vehicle design is the first ever proposed that eliminates the use of wheels and mechanical rotary bearings. This revolutionary approach is possible by incorporating magnetic levitation (maglev) as a non-contact, no-friction bearing system that slashes costly maintenance because there are no moving parts to fail. Propelled by a linear motor, the vehicle requires no active electrical input for the magnets to levitate down the guideway at speeds of up to 150 mph. Energy efficiency is equivalent to a 500 mpg auto.

SkyTran uses a revolutionary maglev technology that stably rides an induced magnetic wave without requiring active electrical input to levitate. Unlike conventional active electrical input systems like the German Transrapid and Japanese HSST technologies, SkyTran's breakthrough approach allows for the design of elegant and compact linear motor/magnetic bearing suspension devices without the complex feedback systems and auxillary power supplies required by conventional maglev.

The magnetic bearings being developed for use in SkyTran use high performance permanent magnet materials combined with embedded conductive elements to provide an unprecedented combination of performance, safety, durability and economy. This approach is passively stable both laterally and vertically by improving upon the basic principle of electrodynamic suspension, producing lift from forward motion but also producing lateral centering forces to keep vehicles stable and on track without active control or unwanted vertical planar components that would hinder merging or diverging. And while in motion the vehicles are rigidly and precisely fixed in the vertical dimension by powerful repulsive magnetic forces and can carry wide-ranging loads without requiring adjustment. These features allow the design of guideways that employ passive and failsafe merge/diverge high speed switching operated solely by solid state devices on the vehicles——a technical achievement impossible to implement with conventional maglev designs. These proprietary switching methods are key to SkyTran's vehicle design. This arrangement allows for reduced guideway structural requirements and allows the safe use of under hanging vehicles which bank naturally in response to turning forces, providing greatly improved passenger comfort, higher cornering speeds, switching speeds and reduced torsion on guideway support structure.



Surface Transportation Infrastructure Growth: A Rockefellar University study* projected the growing dominance of maglev in the 21st century.

In the event of a catastrophic power loss, vehicles continue to levitate while gliding gently down to a low speed before settling onto the track surface unlike conventional maglev designs. The complete lack of moving parts in both guideways and vehicles along with non-contact, friction-free vehicle motion ensures the highest level of reliability with extremely low maintenance requirements. Tightly integrated propulsion is by either linear synchronous or linear induction motors, or both depending on the application. High force and power capabilities enable rapid acceleration and steep grade climbing. Regenerative braking capability like that used in hybrid automotive vehicles improves overall system efficiency.

unimodal

Transport Solutions for People, Products and Data

SkyTran Features

Safety, Convenience & Capacity

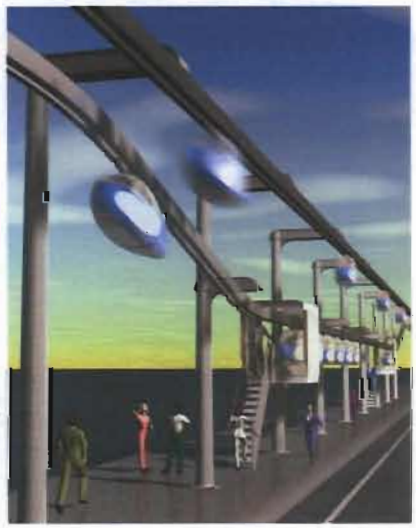
Easy & Convenient. SkyTran is on-demand. There's no waiting, fixed routes or timetables. It's just like using your automobile. Simply board a waiting vehicle at one of many city-wide off-line portals. The destination is either selected via display menu or voice activation. Payment is by credit card or a RFID device similar to a Mobil SpeedPas. Each vehicle has air conditioning, internet , entertainment and audio-video vehicle-to-vehicle communications.

Fully Automated. Before departure, sensors determine the dynamic position of all on-coming SkyTran vehicles on the high speed guideway. At a precise, calculated moment the off-line vehicle accelerates and merges safely with mainline traffic. A high reliability, high-speed, non-mechanical switch provides the transition onto the non-stop guideway. Once on-line you don't stop until you reach your destination. Then, the vehicle is switched off-line again. You exit the vehicle which joins the queue awaiting another rider. In a fully developed network you are never more than a five minute walk from a portal to get on or off.

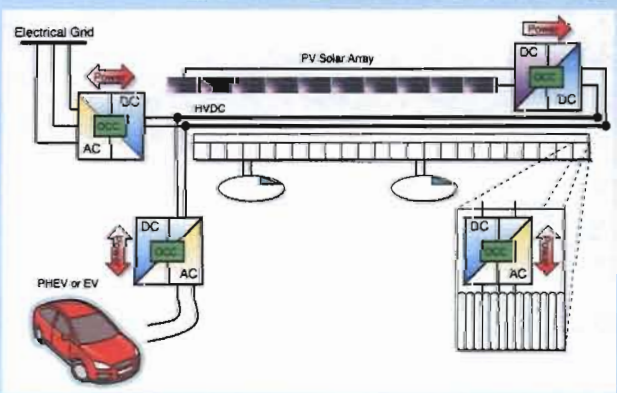
Capacity: A SkyTran guideway has the same capacity as three lanes of freeway traffic. SkyTran utilizes line capacity more efficiently than light rail by moving the vehicles in a continuous stream. Every part of the line is a continuously utilized network as opposed to light rail, where each line segment is utilized only for a few seconds when the train passes over it and then sits idle for extended periods.

Energy Efficient : Solar-powered SkyTran gets the equivalent of 500 miles per gallon at 35 mph using no-contact, no-friction magnetic levitation bearings, and regenerative braking technologies. The lightweight, composite, two-passenger vehicles add to energy efficiency by reducing wind resistance and drag through their aerodynamic design. This attention to vehicle shape and size allows for their suspension on narrow, lightweight, visually unobtrusive aerial guideways supported by standard utility poles with a very small right-of-way footprint.

Safe: There are no intersections where pedestrians or surface vehicles can collide. SkyTran is elevated and vehicles run in only one direction eliminating the threat of vehicle collisions. The guideway's patented design "captures" the maglev-motor assembly in a configuration that makes vehicle derailments impossible. Computer controlled collision-avoidance radar and guideway sensors update thousands of times per second to maintain proper position and speed with other vehicles. Vehicles have seat belts and air bags.



UNIVERSAL INFRASTRUCTURE BACKBONE™



SkyTran guideways provide a conduit for people, power and telecommunications.

The advanced power electronics at the center of SkyTran's extremely efficient OCC energy management system provides for a robust extension of the grid as both a consumer and provider of electricity. In one scenario, SkyTran's Universal Infrastructure Backbone recharges hybrid and electric vehicles at SkyTran commuter park-n-ride stations. In another example, intercity guideways provide transmission paths for remote DC solar photovoltaic farms sited far from the existing grid.

unimodal

Transport Solutions for People, Products and Data

Building Affordable Public Transportation

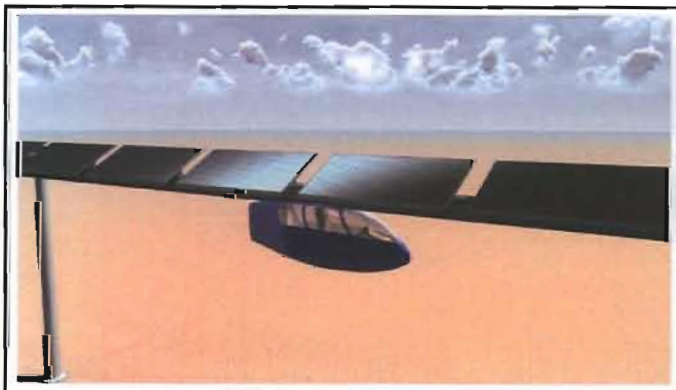
The goal of subsidy-free public transportation can be achieved when government agencies work together with private investment to build and operate public transportation.

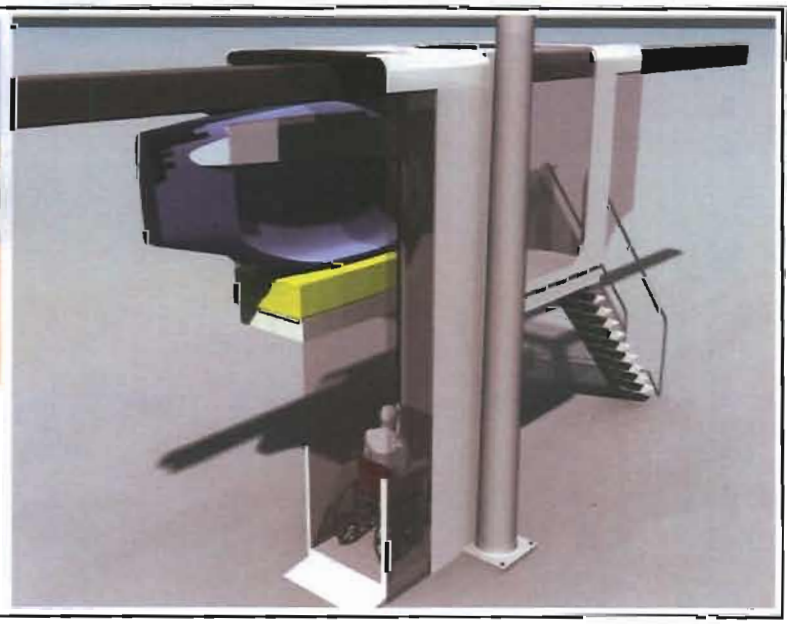
A single guideway can move as many people as 3 freeway lanes.

As the availability of public funding for transportation declines, SkyTran can be deployed as an innovative public-private partnership.

Toll road financing and operation is an example where private financing of transportation infrastructure provides government a mechanism for expanding capacity without tax subsidies. At half the cost of driving, SkyTran provides an attractive market alternative to the automobile.

SkyTran public-private partnerships serve the public interest. At a local and regional level, SkyTran responds to important public policy mandates such as reducing traffic congestion, air pollution and meeting the needs of disabled citizens. At a national level, solar-powered SkyTran addresses strategic challenges like climate change and the United States' dangerous dependence on foreign energy.





A contiguous 24-inch wide solar panel on a SkyTran guideway can supply all the power necessary to move 3,600 vehicles per hour at 35 mph (above). SkyTran portals use an electric lift to provide ADA access for disabled passengers (right).

unimodal

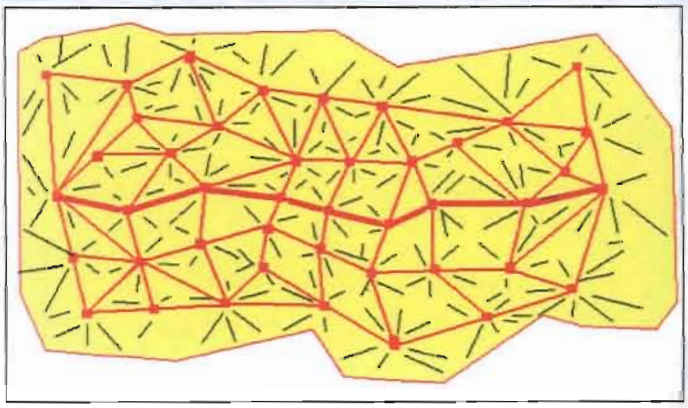
Transport Solutions for People, Products and Data

Bring Transit to Where People Live, Work & Play

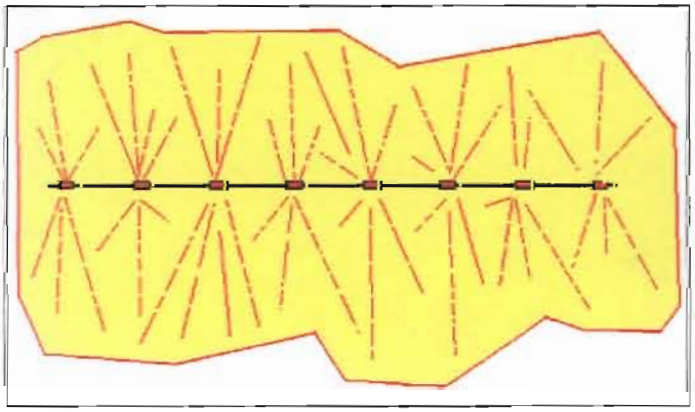
The challenge of mass transit is getting people out of their cars. The physical size of rail and monorails limits their ability to reach people where they live, work and play.

In contrast to a monorail's expensive, massive and visually intrusive support columns and trusses, the SkyTran design is lightweight and agile. SkyTran can be suspended over residential sidewalks, attached to building exteriors, and even routed directly to gates at airport terminals or through the interiors of shopping malls and office buildings.

The Key to Creating Transit Village Networks



SkyTran PRT (above) provides service across an elevated network that substantially expands the domain of transit-oriented development (TOD). A short walk gets you to a SkyTran portal anywhere in a transit village network. This is key to getting people out of their cars. In contrast, **light rail and bus corridors (below)** concentrate TOD to narrow regions with an extremely limited number of stops, leaving most of the community without service.



SKYTRAN: Lightweight, inexpensive, quick to install, and blends seamlessly into the urban landscape. Unites communities. Requires minimal right-of-way.

LIGHT RAIL: Heavy concrete work, extremely expensive, difficult to install, and visually unappealing. Divides communities. Requires extensive right-of-way.

unimodal

Transport Solutions for People, Products and Data

Eliminating Congestion & Greenhouse Gases

Problem: The public overwhelmingly ignores light rail and buses as a solution to automobile gridlock.

Analysis: Despite the reality of gridlock, the perceived convenience of cars outweighs the inflexibility that light rail and buses impose on personal transit.

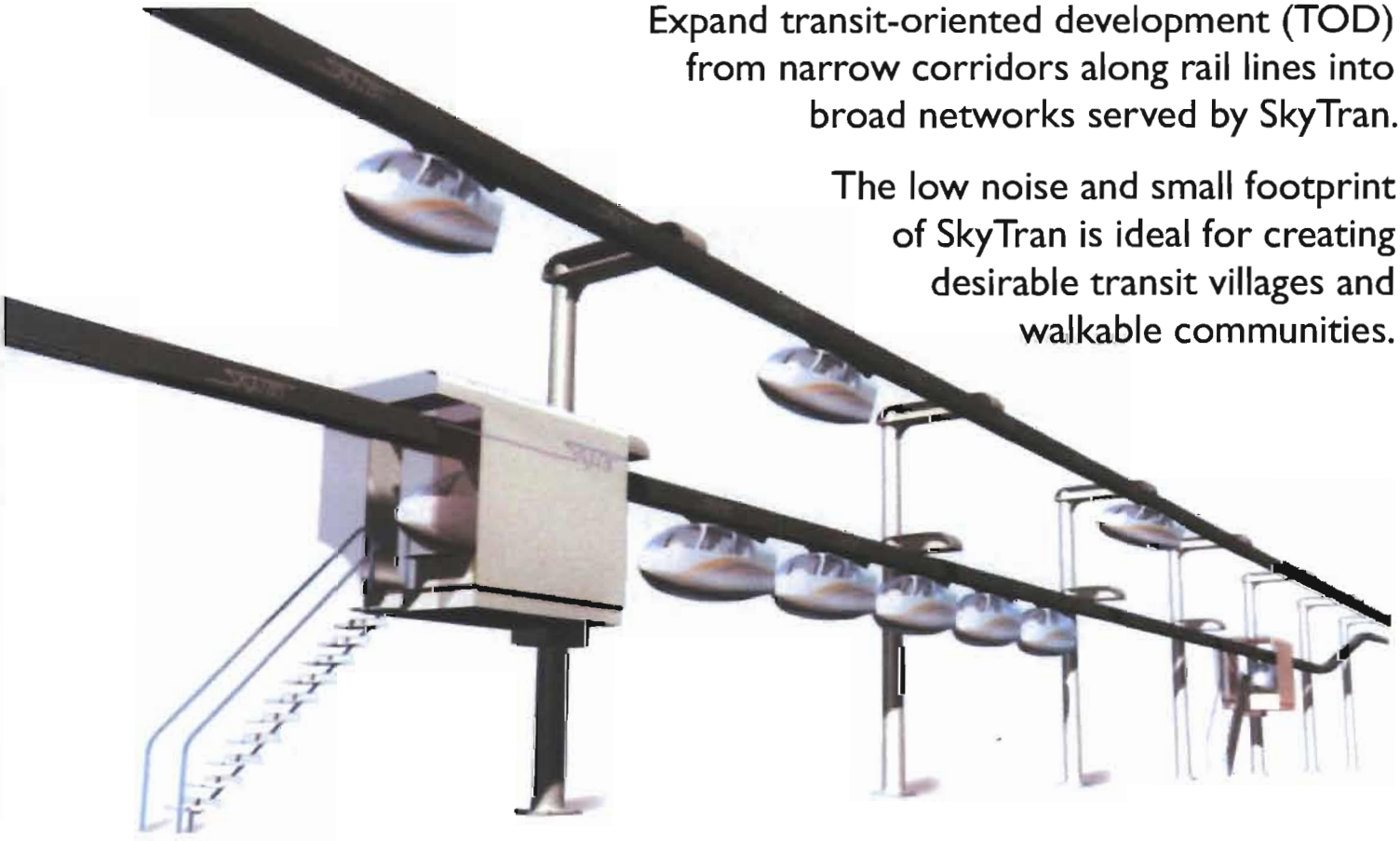
Solution: A transportation option that provides the same privacy and convenience of a car and eliminates congestion and greenhouse gases.

Future Scenarios: Biofuels, plug-in hybrids, and electric cars may provide solutions to our reliance on fossil fuel and help mitigate greenhouse gases. However, these solutions do nothing to eliminate congestion. The key to rapid congestion and greenhouse gas mitigation is a dramatic reduction in automobile use and vehicle miles traveled.

The SkyTran Solution

Expand transit-oriented development (TOD) from narrow corridors along rail lines into broad networks served by SkyTran.

The low noise and small footprint of SkyTran is ideal for creating desirable transit villages and walkable communities.



unimodal™

Transport Solutions for People, Products and Data

SkyTran™

Next Generation Personal Rapid Transit

On SkyTran you travel the city in a small, computer controlled, magnetically levitated vehicle. The elevated network of solar-powered guideways provide you with fast, on-demand, point-to-point, non-stop, personal rapid transit (PRT).

THE SKYTRAN EXPERIENCE

A short walk takes you to one of many conveniently located portals throughout the city. Board a two-passenger vehicle with room for a bike and select your destination. You experience a mild acceleration as your vehicle leaves the portal. You merge onto the main guideway and join the elevated network of vehicles moving to their specific destinations without interruption.

SkyTran behaves like an automatic car...but faster. There's no traffic lights, no traffic jams, and it works with greater capacity, safety, energy efficiency and far less cost.

KEY ADVANTAGES...

Speed: Vehicles travel 45-100 mph in the city and 150 mph between cities.

Cost: The lowest cost transportation mode to install and operate. Five times less than light rail.

Capacity: One guideway has the same capacity as a three-lane freeway.

Energy & Pollution : Vehicles use solar power and get the equivalent of 500 miles per gallon.

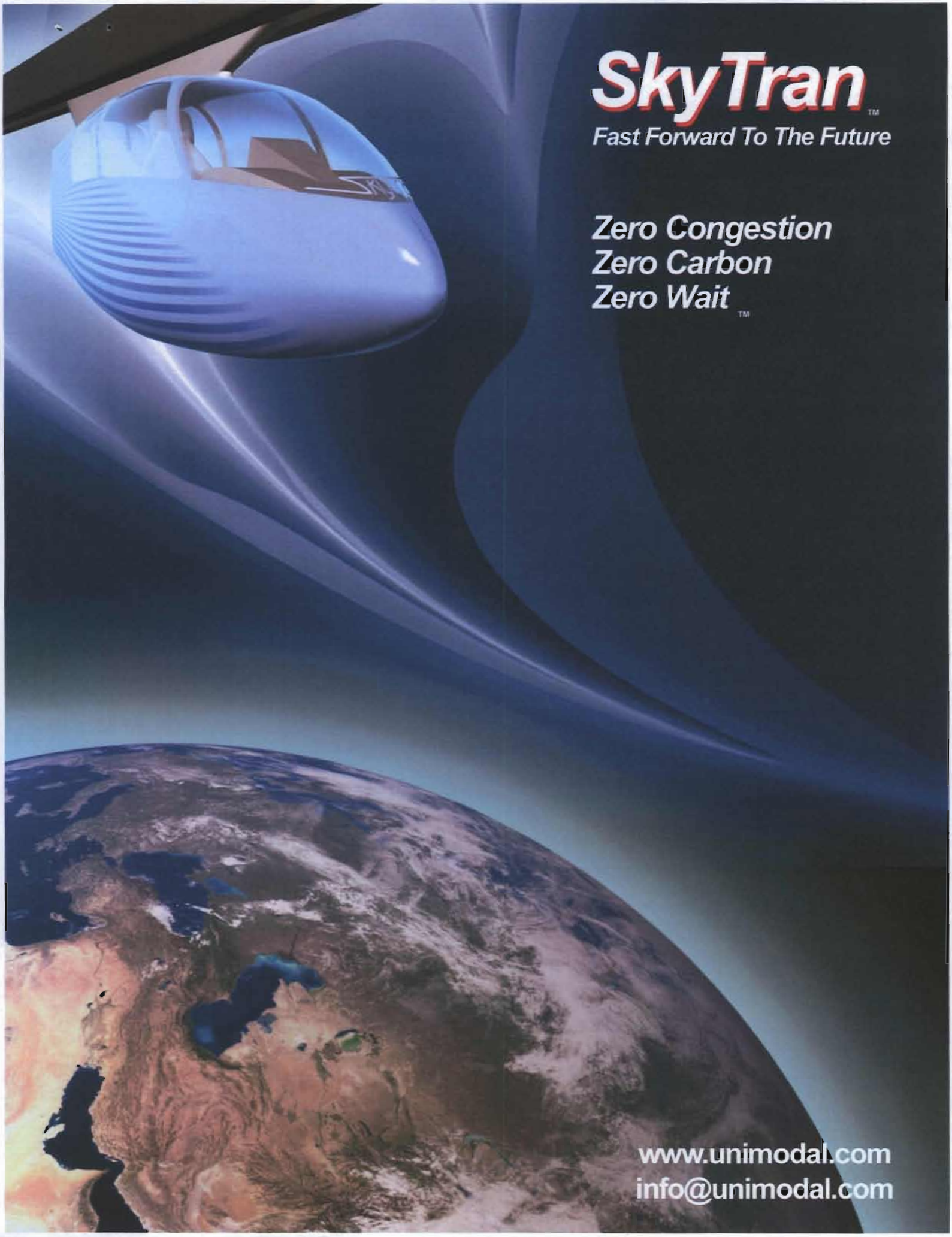
Maintenance: Magnetic levitation eliminates wheels, thus greatly reducing maintenance costs.

Environment: Noiseless, visually unobtrusive, lightweight vehicles and guideways blend into the city.

Safety: Elevated guideways eliminate surface traffic collisions. Driverless, automated vehicles use computers, sensors and radar collision avoidance systems to merge and navigate.

SkyTran™ delivers zero emission public transit with the convenience of a car but without the need for government subsidies to build and operate the system.

Copyright 2008 Unimodal Systems, LLC, Christopher Perkins & Brad Bowman SkyTran, Unimodal, Universal Infrastructure Backbone & Fast Forward To The Future trademarks are the property of Unimodal Systems LLC


SkyTran™
Fast Forward To The Future
Zero Congestion
Zero Carbon
Zero Wait™
www.unimodal.com
info@unimodal.com

California Energy Commission

Alternative and Renewable Fuel and Vehicle Technology Program

July 12, 2010

Back To The Future

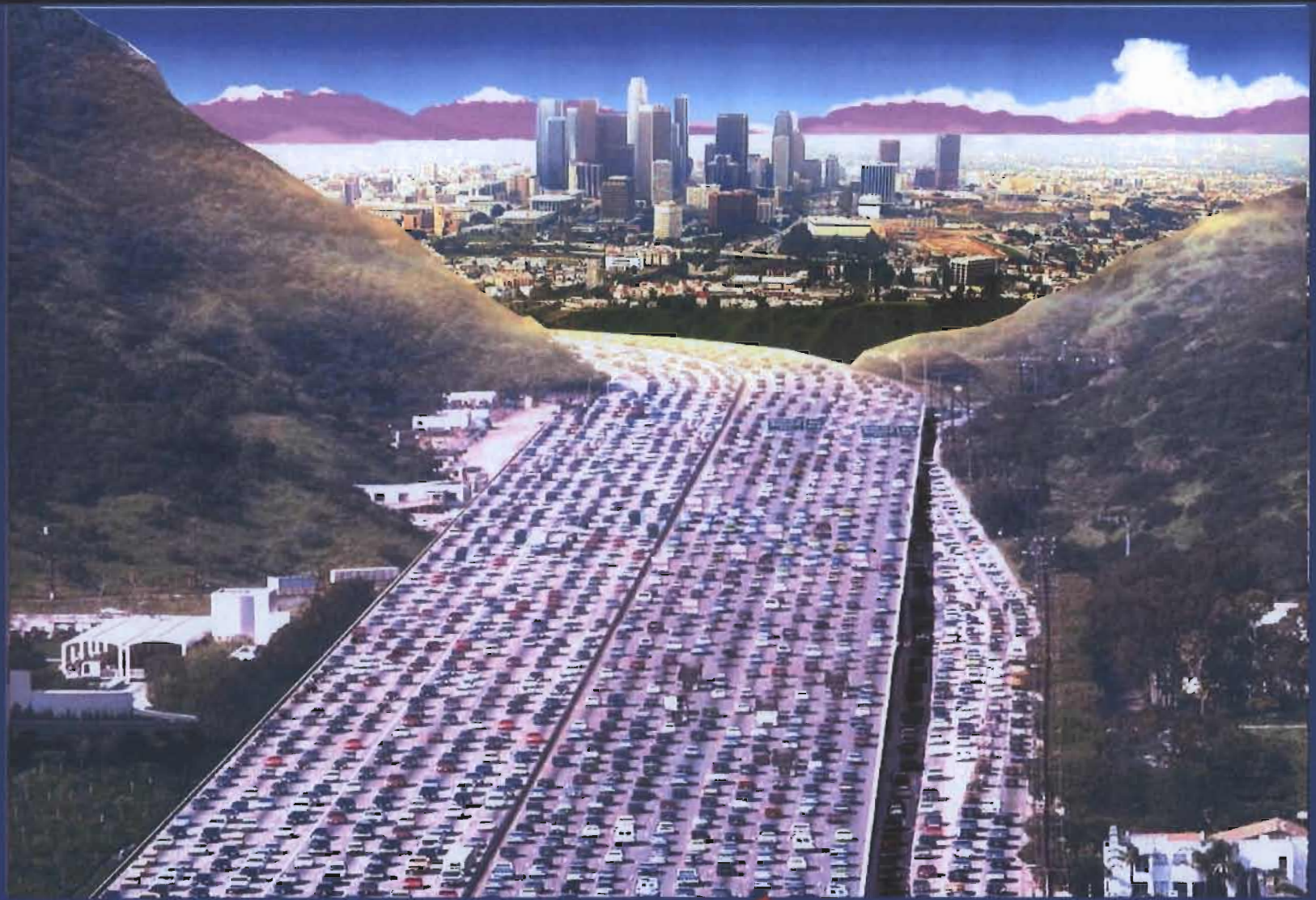
The Case for Personal Rapid Transit

Presentation by

Christopher Perkins
Chairman, Unimodal Systems LLC

Gregory T. Smedley, Ph.D.
CEO, One Cycle Control Inc.

Solution: EV, Hybrid, PHEV, Biofuel Vehicles



Congestion, ~~Pollution~~, Accidents

First Generation Personal Rapid Transit

Historic Morgantown PRT System

Serving West Virginia University campus since 1975

No fatalities, injuries.

Second Generation PRT

Ultra System
Heathrow Airport, U.K.
Deployment Operational
in 2010

Low Speed
Up to 30 mph

2GetThere
Masdar, Abu Dhabi
Deployment Operational
in 2010

Small Scale
Local Circulators Only

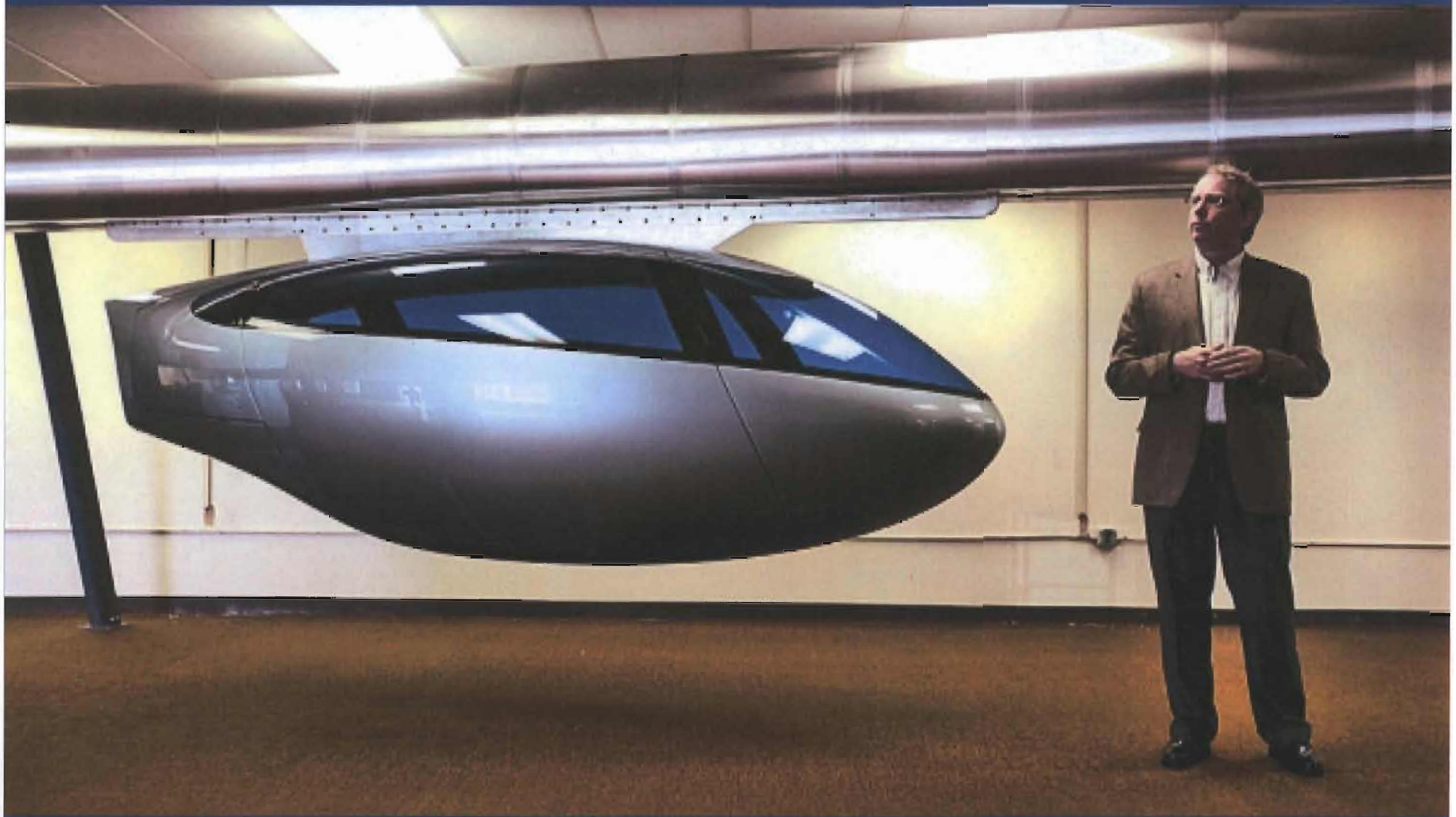
Wheeled Vehicles
Maintenance Intensive

Vectus
Korean PRT
Demonstration System
in Uppsala, Sweden

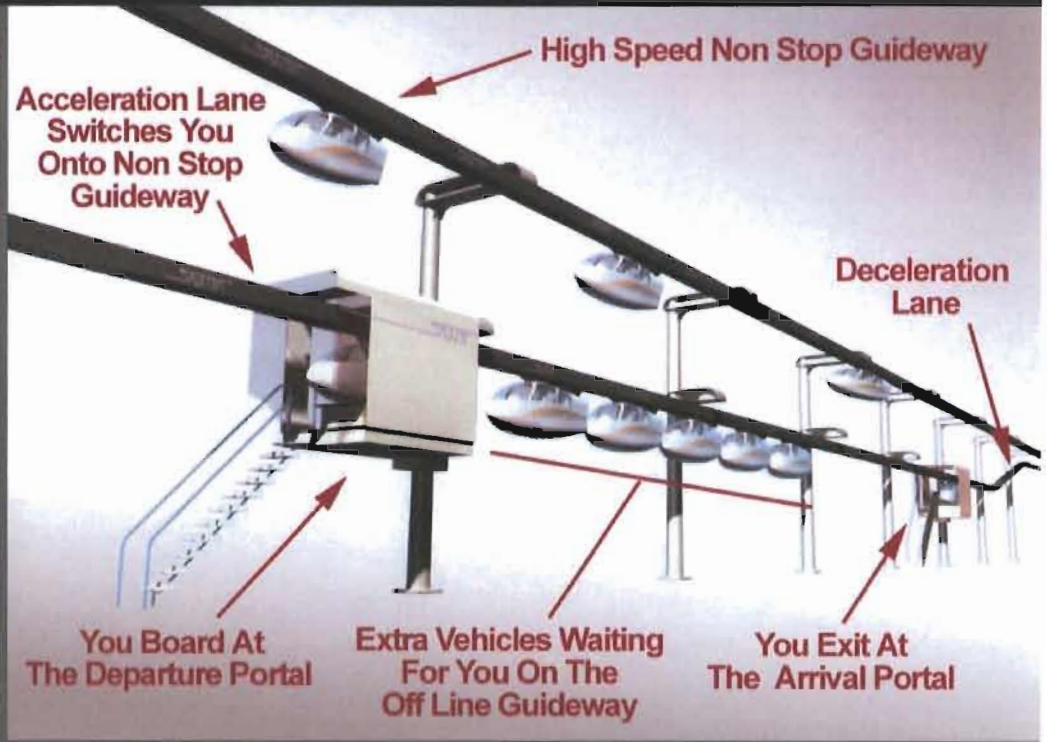
Over 1000 lbs.
Uses larger vehicles

+$200M Overseas Investment in PRT

Next Generation Maglev PRT



PRT Architecture



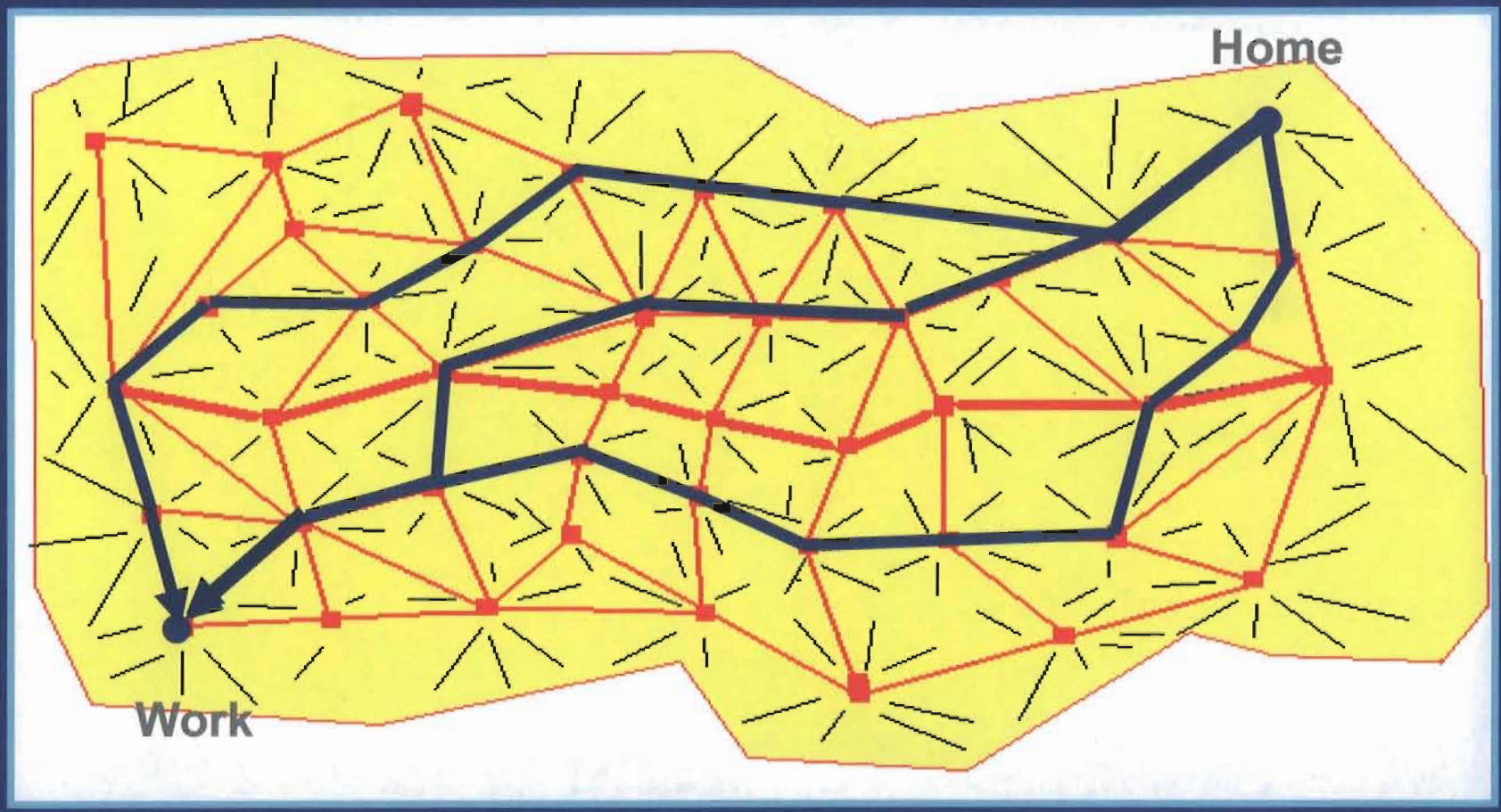
SkyTran PRT Design Same as Interstate Highways

On/off-ramps access non-stop lanes

Offline Stations don't impede through traffic

On/off-ramps access non-stop guideways

Parallel Paths like the Internet



>7,000 vehicles/hr per guideway

(3x greater than highway lane)

Unimodal Technology Partnership

Academic, Government & Industry

NASA Ames Research Center (Mountain View, CA)
NASA National Center for Advanced Manufacturing

United States Dept. of Transportation
Research & Innovative Technology Program Grant
University of Montana Missoula

University of California , Irvine, CA
Power Electronics
System Simulation

One Cycle Control, Inc. - *Power Management Systems (Irvine, CA)*
Jenkins/Gales & Martinez, Inc. – *Project Management (Los Angeles, CA)*
Advanced Digital Manufacturing, Inc. – *Vehicle Development (Santa Ana, CA)*

NASA-Unimodal Maglev PRT Prototype

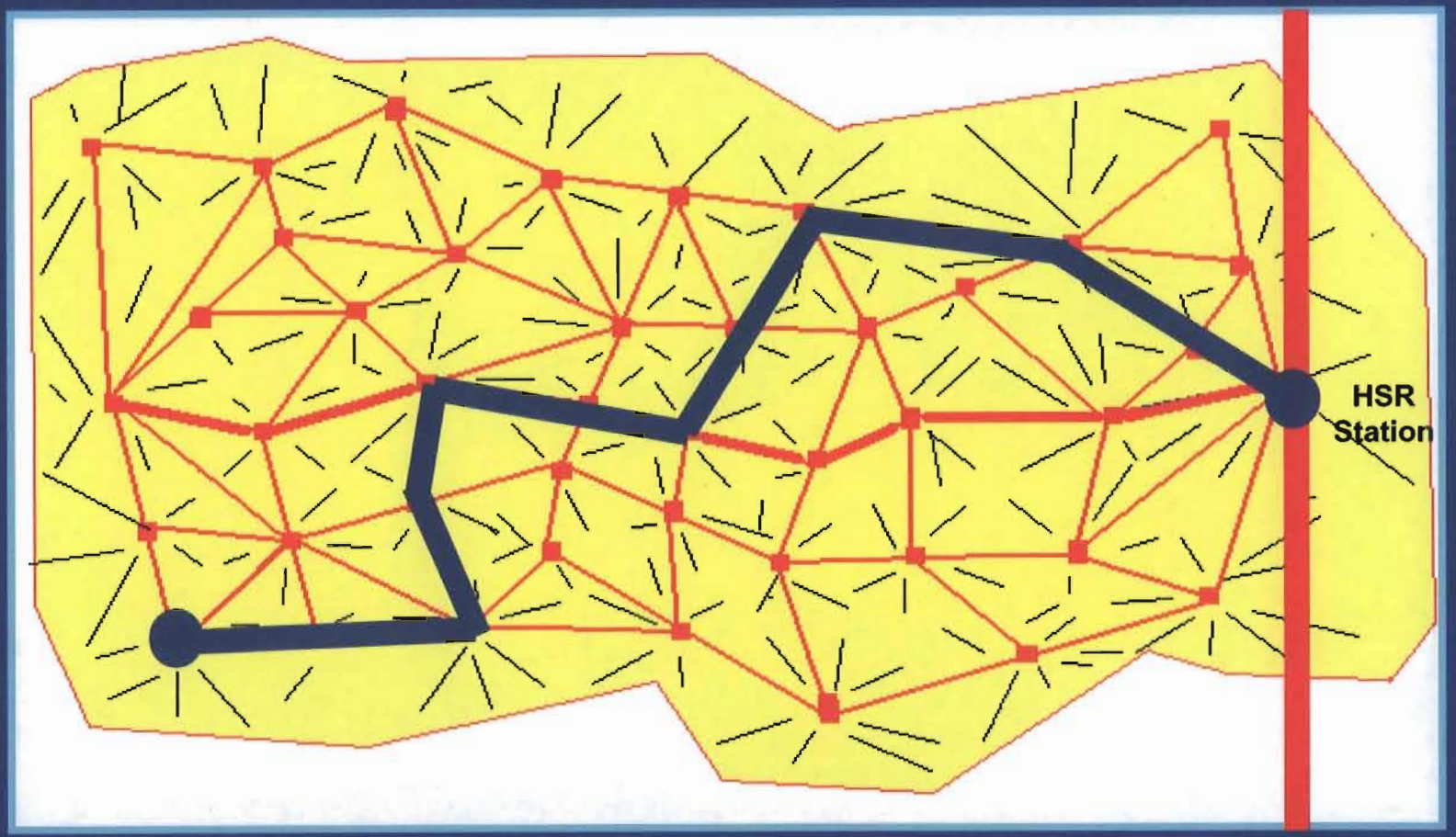
CHSR Endorses PRT

"The California High-Speed Rail Board is asking the 24 cities [with HSR stations] to conduct PRT studies. These studies would help to determine how to serve stations more effectively without encouraging additional automobile traffic or constructing nearby parking facilities."

Rod Diridon
Chair Emeritus
California High Speed Rail Authority

PRT Network Effect

Enables SB 375
Transit Oriented Development



Average 5 minute walk to any urban portal.

Key to Transit Oriented Development

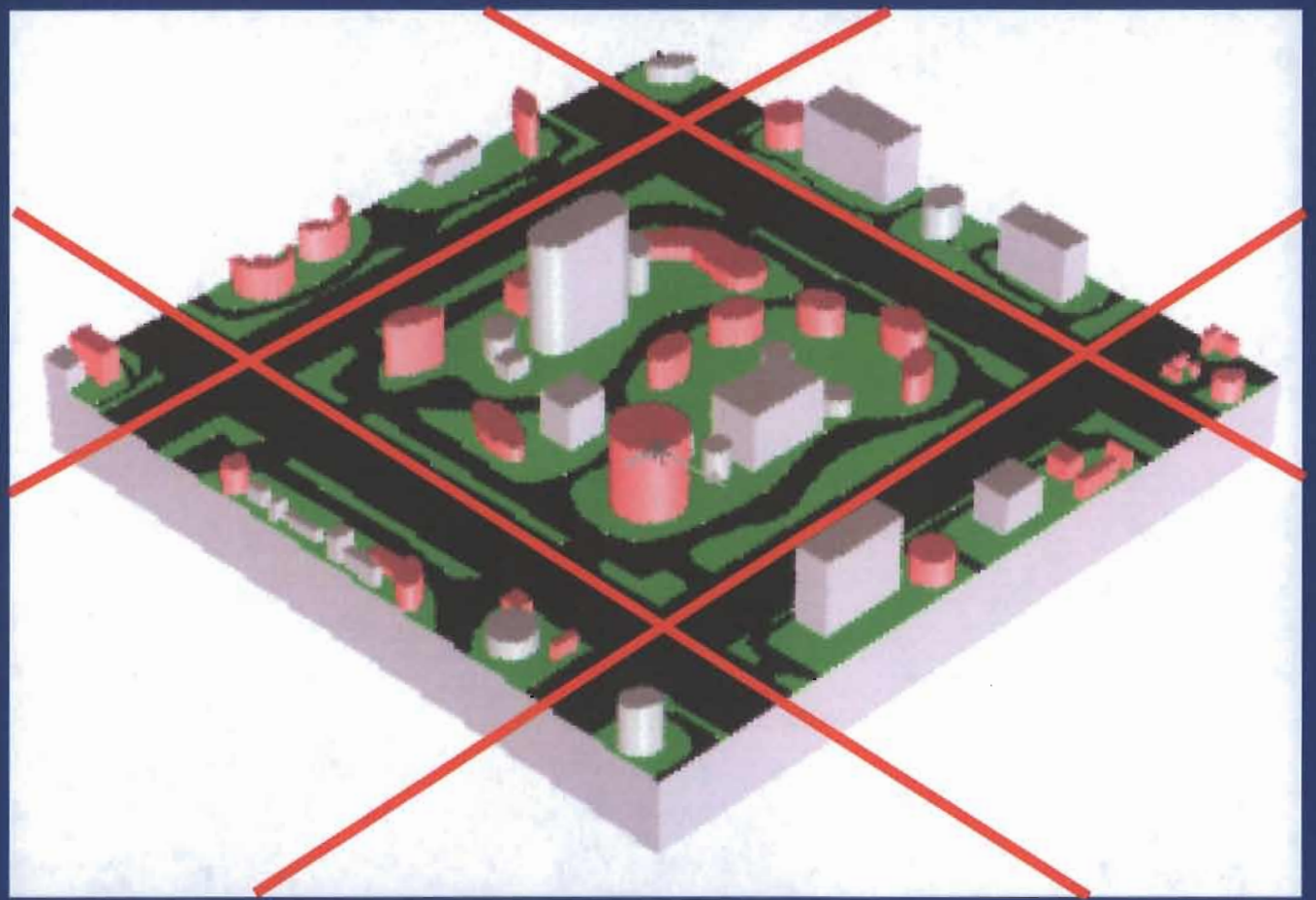
Encourage PRT use to access remote parking

Enables walkable communities

Access Dense Areas with PRT

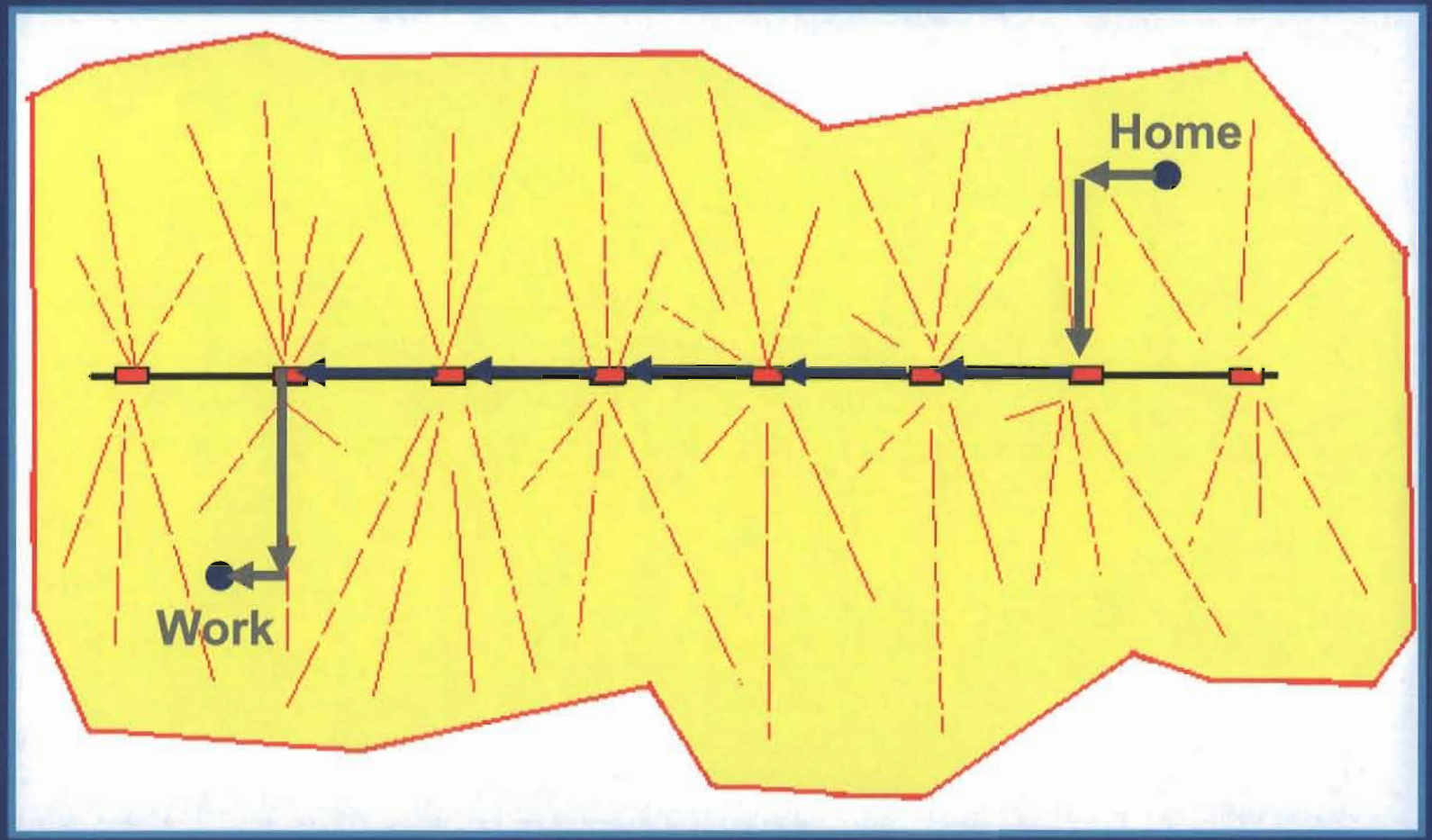
Via Congestion Pricing

More Buildings & Open Space



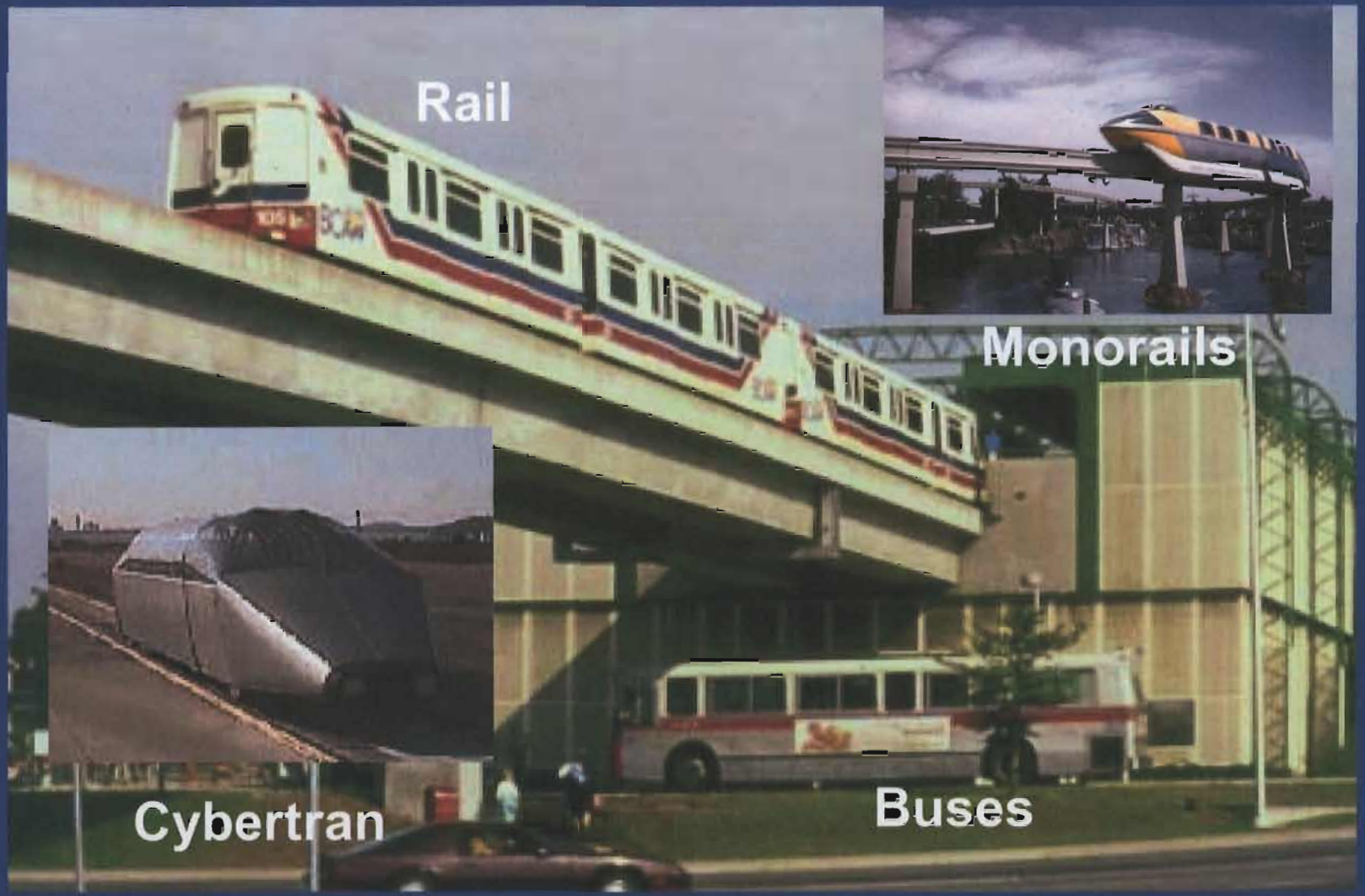
Networks vs. Corridors

Slow & Tedious



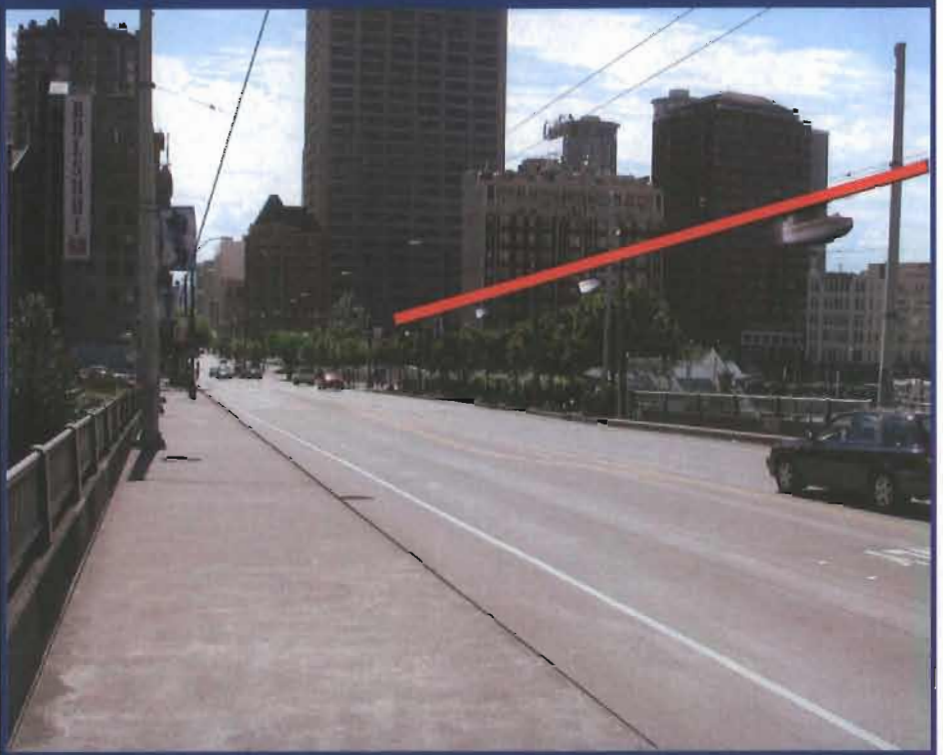
Even Congested Car Travel is Preferred

Corridor Solution: Group Transit



Only ~3% Use Rail/Buses

Group Transit Corridors vs. PRT Networks



Costly

Custom made in place.

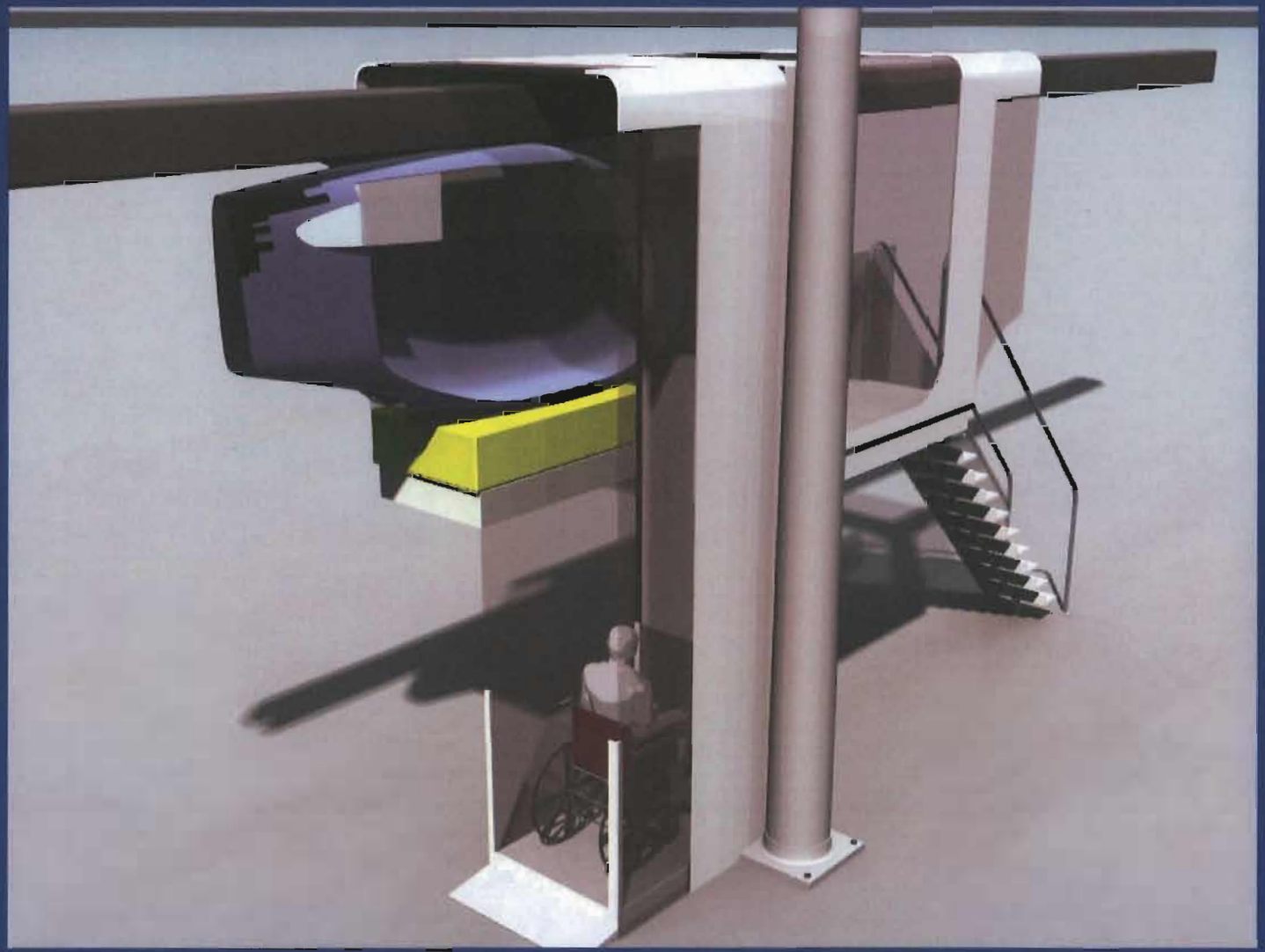
Affordable

Mass produced in factories.
Assembled in place.

www.SkyTran.net


SkyTran
Automated Electric Vehicle Guideway Network
No waiting. Individual on-demand vehicles
Non stop. Eliminates traffic lights, congestion
200 mpg equivalent

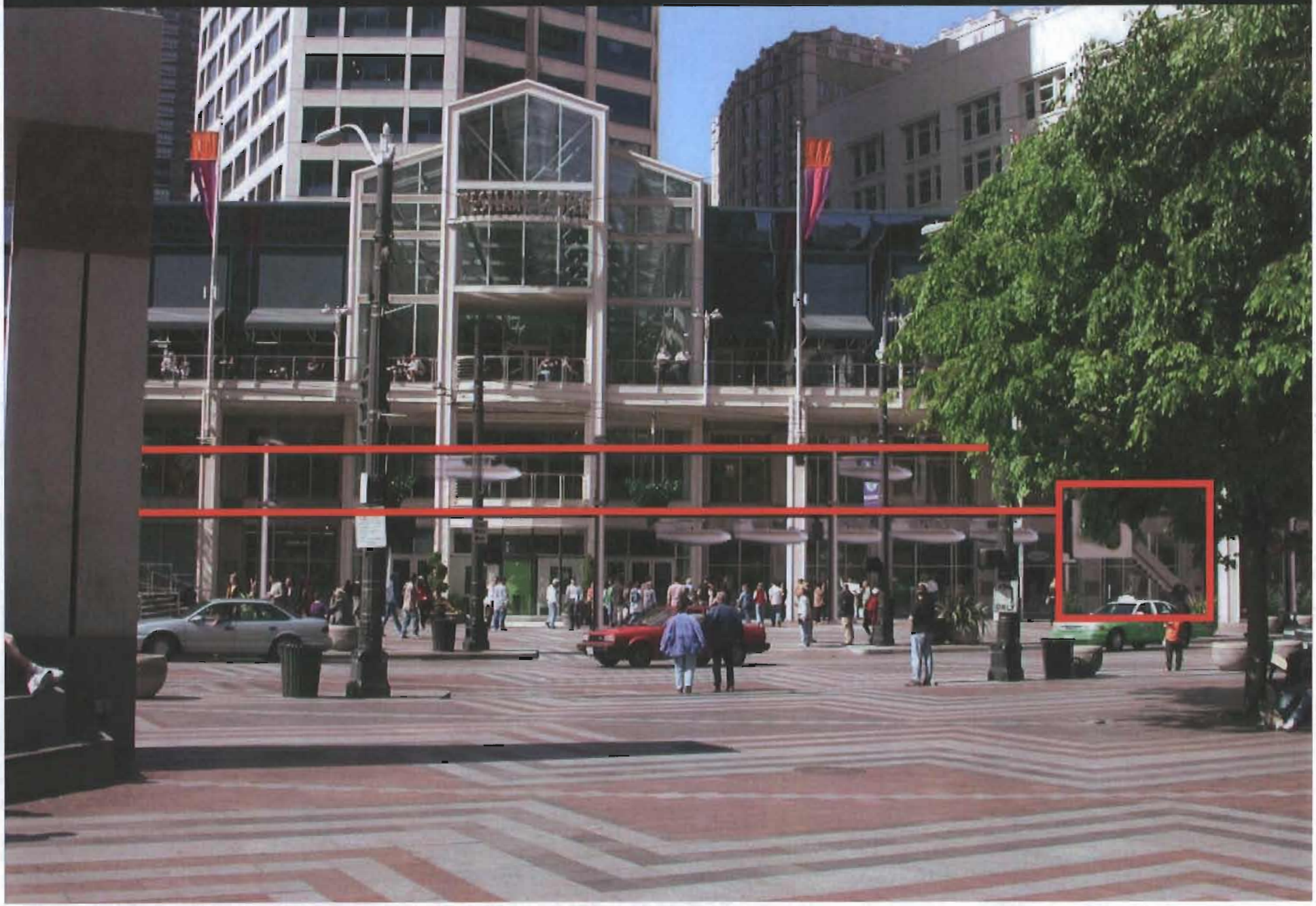
ADA Accessible Portals



SkyTran Guideway $10-15 million/mile

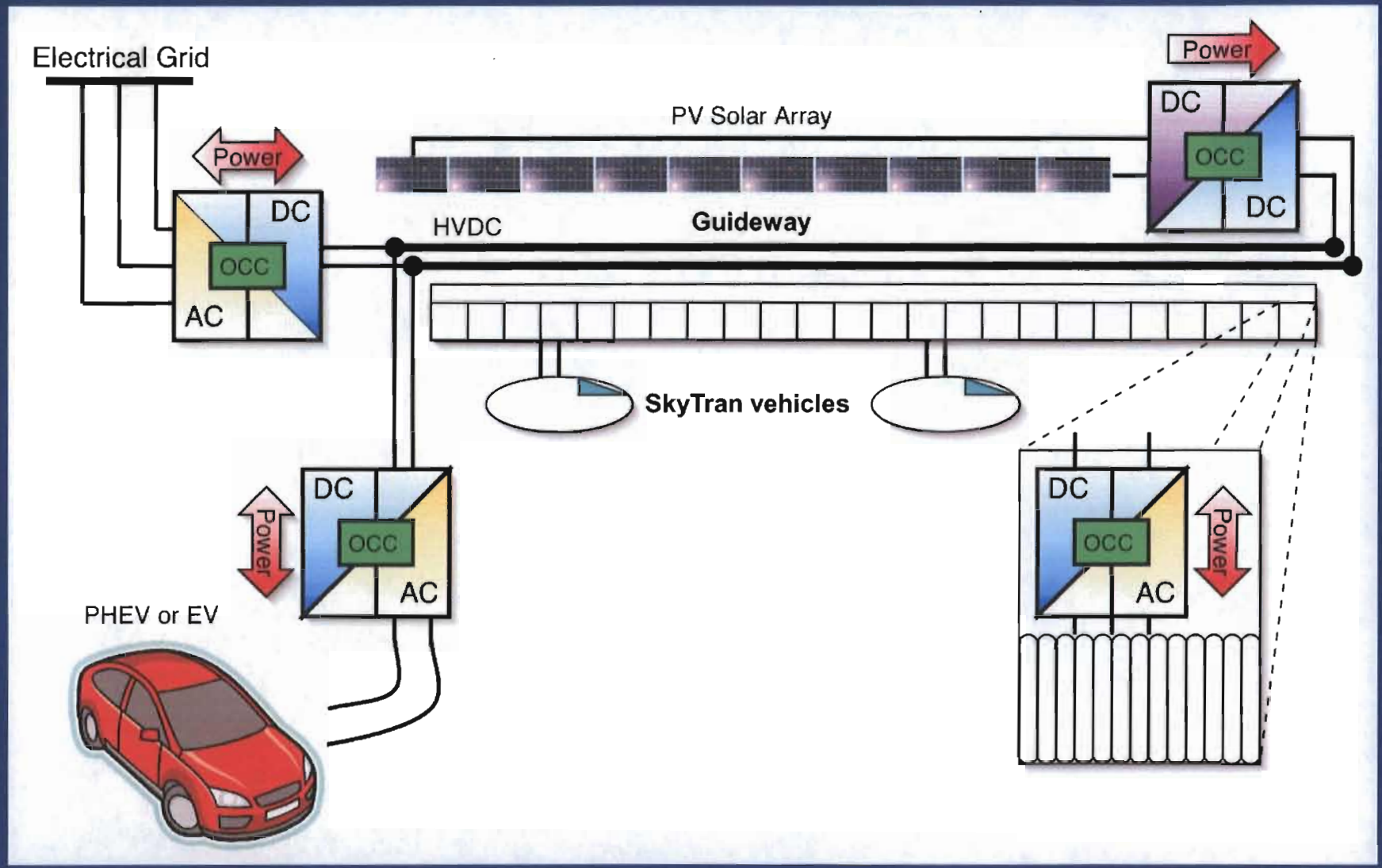
$1 million/mile Seattle sidewalk
$44 million/mile urban Interstate Highway (SkyTran guideway = 3 lanes)
$100 million/mile Expo Light Rail

SkyTran™ Blends with Cityscape



Electric Vehicle Hub

+ PHEV & EV Charging



2008 © One-Cycle Control, Inc.

OCC Contracts

- Government: **DOD, CEC, DOE**

Mobile Electric Power

Power Quality

Peak Reduction

Grid Support

Army Achievement Award (2010)
Selected from 471 candidates.

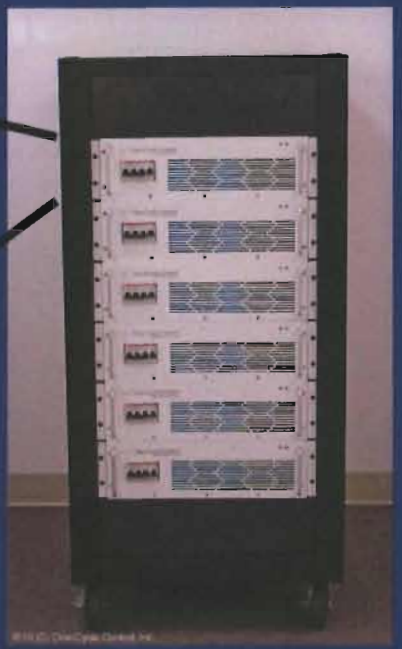
Three-Phase OCC Universal Converter

Universal: PFC, BDC, APF, MTR, UPS, GTI, etc.

~23 kg ~40 kW

Scalable

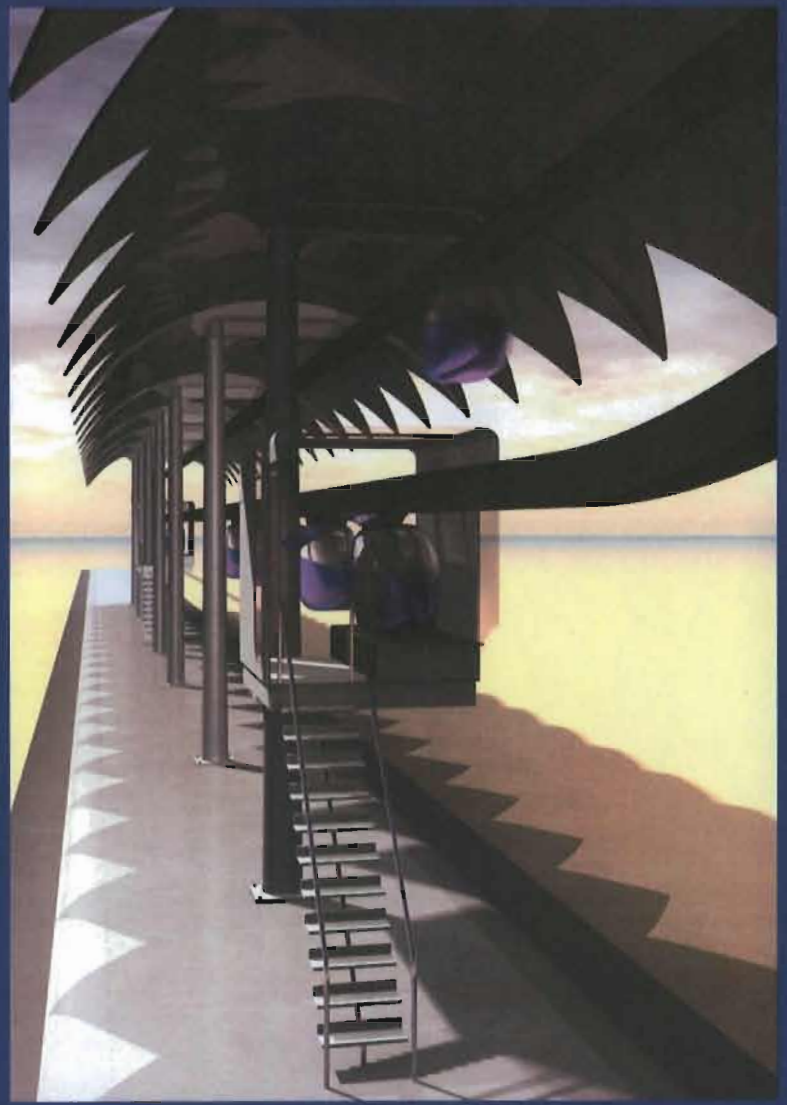
~270 kg 240 kW

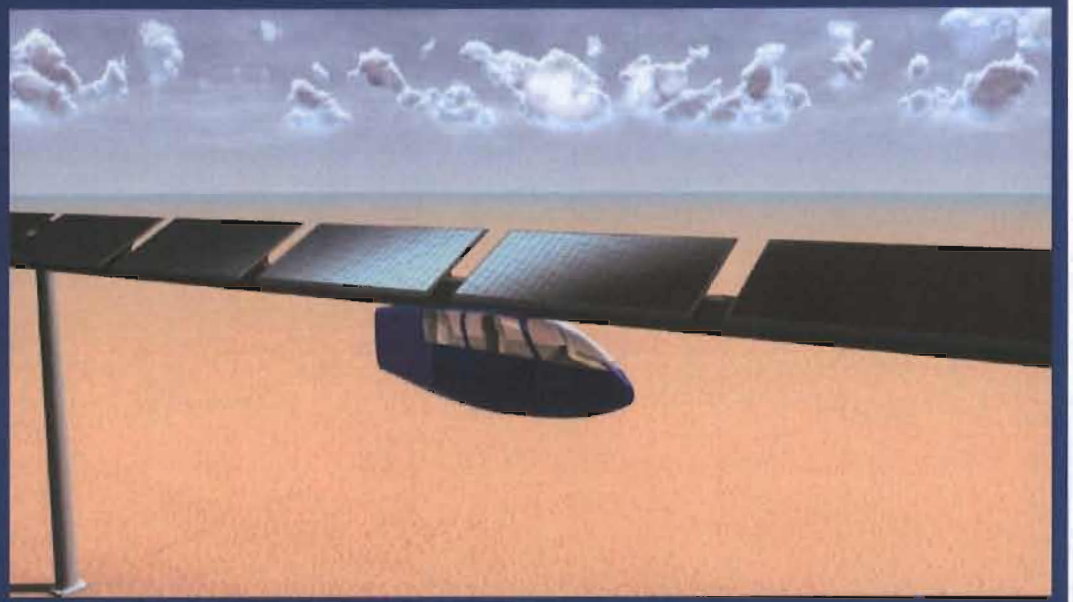


- 19" Rack Mount (3U) or Wall Mount
- High Performance; High Efficiency
- High Power Density (~20 W/in^3; ~1.2 W/cm^3)
- ETL Testing [APF, PFC, BDC] (~ 3Q' 2010) ==>
- Rack up units to process more power
  - Modular N+1 Redundancy; All Masters (no slaves)
  - Field serviceable: Unit Replacement

INTERTEK ETL CM LISTED

Solar-Powered SkyTran





Low power consumption

Affordable to power with PV

Grams CO2 Emissions per passenger mile

	SkyTran	EV	Gasoline Car
Weight	<1000 lbs	~3000 lbs	~3000 lbs
Wh/mile	100	300 - 500	0
gCO2/mile	10	30-50	400
CA Grid Impact (50% VMT)	8.5 BkWh (~3%)	25 BkWh (~10%)	0

Assumes: 108 g CO2/kWh California Mix (U.S. ~ 600 g CO2/kWh)
CA Electricity Consumption ~ 254 BkWh

SB 375 Challenges Solved by SkyTran

	GHG	TOD Land Use	Cost	Congestion
BRT				
Biofuels			dilemma	
PHEV EV			dilemma	
SkyTran PRT				

Station typologie **2** compact station in median

Past

SkyTran

LOISOS + UBBELOHDE
ARCHITECTURE . ENERGY

Station typologie **2** compact station in median

Current

SkyTran

LOISOS + UBBELOHDE
ARCHITECTURE · ENERGY

Station typologie **2** compact station in median

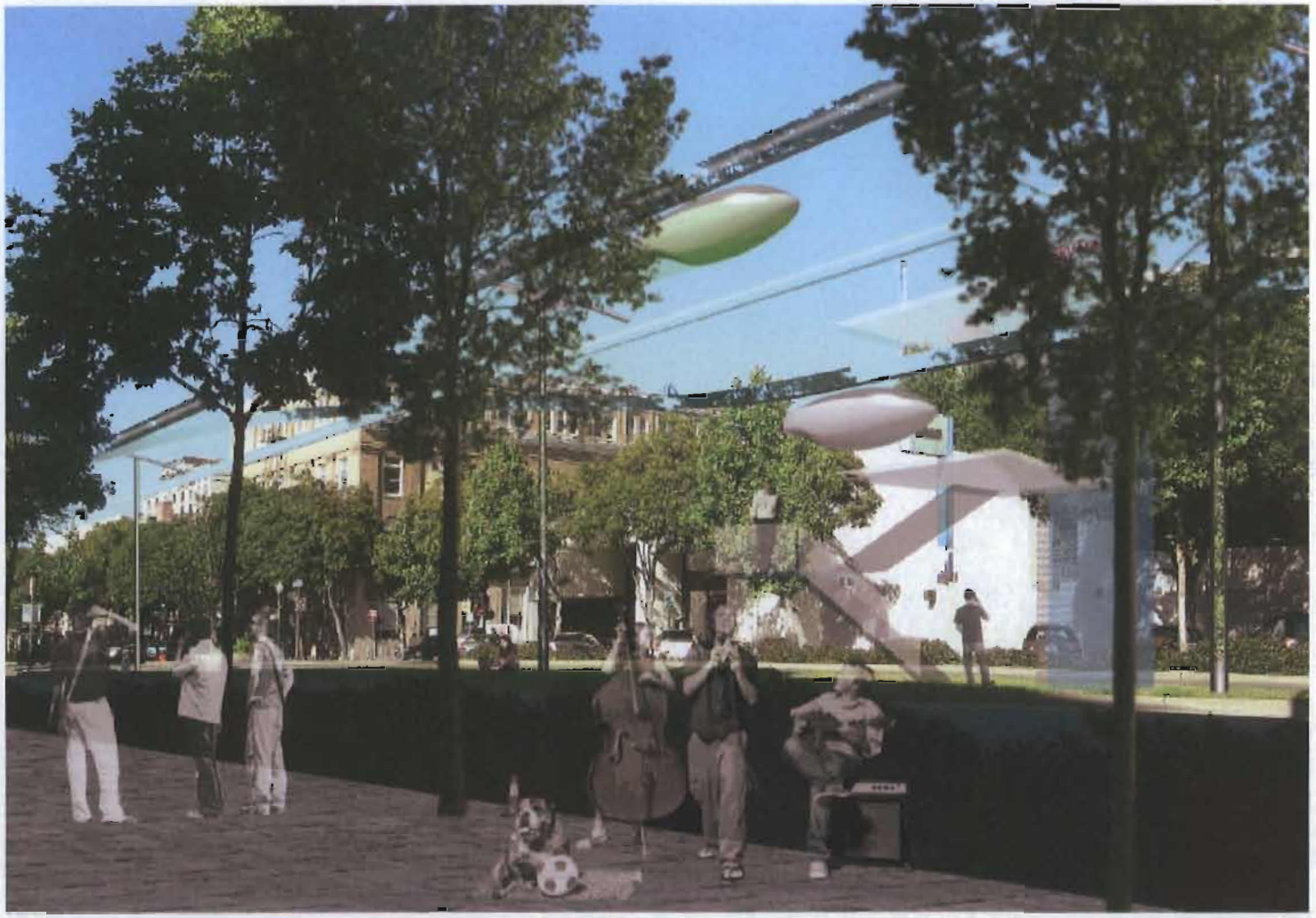
With Sky Tran

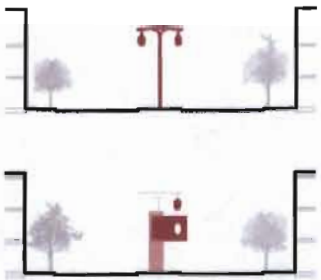
SkyTran

LOISOS + UBBELOHDE
ARCHITECTURE . ENERGY

station typology **2** compact station in median

Future with Sky Tran





SkyTran

LOISOS + UBBELOHDE
ARCHITECTURE · ENERGY

California Opportunities

City of San Jose

Santa Clara Valley Transit Authority (VTA)

City of Santa Cruz

City of Mountain View

Marin County

Fresno

Los Angeles

Pleasanton (HBP)

Export Opportunities

New Orleans, LA

Las Vegas, NV

University of Michigan, Ann Arbor

Ithaca, NY

Sweden

Brazil

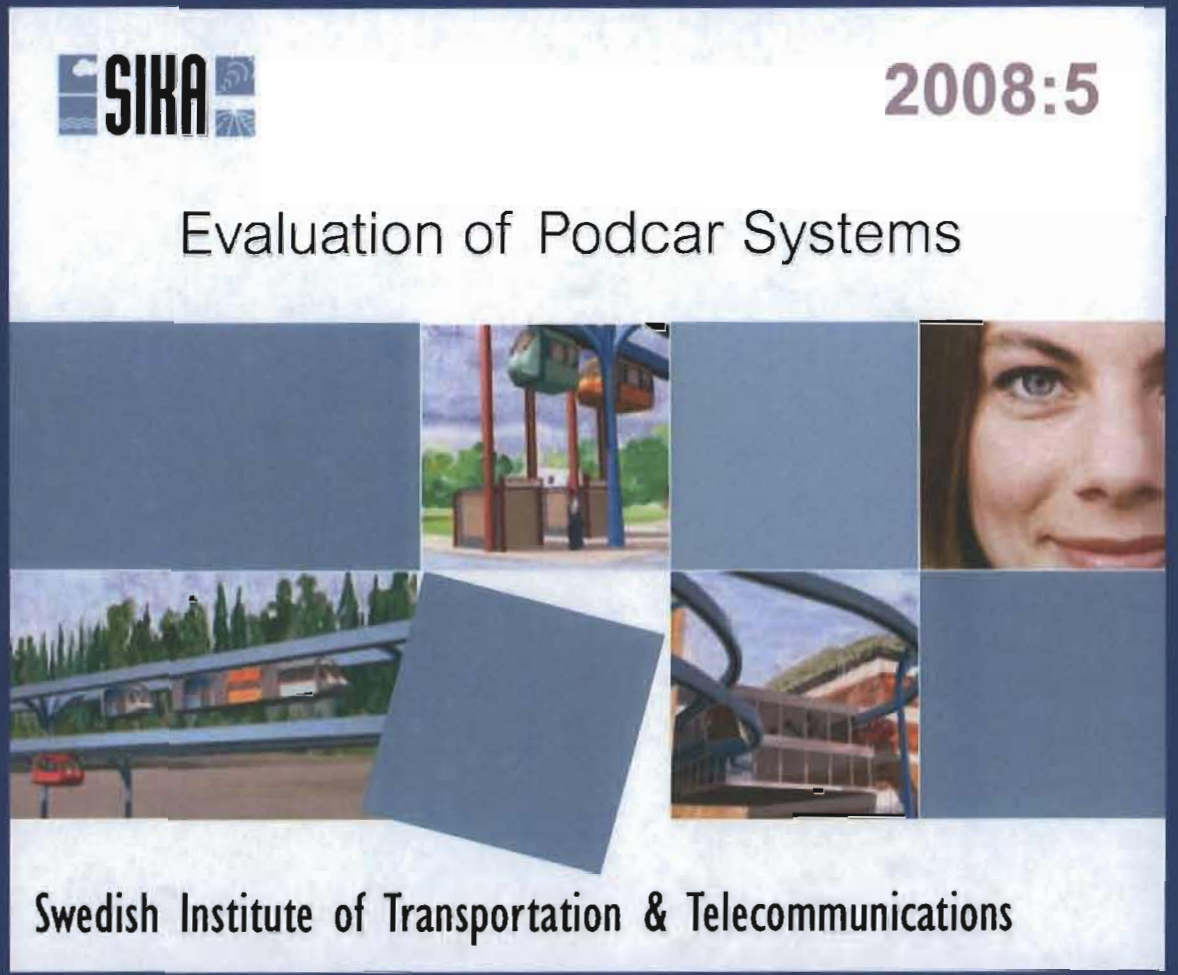
United Arab Emirates

India

Competitive Advantage

"While podcars [PRT] have been seen primarily as a local transport system, SIKA believes that podcars have the potential for both local and long-distance transportation…

…SIKA envisions a [system] offering local systems running at 25-50 kmph *as well as* regional and long distance systems, ***running at 80-250 kmph."***



Lost Opportunity

The CEC Can Make a Real Difference

The Path to Global Leadership

California PRT Demonstration System

Automated Electric Vehicle Maglev Guideway System

California PRT Demonstration System

Hardware Reference Platform (HRP)

Technology Demonstration

Energy Efficiency & GHG Evaluation Platform

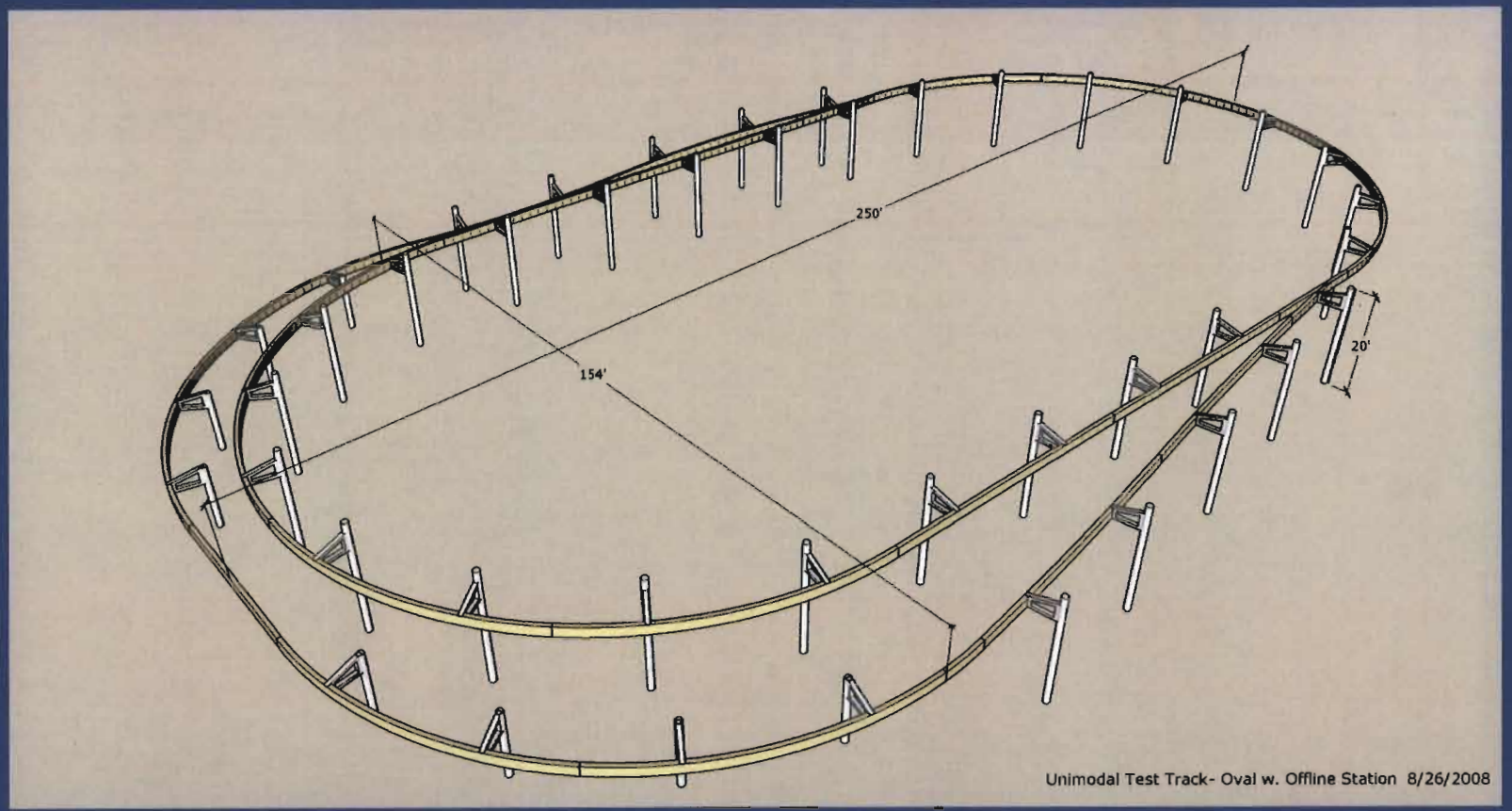
Manufacturing / Installation Development Tool

Government & Regulatory Review Platform

On-going R&D Platform

Budget: $10m

California PRT Demonstration System



1,000 ft. Elevated Maglev Guideway

3 Automated Vehicles

2 Switches

1 Off-line Station

Public Private Partnership

Private Infrastructure Investment Available

Current Design Build Finance Operate (DBFO) MOUs in place

Local, regional, statewide PRT networks

Manufacturing capability

Government Grants & Concessions

Demonstration

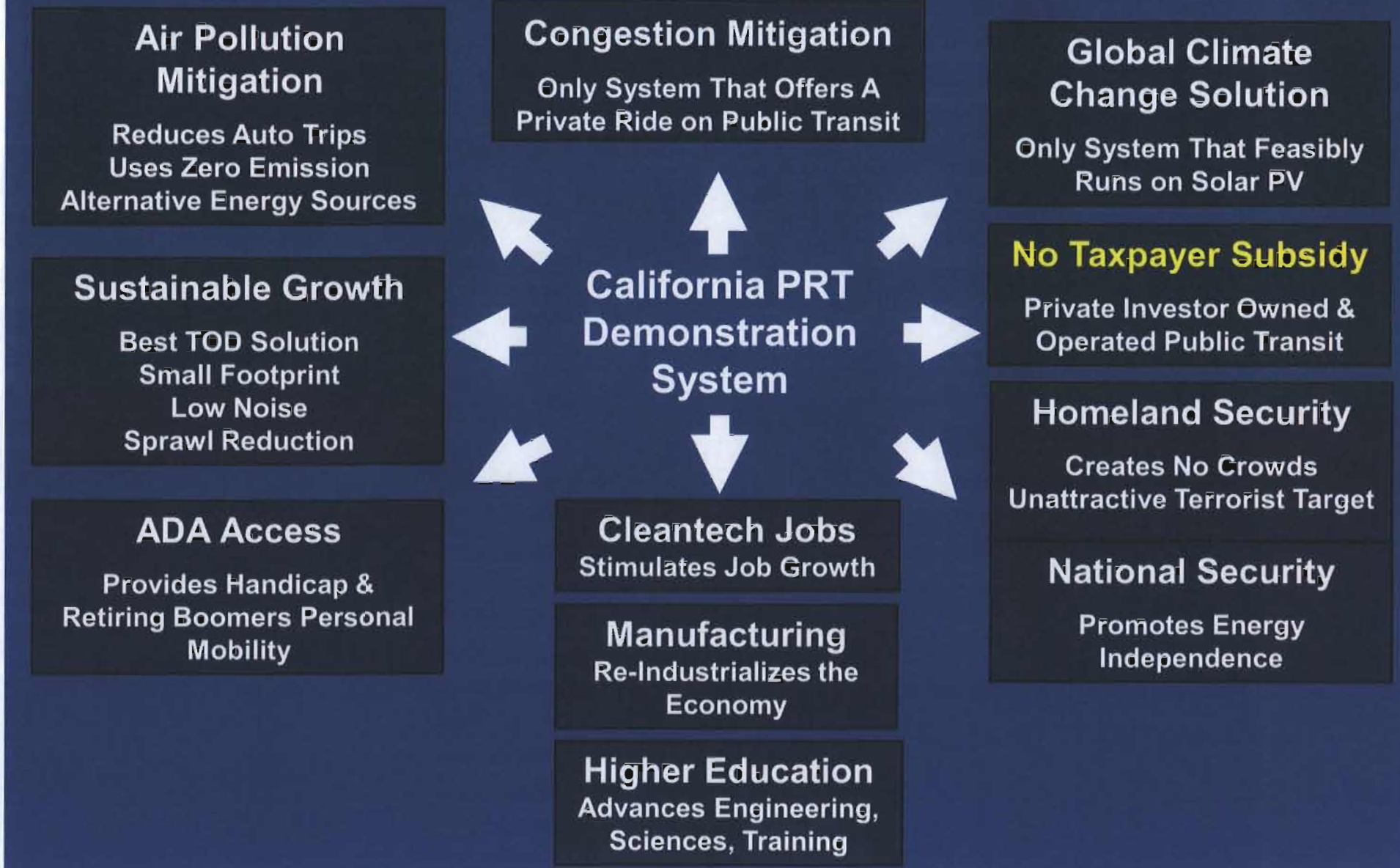
Right of Way

Workforce development

Manufacturing retrofitting

The Big Picture

Synergy of Economic & Sustainability Benefits



California Energy Commission

Alternative and Renewable Fuel and Vehicle Technology Program

July 12, 2010

Thank you!

Presentation by

Christopher Perkins

Chairman, Unimodal Systems LLC

Gregory T. Smedley, Ph.D.

CEO, One Cycle Control Inc.