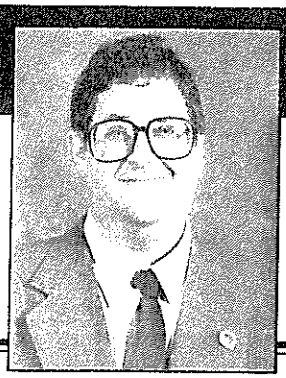

News ...

FROM COUNCIL MEMBER

LEWIS A. FIDLER

ASSISTANT MAJORITY LEADER

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Fidler's Hydrogen Fuel Cell Cars Reso Seeks 'Greener Environment' for Planet, 'Greener Economy' for City

Environmental Protection Chairman Gennaro Joins Fidler in Urging Congress And NYC to Develop and Advance Hydrogen Fuel Cell Technology

GM Sends Two Fuel Cell Cars to City Hall in Support of Hearing and Legislation

At a time when our city needs the economic infusion of a new growth industry nearly as much as our planet needs us to be more industrially responsible, Council Member Lew Fidler has sponsored a resolution that aims to put us on the path toward both these impending necessities. On Thursday, May 7, the Council's Environmental Protection Committee heard Proposed Resolution No. 1223-A, a resolution sponsored and championed by Fidler, the Council's Assistant Majority Leader and a Member from the southeastern part of Brooklyn.

The dual objectives of this oversight hearing on Hydrogen Fuel Cell Vehicles and the Transition to Alternative Technologies were to: (1) Push the city to move forward with the development of the infrastructure needed for these cars, investigating whether we can turn the production of hydrogen into the new growth industry our city needs; and (2) Urge Congress to push hydrogen fuel cell cars forward on the national level. With specific regards to the latter, the resolution calls upon the U.S. Congress to both "fully explore adopting legislation and/or regulatory measures to incentivize the immediate marketing and use of hydrogen fuel cell vehicles" as well as "develop the re-fueling infrastructure to support these vehicles and to consider making the manufacture and importation of gasoline combustion vehicles unlawful" by a date that would be later determined.

While the process of producing energy via hydrogen fuel cells is rather involved, the basic dynamic is fairly simple. 'Fuel cells,' or electrochemical energy conversion devices, convert hydrogen and oxygen into water. In the process, electricity is produced. And unlike simpler electrochemical devices such as batteries, they do so in a cyclical, self-sustaining nature. This means that a fuel cell will never go 'dead' so long as there is a constant flow of chemicals into it. With this flow of chemicals in, comes a constant flow of electricity out. This is why cars powered purely by hydrogen fuel cells possess the potential to be exponentially more fuel and energy efficient than even the most efficient 'hybrid' (part-gasoline/part-electric) or electric battery-powered models.

"Hydrogen fuel cell vehicles are the Holy Grail," declared Fidler. "They are zero emission, totally non-polluting automobiles. We are inches away from the technological leap needed to mainstream them

and that leap will change the world. We will be taking huge steps to clean our air, to be less dependent on foreign oil and it will have earth shaking geo-political consequences."

According to U.S. State Department figures, America is currently forced to import 55% of its oil. Two-thirds of all oil we use on a daily basis is for transportation. The organization Fuel Cells 2000, supports estimations that the amount of oil we'll have to import by 2025 will grow to 68% of our total oil. This means that even if every vehicle on the streets of America today were a hybrid car, the amount of oil we'd need to import by 2025 would still be equal to the amount we need to import right now. And by that time, oil is bound to only be in far lesser supply and at a far higher price.

Fidler further remarked, "It behooves us to press this envelope forward in any way we can, to start working now on developing the infrastructure necessary to support these vehicles in a safe and energy efficient way. And while we are at it, there is no reason that New York City cannot become a leader in the clean, efficient production of hydrogen. I am urging the Bloomberg Administration to press this agenda forward now as part of a plan for a greener, cleaner future for New York."

Supporting these sentiments, Council Member James Gennaro of Queens, Chairperson of the Environmental Protection Committee, stated "Two-thirds of all petroleum use in the country is for transportation, causing 82 percent of total U.S. greenhouse gas emissions. Here we have a vehicle powered entirely by hydrogen, one of the most common elements on our planet, and does not emit any greenhouse gases. This promising technology should be encouraged in our quest to reduce our carbon footprint on this planet."

Presenting testimony at the hearing in support of Fidler's resolution was Daniel O'Connell, the Director of Fuel Cell Activities for General Motors. In fact, O'Connell did more than just present testimony; he and a colleague drove two of GM's newest Chevrolet Equinox Fuel Cell vehicles directly to City Hall, where the cars were displayed for all Members of the Committee to see or even test drive if they wished. The exterior paint on these cars was a color GM termed "Glacial Gold." Perhaps this corporate term to describe the car's outside was the perfect metaphor for the new hope its inside holds for both our economy and the world in which we live and which we want our children to still be able to safely inhabit.

For further information: **Lew Fidler** **(917) 763-0562**
Bryan Lee **(212) 788-7286; (917) 846-1944**

Daniel B. O'Connell –Director of GM Fuel Cell Commercialization
General Motors Statement for NY City Resolution No. 1223A – May 7, 2009.

General Motors first Fuel Cell vehicle was built in 1968. The Global Fuel Cell Program was reestablished in 1990 in conjunction with Los Alamos Lab and moved to our Facility in upstate New York in 1996. Our facilities and resources have expanded in NY State several times since then and now employ nearly 400 people.

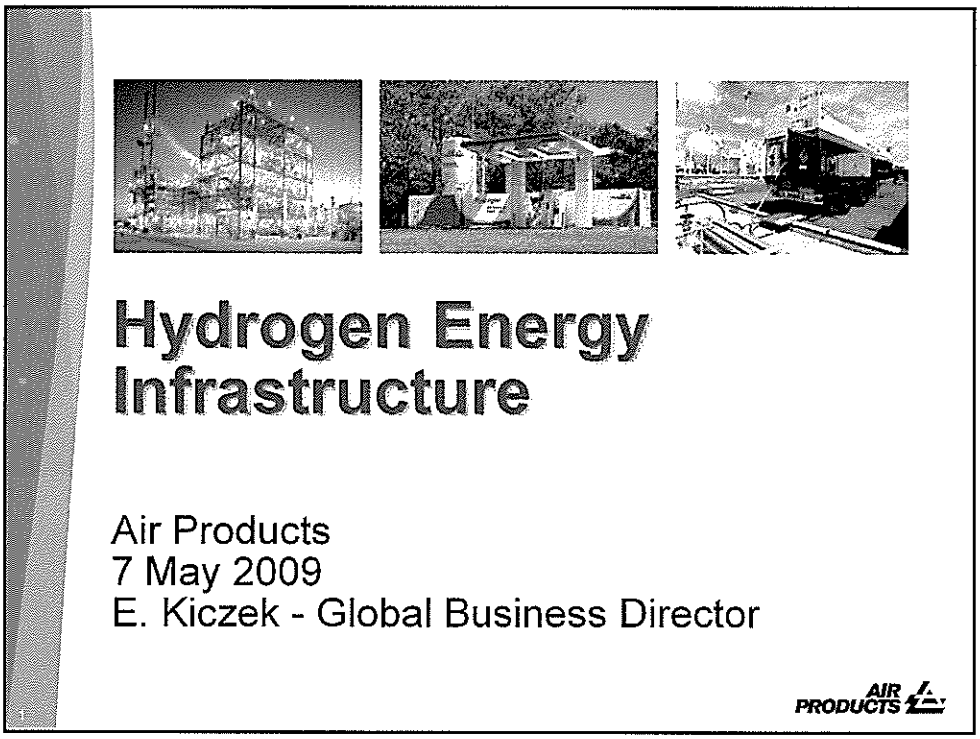
General Motors has taken a leadership role and deployed over 100 Chevrolet Equinox Fuel Cell Electric Vehicles under Project Driveway. Our intention was to get real drivers in real vehicles under real operating conditions. The vehicles have been completely tested and fully certified to meet all current Fuel Cell FMVSS requirements. More than 30 of those vehicles have been operating in NY State for the past 20 months and have performed very well including two very cold winters. Some of our vehicles are well over 20,000 miles and still running very well.

Our drivers have accumulated nearly 750,000 miles with the vehicles and refueled nearly 12,000 times. More than 60 mainstream drivers, municipalities, government agencies, celebrities and the Military have experienced the pleasure of driving our zero emission, zero petroleum hydrogen powered fuel cell vehicles. We have had overwhelmingly positive response to the vehicles with the General Motors Fuel Cell technology inside and we received more than 80,000 applications on our web site to participate in Project Driveway. General Motors has trained nearly 1,400 First Responders on the safety systems and over 300 Technicians on how to service fuel cell vehicles.

General Motors designed, purchased and installed 8 refueling stations across the United States to support our first mover position on Fuel Cell vehicles. In addition we worked with our DoE partner Shell Hydrogen to install an additional 5 stations that we expect will open very soon. The City of White Plains, Town of Hempstead as well as Monroe County and Rochester Institute of Technology have stepped up to take a lead role in installing Hydrogen refueling stations

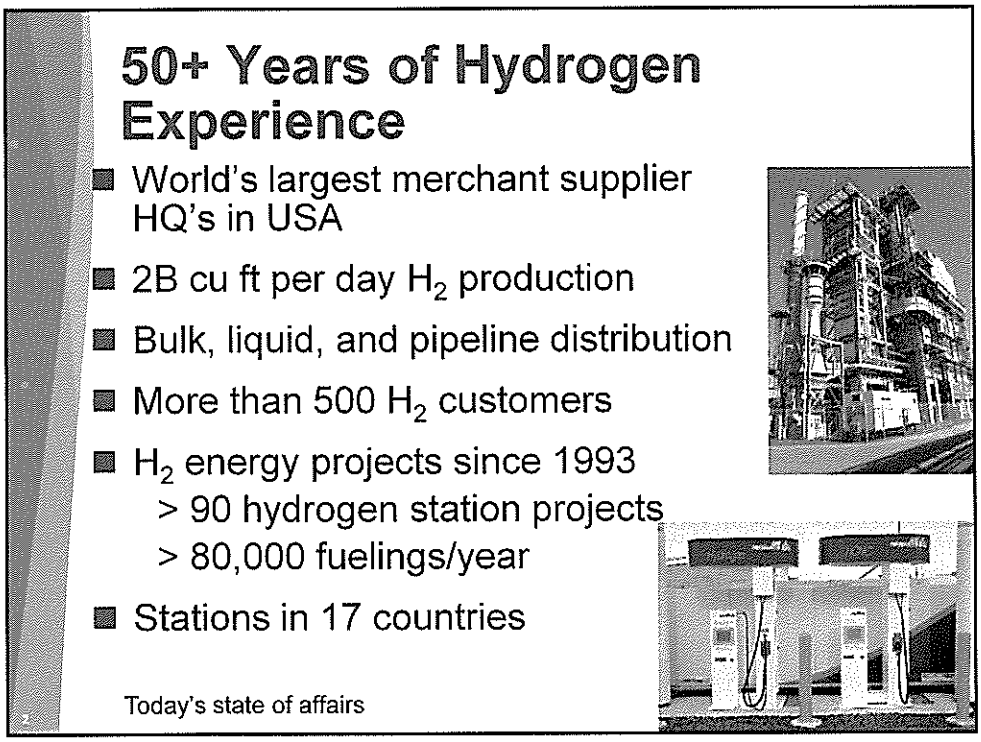
NY State is ideally situated to lead the way in the Hydrogen Infrastructure required to support the introduction of Fuel Cell vehicles. Some Project Driveway refueling stations are using byproduct hydrogen produced from the Chlor-Alkali industry in Niagara Falls, NY. Utilizing this 'green' hydrogen from a renewable source - hydropower - results in a real-world validated 85% reduction in CO2 emissions over a comparable gasoline powered Internal Combustion Engine vehicle and fuel delivery system on a wells to wheels basis. If our fleet of vehicles used the Praxair green hydrogen available here in NY we could have saved 625,000 pounds of CO2 to date.

We are currently working with NYSERDA to install a Hydrogen Highway that would allow our drivers to go from one end of the state to the other. This would not only require funding but also standardization of the codes and the permitting process required to install Hydrogen refueling stations in NY City as well as throughout the state. The Chevrolet Equinox Fuel Cell Electric Vehicle I drove here today and you had the experience of driving earlier gets nearly 2X the fuel economy with zero CO2 emissions. We invite the Council members to tour our Facility in Ardsley our tour any of our network of stations to learn more about the impressive progress being made in the effort to commercialize fuel cell technology. General Motors believes that Fuel Cell Electric Vehicles offers the fast refill time combined with long driving range that our customers demand.



Thank you for the opportunity to address this Committee. My name in Ed Kiczek, I am the Global Business Director of the Hydrogen Energy Systems Group for Air Products , **Air Products** is the worlds largest supplier of merchant hydrogen. My talk today isn't going to delve deeply into the economics of hydrogen production and supply. There is plenty of credible information, literally volumes, that demonstrates that on a large scale, hydrogen can be produced and delivered at a price comparable to gasoline at an equivalent of $2.50/gasoline gallon.

What I'd like to focus on with my time here this morning is where hydrogen is today; provide hydrogen infrastructure deployment thoughts for the coming years; and present some ideas how NYC can be a leader in this effort.



Air Products applauds NYC for taking the time to discuss and recognize the potential gains of pursuing alternative energy. For 50+ years that Air Products has been making and distributing hydrogen.

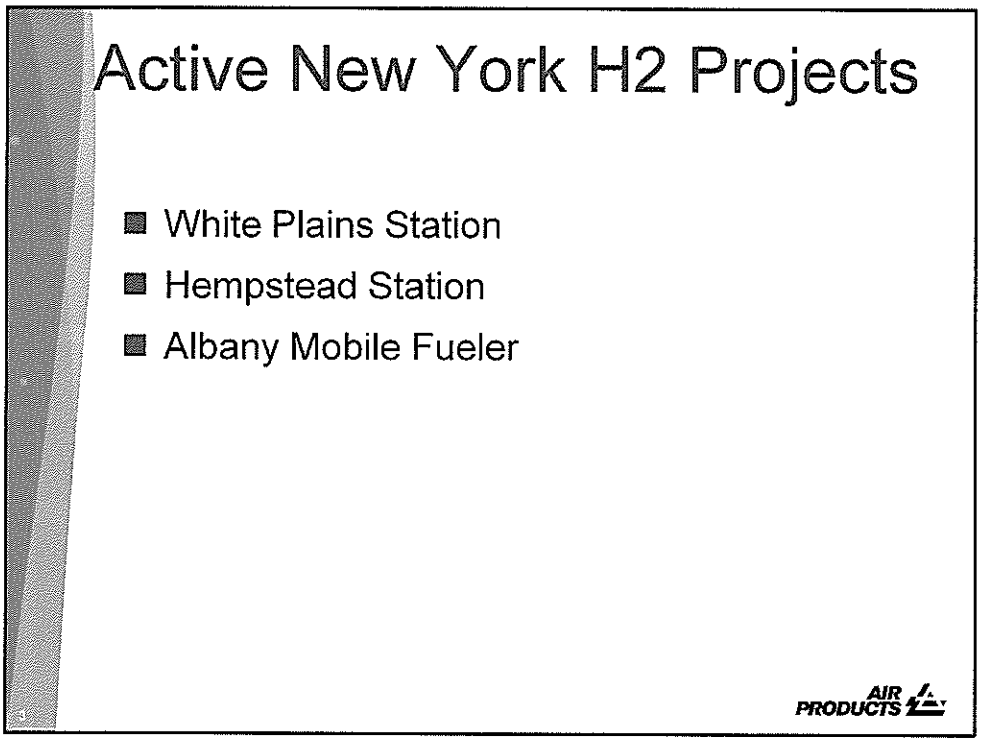
We produce 2B scf/day of hydrogen. Most of this is used to help make cleaner burning gasolines at refineries around the world. Hydrogen is also used in making steel, glass, electronic components and pharmaceuticals and is imbedded into products we touch everyday.

Another way to view this massive hydrogen production, however, is to realize that if Air Products used this hydrogen to directly fuel transportation vehicles, we could fuel 7-8 million vehicles per day.

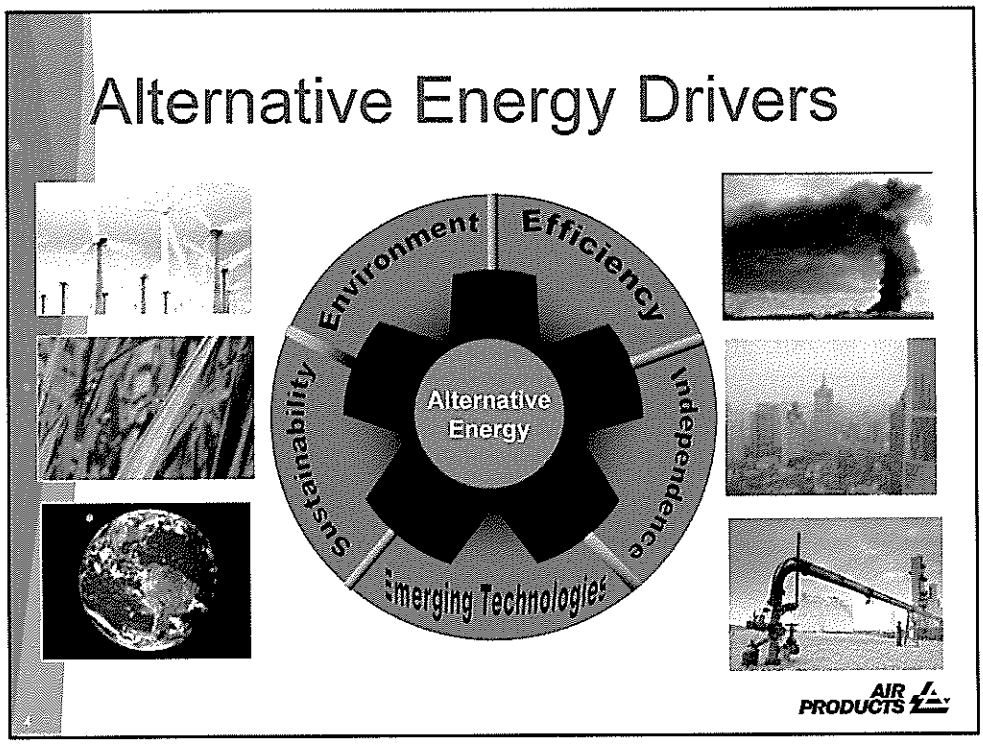
Air Products has been working with the federal government and several state and local governments, as well as being active internationally and with other industry partners on hydrogen projects for many years. We have built over 90 fueling stations in 17 countries and are conducting technical research work that will help support this emerging industry.

An example of project with a New York company, is a project with the United States Department of Defense, Plug Power, Inc. (based in NY state) and our country's largest defense depot in Pennsylvania, for a scale-up deployment of hydrogen powered materials handling equipment. Plug power is supplying the fuel cell packs for the forklifts. Air Products is supplying the hydrogen and dispensing equipment. Also in NY there was a recent announcement of a groundbreaking for an Air Products fueling station to be located in the Town of Hempstead for Long Island's first hydrogen fueling station for vehicles.

Projects like this are rapidly increasing, not only in the government sector, but also within the private sector. This is evidenced by the fact that by next year Air Products will have experienced a threefold increase in the number of hydrogen fuelings from 80,000 /year to a projected 250,000 fuelings by December.



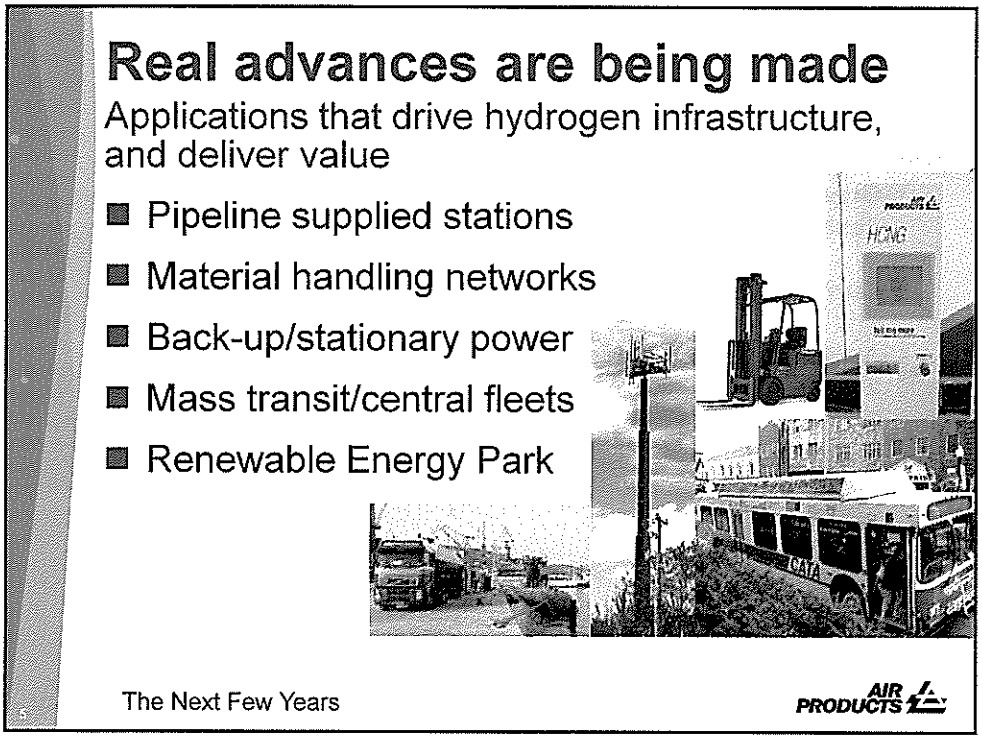
Closer to home , we have several projects in the state of New York. Fuelling stations in White Plains, the one coming on line at Hempstead that I mentioned, and previous demonstration efforts with our mobile fuelers in Albany. We have worked closely with NYSERDA in several of these projects. And we are currently in discussions with the major stakeholders for the hydrogen highway in New York State. Additionally, we have worked closely worldwide with the Clinton Climate Initiative located here in NYC to educate the public on the value on hydrogen as an alternative fuel.



The drivers toward a new energy landscape will be based on 4 key drivers.

- Improved efficiency to more wisely use our precious energy resources.
- Energy sources which reduce our dependence on foreign supplies, especially those where regional instabilities can have severe consequences.
- Improvement in the emissions footprint to reduce global warming and atmospheric pollution.
- And a sustainable energy supply for the long term.

A host of technologies are vying to become next generation energy platform. Hydrogen, Plug-ins, Batteries, Bio-fuels, etc. When closely examined, it is hydrogen which meets the four-driver criteria the best. A fuel cell is 2.5-3.0 times more efficient that an internal combustion engine, when produced from natural gas, hydrogen has 50% less of the carbon and emissions footprint of gasoline, and when hydrogen is made from water, biomass, or renewable power and converted in a fuel cell it can be the forever fuel. Hydrogen fuel cells have a better carbon footprint and well-to-wheels efficiency than plug-ins and battery vehicles. And, fuel cell vehicles come closest to delivering the same value proposition as the gasoline vehicles we drive today. To us, and many others, hydrogen is an obvious choice.



While plenty of the public's mental imagery around the hydrogen economy relates to cars and gas stations, there are several non-auto deployments happening today. These deployments and technology are advancing hydrogen as a fuel in real-world every day use situations.

Of note are a few hydrogen energy applications that are far less public than cars, material handling vehicles – like fork lifts and lift trucks in warehouses and stores, submarines, cell phone towers, and mass transit, bus fleets. Air Products hydrogen fueling technology was in place for the most recent Olympic Games in Beijing powering buses that transported athletes and visitors at the games. These applications are advancing infrastructure roll-outs and providing real every day opportunities to develop technologies in both the production and use sides of the equation. And, we are deploying renewable production of hydrogen technologies which convert waste water sludge to hydrogen.

Bus fleets are particularly amenable early adopters of hydrogen users as these are vehicles that "come home" every night to fuel. Bus fleets are incredibly useful to help deploy hydrogen production, distribution, and dispensing infrastructure. These are the bus fleets like MTA.

I would like to relate to you some key projects and their significance in progressing hydrogen as a fuel.

Pipeline Station Torrance, CA

Greenfield station, retail-like design

Currently in permitting phase

Anticipated onstream early 2010

Will demonstrate a fuel price competitive to gasoline.

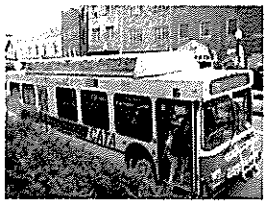
6

AIR PRODUCTS

Of particular note under the infrastructure effort is a station that we will be building as the **world's first pipeline station**. This fueling station will show that in concept a pipeline distribution system similar to that of natural gas will provide competitive pricing to gasoline as a long-term vision. This station will be built in California and will be visible from the 405 freeway in the LA Basin. It will be a show case for the future. It is a showcase because it will demonstrate that hydrogen in a fully deployed mode **WILL BE COST COMPETITIVE WITH GASOLINE.** Participants in this project include the DOE, AQMD, Air Products and Shell with vehicles from Toyota, Honda, GM and Daimler.

Mass Transit-ion Opportunities

- Bus fleets around the world are striving to reduce emissions
- Various technologies are being deployed, including:
  - Fuel Cell
  - H2 –CNG Blends
  - H2 Internal Combustion Engine



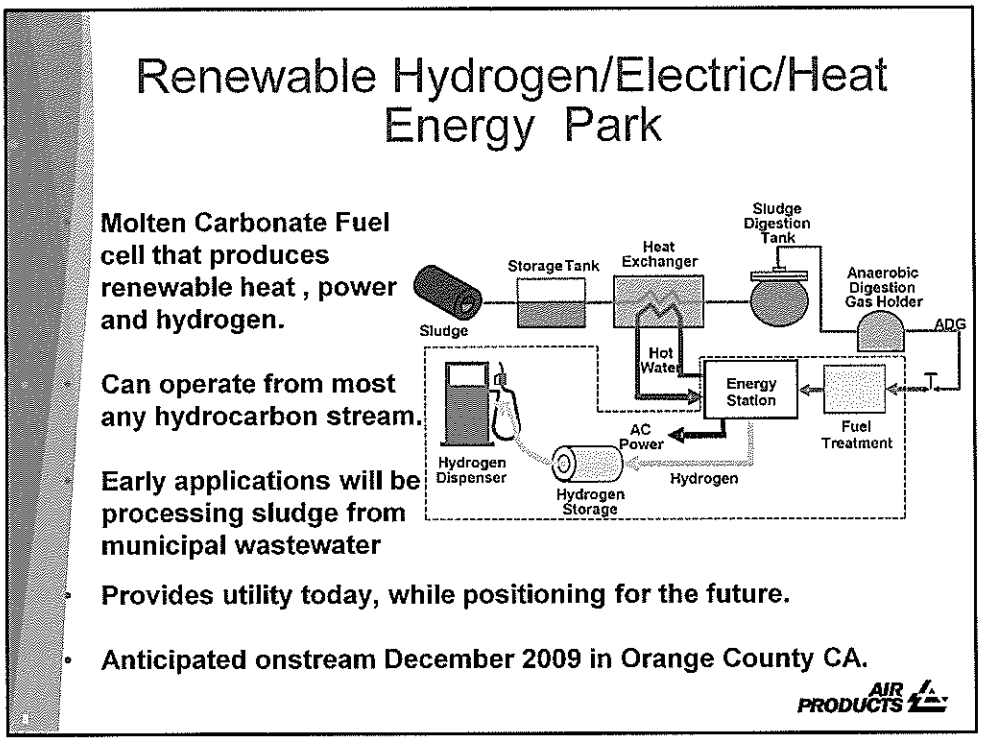
- Bus fleets are convenient from an infrastructure standpoint, as all buses fuel at the same location.
  - One fueling station required. Significant throughput possible.
- Meets EPA 2010 emissions criteria
- Heavy duty vehicles at ports also amenable.

AIR PRODUCTS

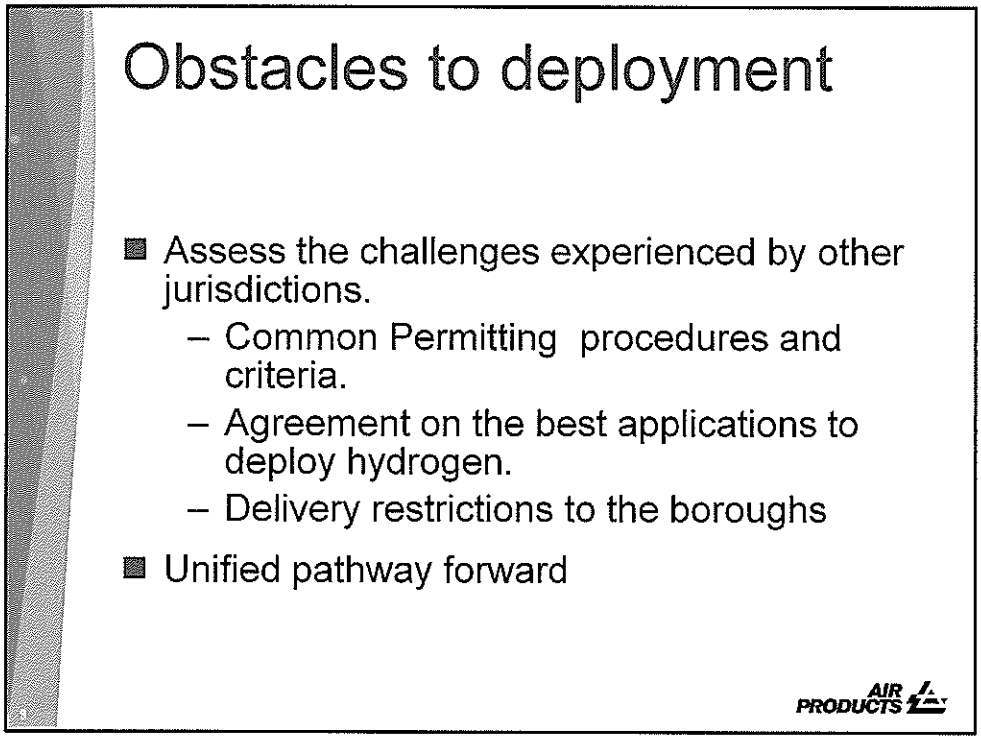
Over the next few years we expect to see the emergence of hydrogen blends and fuel cell technologies as important parts of energy infrastructure. **These are blends of H2 and Natural gas or HCNG.** Applications in mass transit are occurring in Germany , the UK, Spain, India and Korea moving more rapidly than the US.

The applications we continue to target as large volume users for hydrogen is mass transit to seed infrastructure in major areas. HCNG blends reduce emissions by up to 50% compared to traditional fuels. Bus fleets serve as an opportunity to seed hydrogen in an area from which it can be disturbed locally in a hub and spoke fashion.

Additionally, heavy duty vehicles at ports would be amenable to this technology. Vehicles such as drayage trucks.

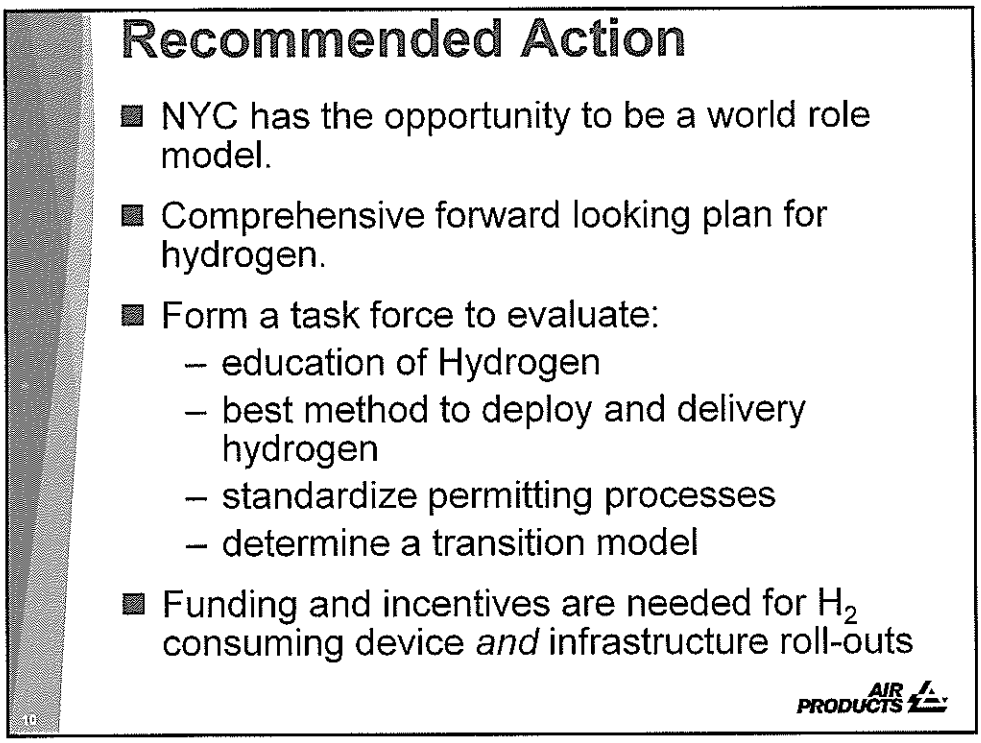


For production of hydrogen, New York's energy plan has a high concentration on renewables. **The fact is that H2 can be produced from renewable waste sources.** A product of ours that fits that application and positions for the future is the molten carbonate fuel cell based energy park. This renewable energy park can produce heat, power and hydrogen from the sludge of a wastewater treatment plant. Where you have people, there is wastewater effluent which can be converted to energy products. And, New York has plenty of people. The first of these units will be on-stream in Orange County California by the end of this calendar year. For every 100,000 people , this product can produce 1MW of power and 500kg/day of hydrogen – all renewable.



How can NYC move forward to the hydrogen economy? Our suggestion would be to first develop an understanding of the obstacles to deployment that have been experienced in many other jurisdictions around the country and for NYC. These issues include permitting and inconsistencies between jurisdictions having authority on these issues -- mainly because hydrogen is a new fuel. There is a learning curve that must be achieved on hydrogen.

A second challenge would be to determine the best applications for the deployment of hydrogen. Is it for fleet vehicles, buses using H2 or hydrogen/natural gas blends? Is it with converting wastes at your wastewater treatment facilities into hydrogen to then generate electrical power, or H2 for transportation vehicles? Or is it finding available gasoline stations with sufficient space for the addition of hydrogen fuel dispensers and also addressing the current restrictions of bringing hydrogen into the NYC boroughs via traditional means of gaseous or liquid delivery through tunnels or bridges.



NYC has the opportunity, because of its stature around the world, to be a role model in advancing alternative energy. We would suggest that a task force we formed to determine how best NYC can take advantage of this stature. This task force could among other objectives determine how best to deploy hydrogen in the city, determine solutions to common permitting processes and provide hydrogen education to the city's residents. Hydrogen is no more or less safe than gasoline , its just a different fuel, with different properties.

With such a plan in place, incentives and funding from both federal, state and city sources could drive hydrogen deployment projects as a showcase to the world. Federal incentives already exist for a $200,000 infrastructure tax credit and $3000/kw fuel cell credit. Further local credits and grants could additionally incent a hydrogen roll-out in the city and bring with it all the positives of using this alternative and potentially renewable form of energy.

In conclusion, we face an uncertain energy future, we need to solve this issue as a legacy for all future generations. I hope that history will write that NYC was a beacon leading the way in alternative energy.

Thank You.


Thank You !
11
AIR PRODUCTS

Testimony by Raymond J. Kenard, President of American Wind Power & Hydrogen, and Member of the Executive Committee of National Hydrogen Association at the New York City Council on May 7, 2009

Topic : Hydrogen Fuel Cell Vehicles and the Transition to Alternate Technologies

I.

Members of the Environmental Protection Committee of the New York City Council, thank you for allowing me to testify today before you concerning hydrogen fuel cell vehicles. American Wind Power & Hydrogen (AWP&H) has been promoting the concept of hydrogen as a fuel for transportation in New York State for the past five years. So we are pleased to testify and support the Council's effort to improve energy security, reduce petroleum consumption, reduce greenhouse gas emissions and reduce generally the emission of criteria pollutants that cause asthma and other medical problems in New York City.

II.

First, I would like to give you a little detail on my company's efforts regarding hydrogen. In 2004, we proposed to install a wind farm at the U.S. Military Academy at West Point, in order to convert the energy produced by this renewable source to hydrogen, and to use this hydrogen to fuel West Point's fleet of vehicles. This proposal would also have allowed the hydrogen to be converted back to electricity in a fuel cell to provide power in the time of a black out or other loss of electricity from the grid. The U.S, Army Material Command funded the completion of the study, but West Point decided not to proceed with the project as outlined in the study. This activity, however, served as the basis for my company's name.

We then took this concept to the New York Power Authority (NYPA) which was very supportive of the proposal. NYPA then provided New York State Energy Research & Development Authority (NYSERDA) with funding for the first New York State hydrogen effort. In late 2004, NYSERDA made two awards for hydrogen projects, including our project at the State University at Buffalo. This project consisted of two hydrogen-fueled Prius internal combustion engine vehicles and a fueling station. The second project consisted of a Honda fuel cell vehicle and a fueling source and was based in Albany.

In 2006, NYSERDA made two more awards to AWP&H, one for the Capital District Transportation Authority (CDTA), the Albany transit operator, and the other for the Albany Airport. These projects were combined and a hydrogen facility built at the Airport to fuel two hydrogen-fueled Prius internal combustion engine vehicles. CDTA uses these in route management service. In addition,

NYSERDA funded two hydrogen-fueled internal combustion engine Silverado pickup trucks, which the Albany Airport uses in general maintenance activities.

Our most recent project is for a hydrogen-fueled fuel cell transit bus for CDTA. A proposal has been filed with the Federal Transit Administration for funding for the project. AWP&H is in the process of preparing another proposal to the FTA for a second hydrogen-fueled fuel cell transit bus for CDTA. The funding sought is stimulus funds available under the FTA's proposal request entitled "Transit Investment for Greenhouse Gas and Energy Reduction Grants".

At the present time there are hydrogen fueling stations located in Rochester, Albany, White Plains, Ardsley, JFK Airport and Hempstead, Long Island. In addition, to these stations another station is being installed in The Bronx.

III.

Now turning to the future, hydrogen can serve as a very effective fuel for transit purposes. This topic is particularly pertinent as the Federal government has decided to invest a significant amount of the Recovery Act funding on efforts to reduce petroleum consumption, to reduce greenhouse gas emissions and to improve energy efficiency.

One of the most important and material ways society can improve energy efficiency and thereby reduce pollution is to replace inefficient diesel-fueled transit buses with hydrogen-fueled fuel cell buses. The attached chart shows that the traditional diesel fueled bus realizes only about 4 miles per gallon, hybrid diesel-fueled buses improve the mileage to about 5 or 6 miles per gallon, while hydrogen-fueled hybrid fuel cell buses realize over 7 miles per equivalent gallon of diesel fuel. A recently introduced battery dominant hybrid hydrogen-fueled fuel cell bus is realizing between 10 and 12 miles per equivalent gallon of diesel fuel. The use of hydrogen increases energy efficiency materially while at the same time eliminating the use of polluting diesel fuel.

An advantage of using hydrogen to fuel transit buses, compared to an individual sedan, lies in the fact that transit buses return to a home base where one fueling station can serve the entire fleet.

To date, the only substantial hydrogen transit bus activity in the United States is occurring in California. AC Transit (Oakland) has three hydrogen-fueled fuel cell buses. Over a three year period, AC Transit's hydrogen buses have driven 146,000 miles, carried 360,000 passengers, increase the energy efficiency by 72 to 100%, replaced 34,000 gallons of diesel fuel and eliminated the production of 174 tons of greenhouse gas emissions. AC Transit has placed orders for eight more hydrogen-fueled buses and has an option on 12 more. A photo of the AC Transit bus is attached.

The California Air Resources Board has a zero emission bus program which will result in a substantial increase in the number of zero emission transit buses over the next few years. Ms. Ogden from California, who is testifying, will undoubtedly cover California's plans in more detail.

Elsewhere in the United States, the Hartford, Connecticut transit company, has one hydrogen-fueled fuel cell bus and is acquiring three more and Massport in Boston is acquiring one such bus.

Europe has moved aggressively to take advantage of hydrogen-fueled buses. The HyFLEET:CUTE project is the world's largest hydrogen fueling effort. There are 48 hydrogen- fueled buses in ten cities. As of December 2007, these transit buses have carried seven million passengers, reduced the consumption of diesel fuel by 169,000 gallons and replaced it with 220 tons of hydrogen.

Attached is a photo of the fourteen hydrogen-fueled buses operated by the Berlin transit company. These buses happen to be hydrogen-fueled internal combustion engine buses manufactured by a German bus manufacturer. The balance of the European fleet uses hydrogen-fueled fuel cell technology buses.

A Hydrogen Bus Alliance has been formed in Europe by ten cities, and joined by Vancouver, which have agreed that each of the ten cities will have 50 hydrogen fueled transit buses in service by 2015.

Mr. Michael McGowan's testimony will provide examples of hydrogen fueling stations in Europe and elsewhere.

Vancouver's BC Transit is placing in service 20 hydrogen-fueled fuel cell transit buses which will be available for the 2010 winter Olympics. The first buses operating are realizing better than seven miles per equivalent gallon of diesel fuel. This is almost a 100% increase in energy efficiency compared to the buses being replaced.

The latest bus technology is a battery dominant hybrid fuel cell bus that has been developed with a Federal Transit Administration R&D grant. The demonstration model has shown fuel efficiencies of between 10 and 12 miles per equivalent gallon of diesel fuel. The first of these buses has been purchased by the California Air Resources Board and will be placed in service in Burbank this month.

Fuel cell buses are expensive. Early models cost over $3 million each. Current models are about $2 million each. The battery dominant bus costs less as it uses a smaller less expensive fuel cell. The ISE Corporation, which assembles and produces buses in California, has built a production line for their backlog of 28 buses. ISE feels that an aggregate order from the Hydrogen Bus Alliance cities will reduce the cost of the next round of buses to about $1 million each.

The Federal Government's American Recovery and Reinvestment Act has substantial funds devoted to energy efficiency and reduction in petroleum consumption. If applied to fuel cell bus procurement it will establish the off take necessary to mass produce the buses.

IV.

It is suggested that the City Council include hydrogen-fueled transit buses in its proposed resolution on the use of hydrogen as these vehicles are major sources of pollution and petroleum consumption. Since fleets of transit buses can be fueled at a home base, an initial program focused on transit buses can be implemented expeditiously as it is not necessary to build a supporting infrastructure first. This would be an expeditious means of initiating the program called for in the Proposed Resolution and would have a major impact on the need to reduce greenhouse gas emissions and petroleum consumption.

Zero-Emission, Zero-Carbon, Zero-Petroleum Fueled Buses

AWP&H
American Wind Power & Hydrogen, LLC

AWP&H creates and develops mobile and stationary projects based renewable resources, electricity, and hydrogen

Hydrogen Fueled Fuel Cells Increase Energy Efficiency

- Transit vehicles are major consumers of diesel fuel
- Diesel fuel consumption
  - Conventional buses ---------- 3-4 mpg
  - Hybrid diesel buses---------- 5-6 mpg
  - Hybrid hydrogen fuel cell buses--- 7 mpge*
  - Battery dominant H2 fuel cell bus- 10 mpge*
- Transit bus fleets require only one fueling station at their home base

* = diesel fuel gallon equivalent

AC Transit (Oakland) - 3 Hydrogen Fueled Hybrid Fuel Cell Buses

- In three years
  - 146,000 miles traveled
  - 360,000 passengers
  - 72 to 100% better energy efficiency
  - 34,000 gallons of diesel fuel replaced
  - 174 tons of CO2 not produced
- AC Transit has ordered 8 more buses and has an option on 12 more

AC Transit's Zero Emission Bus

Europe's HyFLEET:CUTE Project

- **The World's Largest Hydrogen Powered Bus Project**
  - **47 buses in 10 cities**
  - **As of December 2007, 360,000 miles, 7 million passengers**
  - **169,000 gallons of diesel replaced**
  - **220 tons of hydrogen produced**

Berlin's Fleet of 14 Hydrogen Fueled Buses

BC Transit - 20 Hydrogen Fueled Hybrid Fuel Cell Buses

- Now being placed in route service
- Fully operational for the 2010 winter Olympics.
- Fuel consumption is greater than 7 mpge
  - about 100% more energy efficient than diesel buses

BC Transit's Zero Emission Bus

Proterra Battery Dominant Hybrid Hydrogen-Fueled Fuel Cell Bus

- Developed with FTA R&D funding
- First bus in operation in South Carolina in April
- Second bus in operation in California in May
- Fuel consumption in range of 10 to 12 mpge

Proterra's Battery Dominant Hybrid Hydrogen-Fueled Fuel Cell Bus

Impact of Stimulus Funding

- Zero emission vehicles are expensive because they are hand built and have the added cost of advanced technology batteries
- The Federal stimulus bill called American Recovery and Reinvestment Act has substantial funding for reducing petroleum consumption
- Applied to fuel cell bus procurement it will establish the off take necessary to mass produce the buses.

American Wind Power & Hydrogen

- AWP&H creates and develops mobile and stationary projects based on renewable resources, electricity, and hydrogen

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- NY, NY 10022
- rkenard@windpowerandhydrogen.com

Testimony by Michael J. McGowan, Head of Hydrogen Solutions, Linde North America, LLC and Chairman of the National Hydrogen Association, at the New York City Council on May 7, 2009

Topic: Hydrogen Fuel Cell Vehicles and the Transition to Alternative Technologies

I.

Members of the Environmental Protection Committee of the New York City Council, I am honored and pleased to have the opportunity to speak before you today concerning hydrogen vehicles and infrastructure. Today, I am wearing two hats -- one as Linde's Head of Hydrogen Solutions in North America and the other as Chairman of the National Hydrogen Association. The Linde Group has been at the forefront of developing viable pathways to hydrogen production, distribution and dispensing throughout our over 100 year history. Over the last decade, we have been translating our vast industrial experience to the safe, efficient, and economic fueling of on and off road vehicles. We are fully aware of the challenges around developing a sustainable hydrogen infrastructure and, based on our first-hand experiences, are confident they can be met. Linde is committed to the protection of our environment and benefitting the health and welfare of the communities in which we operate throughout the globe. We are extremely excited by the opportunity hydrogen presents to benefit our shareholders and the broader global community.

II.

As Chairman of the National Hydrogen Association, I am pleased to share with you "The Energy Evolution". The Energy Evolution is a comprehensive 100 year analysis of alternative fuel options. As you can read in the handouts I have brought with me, hydrogen shares many of the benefits you hear associated with other alternative fuels. Hydrogen, however, can take the promise of sustainability further than any other option and is the only alternative that can:

- Reduce greenhouse gases to 80% of 1990 levels
  and simultaneously,
- Enable America to reach energy quasi-independence
- Nearly eliminate controllable urban air pollution

... by the end of the century.

III.

As mentioned earlier, Linde has a tremendous amount of hydrogen experience. We have designed, engineered and constructed over 70 hydrogen fueling stations which have been commissioned in 15 countries. Each week, our equipment performs over 300 hydrogen bus and car fuelings. By the end of 2008, our stations provided over 26,000 liquid and more than 125,000 gaseous hydrogen fuelings. Each day, Linde stations complete

approximately 130 fork lift truck fuelings -- indoors. We have the in-house capability to fuel every type of hydrogen vehicle available today, whether the hydrogen is stored as a liquid or a gas at 5,000 psig or 10,000 psig. Linde's main hydrogen source in North America is produced almost entirely renewably. A green byproduct hydrogen stream is purified and liquefied using hydroelectric power. Yes, hydrogen can be produced economically and renewably on an industrial scale -- today.

In total, approximately 9 million tons of hydrogen are produced in the United States each year. That is enough hydrogen to fuel about 35 million cars. This hydrogen flows through pipelines and travel across our highways every day. You already rely on hydrogen to fuel your cars today. About 53% of the hydrogen produced in North America is used to manufacture cleaner gasoline. That hydrogen alone could fuel about 21 million fuel cell vehicles.

IV.

There is a lot of misinformation related to hydrogen being forever a solution far out in the future. While it is true, like any new technology, a sensible and efficient roll-out will take some time, real hydrogen solutions are available today. Some markets like fork lift trucks and back-up power are already commercially embracing hydrogen fuel cells. Markets such as autos and buses only appear limited by society's collective will to commit to this solution and allow volume to bring them further down their cost curves. Progress on all fronts – fuel cell performance and durability, hydrogen production and storage, dispensing, etc.-- has been tremendous and there are sound and achievable technology roadmaps for continued improvements.

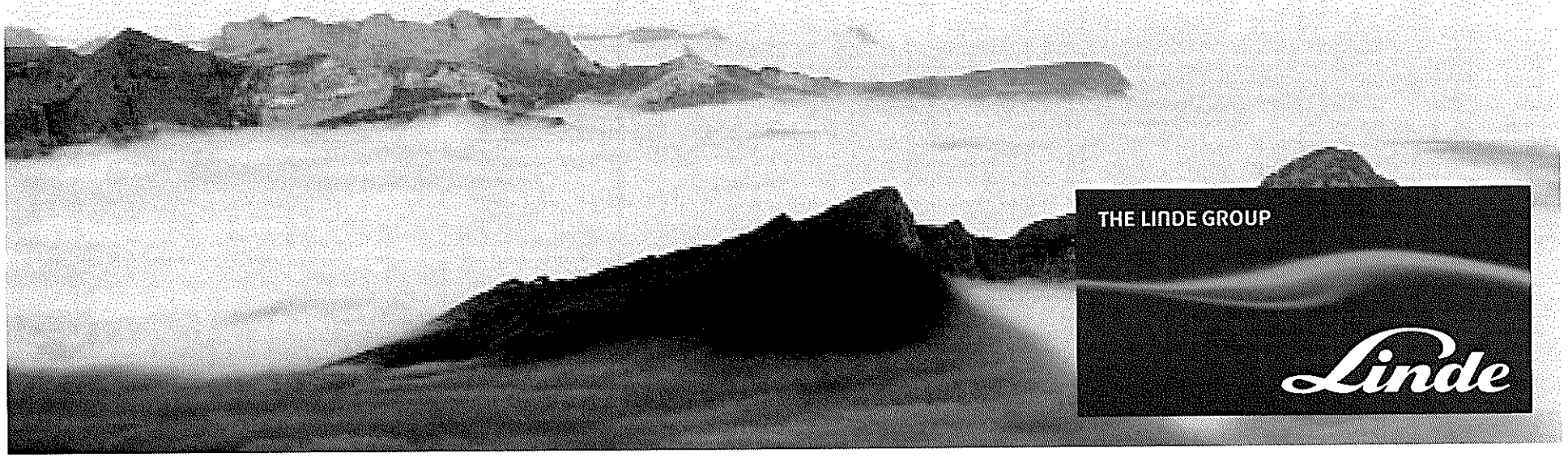
The potential for hydrogen fuel cell vehicles to enhance the environment and quality of life of New York City is great. The world looks to New York City as a leader. A plan to deploy fuel cell vehicles in New York will have a profoundly positive societal impact across the United States and the world. It will also be one more wonderful reason to visit the greatest city in the world.

I would like to spend the remainder of my time sharing some images of stations Linde has worked on across the globe to help you see just how real the promise of hydrogen is.

Linde Hydrogen Vehicle Fueling Systems

Overview of Bus, Car and Forklift Fueling

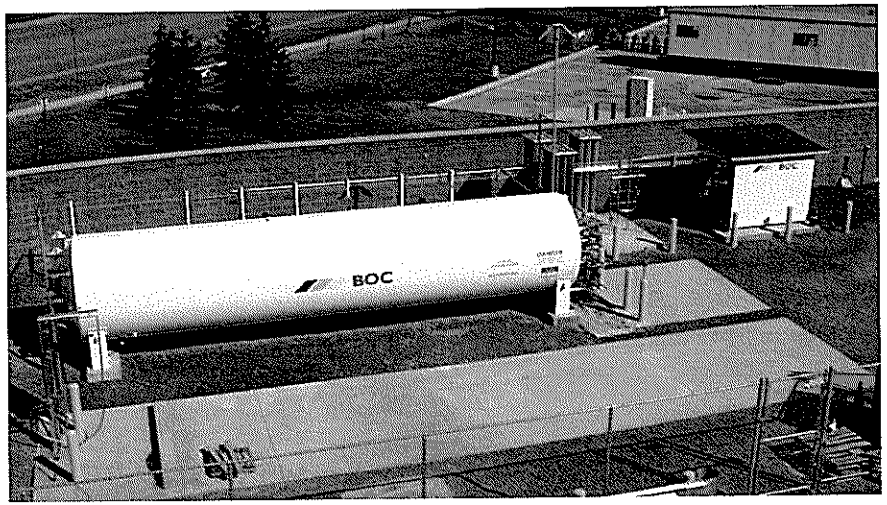
1997 to 2008

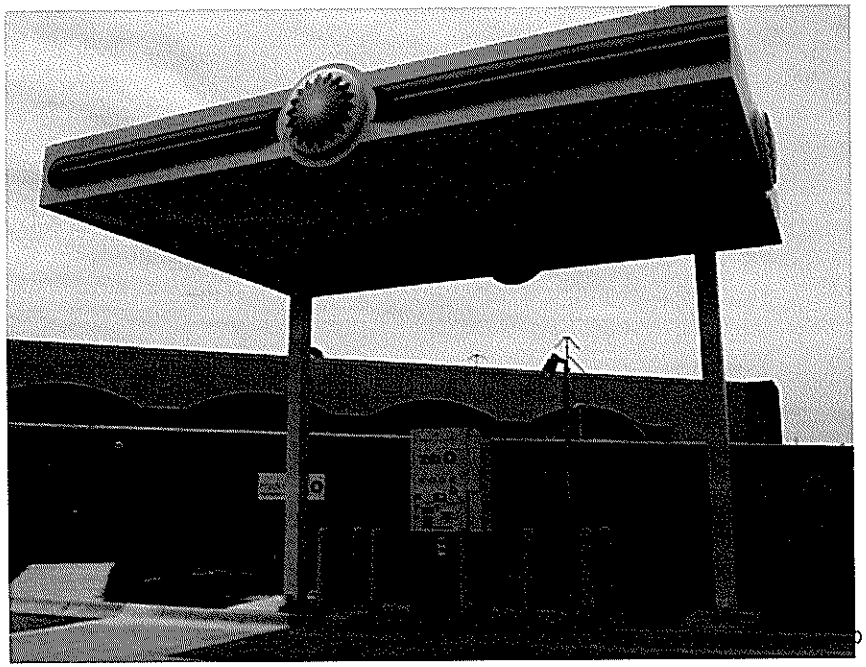


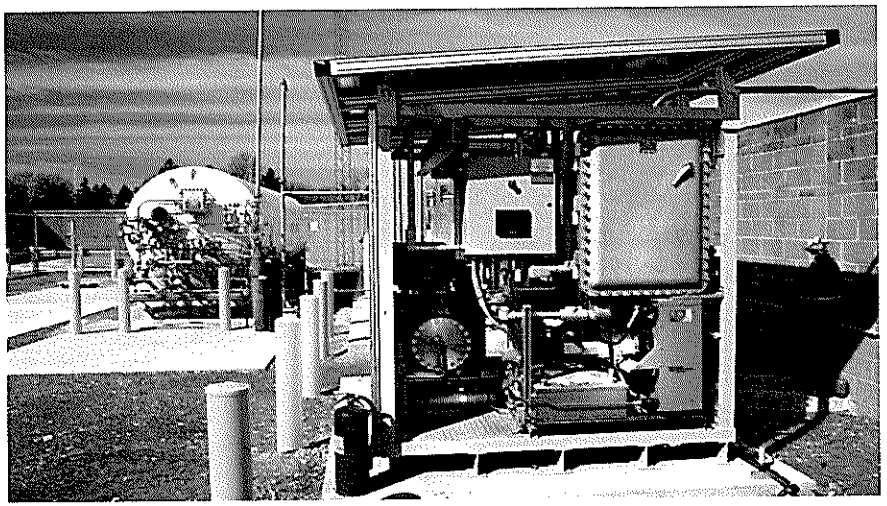
City of Taylor – Taylor, MI
Sep 2006 – Mar 2010

THE LINDE GROUP

- Over 1500 fuelings to date
- Four (4) Ford Focus vehicles @ 35 MPa
- Ford ICE buses @ 35 MPa (30 kg fill)







Linde designed public hydrogen fueling Stations

Compressed and liquid dispensing – Electrolysis and LH2 Storage

THE LINDE GROUP

CEP Clean Energy Partnership

GHW

ARAL

BVG

Linde Gas Linde

VATTENFALL

OPEL

DAIMLERCHRYSLER

Ford

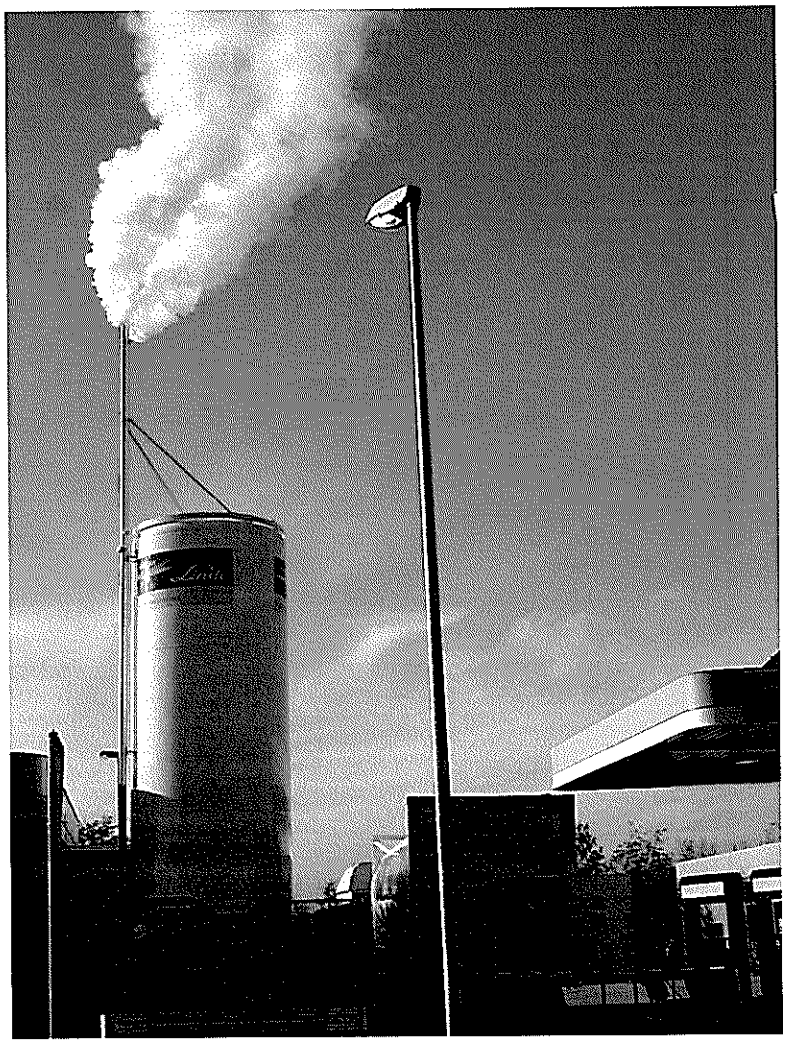
BMW

Infrastructure

THE LINDE GROUP

Public Refueling Station
Frankfurt, Zero Regio Project

THE LINDE GROUP



35 and 70MPa, LH2 dispensing

900 bar Pipeline (1.5 km) & local LH2 Storage

Public Fueling Station – Stavanger – Norway

25, 35, and 70 MPa fueling

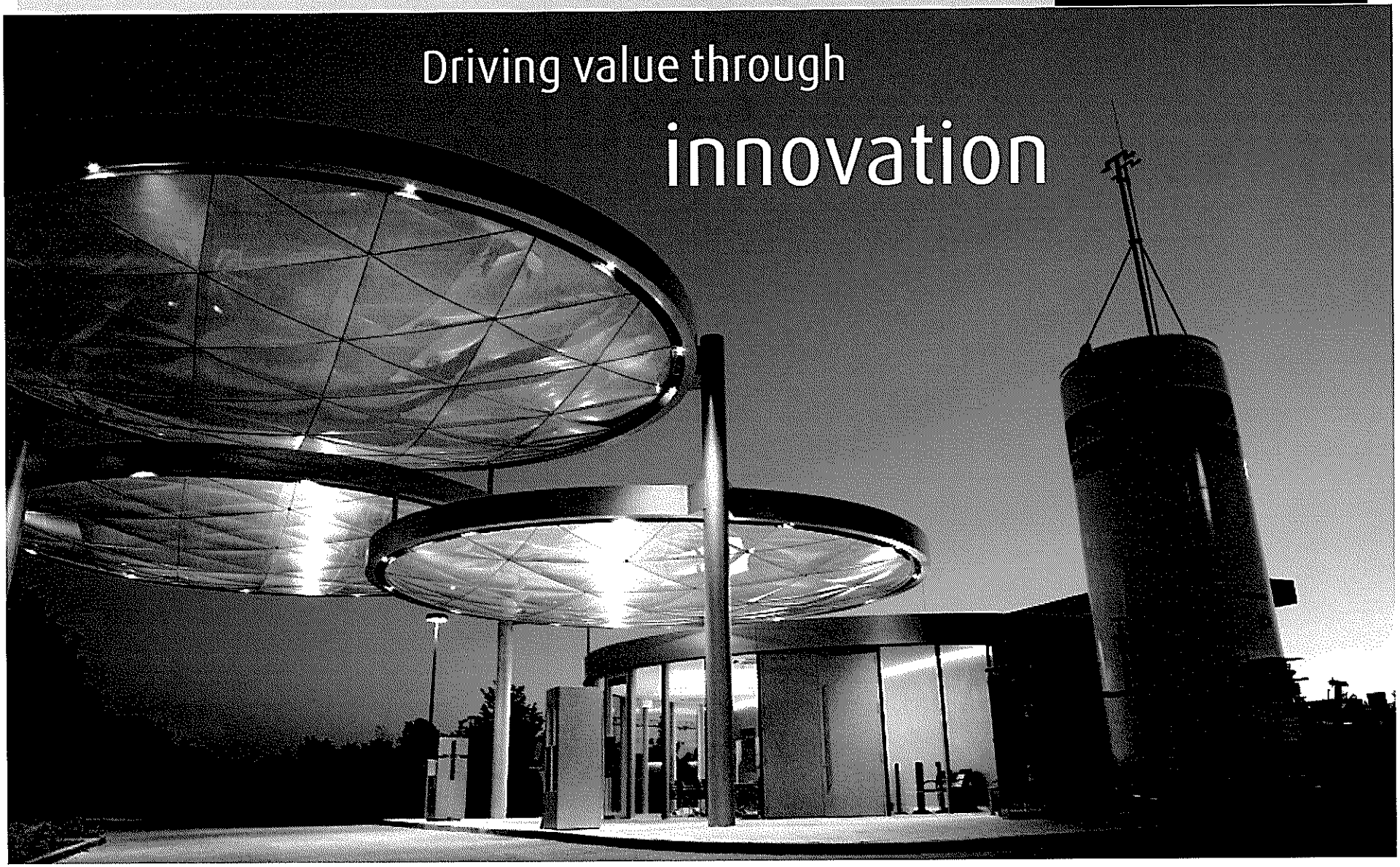
THE LINDE GROUP

Stationary and public refuelling
Ariake, Tokyo

THE LINDE GROUP

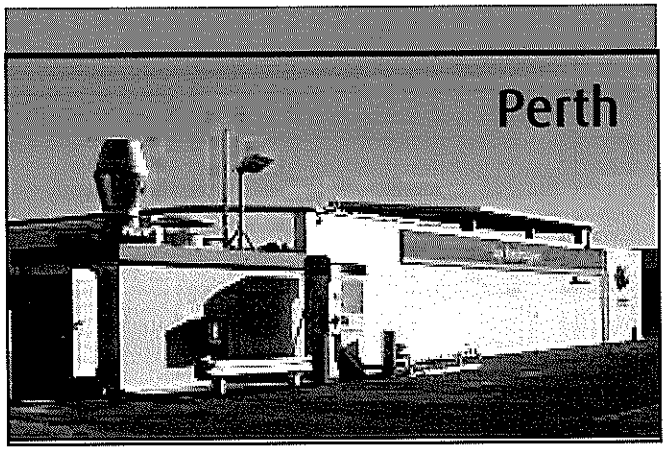
Linde Signature Station – Munich

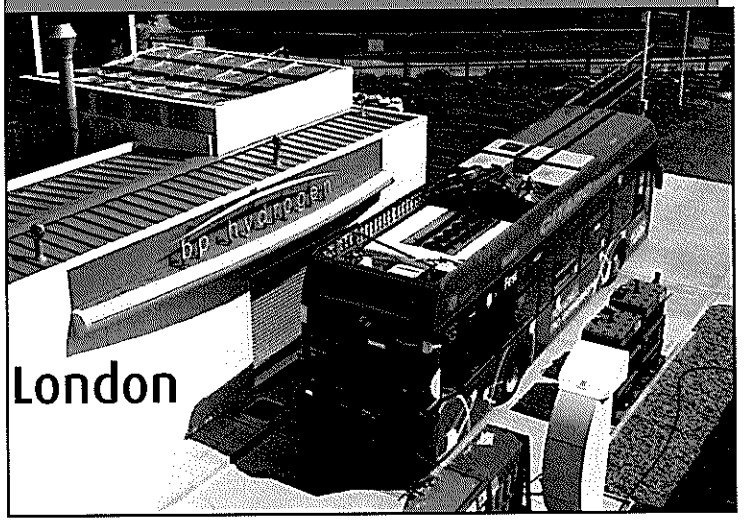
THE LINDE GROUP



Hydrogen Bus Projects Around the World CUTE/STEP

THE LINDE GROUP



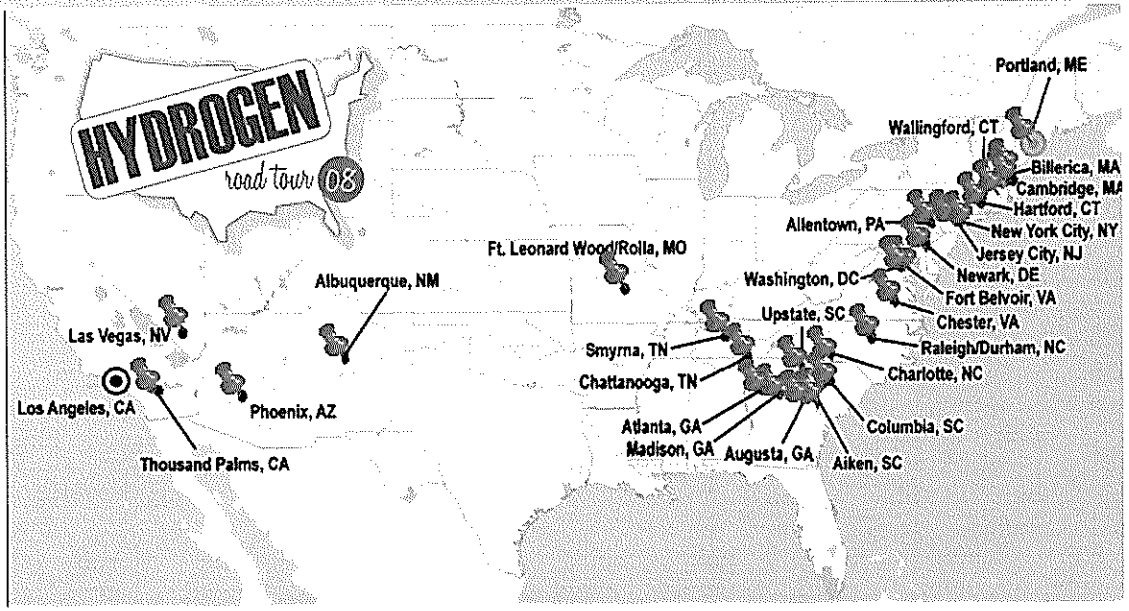


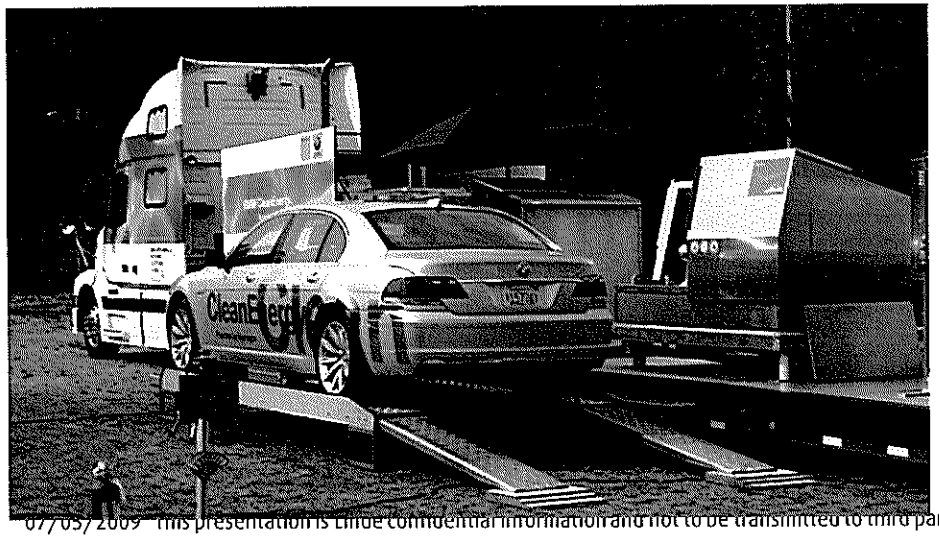
Linde Transportable Dispenser at NHA – San Antonio, Texas
BMW World Tour LH2 Dispenser System for USA - March 2007

THE LINDE GROUP

The Hydrogen Road Tour '08 - August 11-23, 2008
31 cities in 18 states in 13 days

THE LINDE GROUP

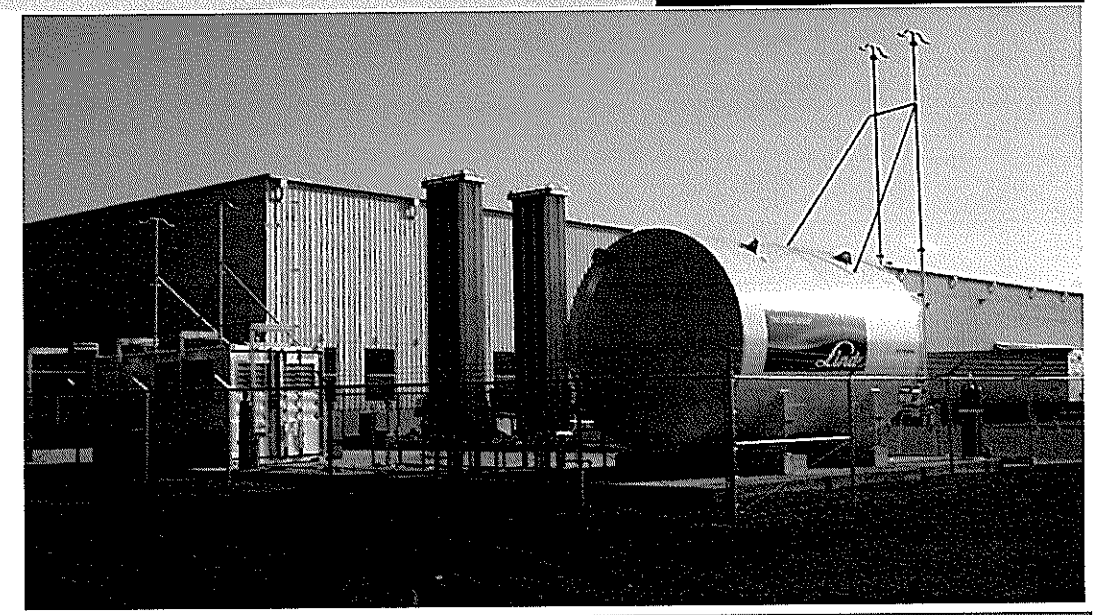




LARGE warehouse and distribution center (100-200 fork lifts and powered pallet jacks)

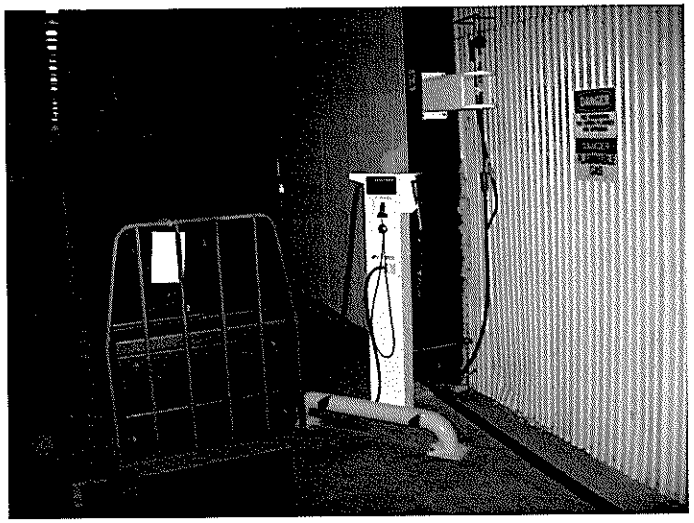
THE LINDE GROUP

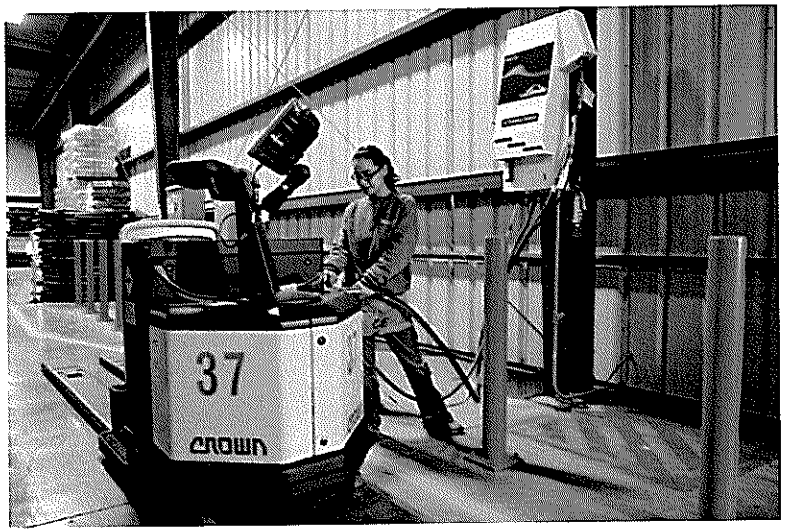
- Operational: July 2008 – July 2015
- *Over 16,000 fuellings since August 2008*
- Sixty-Six (66) Class 3 FLTs @ 25 MPa
- 7500 gallon LH2 tank (1750 kg)
- Two indoor dispensers

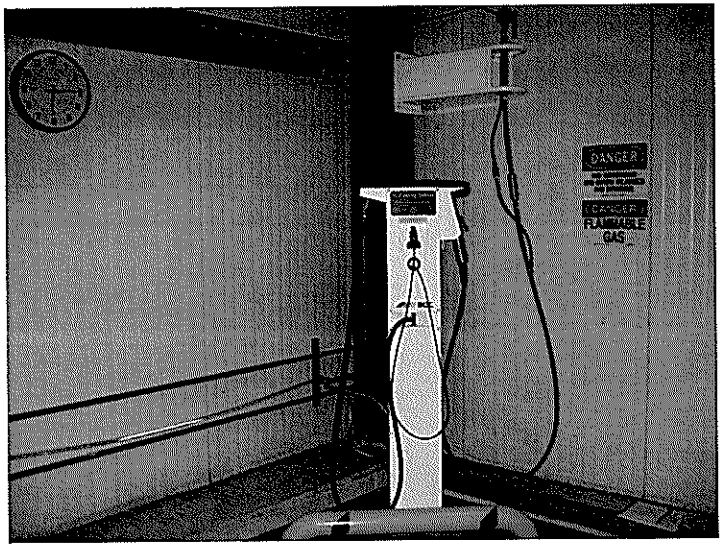


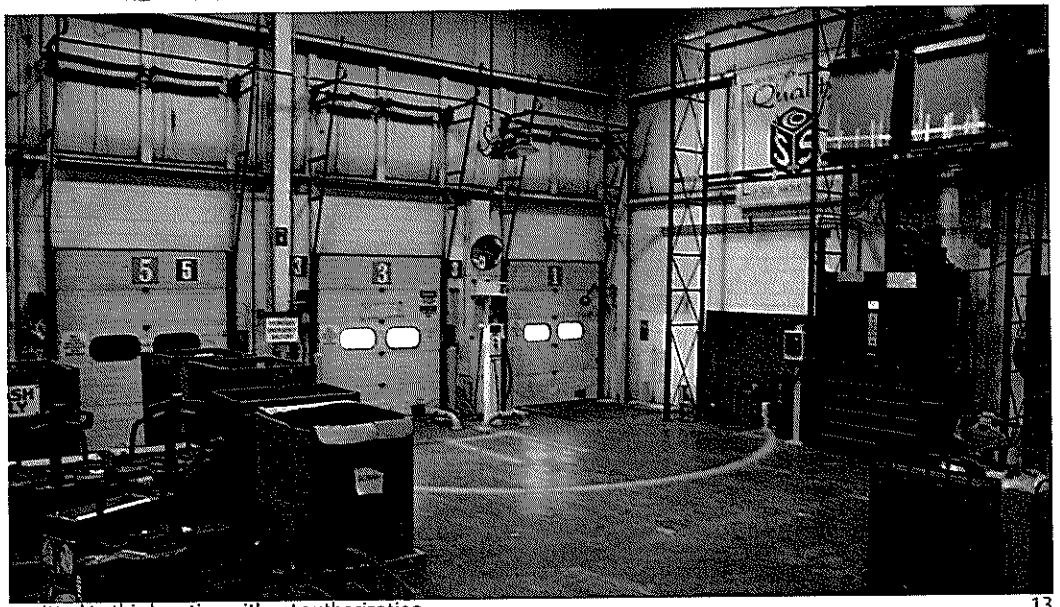
Linde Indoor Fueling for FLTs

THE LINDE GROUP









Linde Hydrogen Vehicle Fueling Experience

THE LINDE GROUP

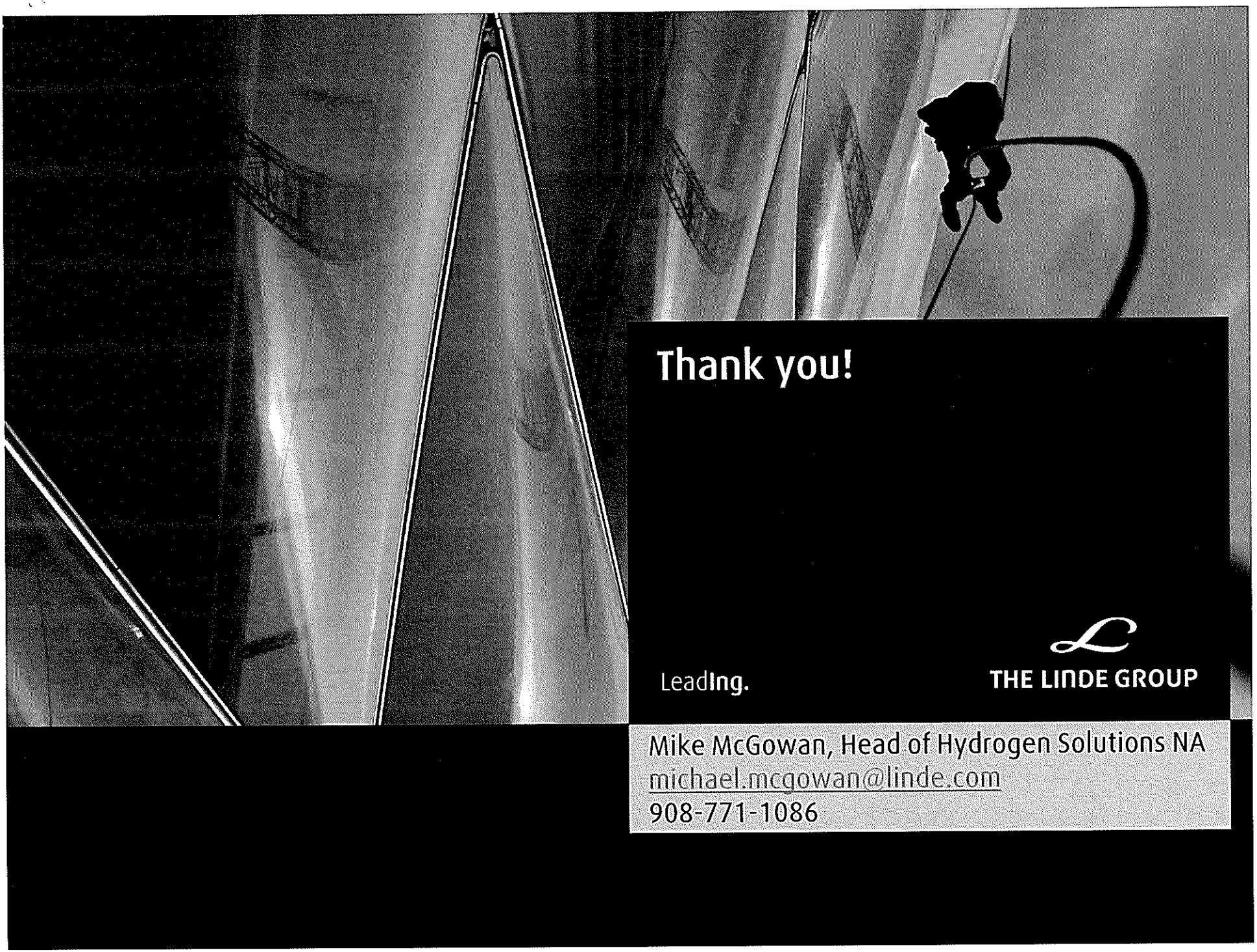
- >125,000 CGH2 refuelings (status: Q4, 2008)

- 26,000 LH2 refuelings (status: Q3, 2007)

- More than 70 hydrogen refueling stations commissioned in 15 countries

- Approximately 300 hydrogen bus and car refuelings per week

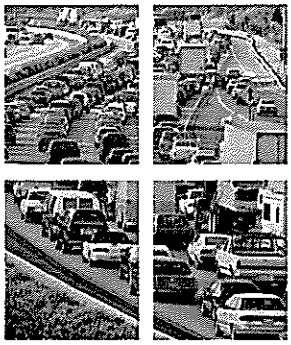
- Approximately 130 Fork Lift refuelings every day

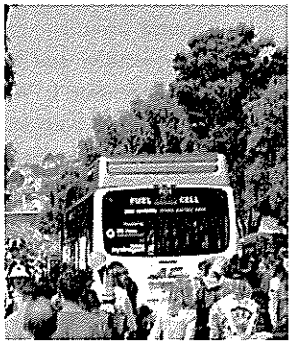


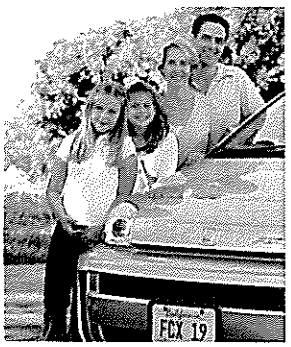
Mike McGowan, Head of Hydrogen Solutions NA
michael.mcgowan@linde.com
908-771-1086

THE ENERGY *EVOLUTION*

an analysis of alternative vehicles and fuels to 2100







EVERY DAY, WE HEAR ABOUT A MORE ENVIRONMENTALLY FRIENDLY VEHICLE OR FUEL WITH THE POTENTIAL TO REDUCE OUR DEPENDENCE ON OIL. WE KNOW WE NEED ALTERNATIVES BUT, WHEN THERE ARE SO MANY OPTIONS, EVEN THE MOST EDUCATED CONSUMER CAN GET CONFUSED.

Are gasoline hybrids the solution? Will plug-in hybrids, fueled with ethanol, meet our needs, long-term? Are battery electric cars the way of the future? What about today's models of cars that burn hydrogen instead of gasoline? Are they the answer?

To meet the demands of our passenger vehicle transportation system, we need energy alternatives that are secure and locally available. We need alternatives that will improve the environment, not pollute it. We need alternatives that will be available for many generations to come. We need alternatives that are economically viable—ones we can afford.

The fact is, several alternative energy vehicle systems and fuels are constructive choices in the near- and mid-term; each one plays a role in transitioning America away from our dependence on petroleum when we drive. The Energy Evolution: An Analysis of Alternative Vehicles and Fuels to 2100 compares more than 15 of the most promising distinct fuel and vehicle alternatives over a 100-year period, in scenarios where multiple alternatives are used early on, with one fuel and vehicle combination later becoming dominant. When compared in terms of its impact on greenhouse gas emissions, oil consumption, urban air pollution and the associated societal costs, one fuel stands out: hydrogen.

For more than 100 years, we've relied on internal combustion engine vehicles that burn gasoline; the engine has developed over time, increasing in efficiency and lowering its environmental impact as a result. However, this technology and fuel combination, no matter how much we improve upon it, will never significantly reduce pollution or our dependency on oil for transportation. In response, just a few years ago, hybrid electric vehicles rolled on our roads, combining batteries and electric motors with regular engines (fueled with gasoline, ethanol or diesel, for example). Today, many hybrid models are available to US consumers; all help us reduce fuel consumption, air pollution and greenhouse gases.

We also hear about battery-only electric vehicles. Their driving range today is limited but, with advances in battery technology, these vehicles could become a viable zero-emission alternative in the future. And we hear a lot about hydrogen vehicles—those that use hydrogen in internal combustion engines, and those that use hydrogen fuel cells to generate electricity to power the car, cleanly and efficiently.

The Energy Evolution scenarios illustrate how several alternatives, if they become dominant in a mix of vehicles, can have a positive impact in terms of energy security, the environment, and the economy.

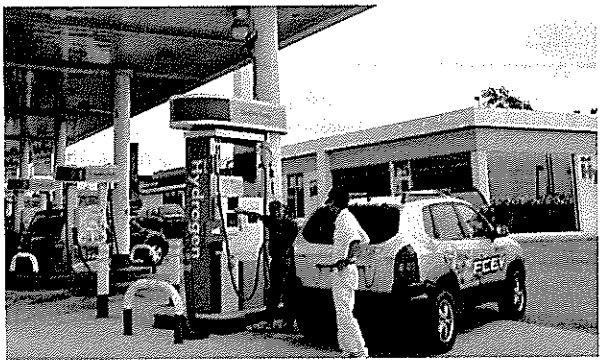
cont'd on page 2

One scenario, where gasoline-powered hybrid vehicles become dominant, will cut the growth of greenhouse gases, urban air pollution and oil consumption. However, over time, these reductions will decrease, and oil consumption will increase as the population (and number of vehicles on our roads and miles traveled per vehicle) grows.

Another scenario, where natural gas-powered hybrids become dominant, will maintain greenhouse gases at today's levels. And in the ethanol plug-in hybrid vehicle scenario (using an ethanol-fueled internal combustion engine plus a battery-powered electric motor), greenhouse gas pollution will be cut to about 25 percent below 1990 levels by 2100, but only if non-corn ethanol production becomes viable.

While these and other technologies offer significant benefits, and we should continue to pursue them as part of the mix of transportation alternatives, *The Energy Evolution* finds that only one fuel, in the right vehicle, can cut greenhouse gas pollution to 80 percent below 1990 levels—the target outlined by climate change action groups. This same fuel can simultaneously help America achieve petroleum independence for transportation; and can nearly eliminate urban air pollution. It is the same fuel that will also save us more than $600 billion per year by 2100, through a reduction in the societal costs associated with urban air pollution, greenhouse gases, and oil consumption.

This fuel is hydrogen.



KEY TAKEAWAYS

What fuel, in the right vehicles, can cut greenhouse gases to 80 percent below 1990 levels—the target set by climate change action groups? What fuel will allow America to achieve energy quasi-independence by 2060? What fuel can almost eliminate urban air pollution? What fuel can save us more than $600 billion per year by 2100 through a reduction in the societal costs associated with our passenger vehicle transportation system?

The fuel is hydrogen.

MANUFACTURING FUEL FOR AMERICA'S SECURE ENERGY FUTURE

Hydrogen is all around us; it's the most abundant element in the universe. It doesn't exist on its own, so we separate it from different sources, including carbon-based fossil fuels, biomass and water. We can find many sources to produce hydrogen locally.

Energy source diversity has many benefits. First, it means greater energy security and less dependence on energy from other parts of the world. When others control production, especially in sometimes-unstable regions, we are impacted by fluctuations in price and supply. Imagine the benefit of meeting our own demand for energy...to be able to make what we need locally. The rules of the game suddenly change in our favor.

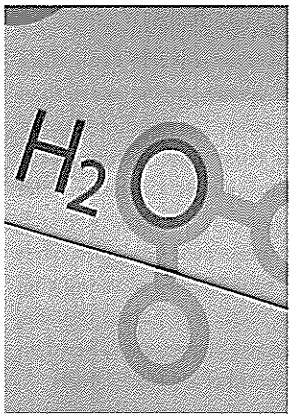
Second, energy source diversity means we can have a choice in how we produce the energy we use; we can make hydrogen from the sources that are abundant and make the most environmental and economic sense for the regions where we live.

TRANSITIONING TRANSPORTATION FUEL PRODUCTION TOWARD ZERO EMISSIONS

Hydrogen offers many environmental benefits when compared to gasoline for transportation. Hydrogen fuel cell cars run two to three times more efficiently than the combustion engine vehicles we currently drive. When you make hydrogen from sources that do not produce pollution—including water, renewable and nuclear energy—hydrogen is a zero emission fuel. Today, since most of the hydrogen we use is made from natural gas, a non-renewable fossil fuel (like oil) which does produce some greenhouse gases, natural gas is viewed as a transitional resource. But did you know, when you use the hydrogen made from natural gas in a fuel cell car, overall greenhouse gases are reduced by 50 percent compared to burning gasoline in regular cars?

Over time, the way we make hydrogen will shift as volumes increase and technology develops. Don't forget, we're talking about an energy *evolution*: with advances in technology and policy initiatives, the environmental and economic benefits of hydrogen as a transportation fuel will increase.

Consider electricity, a form of energy with which we are all familiar. Different parts of the world make their electricity in different ways. In the US, just over half of the electricity we use is generated from coal, creating pollution and greenhouse gases, with only about 10 percent made using renewable resources. But this is changing, as electricity companies and utilities focus on producing cleaner power. Hydrogen is going through a similar transition, from being produced from natural gas to being



The Energy Evolution projects capital costs of $9 billion over the next decade to build a hydrogen infrastructure to support the introduction of fuel cell vehicles. Hydrogen production costs will outpace revenues during this period, resulting in a $3.2 billion cumulative shortfall. This gap could be closed through private or government investments, and could be fully repaid by 2023.

produced by renewables and other emission-free technologies, including nuclear energy and clean coal technologies.

The environmental analysis in *The Energy Evolution* focuses primarily on the four vehicle and fuel combinations most actively pursued by the world's major automotive companies: gasoline-powered hybrid electric vehicles, gasoline plug-in hybrids, ethanol plug-in hybrids and hydrogen fuel cell vehicles.

In terms of greenhouse gases, the report finds that hydrogen, in a fuel cell vehicle scenario, is the only fuel that can cut greenhouse gas pollution in the transportation sector to 80 percent below 1990 levels. Most climate change groups call for greenhouse gas pollution to be reduced to these levels by 2050; this could be possible with a smart, swift market penetration of hydrogen vehicles, or by accelerating the production of hydrogen from low-carbon sources—hopefully both. Hydrogen vehicles are also the only vehicles that will reduce urban air pollution costs towards zero by the end of the century. Battery electric vehicles are second best to hydrogen vehicles in the analysis, cutting greenhouse gases to 60 percent of 1990 levels and reducing urban air pollution as much as hydrogen vehicles.*

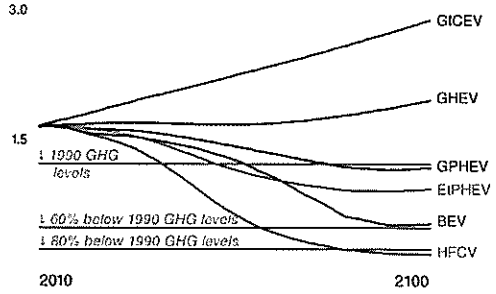
BUILDING AN ECONOMICALLY VIABLE TRANSPORTATION INFRASTRUCTURE

Many industries have already demonstrated a solid track record of safely and economically producing and working with hydrogen. A large hydrogen market and infrastructure exists today, supporting the agriculture, food and oil refining industries, with more than 56 billion kilograms of hydrogen produced globally every year. New hydrogen markets continue to emerge (including mass transit fleets, decentralized power plants, emergency backup power and other applications); all will contribute to increased demand for hydrogen and the economic benefits will follow: more jobs, more development, more manufacturing.

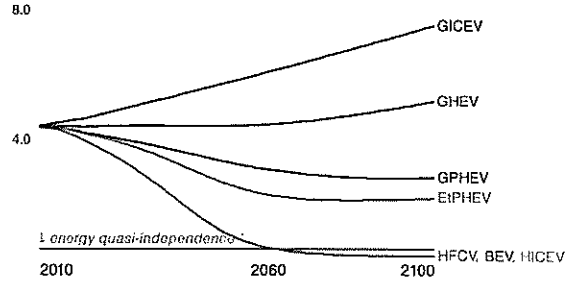
THE STORY AT A GLANCE

These graphs show the impact of four alternative fuel and vehicle scenarios on greenhouse gases, oil consumption, urban air pollution and the societal costs of our passenger vehicle transportation system. In each scenario, several fuel and vehicle alternatives are used early on, but one later becomes dominant. The gasoline internal combustion engine vehicle scenario is included as a baseline.

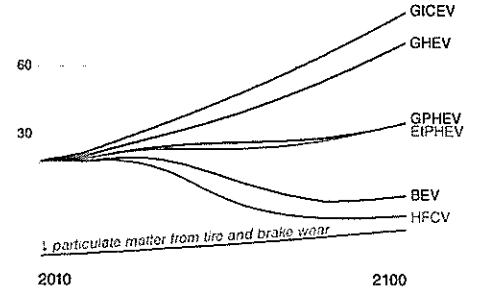
GREENHOUSE GAS POLLUTION
light duty vehicles
billion tonnes CO_2 equivalent/year



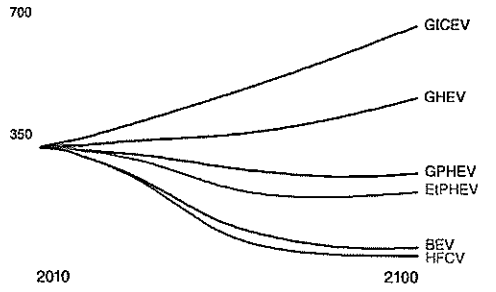
OIL CONSUMPTION
billion barrels/year



URBAN AIR POLLUTION COSTS
$US billions/year



TOTAL SOCIETAL COSTS
$US billions/year

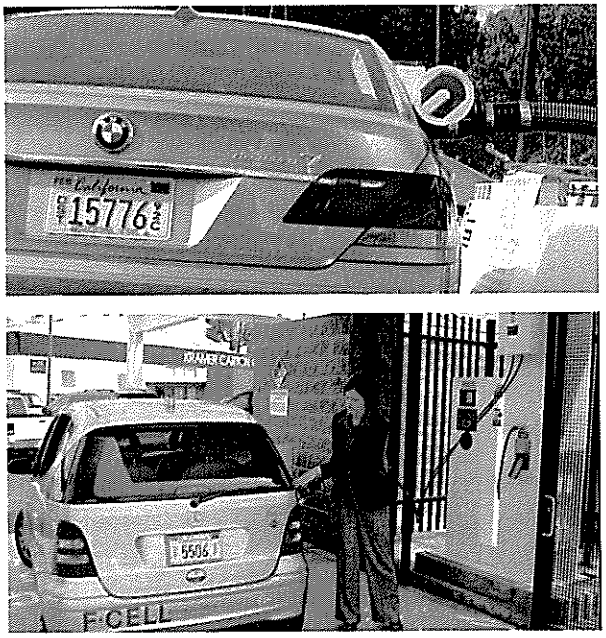


KEY

- gasoline internal combustion engine vehicle scenario
- gasoline hybrid electric vehicle scenario
- gasoline plug-in hybrid electric vehicle scenario
- ethanol plug-in hybrid electric vehicle scenario
- battery electric vehicle scenario
- hydrogen fuel cell vehicle scenario

* *The report simulation assumes an aggressive development of affordable batteries with a range of 250-300 miles and less than 20 minutes for recharging. In 2008, the best full-scale battery pack offers a range of about 100 miles.*

† *energy quasi-independence: a reduction in the use of petroleum by the transportation sector to such an extent that, in a crisis, all remaining non-transportation and critical transportation needs could be fulfilled using local resources*



Little or no government investment in a hydrogen infrastructure would be needed after 2018. That same year, fuel providers will start to make 10 percent after-tax returns on investment. And just five years later, not only will any debt incurred to build the infrastructure be repaid, hydrogen revenues will more than cover ongoing infrastructure development and maintenance.

Building an infrastructure to distribute hydrogen to fuel our cars is often cited as a challenge when considering alternative fuels. Capital investment in this infrastructure will certainly be required, from government and industry. Energy companies' gasoline and diesel capital expenditures to support the existing US system were approximately $87 billion in 2008. *The Energy Evolution* simulation anticipates the cost of the hydrogen infrastructure in 2030 to be $8.7 billion, one tenth of today's investment.

With hydrogen there are many supply options to meet the specific needs of any location. Like gasoline and natural gas, hydrogen can be delivered to a station via truck or pipeline. Hydrogen can even be produced right on site at the station in a variety of ways. It will cost about $9 billion to put 6,500 stations into service over the next 10 years and, by 2018, *The Energy Evolution* estimates fuel providers will start making a 10 percent, after-tax return on investment. Another way to think about it: in this scenario little or no government investment would be required after 2018 to continue building and maintaining a hydrogen infrastructure.

In addition, while greenhouse gases and urban air pollution are critical environmental considerations, they also have an economic impact on society. *The Energy Evolution* monetizes the cost of both, as well as the cost of oil consumption (which includes the military costs associated with defending imported oil), to derive a dollar value to attribute to each of the 15 alternatives considered in the 100-year simulation.

The hydrogen-powered fuel cell vehicle scenario can reduce societal costs more than any other option, saving more than $600 billion per year by 2100 compared to the gasoline internal combustion engine vehicles we drive today. Government incentives will help to jump start the transition to a hydrogen and fuel cell vehicle transportation solution; the National Research Council estimates total government investment needed to offset the initially-higher costs of fuel cell vehicles, and of subsidizing the hydrogen infrastructure, will be about $48 billion over the next 15 years. Interestingly, this projected investment is less than some incentives that currently exist for other alternative fuels.

HYDROGEN: A UNIVERSAL FUEL

Hydrogen is the single most important legacy we can leave our society. *The Energy Evolution* illustrates the role that hydrogen plays as a fuel, working with many other kinds of technologies to provide a wide variety of benefits. It is secure and available, environmentally sustainable and economically viable. Achieving a sustainable automotive transportation system is not only achievable; it is a necessity to address our national energy challenges. Many viable technologies already exist. But we need more action, more investment and a stronger commitment today, publicly and privately, to use these technologies tomorrow.

ABOUT THE ENERGY EVOLUTION: AN ANALYSIS OF ALTERNATIVE VEHICLES AND FUELS TO 2100

The Energy Evolution: an Analysis of Alternative Vehicles and Fuels to 2100 collects what is currently known and published about alternative energy vehicle systems and compares the information in a relative context. The intent of the report is to build understanding about the viability of the choices available for powering the vehicles we drive, and can act as a platform for informed policy development. All alternatives in the report are evaluated on the basis of their contribution to energy security, environmental sustainability and economic feasibility, using data from peer-reviewed publications and with sound technical assumptions, all of which are cited in the final report. You can access *The Energy Evolution* at: http://www.hydrogenassociation.org/evolution.

The Energy Evolution: an Analysis of Alternative Vehicles and Fuels to 2100

National Hydrogen Association
1211 Connecticut Ave NW, Suite 600
Washington DC 20036-2701
http://www.hydrogenassociation.org

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. 1223-A

☑ in favor ☐ in opposition

Date: 5/7/09

(PLEASE PRINT)

Name: DAN O'Connell

Address: 25 Massachusetts Ave, Watervliet NY

I represent: General Motors - Fuel Cell Division

Address: _____

Please complete this card and return to the Sergeant-at-Arms

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☒ in favor ☐ in opposition

Date: May 7, 2008

(PLEASE PRINT)

Name: Edward F. Ricek

Address: 5 Cambridge Dr

I represent: Air Products

Address: 7201 Hamilton Blvd. Allentown, PA

Please complete this card and return to the Sergeant-at-Arms

THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☒ in favor ☐ in opposition

Date: 5/7/09

(PLEASE PRINT)

Name: Michael McGowan

Address: 37 Sedge Rd. Valley Cottage, NY 10989

I represent: Linde North America, LLC and the Nat'l H2 Assoc.

Address: 575 Mountain Ave Murray Hill, NJ 07974 Washington, DC

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THE COUNCIL
THE CITY OF NEW YORK

Appearance Card

I intend to appear and speak on Int. No. _____ Res. No. _____

☐ in favor ☐ in opposition

Date: May 7 2009

(PLEASE PRINT)

Name: RAY KLEINARD

Address: _____

I represent: American Island Power & Hydrogen

Address: 445 Park Ave NY NY 10022

Please complete this card and return to the Sergeant-at-Arms