

CITY COUNCIL
CITY OF NEW YORK

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TRANSCRIPT OF THE MINUTES

of the

COMMITTEE ON ENVIRONMENTAL PROTECTION

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March 7, 2009
Start: 1:30pm
Recess: 3:26pm

HELD AT: Committee Room
City Hall

B E F O R E:
JAMES F. GENNARO
Chairperson

COUNCIL MEMBERS:
Bill de Blasio
Domenic M. Recchia, Jr.
Erik Ulrich
Peter F. Vallone, Jr.
Elizabeth Crowley
Thomas White, Jr.
Mathieu Eugene

A P P E A R A N C E S

COUNCIL MEMBERS:

Lewis A. Fidler

G. Oliver Koppell

A P P E A R A N C E S (CONTINUED)

Daniel O'Connell
Director of General Motors Fuel Cell Commercialization
General Motors Corporation

Edward Kiczek
Global Business Director of Hydrogen Energy Systems
Group
Air Products

Costa Constantinitas
Legislative Director, Environmental Protection
Committee
New York City Council

Raymond Kenard
President
American Wind Power & Hydrogen

Michael McGowan
Head of Hydrogen Solutions / Chairman
Linde North America, LLC / National Hydrogen
Association

CHAIRPERSON GENNARO: We're on, yep. Okay. Okay. No problem. Greetings. I'm Councilman Jim Gennaro and Chair of the Committee on Environmental Protection. Welcome to our hearing today.

MALE VOICE: [Off mic]

CHAIRPERSON GENNARO: What happened? Okay. Take two. Okay. Welcome once again. I'm Councilman Jim Gennaro, Chairman of the Committee on Environmental Protection. Welcome to today's hearing. Today we're holding a hearing on proposed Resolution 1223-A, sponsored by Council Member Fidler. We appreciate his leadership in this area. And, the Resolution is about fuel cell, hydrogen fuel cell vehicles. This is also an oversight hearing on hydrogen fuel cell technology and vehicles. We're joined also by Council Member Bill de Blasio. Happy to have Councilman de Blasio with us today. I'll proceed with my statement.

In the U.S. and Canada, oil use is almost double the consumption of oil per capita of other industrialized nations and, unlike most other industrialized nations, two-thirds of all

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2 petroleum use is for transportation and 58% of it
3 comes from overseas. Use of petroleum and other
4 fossil fuels is responsible for 82% of total U.S.
5 greenhouse gas emissions. With the enactment of
6 Local Law 22 of 2008, New York City has committed
7 to reduce the greenhouse gas emissions by City
8 government in its own operations by 30% by the
9 year 2017 and Citywide by 2030. To honor that
10 commitment, we seek ways to reduce our use of
11 fossil fuels and thereby reduce local air
12 pollution and greenhouse gas emissions.

13 One emerging technology that is
14 generating considerable interest is the use of
15 hydrogen fuel cells for transportation. Imagine a
16 day when water and sunlight can be used to power
17 our appliances, homes and our vehicles. That day
18 is here. And, outside are two vehicles powered
19 entirely by hydrogen, one of the most common
20 elements on our planet. While these vehicles are
21 not currently available for sale, they're
22 available for lease by some automobile companies.
23 And, there is a move underfoot to bring more
24 hydrogen fueling stations to New York City. We'll
25 hear more about that from the good folks from GM

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2 you, Chairman Gennaro. And, I want to thank you
3 for scheduling this hearing. The timing of which
4 is extraordinarily propitious. You know, I
5 sometimes hesitate to bring back issues to this
6 Chamber that we argued about at great length.
7 And, one of them is congestion pricing. At the
8 time of the congestion pricing debate, I proposed
9 nine Resolutions, each of which was designed to
10 address one of the end goals of the planners of
11 congestion pricing.

12 One of the goals of that program
13 was cleaning our air. And, you know, I, you know,
14 note that one of the other goals yesterday was
15 accomplished when the State Legislature passed the
16 payroll tax, the regional payroll tax to pay for
17 mass transit. That was one of the nine
18 Resolutions that we introduced. And, I must say
19 that eight of my colleagues joined me in co-
20 sponsoring that Resolution that has wound up being
21 the solution to paying for mass transit in our
22 City.

23 Twenty-one of my colleagues co-
24 sponsored this Resolution. Tomorrow the Star Trek
25 movie opens in the City of New York. And, for

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2 those of you who follow such, you'll note that, in
3 Star Trek, energy is produced in an
4 environmentally sound, clean manner. And, perhaps
5 not coincidentally, there's also world peace. I
6 think there's a direct relationship between both
7 of those things.

8 And, that is why this hearing is so
9 incredibly important. Hydrogen fuel cell cars are
10 the Holy Grail of transportation. They are zero
11 emission vehicles. You could put your mouth to
12 the exhaust pipe of a hydrogen fuel cell car and
13 inhale and it wouldn't hurt you. If we could,
14 with a magic wand, take every gasoline combustion
15 engine off the streets of the City of New York and
16 replace them with a hydrogen fuel cell car, we
17 would do more to change our world and to clean our
18 air than anything else we have discussed in this
19 Chamber combined. And, we have had a green agenda
20 in this Chamber.

21 So, it is not insignificant. Now,
22 of course, you know, if it is so important and it
23 is so positive an end result, why isn't it
24 happening? And, you know, there are a multitude
25 of answers to that question; none of which, in my

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2 view, are insurmountable. But, there is a role
3 that we can play in government in pushing that
4 envelope. There is, of course, the chicken and
5 egg question. And, that is would you buy a
6 hydrogen fuel cell car if there wasn't a hydrogen
7 refueling station in your neighborhood? And,
8 would you open a hydrogen refueling station in
9 someone's neighborhood if there were no hydrogen
10 fuel cell cars? And, we need, in government, to
11 find a way to answer that conundrum because the
12 end goal is just too important.

13 Second, we need to find an energy
14 positive clean way to produce the hydrogen. We
15 need to get it right. We need to get a delivery
16 infrastructure in place that is safe and is sound
17 and is energy positive. We don't want to cause
18 more greenhouse gases in producing the hydrogen
19 than is absolutely necessary. And, since we are
20 developing this industry from the ground up, we
21 may as well do it right from the ground up.

22 And then, last is the incredible
23 economic opportunity that this presents. And, you
24 know, we talk about green jobs in this City an
25 awful lot. In the petroleum industry, you kind of

1
2 have to mine and refine the petroleum where you
3 find it. That limitation does not apply to
4 hydrogen. We could be a leader in the world in
5 producing hydrogen. We could start it here. We
6 could start it now. We could start it as an
7 economic development tool here in the City of New
8 York.

9 And, I have to say I'm a little
10 disappointed. We met with the Bloomberg
11 Administration about five months ago and asked
12 them to make this part of their green jobs agenda
13 at the Economic Development Corporation. And,
14 they declined to do so because they didn't see the
15 opportunity. I don't understand how you could not
16 see the opportunity in this. The goal is so
17 extraordinary. The benefit is so great. The
18 chance to be at the forefront of something that,
19 not only will have an enormous impact on our
20 environment, but will change the geopolitical
21 balance in this world to end our dependence on
22 foreign oil. All of the good things, things that
23 we talk about here almost whimsically that, if we
24 can do something to push that envelope forward
25 today, then we have done something really

2 significant.

3 So, Mr. Chairman, I thank you for
4 calling this hearing today. I look forward to
5 eventually passing this Resolution so that we can
6 continue to move this process forward.

7 CHAIRPERSON GENNARO: Thank you.
8 Thank you, Council Member Fidler. I want to thank
9 you for your leadership. Thank you for drafting
10 this Resolution. Thank you for bringing us here
11 today. We're joined by Council Member Recchia,
12 Council Member Ulrich and Council Member Peter
13 Vallone, just has come into the room. Grateful to
14 him for being here.

15 And, I will note for the record
16 that the Office of Long Term Planning and
17 Sustainability came down to the parking lot, where
18 we had the vehicles. We had Kizzy [phonetic],
19 Charles Guzmond [phonetic] there. And so, and,
20 happy to have them see the folks from GM who
21 showed us the vehicles. And so, that there
22 hopefully will be some interest that comes from
23 that.

24 And, with that said, we're ready to
25 call our first witness. We have Dan O'Connell

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2 from General Motors. He's the General Motors
3 Director of the Fuel Cell Division of General
4 Motors. Welcome, Mr. O'Connell. You and if you
5 want to bring any of your colleagues up with you,
6 if you want to carry the ball, it's whatever you
7 would wish. We appreciate you taking the time to
8 be here, bringing your vehicles down here for
9 having a program whereby, you know, New York State
10 residents can use this kind of technology for free
11 and give you feedback to help you develop it. We
12 appreciate that there are over 400 jobs of people
13 who live in New York State working on this
14 technology. And, we appreciate the fact that of
15 all the people doing this kind of technology, with
16 regard to autos, there's only one that does it in
17 the U.S. and that happens to be in New York State.
18 And, that's okay with me.

19 And so, with that said,
20 Mr. O'Connell-- whoops, we're joined by Council
21 Member Liz Crowley from Queens. Happy to have her
22 here today. So, we have your statement,
23 Mr. O'Connell. If you could state your name for
24 the record and proceed with your good testimony,
25 we'd be happy to hear it.

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2 DANIEL O'CONNELL: Thank you very
3 much. My name is Daniel O'Connell. And, I'm the
4 Director of GM's Fuel Cell Commercialization.

5 General Motors' first Fuel Cell
6 vehicle was built and operated in 1968. The
7 Global Fuel Cell Program was reestablished in 1990
8 in conjunction with the Los Alamos National Labs
9 and moved to our facility in upstate New York in
10 1996. Our facilities and resources have expanded
11 in New York State several times since then and we
12 now employ nearly 400 people in the State on fuel
13 cells.

14 General Motors has taken a
15 leadership role and deployed over 100 Chevrolet
16 Equinox Fuel Cell Electric Vehicles under our
17 Project Driveway. Our intention was to get real
18 drivers in real vehicles under real operating
19 conditions. The vehicles have been completely
20 tested and fully certified to meet all current
21 Fuel Cell Federal Motor Vehicle Safety Standards
22 and all of the requirements therein. More than 30
23 of those vehicles have been operated in New York
24 State for the past 20 months and have performed
25 very well including two very cold winters. And,

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2 last winter, it was very cold. Some of our
3 vehicles are well over 20,000 miles in customer's
4 hands and still running very well.

5 Our drivers have accumulated nearly
6 750,000 miles with the vehicles and refueled the
7 vehicles nearly 12,000 times. More than 60
8 mainstream drivers, many municipalities,
9 government agencies, celebrities and the Military
10 have experienced the pleasure of driving our zero
11 emission, zero petroleum, hydrogen-powered fuel
12 cell vehicles. We have had overwhelmingly
13 positive response to the vehicles with the General
14 Motors Fuel Cell technology inside and we received
15 more than 80,000 applicants on our website to
16 participate in Project Driveway. The response was
17 overwhelming. General Motors has trained nearly
18 1,400 First Responders on the safety systems
19 within the vehicle and at the stations and over
20 300 technicians on how to service fuel cell
21 vehicles.

22 General Motors designed, purchased
23 and installed eight refueling stations across the
24 United States to support our first mover position
25 on fuel cell vehicles. In addition, we worked

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2 with our DOE partner, Shell Hydrogen, to install
3 an additional five stations that we expect to open
4 very soon. The City of White Plains, the Town of
5 Hempstead, as well as Monroe County and Rochester
6 Institute of Technology have stepped up to take a
7 lead role in installing Hydrogen refueling
8 stations.

9 In our opinion, New York State is
10 ideally situated to lead the way in hydrogen
11 infrastructure required to support the
12 introduction of fuel cell vehicles. Some Project
13 Driveway refueling stations are using byproduct
14 hydrogen produced from the Chlor-Alkali industry
15 in Niagara Falls, New York. Utilizing this green
16 hydrogen from the renewable source, hydropower,
17 results in a real-world validated 85% reduction in
18 CO₂ emissions over a comparable gasoline-powered
19 internal combustion engine vehicle and the fuel
20 delivery system on a wells to wheels basis. So,
21 complete wells to wheels analysis, it's been
22 validated with our actual readings on the
23 technology that we have an 85% reduction in CO₂
24 emissions. If our fleet of vehicles, the 100
25 vehicles, used the Praxair green hydrogen

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2 available here in New York, we could have saved
3 625,000 pounds of CO₂ to date.

4 We are currently working with
5 NYSERDA to install a Hydrogen Highway that would
6 allow our drivers to go from one end of the state
7 to the other; the first state in the Union to be
8 able to do that. This would not only require
9 funding but also standardization of the codes and
10 permitting process required to install the
11 hydrogen stations in New York City, as well as
12 throughout the State. The Chevrolet Equinox Fuel
13 Cell Electric Vehicle I drove here today and that
14 you had the experience of either driving or
15 looking at today, is nearly twice as fuel
16 efficient with zero CO₂ emissions as the internal
17 combustion engine it replaced. We invite the
18 Council members to tour our facility in Ardsley,
19 or tour any of our network of stations, to learn
20 more about the impressive progress being made in
21 the effort to commercialize the fuel cell
22 technology. General Motors believes that Fuel
23 Cell Electric Vehicles offer the fast refill time,
24 combined with the long driving range, that our
25 customers demand.

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Thank you very much.

CHAIRPERSON GENNARO: Thank you.

Thank you, Mr. O'Connell. I have some questions that I'd like to pose to you. I appreciate the opportunity to do that. And, with regard to-- could you tell us a little more about how you get the hydrogen with regard to what's going on up in Niagara Falls? There's a manufacturing process with regard to the production of, you know, chlorine bleach and you're able to use the hydrogen byproduct. Could you explain the environmental benefits of [crosstalk]

DANIEL O'CONNELL: Yeah, the reverse of a fuel cell is called an electrolyzer. And, what that does is it takes water and splits it apart when you put electricity into it. In the case of the Chlor-Akali industry, what they do is they take a brine solution, which is basically saltwater, put it into the reverse of a fuel cell, this electrolyzer, put some electricity into it and split it apart. So, what comes off is hydrogen and oxygen in a gas form. And, what's left is a caustic material that they use to make Clorox products. For most of the East Coast, it's

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2 produced right in Niagara Falls with two different
3 companies there.

4 The hydrogen that we use is
5 normally off gassed to the atmosphere. We've
6 captured that hydrogen, put it into-- purified it,
7 put it into a tanker truck and bring it to
8 Rochester, as well as to New York City, to fuel
9 our vehicles with that green hydrogen that's
10 produced as a byproduct of the Chlor-Alkali
11 industry from renewable electricity from Niagara
12 Falls.

13 CHAIRPERSON GENNARO: And, with
14 regard to you working closely with the State to
15 make this technology, to move this technology
16 forward, you indicated that you're working with
17 NYSERTA to do this Hydrogen Highway. And, could
18 you talk about the, you know, kind of cooperation
19 that you had from New York State, 'cause it seems
20 it would be in the State's, you know, economic
21 interest to advance this technology for economic
22 reasons, as well as the State's, you know, need
23 to, you know, clear our air. And so, talk a
24 little bit about the kind of working relationship
25 you have with NYSERTA and other people within the

2 State government and the Paterson Administration.

3 DANIEL O'CONNELL: Now, we
4 currently have five stations going into the New
5 York City area. There's the station at our
6 facility in Ardsley, New York. Shell has a
7 station that they put into White Plains. Shell
8 also has a station going in in the Bronx, as well
9 as at JFK. In the Bronx, we have a great
10 relationship with the Sanitation Department,
11 because we use their property to put the station
12 in. At JFK, we work very closely with the Port
13 Authority--

14 CHAIRPERSON GENNARO: [Interposing]
15 The City Sanitation Department. The--

16 DANIEL O'CONNELL: The City
17 Sanitation Department.

18 CHAIRPERSON GENNARO: -- New York
19 City Department of--

20 DANIEL O'CONNELL: New York City--

21 CHAIRPERSON GENNARO: --
22 Sanitation.

23 DANIEL O'CONNELL: -- Department of
24 Sanitation, yes. We also work very closely with
25 the New York/New Jersey Port Authority at JFK.

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2 The station is located on their property, just
3 outside of the circle there, adjacent to where the
4 natural gas filling station is. There's now a
5 Shell hydrogen station there. We've worked very
6 closely with NYSERTA to help get the Hempstead
7 station in. That's now currently under
8 construction. So, that would allow you to go from
9 Long Island all the way out to West White Plains.
10 We also are working with the Military to put a
11 station in at West Point. There's currently a
12 station in Albany. We have three stations that we
13 put in in Rochester, New York, where our facility
14 is located, where the technology's developed.

15 And so, our goal is to work with
16 NYSERTA to link those stations up, both in
17 Rochester, New York and Albany and be able to go
18 from one end of the state to the other by adding a
19 station in Syracuse, Utica and Buffalo, as well as
20 an additional station in Albany. That would allow
21 you to go from one end of the state to the other
22 and get fuel all along the way.

23 CHAIRPERSON GENNARO: Thank you.

24 [Pause] What I'll do, Mr. O'Connell, I'm going to
25 come around on a, you know, second round for some

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2 more questions. But, I feel it's only right to
3 offer an early opportunity for the sponsor of the,
4 and the author of the, Resolution, Lew Fidler, to
5 pose some questions to you. And, I'll come back
6 on a second round. I recognize Council Member
7 Fidler.

8 COUNCIL MEMBER FIDLER: Thank you,
9 Mr. Chairman. And, thank you, Mr. O'Connell, for
10 coming here today and hosting the demonstration of
11 the future in the City Hall parking lot. It
12 really it was, I think, enlightening and eye-
13 opening to a lot of people who walked by. I mean,
14 I made reference to the fact that I started
15 talking about this about a year and a half ago
16 here at City Hall. And, I used the same comment,
17 that you could put your mouth and inhale from the
18 tailpipe of the car. And, one of my colleagues,
19 at that time, suggested I might be inhaling
20 something else. And, you know, today, we clearly
21 saw that I wasn't and that it's real and that it's
22 here and, you know, we just need to find a way to
23 make it happen. So, thank you.

24 I want to just, before I ask you
25 some very specific questions about hydrogen

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2 production, I want to talk to you about some of
3 the reactions and myths that exist around these
4 cars. So, I know that we've had this discussion.
5 But, they weren't on the record. So, first of
6 all, do the cars perform in the same way as
7 conventional gasoline combustion engines do in
8 terms of driving performance?

9 DANIEL O'CONNELL: One of the
10 things that we did originally was we put the fuel
11 cell technology in advanced vehicles and people
12 didn't really like it. Our customers said no, I
13 want something that's completely transparent. I
14 want to be able to get out of my current
15 production vehicle and I want to get into the new
16 fuel cell car and not need any special training to
17 be able to just have it perform the same. So, the
18 vehicle is designed to be exactly the same as the
19 vehicle it replaces.

20 It'll do a zero to 60 in under ten
21 seconds. It'll go 100 miles an hour without any
22 problem. The vehicle performs very well because
23 it's electric drive. It has a lot of torque
24 available. So, whenever you press on the
25 throttle, it's very responsive. The starting

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2 sequence is exactly the same. There's no special
3 buttons to push. You go in and tap the on button
4 and the vehicle turns on and allows you to drive
5 away. Our customers, with very little training,
6 are able to get in and drive the car. And, the
7 ultimate compliment to us is after a week, they
8 say I forgot it's a fuel cell car.

9 COUNCIL MEMBER FIDLER: That's
10 great. Now, the second, you know, reaction I get
11 from people is my God, it's hydrogen. Isn't that
12 explosive? And, of course, you have to remind
13 them that so is gasoline. Is it not a fact that
14 these vehicles are actually somewhat safer than
15 gasoline combustion engines because gasoline
16 explodes outward and hydrogen would, if, God
17 forbid, it exploded, would explode upward so that
18 there is less of an impact on people who are on
19 the ground?

20 DANIEL O'CONNELL: All fuels are
21 dangerous. I don't mean to downplay that at all.
22 All fuels that we have today are dangerous. But,
23 we have learned how to handle them correctly. In
24 our fuel cell vehicle, all of the high pressure
25 hydrogen that's in the tank is located within the

1
2 tank. No oxygen can get into that tank to get to
3 a combustible mixture within the tank. So, an
4 explosion of the tank is virtually impossible.

5 We've crash test the vehicle.

6 We've shot them with ballistics. Shot the tanks
7 with ballistics. We set the vehicles on fire.
8 We've flipped them over. We've done everything
9 conceivable to the vehicle and it passes every one
10 of the standards. The vehicle is so safe that I
11 put my two children, 8 and 10 years old, in the
12 backseat, on top of the hydrogen tank, and drive
13 it all over town.

14 There's only four teaspoons of
15 hydrogen in the lines at any one time. So,
16 there's very little fuel outside the tank. The
17 tanks are pretty much indestructible. There are
18 carbon fiber-wrapped plastic liner and in an
19 accident, the tanks survive. The vehicle can be
20 nearly demolished, but the tanks survive.

21 In terms of the safety of hydrogen
22 when it does escape to the atmosphere, it escapes
23 very quickly. It goes up at 45 miles an hour. In
24 a gasoline accident, hydrogen that comes out of
25 the lines or anything can get onto the ground and

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2 spread around, making a very large combustion
3 zone. If you remember back to your chemistry days
4 in high school, it's very difficult to get
5 hydrogen and oxygen trapped, because hydrogen is
6 so small and dissipates so quickly, into a
7 combustible mixture and make it pop. In Chemistry
8 101, they teach you how to pop a little bit of
9 hydrogen. Makes a very little popping noise when
10 you can make it work.

11 So, in our understanding, and all
12 the vehicle testing that we've done and I
13 witnessed most of the testing, the vehicle is
14 completely safe. It is safe, more safer than the
15 vehicles we have on the road today.

16 COUNCIL MEMBER FIDLER: [Off mic]

17 [pause]

18 DANIEL O'CONNELL: Our vehicle
19 holds four gallons equivalent of hydrogen in the
20 tank and can go about 200 miles on that fuel.

21 COUNCIL MEMBER FIDLER: [Off mic]

22 [pause]

23 DANIEL O'CONNELL: The Department
24 of Energy has issued a report that says at high
25 volume production of hydrogen for automotive

1 applications can get down to \$2 a gallon
2 equivalent. And, because the fuel cell is twice
3 as efficient, the cost per mile for the consumer
4 will be significantly less.
5

6 COUNCIL MEMBER FIDLER: [Off mic]
7 [pause]

8 DANIEL O'CONNELL: Yeah, we have
9 some pretty sound data that would indicate that
10 when we are at high volume manufacturing, the cost
11 of the vehicle will be the same as the internal
12 combustion engine vehicles that it replaces.

13 COUNCIL MEMBER FIDLER: And, that's
14 pretty much [pause]

15 DANIEL O'CONNELL: And, that's an
16 excellent--

17 COUNCIL MEMBER FIDLER: [Off mic]

18 DANIEL O'CONNELL: Yes, I can.
19 That's an excellent question. And, we get that
20 question quite often is how much energy does it
21 take to make a gallon of hydrogen versus a gallon
22 of fuel. And, how many miles can you get from
23 that gallon of fuel. And, we did a pretty
24 extensive analysis that, although the energy
25 required to make a gallon equivalent of hydrogen

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2 is greater than gasoline, the end game is that the
3 fuel cell is significantly better than the
4 internal combustion engine. So, the net result of
5 the energy required from a wells to wheels basis
6 is that fuel cells come out significantly ahead to
7 the tune of 25% ahead on an energy input basis.

8 COUNCIL MEMBER FIDLER: Now [pause]

9 DANIEL O'CONNELL: Yeah, what we've
10 done is taken a look at several different pathways
11 to get the hydrogen to our vehicles. The first is
12 the one we talked about from the Chlor-Alkali
13 industry because there's an abundance of byproduct
14 hydrogen available, enough for three million
15 vehicles is produced in Buffalo, New York. So,
16 there's a lot of hydrogen out there.

17 The second one is we use
18 electrolyzers at some of our stations to
19 understand how much electricity is required to
20 make the hydrogen onsite.

21 And then, the last one is from
22 different products, from natural gas, some of the
23 hydrogen is produced from steam reforming of
24 natural gas, which is very efficient, but still
25 produces some CO₂.

2 COUNCIL MEMBER FIDLER: [Off mic]

3 [pause]

4 DANIEL O'CONNELL: Yeah, that's
5 correct.

6 COUNCIL MEMBER FIDLER: You know,
7 is it possible [pause] because hydrogen [pause]
8 hydrogen fuel [pause]

9 DANIEL O'CONNELL: Yes. Hydrogen
10 produced from electricity from a renewable source
11 allows us to get close to that realization of a
12 95% wells to wheel reduction in greenhouse gas.
13 So, there is an opportunity there with solar, with
14 wind and with hydro to be able to use that
15 electricity to make cheap, inexpensive green
16 hydrogen and use those in our vehicles and get
17 that 95% reduction in the wells to wheels.

18 COUNCIL MEMBER FIDLER: [Off mic]

19 [pause]

20 DANIEL O'CONNELL: Yes. I think
21 the way to think of that is if we just said let's
22 get the fuel cells on the road today and we made
23 it from natural-- we made our hydrogen from
24 natural gas, that gives us a 65% reduction in
25 greenhouse gas if we used natural gas as the feed

1
2 stock for the hydrogen. Then, if you go to
3 renewable, it allows you to get all the way to the
4 90 to 95% reduction in greenhouse gas on a wells
5 to wheels basis.

6 So, I think ultimately, you want to
7 start with natural gas, since there is, today, in
8 the world 40 billion tons of hydrogen produced.
9 In the United States, about half the hydrogen
10 produced is used to desulfur gasoline today. They
11 inject hydrogen into the crude in order to take
12 out the sulfur by turning it into hydrogen
13 sulfide.

14 So, a lot of hydrogen is used
15 today. We use it to hydrogenate our food. We use
16 it in processes for chip manufacturer, as well as
17 in the reduction of sulfur in gasoline. So,
18 there's a lot of hydrogen out there. We know how
19 to use it. There's hundreds of miles of pipeline
20 of hydrogen in the U.S. already today. So, we
21 know how to use it, transport it. We're getting
22 to the point where we know how to make it
23 economically and use green hydrogen so, in the
24 future, you would have that full reduction in CO₂
25 emissions.

2 COUNCIL MEMBER FIDLER: And, the
3 last question is kind of a catchall. And, that is
4 okay, so we're here. I'm sold. I was, you know,
5 you had me at hello. So, that was easy. But,
6 what can we do, in government, to make this happen
7 sooner and more efficiently and more effectively?
8 What role can we play to help you make this
9 happen?

10 DANIEL O'CONNELL: I think there
11 are several roles. But, in my mind, the first one
12 is to recognize hydrogen as a transportation fuel
13 and make the permitting process much simpler.
14 Some of the stations that we've had to put in have
15 taken us almost three years to put in in order to
16 get through all the permitting and the
17 requirements. We need to standardize the
18 requirements around hydrogen. I think you'll hear
19 some of my fellow testifying folks here saying
20 similar things, that that's one of the big hurdles
21 to be able to put a station in. However, one of
22 our stations in California was installed in five
23 months. So, it can be done. And, it can be done
24 safely. So, that would be one thing.

25 The other is to, again, exactly

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2 what the Council's trying to do here today is to
3 encourage the infrastructure to go ahead and move
4 forward and to move the infrastructure so that
5 it's in lock step with the technology from the
6 vehicle side so that you have your opportunity to
7 get over that conundrum of chicken and egg, of
8 what comes first, the hydrogen station or the
9 hydrogen vehicle. So, those are the two things
10 that I think really are required.

11 COUNCIL MEMBER FIDLER: Well, I
12 thank you for coming here today. And, I would ask
13 you to forward to me, particularly on that first,
14 you know, the first issue of the permitting and
15 whatnot, whatever information you have so that I
16 can work with that. I have no intention of
17 holding a hearing today and leaving it at that.
18 So, please get that to me and we will see what we
19 can do here in the City and what we can encourage
20 our colleagues in State government to do as well.
21 Thank you.

22 DANIEL O'CONNELL: Thank you.

23 CHAIRPERSON GENNARO: Thank you,
24 Council Member Fidler. We're joined by Council
25 Member Tom White. Tom wants to be recognized for

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questions. I recognize Council Member White.

COUNCIL MEMBER WHITE: [Pause]

CHAIRPERSON GENNARO: Council Member, you have to talk into a microphone for your words to be placed on the record.

COUNCIL MEMBER WHITE: Hello? Can you hear me?

CHAIRPERSON GENNARO: Yep, we're good.

COUNCIL MEMBER WHITE: Okay. In terms of supply and demand, right now quite naturally we're interested in clean air and being able to breathe for centuries to come. In terms of the cost of the vehicle today, it's like a prototype, right?

DANIEL O'CONNELL: Yep.

COUNCIL MEMBER WHITE: What is the cost of that vehicle today? I heard you say Jay Leno drives it or drove it or whatever. What's the cost of that vehicle?

DANIEL O'CONNELL: Today, since we've only made 100 vehicles and they are prototypes, the cost is about ten times the cost of a production vehicle, when you just take a look

1
2 at the hardware that's involved in the system. We
3 do have our line of sight to be able to get it
4 down so that it's equivalent to the internal
5 combustion engine when you make it at high volume.
6 So, we don't think a consumer would have to pay a
7 premium once you hit the high volume.

8 COUNCIL MEMBER WHITE: Give me an
9 idea in dollars and cents.

10 DANIEL O'CONNELL: It's hard to
11 quote because some of the parts are handmade and
12 it's hand-built and it was offline. But, it's
13 about ten times and a normal production vehicle is
14 about \$25,000. So, it's about ten times--

15 COUNCIL MEMBER WHITE: Okay.

16 DANIEL O'CONNELL: --that with
17 these prototypes. And, again, that's only at the
18 100 level. Once you start making hundreds of
19 thousands of them, the cost will come down
20 significantly. And then, we believe that you'll
21 see fuel cell technology in everything. You'll
22 see it in your computers. You'll see it in your
23 cell phones because the cost will have been driven
24 down by the automotive industry high volume.

25 COUNCIL MEMBER WHITE: Okay. Now,

1
2 what impact would that have on the oil that we
3 import from other countries?

4 DANIEL O'CONNELL: Because there
5 are a variety of feed stocks that you can make
6 hydrogen from, including natural gas and water
7 from renewable electricity, we would basically
8 used zero petroleum in our transportation industry
9 when your entire vehicle parts would be converted
10 to fuel cells.

11 COUNCIL MEMBER WHITE: Okay.

12 DANIEL O'CONNELL: So, we would no
13 longer need to use petroleum.

14 COUNCIL MEMBER WHITE: That would
15 have an impact on us, let's say, having less
16 dependence on foreign oil for the automobile
17 industry.

18 DANIEL O'CONNELL: That's correct.

19 COUNCIL MEMBER WHITE: Because, you
20 know, what's that they make out of corn, ethanol?
21 What they make? Corn?

22 DANIEL O'CONNELL: Today we make
23 ethanol out of corn. But, we also have-- they
24 spend a lot time and effort looking on the phase
25 II ethanol that's made differently. It doesn't

1
2 use corn.

3 COUNCIL MEMBER WHITE: Yeah,
4 because I was watching a program on 60 Minutes, I
5 believe, or 20/20, where the cost of making
6 gasoline to run cars out of corn costs us really
7 more than actually processing the oil into
8 gasoline.

9 DANIEL O'CONNELL: Today, some of
10 the processes are in their early stages for corn.
11 That's how we've worked so hard to move away into
12 phase II ethanol with what we've worked with
13 Coscata [phonetic], who is a company who's working
14 on one method and Muscomo [phonetic], who's
15 another company working on a different method, to
16 make hydrogen from-- or, to make ethanol from
17 switch grass, as well as from microorganisms. So,
18 we are working on moving away from corn, which is,
19 again, somewhat intensive in its process. But, in
20 order to get quickly to ethanol, you'd start from
21 corn and then, work toward the phase II ethanol.

22 COUNCIL MEMBER WHITE: Okay. Thank
23 you very much. And, I'd like to join my colleague
24 in terms of this is not the first of many
25 hearings. And, I look forward to, as Chairman of

2 the Economic Development Committee, to take a look
3 at the economics of this whole process. Thank
4 you.

5 DANIEL O'CONNELL: Thank you.

6 CHAIRPERSON GENNARO: Thank you,
7 Council Member White. I appreciate you taking an
8 interest in this with your Committee. That sounds
9 most welcome. Thank you. Thank you for that. I
10 recognize Council Member Crowley.

11 COUNCIL MEMBER CROWLEY: Thank you,
12 Chairman Gennaro. Mr. O'Connell, if you could
13 just give me a detailed description on how one
14 would go about filling their car, like with these
15 fuel cells into the car. What goes into the car?

16 DANIEL O'CONNELL: Yeah, one of the
17 processes that we worked on, again, is we've made
18 some significant improvements since the start of
19 the program 20 months ago. Originally, you had to
20 have personal protection equipment, safety
21 glasses, gloves and a lot of different things with
22 grounding the vehicle.

23 Through our efforts with all of our
24 vehicles, you now pull up to the station; you open
25 the flipper door like you do today, exposing the

1
2 fuel nozzle; you take it off; you press the pump;
3 put the nozzle on. In less than five minutes, you
4 can put four gallons equivalent of hydrogen into
5 the car. Put the nozzle back up, close the
6 flipper door and be on your way. So, there's no
7 personal protection equipment required. There's
8 no connections to the vehicle. We have made it
9 particularly safe by having the vehicle talk to
10 the pump and the pump talk to the vehicle
11 wirelessly so that everything is intact between
12 the two systems before we start to dispense the
13 fuel. So, in our estimation, that could be safer
14 than the situation we have today with gasoline.

15 COUNCIL MEMBER CROWLEY: And,
16 approximately how many miles to the gallon?

17 DANIEL O'CONNELL: Today, our
18 vehicle holds four gallons equivalent of hydrogen
19 under the back seat. And, what we do is took the
20 gasoline tank out and replaced it with hydrogen
21 tanks. So, we have about four gallons. The
22 vehicle gets close to 50 miles per gallon in the
23 real world today. So, you can go about 200 miles
24 on a full tank. It holds 4.2 gallons equivalent
25 of fuel. And, you can do that in about four

minutes at the filling station.

COUNCIL MEMBER CROWLEY: And, what is the cost?

DANIEL O'CONNELL: Today, the cost of hydrogen is about \$8. But, again, that DOE report, when you get into some higher volume and higher use in the automotive industry, says the price of hydrogen can get down to around \$2 a gallon.

COUNCIL MEMBER CROWLEY: Thank you.

DANIEL O'CONNELL: Thank you.

CHAIRPERSON GENNARO: Thank you.

Thank you, Council Member Crowley. But, notwithstanding the fact that the price would go down to \$2 a gallon, it's not sort of an equal comparison by virtue of the fact that these cars are more efficient than those that run on gasoline. So, the, you know, \$2, so, if you can compare the efficiency of your vehicles to regular internal combustion engines, what would that comparison be?

DANIEL O'CONNELL: Today, the technology, when you put the fuel cell in the like apples to apples vehicle, you get about a 2X

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2 improvement in efficiency. So, the production
3 vehicle that gets about 24, 25 miles per gallon
4 will be able to get 50 miles per gallon. And,
5 that's with technology that we have today. The
6 technology we have back in the lab and the
7 vehicles today are about four years old
8 technology. It took us two years to get it into
9 production. It's been on the road for pretty
10 close to two years now.

11 The new technology that we have,
12 the next generation, if you will, is in the labs
13 back in Rochester, New York, where I'm from, is
14 ready to go. And, it's more efficient, which
15 would give you, and it's much lighter, would give
16 you a significant improvement in fuel economy
17 above and beyond what you have today. So, we'd
18 realize in addition to that 2X. So, the cost per
19 mile on a consumer, if the hydrogen and the
20 gasoline were both \$2, would be significantly less
21 because the fuel cell is twice as efficient.

22 CHAIRPERSON GENNARO: Thank you.
23 Thank you. I thought it was important to make
24 that distinction. And, thanks for clarifying that
25 for us. And, my colleagues, who ask such

1
2 wonderful questions on this, that they asked some
3 of the questions that I was going to ask. And so,
4 I'll stop my questioning at this time. And, just
5 thank you for not only being here today, but, you
6 know, trying to make New York State an green
7 technology leader. People talk about green jobs
8 all the time. But, you know, you and your folks
9 are putting New Yorkers to work today, hundreds of
10 people, you know, building green technology. We
11 need more of that in New York State. We need, you
12 know, more of that in New York City.

13 And, I appreciate all of your
14 efforts and your being here today, you know, you
15 and your good team, who came down to really do a
16 whole production for us with regard to making the
17 vehicles available. And, we certainly appreciate
18 that. So, thank you, Mr. O'Connell for being here
19 and appreciate your testimony.

20 DANIEL O'CONNELL: Thank you very
21 much.

22 CHAIRPERSON GENNARO: The next
23 witness, Edward Kiczek, I hope I'm saying that
24 right, representing an entity called Air Products
25 from Allentown, Pennsylvania. Is that right?

2 EDWARD KICZEK: That's correct.

3 CHAIRPERSON GENNARO: Okay. And
4 so, sir, if you could state your name for the
5 record and maybe just hold on one second 'til I
6 have your statement. State your name for the
7 record and begin with your testimony. We'd
8 appreciate that.

9 EDWARD KICZEK: My name is Ed
10 Kiczek. I'm from Air Products and I'm the Global
11 Business Director for our Hydrogen Energy Systems
12 Group. First of all, I'd like to thank the
13 Committee for the opportunity really to come here
14 and talk about hydrogen today. I'm not going to
15 really go in deep into the economics. I think
16 there's plenty of economics out there that prove
17 and show that hydrogen is, in fact, competitive
18 and can be competitive with gasoline to support
19 Dan's statement. There's no question in our mind
20 when hydrogen is produced in mass quantities, it
21 can be distributed at an equivalent cost of \$2.50
22 a gallon today; not in the future, but today.

23 What, I really want to kind of
24 focus on today with some of my time here is where
25 hydrogen is today, some of the activity that's

1
2 going on in hydrogen and hydrogen and
3 infrastructure and present maybe some ideas for
4 New York City on how it can be a leader in the
5 hydrogen economy.

6 Just by way of background, if
7 you're not familiar with Air Products, we have
8 been in the hydrogen business for over 50 years.
9 We are the world's largest producer of merchant
10 hydrogen. We've been making, distributing
11 hydrogen in countries, over 40 countries,
12 throughout the world. Today, we produce over two
13 billion standard cubic feet of hydrogen; most of
14 that goes into making cleaner burning gasolines,
15 as Dan had mentioned earlier.

16 But, hydrogen is used quite
17 pervasively in a number of other industries. It's
18 used in steel, glass, electronics, pharmaceuticals
19 and, quite frankly, it's embedded in many of the
20 products that we touch and come in contact with
21 every day. We just really don't realize that.

22 Kind of a way of looking at what
23 our production is and what it-- sort of getting
24 your hands around it is to realize that the entire
25 quantity of Air Products' hydrogen, if we were to

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2 use that to fill vehicles, we could fill seven or
3 eight million vehicles a day easy. So, a question
4 was mentioned earlier about where's the hydrogen
5 coming from. There's plenty of hydrogen out
6 there; not only United States, but in the world.

7 And, we deliver hydrogen through a
8 whole variety of methods. We deliver it in
9 pipeline. We deliver it as liquid over the road
10 and bulk gaseous hydrogen, as well as onsite
11 generation from various means. But, there's no
12 question that pipeline hydrogen is the cheapest
13 hydrogen that you can deliver today because it's
14 made in mass quantities and you take advantage of
15 those economies of scale.

16 We've been working with the federal
17 government and several of the state and local
18 governments. And, we've been extremely active
19 internationally with a number of industry
20 partners. We've built over 90 fueling stations in
21 17 countries around the world and, continue to do
22 technical research in which helped to support the
23 emergence of this industry.

24 Just as an example, in New York, we
25 are working with the New York company Plug Power

1
2 up in Albany, which you may be familiar with. We
3 have a project which was extremely successful and
4 a showcase on which it was a project that the
5 United States Department of Defense, Plug Power
6 and it was at our country's largest defense depot,
7 DDSP in Pennsylvania. Plug Power supplied the
8 fuel cells. Air Products supplied the hydrogen
9 and dispensing equipment. And, that is for an
10 application which now the Military is looking at
11 dispersing much more widely.

12 In addition to that, we've also
13 just recently broke ground at a station in
14 Hempstead, New York. I know one of our friends is
15 here from Hempstead, as well. And, we look
16 forward to having that come up shortly here within
17 this calendar year to be online.

18 Projects like this are growing
19 rapidly, not only in the government sector, but
20 also in the private sector. And, that's evidenced
21 by the fact that this year, alone, Air Products
22 has experienced almost a threefold increase in the
23 number of hydrogen fuelings that we're doing in
24 vehicles, mainly in forklift and off-road type
25 vehicles. Our fuelings have gone from something

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2 like 80,000 fuelings per year, today, just based
3 on the number of projects we have on the books for
4 the coming calendar year, to 250,000 fuelings.

5 So, there's a tremendous amount of activity that's
6 going on in hydrogen and the generation of, and
7 dispensing of, hydrogen.

8 Kind of closer to home, here in New
9 York, we have several projects that are ongoing.

10 The White Plains station that was mentioned by
11 Dan, we built that station for Shell up in White
12 Plains. We also have the Hempstead station.

13 We've done a number of demonstrations in Albany,
14 New York for some of the executives up in Albany.

15 We're also in discussion with some of the major
16 stakeholders for the Hydrogen Highway, which would
17 run from Buffalo down to Hempstead. And,
18 certainly, we would like to see that go forward.

19 Additionally, we've worked very closely with
20 NYSERTA and also with the Clinton Climate

21 Initiative here in New York City. The Clinton
22 Climate Initiative has been very helpful in

23 pushing the understanding of hydrogen and the
24 benefits of hydrogen, not only in the U.S., but
25 throughout the world.

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2 As we move forward in an
3 alternative energy landscape, there are really, in
4 our opinion, four main drivers. Those drivers are
5 environmental, efficiency, sustainability and
6 energy independence. In our opinion, there's no
7 question that hydrogen has a play there. There
8 are a host of technologies that are really vying
9 for that next generation of energy platform; those
10 that I just mentioned. But, when you really
11 closely examine those technologies and compare it
12 to hydrogen, hydrogen meets those four drivers
13 better than any other alternative that is out
14 there today.

15 A fuel cell could be ultimately two
16 and a half to three times more efficient than an
17 internal combustion engine. When produced from
18 natural gas, hydrogen has a 50% reduction in the
19 carbon footprint. And then, if you were to use,
20 or make, hydrogen from water, biomass or
21 renewable, as was mentioned before, it is a zero
22 emissions technology.

23 Hydrogen fuel cells have much
24 better carbon footprint and wells to wheels
25 efficiency than any of those other opportunities

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2 that I mentioned before, plug-ins, batteries,
3 etcetera. So, to us, hydrogen is really an
4 obvious choice for the future and has a place in
5 the future as an alternative energy source for
6 transportation.

7 Now, while plenty of the public's
8 mental imagery really you think about hydrogen,
9 you're really looking, or thinking about hydrogen
10 economies related to cars and gasoline. What I
11 want to do is just mention that there's a lot of
12 other activities and sort of go through the
13 breadth of those activities so that you understand
14 that hydrogen really is pervasive out there today.
15 We have a number of deployments of technologies
16 that are advancing in the real world. One note
17 are few, very-- of note, I should say, are a few
18 hydrogen energy applications that are far less
19 public than cars; material handling, as I
20 mentioned, in forklifts. We're also filling
21 submarines in five countries around the world;
22 cell towers, mass transit, bus fleets; a number of
23 applications that are going on. The Beijing
24 Olympics that occurred, we fueled buses that were
25 taking the athletes around to various parts of the

1
2 games before those Olympics. And, that was
3 highlighted on a number of television stations.

4 But, in addition to that, we're
5 deploying renewable technologies produce hydrogen
6 because we know that the future has to be
7 renewable hydrogen. And, one of the technologies
8 that we're working on is converting waste water
9 sludge to hydrogen and I'll talk more about that a
10 little bit later on as how New York can take
11 advantage of that.

12 We also feel that bus fleets are
13 particularly amenable as early adopters to the
14 hydrogen as hydrogen users because these vehicles
15 come home every night and fill at the same station
16 every night. Bus fleets are incredibly useful to
17 help deploy hydrogen production, distribution and
18 dispensing infrastructure. And, these would be
19 bus fleets like the MTA. And, I know that MTA has
20 CNG fleets and I'll talk about HCNGs, an
21 opportunity to stepping stone to hydrogen later
22 on.

23 I want to highlight just a couple
24 of these activities 'cause I think they're very
25 important milestones as we move forward in

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2 hydrogen. Of really particular note under the
3 hydrogen-- under infrastructure efforts that we're
4 working on is that we're building the world's
5 first pipeline station out in California. This
6 fueling station will show that, in concept,
7 pipeline distribution systems, that's hydrogen
8 delivered in very large quantities similar to that
9 of natural gas, can be an endgame state in terms
10 of how you would see a long term vision of
11 hydrogen playing out. This station will be in
12 California. It'll be in a very prominent area by
13 the 405 freeway in the LA basin. And, really,
14 it's going to be a showcase mainly because it'll
15 show that the cost of hydrogen will, and can, be
16 competitive today with gasoline when we deploy
17 that model ultimately as a future model.

18 Participants in that project include, not only the
19 Department of Energy and Air Products, we're
20 working with Shell. GM will fill vehicles there,
21 as well as Honda, Toyota and Daimler. And, again,
22 I think that'll be a showcase that hydrogen
23 definitely does have a place in the future.

24 Over the next few years, though, we
25 see that we can expect, really, the emergence of

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2 hydrogen or hydrogen blends in mass transit. And,
3 we think this is a real opportunity. These are
4 blends of hydrogen and natural gas, in some cases
5 as much as 20% hydrogen in natural gas or 30%
6 hydrogen in natural gas. We call that an HCNG
7 blend. There are a number of applications in mass
8 transit that are going on today around the world;
9 in Germany, the U.K., Spain, India, Korea and Air
10 Products is supplying a lot of those
11 opportunities.

12 Unfortunately, we think that there
13 should be much more activity going on in the
14 United States today related to those mass transit
15 and bus-type fleets. These applications we
16 continue to target because they're large volume
17 users of hydrogen as we move forward. And,
18 hydrogen CNG blends today will reduce emissions by
19 up to 50% and it'll position you for hydrogen,
20 full hydrogen, buses, fuel cell buses when they
21 come in subsequent years. The other advantage of
22 having large hydrogen users like a mass transit
23 fleet is it provides kind of a hub and spoke
24 delivery system for surrounding smaller stations
25 and, again, taking advantage of economies of

1
2 scale.

3 Other types of vehicles that can
4 take advantage of this would be ports. Ports
5 generally have significant emissions problems.
6 And, this technology would be amenable to ports,
7 vehicles like drayage trucks. And, we're actually
8 working in California with some of the ports on
9 their drayage trucks.

10 One last technology I think I'd
11 like to highlight is really renewable, the
12 production of renewable was mentioned, solar was
13 mentioned, wind was mentioned before as renewable
14 options. But, we have even another option and
15 that is for the production of hydrogen, we know
16 that New York's energy plan has a high
17 concentration on renewables. The fact is is that
18 hydrogen, as was mentioned, can be produced from
19 renewable waste sources.

20 We have a product that fits that
21 application and positions for the future is a
22 molten carbonate fuel cell based, what we call an,
23 energy park. The renewable energy park can
24 produce heat, power and hydrogen from sludge of a
25 waste water treatment plant. Where you have

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2 people, you have waste water effluent and
3 certainly one think that New York has a lot of is
4 people. Just to give you sort of a sense of that,
5 a rule of thumb is that for every 100,000 people,
6 this product can produce a megawatt of power,
7 renewable power, as well as 500 kilograms a day of
8 hydrogen; all renewable. Our first unit is going
9 in, it's actually being shipped out to Orange,
10 California for start up in the summer, summer of
11 this year.

12 I guess maybe the last two
13 concluding slides here is really how can New York
14 City move forward in hydrogen and hydrogen
15 economy. Our suggestion would be is first to
16 develop and understanding of the obstacles of
17 deployment that have been experienced by other
18 jurisdictions, as well as New York City. These
19 include permitting and inconsistencies between
20 jurisdictions having authority on placing stations
21 and getting hydrogen into New York City. And,
22 this is mainly occurring because it's an education
23 process. And, that's one of the things that has
24 to occur. It's a new fuel. It's a different
25 fuel. And people don't necessarily understand it

1
2 because they just haven't dealt with it enough.

3 The second challenge would be
4 really to determine what's the best application
5 for the deployment of hydrogen in the City? Is it
6 fleet vehicles? Is it buses? Is it taxis? And,
7 there are a number of ways that New York can be a
8 leader in moving hydrogen vehicles forward. One
9 of the issues that we will have to address at some
10 point, and I think this goes to a question that
11 was asked previously, is that currently there are
12 many restrictions on bringing hydrogen into the
13 City over the tunnels and bridges, making it much
14 more expensive. There's no question that the
15 cheapest hydrogen is that that's delivered in a--
16 that's made in a large quantity, high production
17 plant and delivered over the road, as opposed to
18 smaller onsite generation. That's an issue that
19 would have to be addressed and worked on.

20 As just to conclude here, I really
21 think that New York City has a tremendous
22 opportunity because of its stature around the
23 world and, obviously, garners a lot of interest.
24 Our suggestion is that maybe a task force would be
25 formed, and Air Products would be more than happy

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2 to help and sit on that task force, which could
3 determine how best New York can take advantage of
4 hydrogen in select applications, not only for the
5 application itself, but what are the right
6 delivery modes and what issues do we have to
7 overcome.

8 With such a plan in place, we
9 believe that the incentives and funding from both
10 the federal and the state and City sources could
11 drive deployment of projects in New York City.
12 Right now, there are federal incentives for
13 \$200,000 for infrastructure credit. There are
14 \$3,000 a kilowatt for fuel cell credit. And,
15 potentially, further local credits and grants
16 could really additionally incent hydrogen to roll
17 out in the City in a very positive way. And, if
18 you take advantage of the renewables, I think it
19 would clearly be a showcase for the rest of the
20 world.

21 Just in conclusion, I'd like to say
22 that we really face an uncertain energy future. I
23 applaud New York City for really recognizing that
24 something has to be done here. And, we really
25 need to solve this issue as a legacy for future

1
2 generations. And, I really hope that New York
3 City becomes a beacon leading the way in
4 alternative energy. Thank you.

5 CHAIRPERSON GENNARO: Thank you.
6 Thank you. And, I just don't want to mispronounce
7 your last name. How do you say it?

8 EDWARD KICZEK: It's 'Keycheck'.
9 Key, with a checkmark.

10 CHAIRPERSON GENNARO: Oh,
11 'Keycheck', okay. Thank you, sir. Mr. Kiczek,
12 just to respond to some of your statements, with
13 regard to the whole, you know, task force concept
14 and your willingness to participate and I'm sure
15 there are many people in this room who would like
16 to have an opportunity to give New York City
17 policymakers the benefit of your views. You're
18 doing that here in our branch of government. The
19 Mayor's Office of Long Term Planning and
20 Sustainability, you know, did come down to the
21 parking lot to, you know, check out the cars.

22 I would just mention to Michael,
23 from the Mayor's office, to the extent that the
24 Office of Long Term Planning and Sustainability
25 could give entrée to, you know, some of these

1
2 folks who are in this business, you know, perhaps
3 the Office of Long Term Planning and
4 Sustainability could, you know, benefit from, you
5 know, some of the brainwaves that would be, you
6 know, generated in that meeting. We have a whole
7 think tank now over in the Mayor's office. It's a
8 very good thing, actually, that we have such a
9 think tank. And, I actually wrote the law to make
10 sure that we had that think tank in all, you know,
11 future Mayor's offices. So, I'll make that
12 request, Michael.

13 You know, Kizzy was down there
14 looking at the cars today. I know the Mayor's
15 office, particularly that office, is always eager
16 to get the benefit of people who have interesting
17 technologies and have real world experience on
18 what they've been through in other jurisdictions
19 and how we could do things a little differently
20 here to, you know, make this more of a reality
21 here. So, that's item one.

22 And, item two, my Legislative
23 Director Costa Constantinitas [phonetic] is here.
24 He's going to be here for the duration of the
25 hearing. Everyone should get to know him, as well

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2 as the counsel to the Committee and the Policy
3 Analyst of the Committee. I think going forward,
4 we all need to know who each other are so that we
5 could have a better exchange of information. Oh,
6 I just want to recognize the presence of Council
7 Member Eugene, a member of the Committee who was
8 here. And, [pause]

9 I was telling Council Member Fidler
10 that I have to take my wife to a medical
11 appointment. So, I'll not be here for the
12 remainder of the hearing. Instead, I will turn
13 over Chairmanship of the hearing to a member of
14 the Committee, Council Member Liz Crowley, who
15 will, you know, pilot the boat from here forward.
16 Recognize that notwithstanding the fact that I
17 will not be here, my own Legislative Director,
18 Costa Constantinitas is here. People should get
19 to know him. The staff of the Committee is also
20 available to you. Council Member Fidler will be
21 here. I deeply apologize for the fact that I have
22 to move on.

23 Liz, I'm going to, you know, give
24 you the gavel. You Chair from right here. And,
25 you will have an opportunity to-- yes, this is a

1
2 real deal. This is it. And then, you know, you
3 will have the opportunity to recognize Council
4 Member Fidler for questions of this good witness.
5 And, I'm going to see how you do that just to make
6 sure you recognize him properly. He's a good guy.
7 Say nice things about him as you're recognizing
8 him. And so, there you go. This is yours.

9 COUNCIL MEMBER CROWLEY: Great.

10 CHAIRPERSON GENNARO: [Pause]

11 Kiczek, thank you for being here. I want to thank
12 you for being here. I'm going to have to go.
13 But, yeah, that is mine. Okay. Madam Chair.

14 ACTING CHAIRPERSON CROWLEY: Thank
15 you, Chairman Gennaro. And now, Council Member
16 Elizabeth Crowley. So, this is the first time I'm
17 having the opportunity to Chair the Environmental
18 Committee. And, I welcome you all here today.
19 I'd like to recognize Council Member Fidler for a
20 question.

21 COUNCIL MEMBER FIDLER: Thank you.
22 I hope this comes over as well on TV as it was
23 here. So, I just really have one or two. You
24 mentioned that the most cost effective way of
25 bringing hydrogen to the consumer is by mass

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2 producing it and trucking it. And, that there are
3 impediments to trucking hydrogen through, I guess,
4 a costly permitting process. Is that what you're
5 telling--

6 EDWARD KICZEK: That is correct.
7 As I understand it, it's specially liquid. It's a
8 permitting process issue. There are a number of
9 restrictions. As I understand it, liquid cannot
10 be moved in over the-- in the tunnels or liquid
11 hydrogen cannot be moved in the tunnels or over
12 the bridges. And, that just adds cost and
13 depending upon the quantity of hydrogen, I believe
14 gaseous hydrogen, some of them require special
15 permits and escorts. So, it just adds to the
16 cost.

17 COUNCIL MEMBER FIDLER: Now, given
18 the current state of technology, are those
19 restrictions warranted in your view?

20 EDWARD KICZEK: We don't believe
21 so. And, again, I think it's just an education
22 process of understanding hydrogen, understanding
23 the ability. You, yourself, had mentioned about
24 hydrogen, the safety of hydrogen in the previous
25 testimony. And, we see that hydrogen is no more

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2 or less safe than gasoline. It's a different
3 fuel. It's a lighter than air fuel versus a
4 heavier than air fuel, gasoline. And, I think if
5 you go back 100 years, people were afraid of
6 gasoline; didn't understand it. You know, there
7 are a number of instances-- I can tell you that
8 Air Products is the world's safest chemical
9 company. And, we've had very few incidences
10 related to hydrogen. And, I can tell you we have
11 never had a fatality regarding hydrogen in 50
12 years.

13 COUNCIL MEMBER FIDLER: The
14 hydrogen that is being trucked, is that being
15 trucked in liquid or gas form?

16 EDWARD KICZEK: There are two
17 forms. One is liquid. You'll see the big liquid
18 tankers. It's like a big thermos bottle. It
19 looks somewhat similar to a gasoline tanker. And
20 then, there's tube trailers, which are large long
21 tubes in the U.S. and they carry high pressure
22 gas.

23 COUNCIL MEMBER FIDLER: And, the
24 fuel that will be necessary for fuel cell vehicles
25 would be trucked as liquid or as gas - - ?

2 EDWARD KICZEK: It depends on the
3 quantity. The quantity of hydrogen really sets
4 the mode of delivery. In very, very large
5 quantities, you would have a tendency to deliver
6 liquid. In smaller quantities, you would deliver
7 gaseous tube trailers. So--

8 COUNCIL MEMBER FIDLER: Is one
9 safer than another?

10 EDWARD KICZEK: No.

11 COUNCIL MEMBER FIDLER: And, who
12 imposes the restrictions? The state or the
13 federal government or both?

14 EDWARD KICZEK: It's a combination.
15 But, for the most part, there are federal
16 regulations. But then, my understanding is New
17 York City has its own further restrictions upon
18 hydrogen.

19 COUNCIL MEMBER FIDLER: Again, in
20 an effort to press the envelope, I would ask you
21 if you could send to me the specific restrictions
22 that you find burdensome, particularly those that
23 the City of New York has.

24 EDWARD KICZEK: Right.

25 COUNCIL MEMBER FIDLER: So, that we

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can begin the process of working on that.

EDWARD KICZEK: I would be--

COUNCIL MEMBER FIDLER: So, that something constructive happens here.

EDWARD KICZEK: --be very happy to do that.

COUNCIL MEMBER FIDLER: The other question I had, and you kind of lost me a little bit when you were talking about effluent as a renewable energy source.

EDWARD KICZEK: Right.

COUNCIL MEMBER FIDLER: Can you explain that to me how that works a little bit--

EDWARD KICZEK: [Interposing] The waste water treatment?

COUNCIL MEMBER FIDLER: Yeah.

EDWARD KICZEK: Waste water treatment basically what you have is the sludge comes into an anaerobic digester. That anaerobic digester really creates a sludge and then, it creates an off gas. That off gas is a hydrocarbon gas. And, quite frankly, from any hydrocarbon gas, you can separate and produce hydrogen. That hydrocarbon gas goes into a molten carbony fuel

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2 cell, which reforms that hydrocarbon into
3 hydrogen. And then, we use that. We can take off
4 a stream of that hydrogen in order to use that for
5 vehicles. And, it also produces power.

6 COUNCIL MEMBER FIDLER: Oh.

7 EDWARD KICZEK: It's what's called
8 a high temperature fuel cell.

9 COUNCIL MEMBER FIDLER: And, would
10 that process-- that process would be an energy
11 positive process?

12 EDWARD KICZEK: Yes.

13 COUNCIL MEMBER FIDLER: And so, you
14 know, my constituents are all too familiar with
15 the fact that we have sewage treatment plants--

16 EDWARD KICZEK: Um, hm.

17 COUNCIL MEMBER FIDLER: --
18 throughout our City. I have one less than a mile
19 from my home.

20 EDWARD KICZEK: Right.

21 COUNCIL MEMBER FIDLER: Every now
22 and then we smell it. The question I have for you
23 is given the quantity of matter going through New
24 York City's sewage treatment plants--

25 EDWARD KICZEK: Um, hm.

2 COUNCIL MEMBER FIDLER: -- could
3 those plants themselves been converted into
4 hydrogen-producing facilities?

5 EDWARD KICZEK: We would have to
6 look at those to make sure that there would be
7 sufficient plot space or someplace where we would
8 be able to add these molten carbony fuel cells.
9 And, we would have to look at it on a case by case
10 basis.

11 COUNCIL MEMBER FIDLER: How--

12 EDWARD KICZEK: But, there's no
13 question that the technology is amenable.

14 COUNCIL MEMBER FIDLER: How much
15 space do you need for something--

16 EDWARD KICZEK: It's going to vary
17 depending upon the size of the individual waste
18 water treatment plant. But, I would be happy to
19 provide dimensions to yourself or anyone among the
20 Committee that say, you know, here's typically
21 what a one megawatt or three megawatt size.

22 COUNCIL MEMBER FIDLER: I would
23 appreciate whatever information you had on that as
24 well.

25 EDWARD KICZEK: Right.

2 COUNCIL MEMBER FIDLER: I mean, you
3 know, clearly here's a resource that's sitting
4 there. I know the sewage treatment facility in
5 Sheepshead Bay is of significant size. There's a
6 lot of land in and around it. And, you know, I
7 mean, if we can turn it into something productive,
8 you know, why not. I mean--

9 EDWARD KICZEK: Absolutely. If, as
10 you said, if there's adjacent large plots of land,
11 then it's probably going to be the only
12 restriction. So, Sheepshead Bay may be an ideal
13 first application in New York City.

14 COUNCIL MEMBER FIDLER: Well, I can
15 only imagine that most of our sewage treatment
16 plants are not sitting in the middle of condensed
17 real estate--

18 EDWARD KICZEK: Right.

19 COUNCIL MEMBER FIDLER: -- you
20 know, where there's a lot of action, you know,
21 building right on each side.

22 EDWARD KICZEK: Um, hm.

23 COUNCIL MEMBER FIDLER: So, I would
24 tend to think that, you know, you know, they would
25 all be appropriate. So, I mean, would we be able

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2 to, given, if you know, the amount of waste water
3 and sewage being treated in the City, would we be
4 able to generate and create a significant amount
5 of hydrogen?

6 EDWARD KICZEK: Yes.

7 COUNCIL MEMBER FIDLER: Do you have
8 any guess as to how much?

9 EDWARD KICZEK: Well, for every
10 100,000 people, it's one megawatt of power and 500
11 kilograms a day is the typical number we use as a
12 ballpark. I don't know the size of any of your
13 individual waste water treatment plants. But,
14 it's kind of just based on the number of people it
15 serves, you can get sort of a ballpark number of
16 how much power and hydrogen you can produce.

17 COUNCIL MEMBER FIDLER: How new is
18 this technology?

19 EDWARD KICZEK: The first one is
20 being deployed in Orange County. We work with a
21 company called Fuel Cell Energy in Danbury,
22 Connecticut. It's running in Danbury, Connecticut
23 today. We're about to kind of close it up, if you
24 will, and then, move it out to Orange County. We
25 expect it to be--

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COUNCIL MEMBER FIDLER:

[Interposing] Orange County, New York?

EDWARD KICZEK: Orange County, California, I'm sorry.

COUNCIL MEMBER FIDLER: That figures.

EDWARD KICZEK: And, it'll be running by the end of this year in actual operation.

COUNCIL MEMBER FIDLER: Okay. Well, I find that, you know, particularly fascinating. I mean--

EDWARD KICZEK: Yeah.

COUNCIL MEMBER FIDLER: -- it just seems like an, you know, an energy efficient green way of dealing with our own waste products and turning them into something, you know, something useful. So, I'd be very interested in--

EDWARD KICZEK: Absolutely.

COUNCIL MEMBER FIDLER: Okay.

EDWARD KICZEK: Be happy to provide all the information you need with whomever you designate.

COUNCIL MEMBER FIDLER: Thank you

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very much. Madam Chair.

ACTING CHAIRPERSON CROWLEY: Thank you, Council Member Fidler. Do we have any other Council Members who'd like to ask questions? No. I'd like to reiterate Council Member Fidler's request and also say how, you know, it makes sense for us to put these types of hydrogen generating equipment where we have sewage waste. And, also, ask a question about regular refuse, you know, garbage--

EDWARD KICZEK: Um, hm.

ACTING CHAIRPERSON CROWLEY: -- and whether we could take maybe the organic garbage and generate similar activities with that?

EDWARD KICZEK: I think that's possible. But, that's going to be much further down the road. You may not be aware, but Air Products previously had a joint venture with American Refuel in landfill processing to valuable power, clean power and other products. The difficulty with landfill is, one, inconsistency of the waste and, two, what I call a lot of cats and dogs in there that have to be removed that are very costly to remove. That's not to say that it

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2 can't be done. But, it's a technology that'll
3 probably come further down the road. And,
4 actually, we are working on various technologies
5 in order to be able to do that with landfill solid
6 waste. You can, however, take, and if you can
7 produce methane or biomethane off of landfill gas,
8 take that gas and then use that in reforming it to
9 make hydrogen in what's called the typical steam
10 methane reformer. And, that's being done today.
11 In fact, some of the gas that we provide in some
12 of our plants come off of biomethane steams.

13 ACTING CHAIRPERSON CROWLEY: Thank
14 you, Mr. Kiczek.

15 EDWARD KICZEK: Thank you.

16 ACTING CHAIRPERSON CROWLEY: We are
17 ready for our next speaker, Mr. Ray Kenard.

18 RAYMOND KENARD: Thank you. Thank
19 you. My intent today is to testify about the
20 subject of the use of hydrogen for transportation
21 purposes, and, specifically, as applied to the use
22 for transit fuel, fuel for transit buses.
23 However, before I address that and comment on some
24 of the other--

25 ACTING CHAIRPERSON CROWLEY: Excuse

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2 me. Sorry, Mr. Kenard. I'm sorry to interrupt
3 you, but if you could just state what organization
4 you're-- or, where you are from.

5 RAYMOND KENARD: Oh, certainly,
6 certainly, I'm sorry.

7 ACTING CHAIRPERSON CROWLEY: And,
8 your name.

9 RAYMOND KENARD: Yeah, yeah. My
10 name is Ray Kenard. I'm the President of a
11 company named American Wind Power & Hydrogen. I'm
12 also on the Executive Committee of the National
13 Hydrogen Association and on their Board of
14 Directors. We've been involved in hydrogen
15 activities in New York State for the last five
16 years, which I will comment on in a moment.

17 But, I wanted to comment first on
18 what the Air Products representative was saying
19 about the fuel cell technology. We did a survey
20 of four of the 14 waste water treatment plants in
21 New York City; Jamaica Bay, Bowery Bay, New Town
22 Creek and Ward's Island, and identified quite
23 substantial quantities of off gas that could be
24 converted to hydrogen at these locations. The
25 Department that controls those facilities was not

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2 interested in hydrogen. So, we actually ended up
3 making a proposal for New Town Creek for the
4 conversion of that gas to electricity. However,
5 there is a remarkable resource available. And,
6 we, too, work with Fuel Cell Energy, which is the
7 fuel cell company that produces the fuel cell
8 that, in turn, produces hydrogen. I would be
9 delighted to send you some more information on
10 that in due course.

11 But, particularly, my concern with
12 hydrogen started back in 2004, when we made a
13 proposal to West Point to put a wind turbine on
14 the hills back of West Point, have electrolysis to
15 generate hydrogen, store the hydrogen and use the
16 hydrogen for the fuel to fuel the fleet of
17 vehicles at West Point. The surplus hydrogen
18 would be stored and could be brought back through
19 fuel cells to produce additional electricity in
20 the case of a energy blackout, a grid blackout,
21 which had occurred in 2002. We did this study.
22 It was funded by the Army Material Command. But,
23 West Point did not choose to go forward with the
24 program.

25 We then addressed the program to

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2 the New York Power Authority, NYPA. They thought
3 pretty highly of some of the ideas. They provided
4 funding for NYSERTA, New York Energy Research and
5 Development Authority. And, we were awarded one
6 of the two first contracts in New York State for a
7 hydrogen project. The hydrogen project was in
8 Buffalo at the State University in Buffalo. It
9 was for two hydrogen fueled internal combustion
10 engine vehicles. They were Prius vehicles that
11 were modified to use hydrogen and a fueling
12 station. We chose Buffalo for reasons that were
13 mentioned by the General Motors representative.
14 The proximity to Niagara Falls led us to believe
15 that if there was to be growth in the area of
16 producing hydrogen for transportation purposes,
17 that Buffalo and Niagara Falls, particularly, as a
18 source of a low-cost electricity, and Buffalo
19 would be an ideal place to focus the attention.

20 Unfortunately, we completed our
21 project. It operated for about two years;
22 operated very successfully. But, there was no
23 further interest at that time. We subsequently
24 have had contracts from NYSERTA for two additional
25 projects; one for the Capital District Transit

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2 Authority, the Albany transit company, for two
3 hydrogen fueled Prius vehicles, the same vehicle
4 we used in Buffalo, and a fueling station.

5 And, another contract was awarded
6 for a project at the Albany airport. This one was
7 for two Silverado pickup trucks that had been
8 modified to use hydrogen. These, too, were
9 internal combustion engine vehicles. Internal
10 combustion engine vehicles can be modified to use
11 hydrogen rather inexpensively, compared to what
12 the cost of a fuel cell vehicle is. They don't
13 have the same sort of energy efficiency a fuel
14 cell vehicle has. But, they are considerably less
15 costly and, in the early stage of the development
16 of the hydrogen economy, the funding that was
17 available to us would not let us use fuel cell
18 vehicles. Instead, we used the internal
19 combustion vehicles.

20 These two projects, the Transit
21 Company project and the airport project, were then
22 merged and we now have, at the Albany airport,
23 four hydrogen fuel vehicles; two Prius vehicles,
24 two Silverado pickup trucks and a fueling station.
25 It's in service; was put in service about near the

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2 first of the year. And, we will be having, within
3 the next month or so, a ribbon cutting ceremony at
4 the Albany airport. We have not had it earlier
5 because the winter was so severe and this is an
6 outdoor installation. We did not choose to have
7 such a ceremony earlier.

8 The whole subject of the use of
9 hydrogen for the future we believe relates to its
10 use as a transportation fuel for transit purposes.
11 There is certainly a very viable future for sedans
12 for individual purposes. But, immediately one can
13 move into the direction of having transit
14 vehicles, full size transit buses operated on
15 hydrogen fuel. There are very few projects of
16 this nature in the United States. But, there are
17 many, many projects elsewhere in the world. And,
18 I will speak about them in a moment.

19 The thing that's important about
20 the use of hydrogen for transit vehicle is
21 illustrated, if you will turn to the PowerPoint
22 presentation, it could be put up on the screen.
23 But, it's probably more convenient to look at the
24 PowerPoint presentation. If you look at page 2 of
25 the PowerPoint presentation, it's titled Hydrogen

1
2 Fueled Fuel Cells Increase Energy Efficiency.
3 Energy efficiency is the really important thing.
4 The more efficient the conversion of energy, the
5 less fuel you have to use; the less petroleum that
6 you have to use; the less greenhouse gas emissions
7 and other pollutants are emitted.

8 We've indicated there that diesel
9 fuel consumption in a conventional transit bus is
10 about-- you get about three miles per gallon of--
11 three to four miles per gallon for diesel fuel.
12 Diesel buses are now being hybridized with
13 batteries included and you can increase the
14 mileage to five to six miles per gallon. However,
15 if you use a hybrid hydrogen fuel cell bus, you
16 can get up to about seven miles per gallon. And,
17 as you see, if a standard diesel bus is only three
18 to four miles per gallon and the hydrogen hybrid
19 fuel cell bus is seven miles a gallon, you've
20 increased energy efficiency by 100%.

21 The further developments in the
22 field of transportation and transit vehicles has
23 been, along with the evolution of advanced battery
24 technology, has resulted in a battery dominant
25 hydrogen hybrid fuel cell bus that gets as high as

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2 ten miles per gallon. And, this is very material
3 when you think of the amount of diesel fuel that's
4 burned by transit buses traveling over the cities
5 of New York. And, what's more important is that
6 the fueling of these vehicles can all be done at
7 one central location, or perhaps more than one if
8 there're more than one fleet. But, at the fleet's
9 headquarters where the buses come back every night
10 to be refueled and maintained, they can be fueled
11 up with hydrogen. The typical hydrogen fuel bus
12 will have 30, 35 or 40 kilograms of hydrogen
13 storage on it, would usually run a distance of 250
14 to 300 miles, which is more than enough, much more
15 than the amount of mileage usually put on a
16 transit bus in New York City. The distances are
17 relatively small.

18 If you think about this situation
19 and wonder why more is not being done, it's a good
20 question. There is only one transit company in
21 the United States that's really recognized this
22 problem and done anything about it. And, if you
23 turn to the third page of the PowerPoint, AC
24 Transit, which is a transit company in Oakland,
25 California, three years ago put into service three

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2 hydrogen fuel cell buses, transit buses. And,
3 these buses, in the three years, have traveled
4 146,000 miles. They've carried 360,000
5 passengers. They've had almost 100% better fuel
6 efficiency, better energy efficiency. They've
7 replaced 34,000 gallons of diesel fuel. And,
8 they've reduced the CO₂ emissions. They have not
9 produced about 172 tons of CO₂ that would have been
10 produced by using diesel fuel in the buses. AC
11 Transit has been so positive about these buses
12 that they've now ordered eight more. And, they
13 have option on 12 more buses beyond that.

14 The next page, page 4, is a picture
15 of their zero emission bus, prominently noted as a
16 zero emission bus.

17 If you turn to the next page, which
18 is the fifth-- sixth, I'm sorry, fifth page, we
19 speak about what Europe is doing with hydrogen
20 fuel transit buses. And, the program in Europe is
21 referred to as the hydrogen fleet-- the
22 HyFLEET:CUTE project. And, there are 47 hydrogen
23 fueled transit buses operating in ten cities. As
24 of about a year and a half ago, which is the
25 latest data I had, these buses had travelled over

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2 360,000 miles, have moved seven million
3 passengers, have not chosen to fuel 169,000
4 gallons of diesel fuel and that diesel fuel was
5 replaced by 220 tons of hydrogen.

6 And, if you turn the page, the next
7 page is a picture of the fleet of 14 hydrogen-
8 fueled transit buses in the City of Berlin. The
9 efforts in Europe are now so substantial that
10 there is a Hydrogen Bus Alliance. It consists of
11 ten cities. And, these ten cities have all agreed
12 that by the year 2015 each city will have at least
13 50 hydrogen-fueled fuel cell buses, or hydrogen-
14 fueled buses. It happens the Berlin buses are
15 internal combustion engine buses, which are less
16 costly, but are also less efficient.

17 But, it shows a dedicated effort to
18 build a hydrogen economy with the bus
19 transportation being the major source of
20 pollutants with a secondary level effort to build
21 fleets of other types of sedans and vehicles that
22 people will use. In fact, Mr. McGowan, who will
23 speak after me, will speak about some of the
24 fueling stations that exist in Europe, which are
25 suitable for both use by people with their own

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2 individual vehicles, but are also basically geared
3 to fueling these large fleets of vehicles.

4 Of the most recent hybrid fuel cell
5 bus project is noted on page seven. And, that's
6 BC Transit in Vancouver. On this, they are now
7 placing into route service 20 hydrogen-fueled fuel
8 cell buses. These buses will be fully operational
9 by the 2010 Winter Olympics. Their early
10 consumption of fuel, of hydrogen, is better than
11 seven miles per gallon equivalent diesel. And,
12 that's roughly 100% more energy efficient than
13 they were realizing in their previous fleet of
14 vehicles. The next page is a photograph of the BC
15 Transit zero emission bus.

16 Finally, the latest development in
17 the bus technology is the battery-dominant hybrid
18 hydrogen fuel bus. And, this was developed with
19 funding from the Federal Transit Administration.
20 The first bus is in operation and will be put in
21 operation-- well, it was put in operation in South
22 Carolina last month. The second bus is being
23 placed in operation in Burbank this month. And,
24 the fuel consumption in these vehicles are
25 uniquely high. They're between ten and 12 miles

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2 per kilogram of hydrogen or per mile per gallon of
3 diesel fuel. The heat content of a diesel, gallon
4 of diesel fuel is approximately equivalent to the
5 heat content of a kilogram of hydrogen. On the
6 next page is a picture of Proterra. That's the
7 battery-dominant bus. Their hybrid-fueled fuel
8 cell bus.

9 In terms of what this means in New
10 York State, our efforts since the Albany project
11 was to get involved with the Capital District
12 Transit Authority again. And, we have submitted a
13 proposal or they have submitted. We prepared for
14 them. We have submitted a proposal to the Federal
15 Transit Administration for one hydrogen-fueled
16 fuel cell bus, which will be located, run on
17 routes in Albany. And, we're in the process of
18 preparing a proposal to the Federal Transit
19 Administration under the more recent stimulus
20 funding for another two hydrogen-fueled transit
21 buses for Albany, also.

22 The stimulus program has funds that
23 have been dedicated, very, very large sums of
24 funds dedicated to the purposes that you have
25 defined in the proposed Resolution that you have;

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2 reduce petroleum consumption, reduce greenhouse
3 gas emissions, reduce our export of capital to
4 foreign countries for the import of petroleum
5 products and generally, improve the environmental
6 situation in our major cities.

7 I would like to suggest, in
8 conclusion, that when you finish your efforts,
9 that your Resolution, your proposed Resolution,
10 should also name the transit bus opportunity with
11 hydrogen as a primary potential aspect to the
12 solution of the problems that you have identified.

13 ACTING CHAIRPERSON CROWLEY: Thank
14 you, Mr. Kenard. I have a question on the cost of
15 the buses, on average. [Pause]

16 RAYMOND KENARD: I'm sorry?

17 ACTING CHAIRPERSON CROWLEY: The
18 cost of a bus?

19 RAYMOND KENARD: Oh, the cost of
20 the bus, yes, certainly. The first buses that
21 were built cost over \$3 million because they were
22 demonstration, individual testing vehicles. The
23 round of buses that are now being purchased cost
24 in the range of about \$2 million. There is a
25 company in California who goes by the initials of

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2 ISE, who are the ones that do the drivetrains and
3 integration of the fuel cells on these buses.
4 And, they have a backlog of 28 buses. There are
5 eight of them going to London and the 20 that are
6 going to Vancouver. And, for this backlog of
7 buses was great enough for them to build a
8 production line. And, they've been able to get
9 their costs down. And, if they get a continued
10 flow of business, they expect that they can get
11 the production cost of a hydrogen-fueled bus down
12 to about a million dollars a piece. The typical
13 hybrid diesel fuel buses, 650, \$700,000 in that
14 order - - price.

15 So, hydrogen-fueled vehicles are
16 still more expensive. But, what you get out of
17 them is a high efficient situation that has other
18 benefits, yes.

19 ACTING CHAIRPERSON CROWLEY: Can
20 you just compare the hybrid one to the regular
21 fuel efficient hydrogen bus? So, there's a
22 difference between the one that currently costs,
23 did you say three million, 30 million?

24 RAYMOND KENARD: I'm sorry, excuse
25 me.

2 ACTING CHAIRPERSON CROWLEY: Two
3 million.

4 RAYMOND KENARD: Please--

5 ACTING CHAIRPERSON CROWLEY: I just
6 want to clarify the cost difference between a
7 hybrid hydrogen--

8 RAYMOND KENARD: Yes.

9 ACTING CHAIRPERSON CROWLEY: --
10 compared to one that's just hydrogen.

11 RAYMOND KENARD: If you can get a
12 small production line in operation with sufficient
13 volume of fleet vehicles going through it, price
14 will be roughly a million dollars. The comparable
15 vehicle as a diesel-fueled hybrid bus is 650,
16 \$700,000. Now, ultimately, when you get out to
17 full production, it'll go less than a million
18 because what the 650, \$700,000 range is the price
19 for buses that are being made in the hundreds, you
20 know, so forth. So, they're still somewhat more
21 expensive, but price is coming down.

22 ACTING CHAIRPERSON CROWLEY: Thank
23 you. I'd like to recognize Council Member Fidler
24 for a question.

25 COUNCIL MEMBER FIDLER: Yeah, just

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2 a follow up on that. I'm a little, I think I'm a
3 little confused. The cost of the average New York
4 City bus, the ones, you know, if you went outside
5 and, you know, right here on Broadway, you're
6 telling me is \$650,000 a piece?

7 RAYMOND KENARD: If they're the
8 latest model hybrid bus. I mean--

9 COUNCIL MEMBER FIDLER: A hybrid
10 bus.

11 RAYMOND KENARD: Yeah, that's
12 right.

13 COUNCIL MEMBER FIDLER: How about
14 for the old--

15 RAYMOND KENARD: The old ones, I
16 don't--

17 COUNCIL MEMBER FIDLER: -fashion--

18 RAYMOND KENARD: -- [crosstalk]

19 COUNCIL MEMBER FIDLER: -- the
20 pollute like crazy buses.

21 RAYMOND KENARD: They'll be less,
22 considerably less, yeah.

23 COUNCIL MEMBER FIDLER:
24 Significantly less.

25 RAYMOND KENARD: Yeah.

2 COUNCIL MEMBER FIDLER: Okay.

3 RAYMOND KENARD: Hybridation is
4 pretty expensive because you put a heavy duty
5 battery and there's a lot of mechanical work that
6 has to be done to do the integration, do the
7 management of the control system for the vehicle.
8 And, it's a very sophisticated vehicle.

9 COUNCIL MEMBER FIDLER: And,
10 there's nobody that you know now who's
11 manufacturing hydrogen fuel cell buses, non-
12 hybrid, but hydrogen fuel cell buses.

13 RAYMOND KENARD: Hydrogen fuel cell
14 buses.

15 COUNCIL MEMBER FIDLER: Nobody is
16 doing that now.

17 RAYMOND KENARD: No, well, hydrogen
18 fuel cell bus has a battery in it, too.

19 COUNCIL MEMBER FIDLER: Right.

20 RAYMOND KENARD: Yes. Because, as
21 a matter of fact, particularly the latest model,
22 the battery-dominant one, that bus can operate on
23 the battery for 60 minutes without the fuel cell
24 ever operating. And, the fuel cell will fully
25 charge the battery in about 20 minutes. So, you

1
2 can run for an hour and you're only operating the
3 fuel cell for about 20 minutes out of that hour.
4 What is unique about this is the fuel cell happens
5 to be the most expensive part of the bus. And, by
6 virtue of the advanced battery technology used in
7 that bus, that bus already you can buy. The price
8 for that bus is between 1.5 to \$1.8 million is
9 about what that bus would cost on the market
10 today. And, that's just, again, that's not a
11 production model. But, that's comparable to the
12 \$2 million for the bus with a heavier duty fuel
13 cell in it.

14 COUNCIL MEMBER FIDLER: Now, Mr.
15 Kenard, your PowerPoint presentation had a panel
16 that you didn't refer to about stimulus funding
17 that might be available--

18 RAYMOND KENARD: Yeah, yes.

19 COUNCIL MEMBER FIDLER: -- in this
20 area. Could you just speak to that for a moment?

21 RAYMOND KENARD: Yes. Well, the
22 stimulus funding has a lot of mysteries associated
23 with it because the funding came out and what was
24 issued were a series of requests for proposals.
25 Three of them-- well, many from many departments

1
2 in the government, but in those areas of interest
3 to us, three of them came from the Department of
4 Energy. One was called a Clean Cities Fiscal Year
5 '09 Petroleum Reduction Request for Proposals.
6 That was a \$300 million project. It's a
7 competitive bid project. And, only clean city
8 operations can submit proposals on that.

9 There was a second proposal called
10 Transportation Electrification, which deals with
11 electrification of vehicles that is either
12 electrification as is battery-dominant fuel cell
13 bus is electrified and in all-electric buses are
14 obviously electrified. That's a \$400 million
15 competitive bid solicitation.

16 There is a third one which is for
17 battery manufacturing facilities and drivetrain
18 construction facilities-- facility construction,
19 which is another \$300 million. And, these are the
20 three most prominent ones that the DOE has turned
21 out.

22 The Department of Transportation
23 has a \$900 million request for proposals out, of
24 which \$100 million of that is appropriate to the
25 sort of business that we are particularly talking

1
2 about today, which is the transit bus area.

3 And then, there is another one, and
4 I don't know what the dollar value is, but the APA
5 has two I believe proposals out for diesel
6 retrofit technology, which are very substantial.
7 And, it generally appears, although I don't-- I'm
8 not speaking with any degree of expertise on this,
9 it generally appears that there will probably be a
10 further series of these proposals that will come
11 out subsequently to this because these three or
12 four, five proposals I mentioned were all turned
13 out within about a month's period of time. And,
14 the government has not previously worked that
15 quickly in turning out proposals and doing
16 evaluations.

17 COUNCIL MEMBER FIDLER: I just want
18 to say that, you know, part of the logic of
19 talking about using this technology, hydrogen
20 refueling, for buses is that they all return home
21 at night and so, you need a single refueling
22 station. I just, you know, it occurs to me that
23 there are other, several other large groups of
24 fleets, you know, in and around our City that
25 would also fit into that. Certainly Sanitation

1
2 trucks return home at night. The police cars
3 return home at night.

4 RAYMOND KENARD: Absolutely.

5 COUNCIL MEMBER FIDLER: Fire trucks
6 return home at night. Ambulances return home at
7 night. So, you know, as we look to plant these
8 seeds so that this becomes a more accepted common
9 place technology, there are many of them that
10 follow that same logic, different economics
11 perhaps, but follow the same logic.

12 RAYMOND KENARD: Yeah, well, your
13 observations are really quite appropriate. But,
14 no, the answer is we haven't. The reason we
15 haven't is simple because, it was about three
16 years ago, we made a proposal to NYSERTA to do a
17 study of the barriers to the use of hydrogen in
18 the City of New York. And, we worked out an
19 arrangement with the Bronx Community College to
20 cooperate on this and with one of the major
21 transportation company-- transportation
22 engineering companies, Parsons Brinckerhoff to do
23 a joint proposal.

24 The problem you have with hydrogen
25 in New York City as of two or three years ago was

1
2 that the Fire Department would not even consider
3 talking to you about it. And, as a consequence,
4 we've, as you see, we focused our attention on
5 Albany and Buffalo, even though I'm a resident
6 here in New York City. We'd be delighted to do
7 business with all those people that you
8 recommended and we prepared to pursue that with
9 them. The problem is will the Fire Department
10 allow hydrogen fueling stations to be built.
11 Where are they going to be located? We built the
12 one in Buffalo. We built one in Albany. And, we
13 can build any number of them here in New York
14 City, too.

15 COUNCIL MEMBER FIDLER: Now, I'll
16 ask you the same question I asked the gentlemen
17 from Air Products. Do you think that there's any
18 justification for the position of the Fire
19 Department? I mean, you know, is the public
20 safety at risk?

21 RAYMOND KENARD: I'm sorry. Would
22 you please restate that?

23 COUNCIL MEMBER FIDLER: Yes. You
24 know, you said that the impediment to doing
25 business in New York City is the Fire Department.

2 RAYMOND KENARD: Yes.

3 COUNCIL MEMBER FIDLER: I'm sure
4 that it's not because, you know, they've invested
5 in gasoline. They obviously think there's a
6 public safety concern. Do you agree with them?
7 Do you think that it is well founded or not?

8 RAYMOND KENARD: Do I think what?
9 I'm sorry.

10 COUNCIL MEMBER FIDLER: Do I think
11 the Fire Department's concern about hydrogen
12 refueling is--

13 RAYMOND KENARD: [Interposing] No,
14 I don't think the Fire--

15 COUNCIL MEMBER FIDLER: -- well
16 founded.

17 RAYMOND KENARD: Yes. No, I don't
18 think their concern is appropriate, much as I
19 think the General Motors gentleman testified there
20 is, surprisingly, although we are not able to
21 build hydrogen fueling stations, or have not been
22 able to build hydrogen fueling stations, in New
23 York, there's a tremendous amount of hydrogen that
24 already comes to New York. Cylinder hydrogen is
25 used in most hospitals as an inert gas. And,

1
2 cylinder hydrogen is delivered every day in
3 trucks. I don't know whether any liquid hydrogen
4 is actually delivered in the City. But, there is
5 a lot of hydrogen in the City already. It's just
6 not apparent to anybody that it's there. It's
7 just like a cylinder of argon or a cylinder of
8 nitrogen. Here's a cylinder of hydrogen.

9 So, there's no reason to expect
10 that there should be any real reason that it would
11 not be acceptable as-- it would have any problems
12 of that sort.

13 COUNCIL MEMBER FIDLER: Now, that
14 study that you just referenced, did that actually
15 get printed and written?

16 RAYMOND KENARD: I'm sorry?

17 COUNCIL MEMBER FIDLER: The study
18 that you just referred to about doing hydrogen,
19 doing hydrogen business in New York City, did that
20 study get written?

21 RAYMOND KENARD: No, no. NYSERTA
22 declined to fund it.

23 COUNCIL MEMBER FIDLER: Too bad.

24 RAYMOND KENARD: I know. That's--

25 COUNCIL MEMBER FIDLER: Okay.

2 RAYMOND KENARD: I agree 100%. We
3 actually made a proposal to do the same study for
4 Albany and it got rejected by NYSERTA, as well.
5 And, all I can say is that the managing director
6 or Chief Executive Officer of the Albany Transit
7 Company is an unusually progressive and positive-
8 minded individual who said that we should be
9 involved with hydrogen fuel cell transit vehicles
10 and we're going to be involved. And, we, you
11 know, we had someone to work with; someone that
12 would encourage us. We're prepared to work. We
13 work very hard for the business that we do get.
14 But, there has to be a receptive audience there.
15 And, fortunately, in Albany, we have found a
16 receptive audience in the Transit Company and we
17 also--

18 COUNCIL MEMBER FIDLER:

19 [Interposing] We'll try and find a receptive
20 audience here, as well. Thank you.

21 RAYMOND KENARD: Okay.

22 ACTING CHAIRPERSON CROWLEY: Great.
23 Thank you, Mr. Kenard. Our next speaker is
24 Michael McGowan.

25 MICHAEL MCGOWAN: Good afternoon.

1
2 Members of the Environmental Protection Committee
3 of the New York City Council, I am honored and
4 pleased to have the opportunity to speak before
5 you today concerning hydrogen vehicles and
6 infrastructure. Today, I am wearing two hats; one
7 as Linde's Head of Hydrogen Solutions in North
8 America and the other as Chairman of the National
9 Hydrogen Association.

10 The Linde Group has been at the
11 forefront of developing viable pathways to
12 hydrogen production, distribution and dispensing
13 throughout our over 100-year history. Over the
14 last decade, we have been translating our vast
15 industrial experience to the safe, efficient, and
16 economic fueling of on and off-road vehicles. We
17 are fully aware of the challenges around
18 developing a sustainable hydrogen infrastructure
19 and, based on our first-hand experiences, are
20 confident they can be met. Linde is committed to
21 the protection of our environment and benefitting
22 the health and welfare of the communities in which
23 we operate throughout the globe. We are extremely
24 excited by the opportunity hydrogen presents to
25 benefit our shareholders and the broader global

1
2 community.

3 As Chairman of the National
4 Hydrogen Association, I am pleased to share with
5 you The Energy Evolution, one of the documents I
6 just handed out. The Energy Evolution is a
7 comprehensive 100-year analysis of alternative
8 fuel options. As you can read in the handouts I
9 have brought with me, hydrogen shares many of the
10 benefits you hear associated with other
11 alternative fuels. Hydrogen, however, can take
12 the promise of sustainability further than any
13 other option, as the only alternative that can
14 reduce greenhouse gases to 80% of the 1990 levels
15 and simultaneously, enable America to reach energy
16 quasi-independence and nearly eliminate
17 controllable urban air pollution by the end of
18 this century.

19 As mentioned earlier, Linde has a
20 tremendous amount of hydrogen experience. We have
21 designed, engineered and constructed over 70
22 hydrogen fueling stations, which have been
23 commissioned in 15 countries. Each week, our
24 equipment performs over 300 hydrogen bus, car
25 fuelings. By the end of 2008, our stations

1
2 provided over 26,000 liquid and 125,000 gaseous
3 hydrogen fuelings.

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

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

1
2 There's a lot of misinformation
3 related to hydrogen being forever a solution far
4 out in the future. While it is true, like any new
5 technology, a sensible and efficient roll-out will
6 take some time, real hydrogen solutions are
7 available today. Some markets, like forklift
8 trucks and back-up power, are already commercially
9 embracing hydrogen fuel cells. Markets such as
10 autos and buses only appear limited by society's
11 collective will to commit to this solution and
12 allow volume to bring them further down their cost
13 curves. Progress on all fronts; fuel cell
14 performance and durability, hydrogen production
15 and storage, dispensing, etcetera, has been
16 tremendous and there are sound and achievable
17 technology road maps for continued improvements.

18 The potential for hydrogen fuel
19 cell vehicles to enhance the environment and
20 quality of life in New York City is great. The
21 world looks to New York City as a leader. A plan
22 to deploy fuel cell vehicles in New York will have
23 a profoundly positive societal impact locally,
24 across the United States and throughout the world.
25 It will also be one more wonderful reason to visit

1
2 the greatest city in the world.

3 I'd like to spend the remainder of
4 my time sharing some images of the stations Linde
5 has worked on across the globe to help you see
6 just how real the promise of hydrogen is. I'll
7 have to get up and use the computer. [Pause]
8 shows [pause] first 'cause it's a station in the
9 United States. It's a little bit more foreboding
10 looking than the stations in Europe. You'll see a
11 lot more barricades around it. And, I show you
12 what our stations in Europe, they're much more
13 publicly accessible.

14 This is a station in Berlin.
15 Here's another one in Berlin with a state-of-the-
16 art ionic compressor. This ionic compressor has
17 allowed us to reduce the cost of our stations by
18 about 50% in the last year. So, you talk about
19 another cost curve coming down, it was
20 dramatically improved. And, you see all there is
21 is a curve, like you see the normal gasoline
22 station. If I wasn't telling you it was a
23 hydrogen station, you mightn't know it is.

24 This is Zero Regio [phonetic]
25 project in Frankfurt. And, this is both dispenses

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2 liquid hydrogen and gaseous hydrogen. That plume
3 you see is condensed air. And, we're putting the
4 liquid hydrogen into that tank. Hydrogen goes out
5 the stack. There's no fire. There's no
6 explosion. It's clean. You couldn't emit any
7 other fuel that way and not affect the
8 environment.

9 This is Norway, again, a station,
10 it just looks like the normal gas station. You
11 asked about, you know, how would you fuel your
12 car. How do you fuel your gasoline car? They
13 just go up, put the nozzle in, you push a button
14 and you continue.

15 This is Japan. This is a station
16 we built for ourselves and, outside one of our
17 engineering centers. It fuels liquid and gaseous
18 hydrogen.

19 Ray talked about the bus programs
20 in Europe. Linde's been part of five of them.
21 Here's pictures of four of them; Amsterdam,
22 Barcelona, Perth and London.

23 This is to fuel BMWs, North
24 American headquarters in Montvale, New Jersey.
25 They use internal combustion engine and they store

1
2 liquid hydrogen on board versus gaseous hydrogen.
3 We have a liquid hydrogen tank and we can travel
4 along with them, as a portable dispenser that we
5 literally plug in to an outlet and we can fuel
6 those vehicles. We did it last summer in 31
7 cities over the course of a little bit less than
8 two weeks. It was part of the hydrogen road tour.

9 And, we talked about the permitting
10 challenges. We, meaning collective we, the
11 industry decided to do this early summer. And,
12 you know, by August, we're able to get the
13 approvals to do those fuelings across the country.
14 So, the challenges were real. They weren't
15 insignificant. But, they were overcome. And, we
16 were able to fuel, on a temporary basis, by
17 getting the approval of local officials in 31
18 cities in 18 states.

19 Just want to talk a little bit
20 about the forklift application largely because the
21 fueling's largely the same. The same type of
22 nozzle; same type of receptacle. The equipment is
23 largely the same. But, it's indoors. People
24 worry about fueling their cars. This is inside a
25 building. And, we can fuel safely, efficiently

1
2 next to cardboard boxes, in wood and cleaners and
3 detergents. And, it's not a very sterile
4 environment. And, we're able to go in there and
5 fuel, you know, at this one in DC, we're doing 66
6 forklifts, each fueled probably about twice a day.
7 And, the forklift operators do the fueling
8 themselves.

9 This is an application where the
10 environmental benefit is an adder. It's just a
11 better solution where the forklifts operate much
12 more efficiently using fuel cells than they do on
13 batteries. This is what it looks indoors. This
14 is different types of dispensers we have. But,
15 you can see in that lower right hand, you know,
16 it's not-- it's an environment where we literally
17 paint a yellow line on the floor so you don't put
18 any combustibles inside that area. But, wherever
19 the truck travels, the truck is traveling
20 throughout the aisles of the warehouse.

21 - - statistics I talked about
22 already.

23 The point there was just to show
24 you the stations are real. They're not
25 foreboding. They're not science projects. And,

1
2 in Europe, they're much more publicly accessible
3 than in the United States, should they become
4 increasing publicly accessible in recent years,
5 but in Europe, there's several examples of
6 stations that are out there in the public domain
7 being safely operated.

8 ACTING CHAIRPERSON CROWLEY: Thank
9 you, Mr. McGowan. I have a few questions. You
10 have the U.S. road tour.

11 MICHAEL MCGOWAN: Yes.

12 ACTING CHAIRPERSON CROWLEY: That
13 happened last summer?

14 MICHAEL MCGOWAN: Yep.

15 ACTING CHAIRPERSON CROWLEY: Are
16 these stations still operable?

17 MICHAEL MCGOWAN: No, because some
18 of the stops along those tour have permanent
19 stations, largely in California, some of them in
20 New York, some other spots along the way. But,
21 Air Products, the company Mr. Kiczek represents,
22 and my company, we both traveled along with the
23 vehicles. They supplied the gaseous fueling to
24 vehicles that stored gas on board. We supplied
25 the liquid fueling to the BMWs that stored liquid

1
2 on board. And, we traveled with them with
3 portable stations. So, we brought the
4 infrastructure to the cars just because, in the
5 heartland, it's just not there yet. And, they're
6 going to repeat that road tour this summer going
7 up from San Diego up to Vancouver. That'll be
8 much less of a need in California for the portable
9 fueling stations 'cause there are some stations
10 throughout the state and up in Vancouver.

11 ACTING CHAIRPERSON CROWLEY: You
12 have a picture of the station in Munich.

13 MICHAEL McGOWAN: Yeah.

14 ACTING CHAIRPERSON CROWLEY: Does
15 this help? Or, is this decorative?

16 MICHAEL McGOWAN: That's decorative
17 because that's our own station. And, it's, you
18 know, you're going to have a canopy over the
19 station to protect you from the elements. And so,
20 given that's at our headquarters, we made it a
21 little bit nicer than you might do otherwise.

22 ACTING CHAIRPERSON CROWLEY: And,
23 can you give a percentage of how many vehicles--
24 the percentage of vehicles are hydrogen fuel
25 injected in Berlin or other European company that

1
2 seem like leaders, countries?

3 MICHAEL MCGOWAN: Yeah. I mean, I
4 think it's not even at the point where percentages
5 are appropriate. It's, you know, it's less than
6 the 1% type of number. But, the California Fuel
7 Cell Partnership recently issued a vision document
8 where they've asked the different auto
9 manufacturers to, in confidence, submit their
10 projections of what they want to do in California,
11 at least. And, if you read that document, it's
12 accessible online, you'll see, you know, it gets
13 to a few thousand in the next few years; several
14 thousand in 2014 and then, you get to 2017 or so,
15 they're talking the tens of thousands of vehicles,
16 you know, 40, 50,000 vehicles in California. So,
17 and, that's, you know, based on information they
18 got from the auto manufacturers. One would think,
19 if the infrastructure was more aggressive, then,
20 perhaps, you know, the auto companies, you know,
21 might consider deploying in other areas, as well.

22 COUNCIL MEMBER FIDLER: Just more
23 of a comment than a question. It always irritates
24 me to find out that California is ahead of us on
25 anything.

1

MICHAEL McGOWAN: Yeah.

2

COUNCIL MEMBER FIDLER: But,

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sometimes, you know, you get what you ask for.

4

And so, I think, and I hope, that today we've, in

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part, opened the door here in New York. Clearly,

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your predecessor, Mr. O'Connell, from GM has shown

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that there is an investment in this state in this

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and, you know, hopefully we'll have that Hydrogen

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Highway that I know they have in California

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already. So, you know, I know that it's, you

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know, in something like this, you look at the path

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of least resistance and I hope that you'll look at

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New York now as a path of lesser resistance than

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you did before you came here today.

15

And, you know, so, I do have one

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question. And, you heard the questions I asked a

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number of the other witnesses before you about the

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permitting restrictions; the difficulty the Fire

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Department has placed; concerns about transporting

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hydrogen. I'm guessing I know the answer. But,

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do you agree that the concerns about transporting

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hydrogen, the concerns about fueling stations in

23

terms of public safety, are unwarranted?

24

MICHAEL McGOWAN: Yeah. I mean,

25

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2 I'm certainly happy that the concerns exist, at
3 least momentarily and that the appropriate
4 officials are satisfied that they are unwarranted.
5 But, you know, with the gift of more knowledge and
6 of having worked with hydrogen for decades in
7 industrial applications, Linde feels very
8 confident that, you know, the Fire Marshalls, once
9 they're more educated and once they understand how
10 we're using it, how we're handling the hydrogen,
11 those, you know, just early concerns will be
12 satisfactorily, you know, they will be satisfied.

13 And, like I said, we're doing
14 several demonstrations indoors, inside warehouses.
15 And, honestly, sometimes we get less resistance
16 over those because there's no paradigm you're
17 trying to work against versus, I think, you know,
18 when you have a existing fueling solution, you
19 know, with vehicles, you almost have to overcome
20 well, why change; why accept something different
21 and new versus, you know, inside the warehouse
22 where they're not comparing it to another, you
23 know, gaseous fuel that's dispensed that way
24 indoors.

25 COUNCIL MEMBER FIDLER: I think we

1
2 heard about a thousand good reasons for why change
3 today. But--

4 MICHAEL MCGOWAN: Yeah.

5 COUNCIL MEMBER FIDLER: -- I don't
6 know that you had the opportunity. Have you had
7 any chance to interact with the New York City Fire
8 Department on any of these issues?

9 MICHAEL MCGOWAN: I haven't. A
10 gentleman who works for me has been at workshops
11 that were actually largely hosted in New Jersey
12 that some people from New York, you know,
13 attended. And, his impression, you know, was that
14 there'd be work to do. But, his impression wasn't
15 that it was impossible. But, we have some
16 convincing to do.

17 COUNCIL MEMBER FIDLER: I mean, so,
18 I don't know if this was a dialogue at all. I
19 mean, if so, can you tell us what the Fire
20 Department said? I mean, you know, you know--

21 MICHAEL MCGOWAN: [Interposing]
22 Yeah, I don't have firsthand knowledge of that.
23 But, I think it's, you know, it's largely around
24 just not understanding, not knowing and, you know,
25 most people do not have to-- don't have to

1
2 directly interface with hydrogen on a daily basis.
3 And, everything they've heard is unrelated to
4 hydrogen fueling. So, you know, hydrogen is an
5 exceptional energy carrier. And, you know,
6 anything that contains a lot of energy, you know,
7 all great fuels contain a lot of energy. I think
8 from a simple view, that frightens some people.
9 But, others, other characteristics of hydrogen,
10 which mitigate that and actually make it a safer
11 fuel.

12 COUNCIL MEMBER FIDLER: Thank you.

13 ACTING CHAIRPERSON CROWLEY: Thank
14 you, Council Member Fidler. Mr. McGowan, I just
15 have, I guess, as a representative of the national
16 organization of hydrogen--

17 MICHAEL MCGOWAN: National Hydrogen
18 Association.

19 ACTING CHAIRPERSON CROWLEY: Okay.
20 Could you see into the future? Because, here in
21 New York City, the majority of the carbon
22 footprint that we have comes from buildings.

23 MICHAEL MCGOWAN: Um, hm.

24 ACTING CHAIRPERSON CROWLEY: I
25 think it's something like 80%. Could you see a

1
2 way of utilizing hydrogen in operating buildings?

3 MICHAEL MCGOWAN: I think one of
4 the applications, you know, Mr. Kiczek spoke
5 about, you know, we are also exploring. It's a
6 very popular mode right now of high temperature
7 molten carbonate fuel cells to take natural gas or
8 any other methane stream, whether it's landfill
9 gas or, you know, and/or we digest their off gas,
10 produce power and make hydrogen as well. So,
11 hydrogen will have different utilities, different
12 applications. As a fuel for vehicles, it's
13 excellent. If your intent is to make electricity
14 for a building, well then, maybe you just go
15 directly to electricity with that molten carbonate
16 fuel cell, make electricity, use it. And then,
17 use this off gas, this anode [phonetic] gas to
18 capture hydrogen to power our vehicles that are in
19 that area. So, it's very symbiotic with other,
20 you know, relationships and other fuels.

21 ACTING CHAIRPERSON CROWLEY: Thank
22 you. And, thank you for your testimony. As, the
23 Chairwoman of today's Environmental Protection
24 Committee, I'd like to thank all the speakers and
25 congratulate Fidler for bringing upon this

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COMMITTEE ON ENVIRONMENTAL PROTECTION110

Resolution, which makes sense and would work in favor of reducing carbon in this City and across the country. So, thank you and I hereby adjourn the meeting of Environmental Protection.

C E R T I F I C A T E

I, DeeDee E. Tataseo certify that the foregoing transcript is a true and accurate record of the proceedings. I further certify that I am not related to any of the parties to this action by blood or marriage, and that I am in no way interested in the outcome of this matter.

Signature DeeDee E. Tataseo

Date June 9, 2009