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Testimony of John Harrity
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Supporting Proposed HB 6127

AN ACT PROMOTING THE USE OF FUEL CELLS IN VEHICLES

Transportation Committee
February 14, 2011

Senator Maynard, Representative Guerrera, members of the committee: my name is John Harrity. I serve as Director of GrowJobsCT, a coalition of business, labor and community groups, along with elected officials, that focuses on the need to sustain and expand manufacturing jobs in the state of Connecticut.

GrowJobsCT is a founding member of the Connecticut Hydrogen and Fuel Cell Coalition.

I am also a representative of the Machinists Union.

I am here today to speak in support of **HB 6127, AN ACT PROMOTING THE USE OF FUEL CELLS IN VEHICLES.**

This bill would mandate the state to utilize fuel cell vehicles for 1% of their light duty passenger vehicles and 1% of the transit fleet buses by 2015, growing up to 10% of these vehicles by 2025.

One percent would equate to 40 light duty passenger vehicles and 10 buses in 2015, and ten times that – 400 passenger vehicles and 100 buses – by 2025.

The bill would also exempt fuel cell vehicles from the state sales tax.

This bill is in keeping with the recommendations of the "Connecticut Hydrogen and Fuel Cell Deployment Transportation Strategy" submitted to the legislature by the Connecticut Department of Transportation and the Connecticut Center for Advanced Technology in January 2011. The Executive Summary of that report is attached to my testimony.

There are well-known, I hope, benefits of using fuel cells in vehicles, including environmental and public health advantages, less dependence on imported oil and making mass transit more appealing and comfortable.

I would like to focus on the benefits of HB 6127 for Connecticut's economic development and job growth.

Connecticut currently accounts for 13% of global employment in the fuel cell and hydrogen-related sector, and is considered the world center of the industry. Much of that

employment and activity is in transportation, and in electrolysis equipment – the machines that produce hydrogen from water.

Right now Machinists Union members are assembling fuel cells for buses at UTC Power in South Windsor, CT. Scientists, engineers, technicians and others are working across the state on fuel cells for cars. A number of Connecticut companies are manufacturing machines for producing hydrogen.

Placing a significant order for innovative, green technology developed and produced here in Connecticut will have a positive impact on reducing the cost of that technology, and allow Connecticut to serve as a showcase for potential customers, including other states and countries.

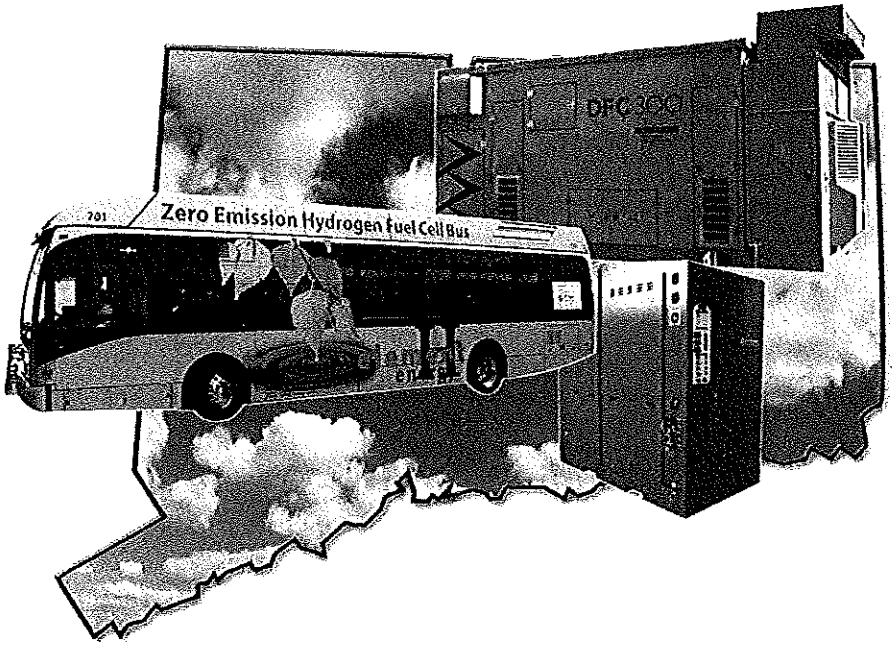
State employment in these fields could expand by thousands of jobs in the future. The challenges of maintaining this industry as it grows are substantial. But it is certain that if we take no steps, and offer no measures of responsible and reasonable support, we will lose not only the potential jobs but the jobs we have now in this growing industrial sector.

Thank you.

Connecticut Hydrogen and Fuel Cell Deployment Transportation Strategy

2011-2050

January 2011



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Executive Summary

Connecticut industrial corporations have been the leaders and innovators of fuel cell and electrolysis technologies since the 1950s, and pioneered applications for spacecraft, submarines, and stationary power. Beginning in the 1990s, Connecticut companies have participated in applying fuel cell and hydrogen generation technology to transportation applications, which is a major component of the economy. The attributes of fuel cell vehicles and the advances in hydrogen production suggest a growing market and opportunity for improvement in transportation systems, economic development, and improved environmental performance.

Markets

Fuel cell vehicles, like electric vehicles, are propelled by electric motors utilizing the fuel cell to create its own electricity using hydrogen fuel and oxygen from the ambient air. Today, fuel cells successfully power cars, trucks, buses and other service vehicles like forklifts. Compared to conventional vehicles, hydrogen-fueled vehicles with fuel cell power plants have many advantages, including:

- high efficiency;
- no emissions of controlled pollutants such as nitrous oxide, carbon monoxide, hydrocarbon gases or particulates from the vehicles themselves;
- no emissions of greenhouse gases (GHG) from the vehicles themselves;
- substantial reduction in GHG emissions on a "well-to-wheel" basis;
- fewer parts resulting in lower maintenance;
- ability to fuel vehicles with indigenous energy sources;
- greater range than all-electric or battery powered vehicles; and
- quiet operation.

Further, as the demand for conventional transportation fuels begins to exceed supply, price volatility will increase, and supply will become less certain. Consequently, there will be an increasingly critical need to begin the process to transition from fossil fuels, which are limited and primarily supplied through the import of foreign oil, to domestically produced energy sources such as hydrogen.

Near term projections developed from this Plan suggest that Connecticut may realize the deployment of between 6 and 20 hydrogen fuel cell buses and 40 passenger vehicles by 2015.With the delivery of an additional fuel cell bus planned for operation in 2011, CTTransit will operate a total of six hydrogen fuel cell buses in Connecticut. Assuming fuel cell buses utilize 25 kg of hydrogen per day and passenger vehicles utilize 1 kg of hydrogen per day, a total of between 190 kg and 540 kg of hydrogen would be needed each day. The total production capacity for the existing and planned hydrogen refueling stations that will be operational by 2011 could provide enough hydrogen fuel to satisfy the refueling requirements for the lower range of vehicles; however, approximately 200 kg of additional hydrogen production, storage, and refueling capacity would be needed to meet the maximum projected demand by 2015.

Longer term, the U.S. Department of Energy has projected that between 15.1 million and 23.9 million light duty fuel cell vehicles will be sold each year by 2050 and between 144 million and 347 million light duty fuel cell vehicles will be in use by 2050 with a transition to a hydrogen economy. These government estimates could be accelerated if political, economic, energy security or environmental polices prompt a rapid advancement in alternative fuels.

In order to meet the projected hydrogen demand for fuel cell vehicles in the United States, the quantity of hydrogen dispensed per day would need to grow from 3,023 kg in 2010 to over 300 million kg by 2050. The average price per gallon equivalent (gasoline) for hydrogen dispensed is assumed to cost $4.67 in 2010 and $3.58 in 2050. However, because of the high efficiency of fuel cells, the price of fuel per mile traveled is much lower for hydrogen than for conventional fuels such as gasoline or diesel.

Economic Development

Economic indices, developed in conjunction with the Connecticut Department of Economic and Community Development, suggest that the hydrogen and fuel cell industry is an emerging economic cluster. Since the 1960s, Connecticut companies pioneered the development of fuel cell technology for stationary power applications and continue to lead the world in this fuel cell application. The major fuel cell original equipment manufacturers (OEM) in Connecticut are also involved with transportation applications and/or generating hydrogen from renewable energy or hydrocarbon fuels such as natural gas. UTC Power has fuel cell power plants in the drive systems of demonstration automobiles for Hyundai and Nissan, in auxiliary power units in BMW's vehicle demonstrations, and in several fuel cell buses in California, Connecticut and Europe.

Connecticut companies have also been involved with hydrogen generation through electrolysis for decades. More recently, Connecticut companies have been involved with hydrogen generation for transportation including the co-production of hydrogen in a fuel cell unit, fuel reforming, and electrolysis. These in-state manufacturers include: FuelCell Energy, UTC Power, Avālence, Proton Energy Systems, Treadwell Corporation, and Precision Combustion, Inc.

In 2010, the hydrogen and fuel cell industry contributed to the State's economy by providing over 1,200 jobs directly associated with research and development and the manufacture of equipment, and over 1,500 indirect jobs for a total of over 2,700 jobs statewide. It is projected that employment in Connecticut would increase as a result of the transition to a hydrogen and fuel cell economy. The employment increase is expected to consist of a transfer of jobs from traditional markets and services. Connecticut's most significant employment increases will be realized in the electrolysis manufacturing sector. Connecticut's employment in this sector is projected to grow from approximately 110 in 2010 to over 31,000 by 2050. Vehicle power plant manufacturing is also expected to increase to over 18,000 jobs by 2050. It is projected that these two sectors would combine to contribute over 50,000 jobs to Connecticut's economy by 2050.

Environmental Performance
The use of fuel cells, and especially fuel cells that directly utilize hydrogen, provides high value for improving air quality and reducing greenhouse gas (GHG) emissions. It has been calculated that the potential annual emissions reductions are between 26.2 and 37.3 pounds of NOx; 0.192 and 0.299 pounds of SO_2; and 10,169 and 15,772 pounds of CO_2 per passenger vehicle and light duty truck, respectively. For each transit bus, the potential emissions reductions have been calculated at approximately 1,020 pounds of NOx; 1.75 pounds of SO_2; and 183,000 pounds of CO_2 annually. Although the efficiency of conventional diesel buses has increased, conventional diesel buses use a hydrocarbon fuel and emit GHG, and have the potential for energy savings using fuel cell applications when compared to most other transportation applications.

Connecticut's transportation sector is also responsible for the most petroleum used in the state and is the largest portion of total statewide petroleum expenditures accounting for 52,573 out of 86,141 barrels of petroleum (61 percent) and $4,104 million out of $6,122 million (67 percent) of fuel expenditures annually. The amount of fuel energy saved using fuel cells for transportation applications ranges from 2,407.40 Btu/mile for passenger cars to 16,264.20 Btu/mile for transit buses. The increased efficiency of using fuel cells and hydrogen for transportation would result in significant fuel savings. The operation of the 2011 CTTransit fleet of six hydrogen-fueled fuel cell buses will use approximately 37,000 kg of hydrogen each year and completely displace approximately 49,000 gallons of diesel fuel annually. This displaced fuel is expected to result in the reduction of over one million pounds of CO_2 annually.

Deployment
On the east coast, initial introduction of hydrogen and fuel cell vehicles has occurred in New York City and more recently in Connecticut. Connecticut is expected to have four hydrogen refueling stations in operation by 2011. With support from the federal and state government and private industry, approximately seven or eight hydrogen refueling stations could be in operation by 2020, and as the market expands this could result in over 1,000 hydrogen refueling stations in operation by 2050.

In considering the locations for these hydrogen fueling stations, it would be advantageous to accommodate public transit, public and private fleet vehicles, and other commercial and private vehicles traveling between Washington and Boston along an East Coast version of California's Hydrogen Highway. Locations on, or with easy access to, major highways must be evaluated, including service plazas along Connecticut's interstates that are being considered for renovation and expansion. Consideration must also be given to locations that could serve public and private fleet vehicles, including transit operations.

The fuel cell buses operated by CTTransit, which are part of a demonstration program, cost over $2 million each; however, with all new technologies, increased production will lead to lower unit costs and increased economic opportunities for Connecticut companies. Hydrogen refueling infrastructure may cost between half a million dollars and $1.5 million for each station depending on how the hydrogen is produced and the production and dispensing capacity of the station. While the cost of a fuel cell bus does not currently

achieve parity with the cost of a conventional diesel bus, as costs decrease for hydrogen fuel cell technology the operation of these buses will provide a positive cost / benefit when considering the fuel savings associated with high efficiency; the air pollution emissions reductions associated with using hydrogen as a fuel; and economic benefits associated with the development and manufacture of fuel cell power plants and hydrogen infrastructure that currently resides in the state. If and when the capital cost of a fuel cell bus achieves parity with a conventional diesel bus, fuel cost savings alone could be significant, and savings would increase as the cost of fossil fuels increases over time.

Implementation for the conversion of conventional technology to hydrogen and fuel cell technology will face challenges, including the availability of fuel cell powered transit buses, cost, funding, and long term durability/reliability of the technology. The schedule for the deployment of vehicles, infrastructure, and associated equipment may be different than identified herein, and will be largely dependent upon the availability of funds. Hence, annual consideration of this plan will be necessary to maximize opportunities to leverage funding, and to account for changes in technology, cost, fuel availability, and public awareness.

Conclusion:
In summary, information in this Plan suggests that a transition to a hydrogen economy and the deployment of zero-emission, hydrogen fuel cell buses state-wide will increase transportation efficiency, improve environmental performance, increase economic development, and create new jobs. The technical and financial arrangements needed for such a transition from conventional vehicles and bus fleets will require initial investment by the state and federal government and private industry; however, such investment is well justified and will become a necessity as concerns about public health and climate change increase and the supply of conventional fuels becomes more limited. Furthermore, the use of domestic fuel and technology manufactured in Connecticut rather than fuel primarily produced overseas and bus engines manufactured out of state will provide value to Connecticut's economy and Connecticut's workers. The Plan also suggests that there are many specific locations for hydrogen refueling stations along state highways or at locations that could potentially be utilized by state fleets or other public or private-sector fleets.