Zero Emission Vehicles: Clearing the Air

New Jersey Clean Air Council
Public Hearing April 12, 2018

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New Jersey Clean Air Council Website
http://www.state.nj.us/dep/cleanair

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I. EXECUTIVE SUMMARY

The New Jersey Clean Air Council (CAC or the "Council"), as an advisory body to the Commissioner of New Jersey Department of Environmental Protection (NJDEP), has undertaken a public hearing to provide recommendations to the Commissioner to help expand the use of zero emission vehicles (ZEV) in the State. The following report summarizes the testimony and data received during the CAC's public hearing and comments on this important issue. The Council is pleased to present this report as a start to promoting zero emission vehicles in New Jersey, and supplementing the Murphy Administration's goal of further reducing air emissions in the State.

For over 50 years, the State of New Jersey has made great strides in reducing air pollution resulting in cleaner air for its residents for generations. Through the implementation of Federal and State regulatory and enforcement programs, major emitting sources have been required to meet strict emission standards. Control technologies such as selective catalytic reduction, scrubbers, carbon injection and baghouses have been installed on power plants and other industries, reducing pollution significantly at these facilities.

As we have cleaned New Jersey's air, one of the largest contributors to air pollution continues to be the transportation sector. While the emissions from the automobile fleet continue to improve, the fact remains that light and heavy-duty vehicles continue be a significant source of New Jersey's air pollution. It is estimated that transportation, including onroad and offroad vehicles, contributes 50% of NJ's ozone and 30% of NJ's fine particulate matter, making it the largest contributor to our state's air pollution health risks. During the past decade, numerous epidemiologic studies identified an increase in occurrence of adverse health outcomes associated with exposures to traffic-related pollutants that include mobile source emissions and re-suspended roadway particulate matter. These adverse outcomes include asthma, other respiratory diseases (e.g., chronic bronchitis, decreased lung function), cardiovascular effects (e.g., heart attacks), cancer, developmental effects, and death. Transportation is also the largest source of ozone precursors in New Jersey, and contributes 42% of the state's greenhouse gas (GHG) emissions, which is higher than the national average. Vehicles emit nitrogen oxides, also called NOx, which react with other pollutants to create ozone. Ground level ozone, also called smog, is like sunburn in the lungs and can cause permanent lung damage. Ozone remains a challenge, especially since the standard was lowered to 75 ppb in 2008 and 70 ppb in 2015. While concentrations of ozone have decreased steadily since 1988, complying with the new National Ambient Air Quality Standard will require further reductions in ozone precursors.

Electric vehicles (EV) are expected to be a significant part of the solution to the air pollution problems in NJ and the region. In recent years, an increasing number of electric automobiles have been sold in New Jersey. However, much more must be done to increase the sale and use of these vehicles, particularly to more of the mainstream public, as well as fleets of heavy duty vehicles and buses. The development of the electric vehicle fleet has inherent challenges, such as affordability and the expansion of charging infrastructure. Issues of equity are a particular challenge as New Jersey attempts to reap the benefits of electric vehicles in highly impacted urban areas.

As expanded upon in the latter section of this report, the Council has made the following three key recommendations toward the promotion of zero-emission vehicle ownership and use:

1. **Affordability:** Develop greater financial incentives for consumers to purchase zero emission vehicles, while being sensitive to our current economic climate and fiscal challenges of the state. One of the Council's key recommendations is a zero-emission vehicle purchase rebate program.

2. **Infrastructure:** Develop a long-term sustainable strategic plan for ZEV infrastructure in consultation with stakeholders (e.g., NJ Board of Public Utilities, NJ Department of Transportation, NJ Turnpike Authority, NJ TRANSIT, Metropolitan Planning Organizations, etc.) to guide state, regional, and local deployment of infrastructure to support the broad portfolio of charging needs at home, work, around town, at destination locations and on the road.

3. **Awareness:** Develop consumer awareness strategies that highlight the wide range of desirable, high-performing zero emission vehicles; available incentives, a rapidly-expanding network of charging stations, and the economic, environmental, and public health benefits of zero-emission vehicle ownership.

II. RECOMMENDATIONS

Based upon the questions asked and the testimony received at the public hearing, the Council has focused its recommendations on the three main obstacles to widespread ZEV adoption: 1) affordability; 2) infrastructure; and 3) awareness; and on emerging opportunities and crucial considerations for transportation electrification: 4) equity; 5) heavy-duty and fleet vehicles; and 7) the role of electric utilities.

The following recommendations to the NJDEP have been developed to address these factors and propose solutions. The Council recognizes that identifying funding for new initiatives is challenging in a time of competing budget priorities. Some of the potential funding sources for financial incentives could include, but are not limited to: the Volkswagen settlement, Regional Greenhouse Gas Initiative auction proceeds, federal grants, private foundation grants, public-private partnerships, Supplemental Environmental Projects, and, if approved by BPU, the Societal Benefits Charge and utility investments.

Affordability

Financial and non-financial incentives are critically important in the near-term to offset the higher purchase price of electric vehicles (EV) until battery costs decline further and manufacturing economies of scale close the price gap between EVs and conventional vehicles.

1. Develop greater financial incentives for dealerships to sell and for consumers to purchase electric vehicles, while being sensitive to our current economic climate and fiscal challenges of the state:

    a. Establish a vehicle purchase rebate program for new Battery Electric Vehicles (BEV) and Plug-in Hybrid Electric Vehicles (PHEV), using principles for optimal design of EV incentives: rebates should be substantial, available at the point of sale ("on-the-hood"), offered to the full target market (individuals, fleets, taxi and car-sharing services, leases and purchases), durably locked into place for at least several years, and relatively simple for consumers and dealers to understand their value;

    b. Consider extending the state sales tax exemption – which currently applies only to new and used Battery Electric Vehicles – to include new and used Plug-in Hybrid Electric Vehicles;

    c. Consider establishing incentives for local government fleet purchases. Volume purchases or low-interest loans may be appropriate tools;

    d. Reduce vehicle registration fees on all electric vehicles, or eliminate these fees altogether for the first five years of ownership of an electric vehicle;

    e. Expand the Green Pass Discount (10% discount on the off-peak rates on the NJ Turnpike and Garden State Parkway for low emission vehicles) to apply to peak rates for BEVs and PHEVs;

    f. Establish a rebate program for residential chargers;

    g. Consider establishing a grant or rebate program to encourage EV car-sharing, e-bikes and e-scooters;

    h. Continue the state sales tax exemption for the purchase or lease of new and used BEVs.

2. Develop non-financial incentives for owners of electric vehicles to encourage greater use of these vehicles:

    a. Preferential parking for EVs; and

    b. Preferential parking in congested urban areas for electric delivery vehicles.

Infrastructure

"Range anxiety" is one of the most frequently-cited obstacles to EV sales. A robust statewide network of EV charging infrastructure will build consumer confidence and support the growth in consumer demand for these vehicles.

1. Develop a strategic plan to guide public and private deployment of EV infrastructure to support the broad portfolio of charging needs at home, work, around town, at destination locations and on the road. An effective strategic plan would include goals and milestones for the number of EVs statewide, goals and milestones for the number of charging stations statewide, priority use cases such as workplaces, retail and destination locations, and along commuting and major travel corridors; criteria to help prioritize investments, and mapping and modeling analyses to inform the design and implementation of efficient corridor and community charging networks;

2. Provide sustained funding for "It Pay$ to Plug In," DEP's grant program for charging stations;

3. Explore charging solutions for multi-unit dwellings (apartments, condominiums, townhouses, etc.), as well as for urban areas without private garages and driveways. Potential approaches include neighborhood EV parking/charging areas, infrastructure for rideshare vehicles, infrastructure in public parking lots and parking garages, curbside chargers, and curbside charging infrastructure that utilizes power from utility poles and streetlights;

4. Consider siting direct current (DC) fast chargers in high-utilization transport hubs to support electric taxis and ride-share vehicles;

5. Work with stakeholders to identify and address barriers to streamlined permitting for construction and operation of charging stations;

6. Update building codes to require supporting electric infrastructure for EV infrastructure in new construction, major renovations and electric infrastructure upgrades;

7. Encourage municipalities to update zoning ordinances and redevelopment plans to include EV infrastructure;

8. NJDEP should continue to work in partnership with NJDOT, NJ TRANSIT, South Jersey Transportation Authority and NJ Turnpike Authority to develop a strategic plan for siting publicly-available charging stations at rest areas and park-and-ride facilities, specifically coordinating upgrades and installations during scheduled improvement projects. Additionally, these agencies should have discussions regarding alternative fuel vehicles (users of roads and bridges) and how the State engages them in the future replenishment of the Transportation Trust Fund;

9. Take measures to "future-proof" state infrastructure investments to accommodate developing technologies such as high-speed charging and hydrogen fuel cell vehicles;

10. Lead by example by installing EV chargers at state agencies, state parks and other locations under the state's jurisdiction;

11. Encourage counties and municipalities to install EV chargers at locations under their jurisdiction;

12. Utility investment in EV infrastructure should be allowed in order to scale infrastructure, particularly in use cases where the private market is likely to be slow to respond, such as multi-family housing, public DC fast charging, and charging in urban communities;

13. Continue to expand the number of federally-designated EV corridors to publicize the availability of DC fast chargers on highways throughout the state.

Awareness

The vast majority of consumers have little understanding about the capabilities and advantages of EVs, the wide range of available models, and the nature of the charging experience. Effective strategies will build consumer awareness and interest in EVs.

1. Develop consumer awareness strategies that highlight the wide range of desirable, high-performing zero emission vehicles; available incentives, a rapidly-expanding network of charging stations, and the economic, environmental, and public health benefits of ZEV ownership;

2. Continue to support the brand-neutral EV awareness campaign, *Drive Change. Drive Electric*;

3. Encourage "Ride and Drive" events (EV test drive opportunities) at workplace and community events to give consumers a first-hand experience with these vehicles;

4. Continue to work with the eight other states that have signed the Multistate ZEV Memorandum of Understanding (MOU) to identify and implement additional effective consumer awareness strategies; and

5. Support dealership efforts to increase EV sales by developing a dealer recognition program for top-performing dealerships; and by collaborating with dealerships and dealership associations to grow consumer awareness of EVs and improve consumers' shopping experiences.

Equity

We must ensure that low-income communities and communities of color, which have historically been exposed to disproportionately high levels of pollution, share in the benefits of transportation electrification.

1. Prioritize electrification of medium-duty and heavy-duty vehicles and equipment that operate in large numbers in low-income communities and communities of color. Good candidates for electrification are:

    a. Trucks, particularly those that service the ports
    b. Garbage trucks and other waste-handling equipment at waste facilities
    c. Transit buses

2. Work with the Port Authority and other stakeholders to develop clean truck programs that include funding for drayage truck owner-operators to obtain newer, cleaner trucks;

3. Work with stakeholders to develop and implement strategies that will further a goal of zero emission ports:

    a. Shore power for ships at dock
    b. Electric cargo handling equipment
    c. Electric tug boats

4. Explore charging solutions for multi-unit dwellings (apartments, condominiums, townhouses, etc.), as well as for urban areas without private garages and driveways. *See the Infrastructure section above for potential approaches.*

Heavy-Duty Vehicles and Fleet Vehicles

Light-, medium- and heavy-duty fleets in public and private sector organizations represent a sizeable share of total vehicle purchases. This sector has the potential to realize substantial environmental benefits from electrification while reducing operational costs.

1. Consider incentives to delivery companies to use electric delivery trucks in high traffic urban areas with traditionally high pollutant levels, as well as in low income communities and communities of color;

2. Promote purchasing of green fleets in government by including ZEVs as bid preferences on state/local purchasing contracts;

3. DEP should encourage the Port Authority of New York and New Jersey to continue expanding partnerships with air carriers and ground support contractors to purchase and use electric ground support equipment wherever possible;

4. Add ZEVs to state vehicle contracts to facilitate procurement of fleet vehicles by state agencies, municipalities, and other entities that can purchase vehicles from state contracts;

5. Lead by example by incorporating ZEVs into state agency fleets; and

6. Provide resources for private- and public-sector fleets to support decision-making by fleet administrators. Resources may include case studies, calculators to compare financial and emissions impacts of ZEVs versus conventional vehicles, best practices, etc.

The Role of Electric Utilities

The Council wishes to acknowledge the BPU's Electric Vehicle Infrastructure Stakeholder Process, and recommends that BPU consider the following recommendations, which reflect testimony received by the Council, during the development of the BPU's EV Infrastructure Report:

1. BPU should work with utilities to:
   a. consider Time-of-Use electricity rates or other "managed charging" programs to provide benefits to EV drivers and all ratepayers;

   b. develop EV educational materials for residential customers;

   c. identify locations where there is, or could be, sufficient grid capacity to support DC fast chargers; and

   d. identify solutions that could minimize or eliminate demand charges.

2. BPU should promptly determine whether EV charging operators should be regulated as utilities, which is a potential obstacle to greater infrastructure deployment; and

3. DEP should review and comment on BPU's Draft Report when it is released.

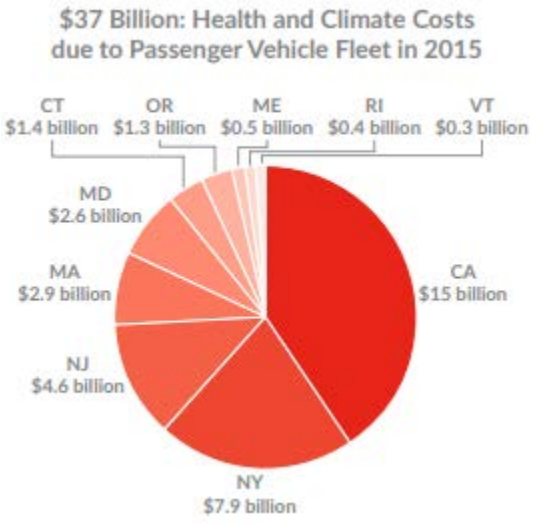
Cross-Cutting Recommendation

DEP should lead an interagency task force of relevant state agencies and authorities to inform the development and implementation of the strategic plan recommended in the Infrastructure section above, as well as to address critical issues such as infrastructure interoperability, signage, building codes, permitting, rate design, grid integration, and electrification of the state fleet.

III. Background and Recent Achievements

Conventionally-fueled vehicles not only contribute to adverse impacts on our climate, but also adversely impact public health. Vehicular emissions include carbon monoxide, particulate matter, hydrocarbons, nitrogen oxides and greenhouse gases. These pollutants contribute to serious respiratory diseases, such as asthma and chronic obstructive pulmonary disease (COPD), myocardial infarctions, and can lead to premature death. Additionally, motor vehicle exhaust contains specific air toxics which include benzene, acetaldehyde, formaldehyde, and 1,3-butadiene. According to a 2013 Massachusetts Institute of Technology study, road transportation emissions cause 53,000 premature deaths per year nationally, making transportation the largest single contributor to premature deaths from air pollution, even exceeding power plant emissions.

The American Lung Association (ALA) released a report in 2016 entitled, "Clean Air Future: Health and Climate Benefits of Zero Emission Vehicles," which focused on 10 states, including New Jersey, that have adopted a ZEV program. The report illustrated that, in 2015, pollution from passenger vehicles in these states totaled $37 billion dollars in both healthcare and climate costs. Twenty-four billion of those dollars were related to healthcare costs alone. It was further estimated that each 16-gallon tank of gasoline consumed in these ZEV program adoption states contributed $18.42 in combined health and climate costs ($11.82 for health, $6.55 for climate). More recently, the American Lung Association reported that in 2016, pollution from motor vehicles cost New Jersey residents $4.6 billion dollars in global warming damage and medical problems resulting from inhalation of related pollutants.



Based on the ALA report and related studies, air pollution and related healthcare costs are also not evenly-distributed throughout the state. In more urbanized areas, most impacts fall disproportionately on children, the elderly, low-income people, and people of color. Rates of premature death due to air pollution are higher in high-poverty neighborhoods and in neighborhoods in which the majority of residents are people of color. Hospitalizations due to air pollution are also increased in low-income neighborhoods and in neighborhoods of people of color. Asthma-related emergency department visits and hospitalizations are also higher in neighborhoods heavily impacted by pollutants from roadways, ports, railroads, and other areas heavily traveled by conventionally-fueled vehicles. Human exposure studies conducted during the past two decades have also identified an exposure zone between 300 and 500 meters from major roadways as the most highly impacted by traffic emissions. Electric vehicles reduce harmful emissions. The human health benefits of these emissions reductions are amplified in densely populated urban areas.

According to the 2016 American Lung Association report, adverse health and environmental impacts could be significantly curtailed by 2050 in the aforementioned ZEV program adoption states if 100% of new vehicle sales and 65% of all vehicles driven were ZEVs. Under this scenario,

there would be a $21 billion decrease in costs related to healthcare and climate impacts and over 85% reduction in lost work days. Among all 10 ZEV program adoption states in 2015, there were over 109,000 asthma attacks; 220,000 lost work days; 2,500 premature deaths; 1,800 heart attacks; and 1,800 emergency room visits and hospitalizations attributed to ozone and fine particulate matter generated by vehicles. The report further estimated that, by following a roadmap to achieve mostly ZEV traffic on our roadways, the 10 ZEV program adoption states would see 96,370 fewer asthma attacks; 194,908 fewer work-loss days; 2,246 fewer premature deaths; 1,625 fewer ER/Hospitalizations; and 629 fewer heart attacks.

According to the U.S. Global Change Research Program Report – "*The Impacts of Climate Change on Human Health in the United States*" – "climate change is a significant threat to the health of the American people. Rising GHG concentrations result in increases in temperature, changes in precipitation, increases in the frequency and intensity of some extreme weather events, and rising sea levels. These climate change impacts endanger our health by affecting our food and water sources, the air we breathe, the weather we experience, and our interactions with the built and natural environments." Greenhouse gases increase ground-level ozone and fine particle concentrations which can trigger a variety of reactions including coughing, throat irritation, and congestion, as well as reduced lung function and respiratory tract inflammation. Increasing temperatures and precipitation can also lead to an increase in mold spore distribution and exposure.

A review of information available on EV ownership and use has revealed some surprising facts not usually known or considered by the driving public. Initially, the cost of ownership is seen as a major hurdle toward having an electric vehicle. In many instances, electric vehicles can actually be cheaper to own than gas-powered vehicles once federal tax credits, purchase incentives offered by some states and dealerships, savings on fuel and routine maintenance, and insurance discounts are realized. Operational costs are reduced for electric vehicles since there are fewer moving parts requiring service (e.g., no transmissions, spark plugs, etc.) and electrical pricing is also more stable annually than conventional fuel costs. 'Drive Change. Drive Electric.', a public-private partnership between auto manufacturers and Northeast states to advance consumer awareness, understanding, consideration and adoption of electric cars, including battery electric, plug-in hybrid electric, and fuel cell electric vehicles, has developed a website (https://driveelectricus.com/explore-electric-cars/) to educate the consumer about the various available drive trains and types of cars currently available on the consumer market.

Range anxiety is also a major factor that individuals consider when deciding on whether or not an electric vehicle is right for them. In more rural areas of the country, charging stations are located at sporadic intervals or are non-existent. However, in places such as New Jersey, charging stations and fast charging locations have become more available over the past 3-5 years and additional locations continue to be developed. The average driver in the U.S. drives less than 40 miles per day and current battery technology gives electric vehicles a driving range between 80 and 300 miles. In an effort to reduce range anxiety and promote electric vehicle, as well as alternative fuel vehicle use, the U.S. Department of Energy has developed an 'Alternative Fueling Station Locator' website at https://www.afdc.energy.gov/stations/#/find/nearest .

New Jersey Clean Air Council 2018 Public Hearing

The New Jersey Clean Air Council (CAC or the "Council") is a statutorily created advisory body that provides ongoing input and recommendations to the NJDEP on air quality issues. The CAC conducts annual public hearings that highlight the most pressing air quality issues affecting New Jersey. After considering the testimony received at the April 12, 2018 hearing, the CAC has prepared this report with specific recommendations for presentation to the Commissioner of the NJDEP related to achieving the state's goal for zero emission vehicle ownership and use along New Jersey's roadways. The NJDEP will make the report available to the public. For 2018, the Council is pleased to present this report entitled, "Zero Emission Vehicles: Clearing the Air."

New Jersey has an estimated 6.3 million vehicles, over 15,000 battery electric and plug-in hybrid electric vehicles, and 78 billion vehicle miles traveled. The amount of traffic has a direct impact on air quality. Mobile sources of air pollution including cars and trucks are the most significant source of air pollution in New Jersey. The Clean Air Council examined electric vehicles and other alternative fuel vehicles in 2014, resulting in several successful new initiatives and increased EV sales. With breakthroughs in battery technology, rapidly-declining battery costs, and increased availability of electric cars, trucks, buses and other vehicles, the Council revisited the subject to examine ways that transportation electrification could improve our air quality and health. While EV ownership has been increasing steadily since 2011 (see chart below, "New Jersey Plug-In Vehicle Registrations 2011 – 2017"), NJ hopes to see even faster growth in the upcoming years.

The main obstacles to widespread adoption of EVs are the purchase price of EVs compared to conventional vehicles, insufficient charging infrastructure, and lack of public awareness. Strategies need to address these three obstacles in order to accelerate market penetration of EVs, reduce vehicle emissions and clean the air.

The goal of the 2018 NJDEP Clean Air Council public hearing was to re-evaluate the hurdles and potential solutions to achieving widespread use of electric vehicles and make recommendations to the Commissioner of the NJDEP. Questions considered by the Council during the hearing included but were not limited to:

- **Affordability –** How can the state address the affordability gap between electric vehicles and comparable conventional vehicles? What incentives have been the most effective? Are different strategies needed to encourage EV adoption by New Jersey residents, businesses and governments?

- **Infrastructure –** How can the state grow the charging station network to attract and sustain EVs? What policies, programs and incentives have been effective in other states and municipalities? What are the barriers and options for EV charging in urban areas, and for apartments and condominiums? How can we ensure that new and existing buildings are "EV-ready"? How can we future proof our investments to accommodate developing technologies such as high-speed charging and fuel cells?

- **Awareness –** How can the state raise awareness of the availability and benefits of EVs? What outreach and education strategies have been most effective? How can the State's fleet "lead by example"?

- **Equity –** How can the state ensure that low-income communities and communities of color, which have historically been exposed to disproportionately high levels of pollution, share in the benefits of clean transportation? How can EVs be used for transit, ride-sharing and other mobility solutions?

- **Heavy-duty vehicles –** How can the state help to expand medium-duty and heavy-duty EV markets?

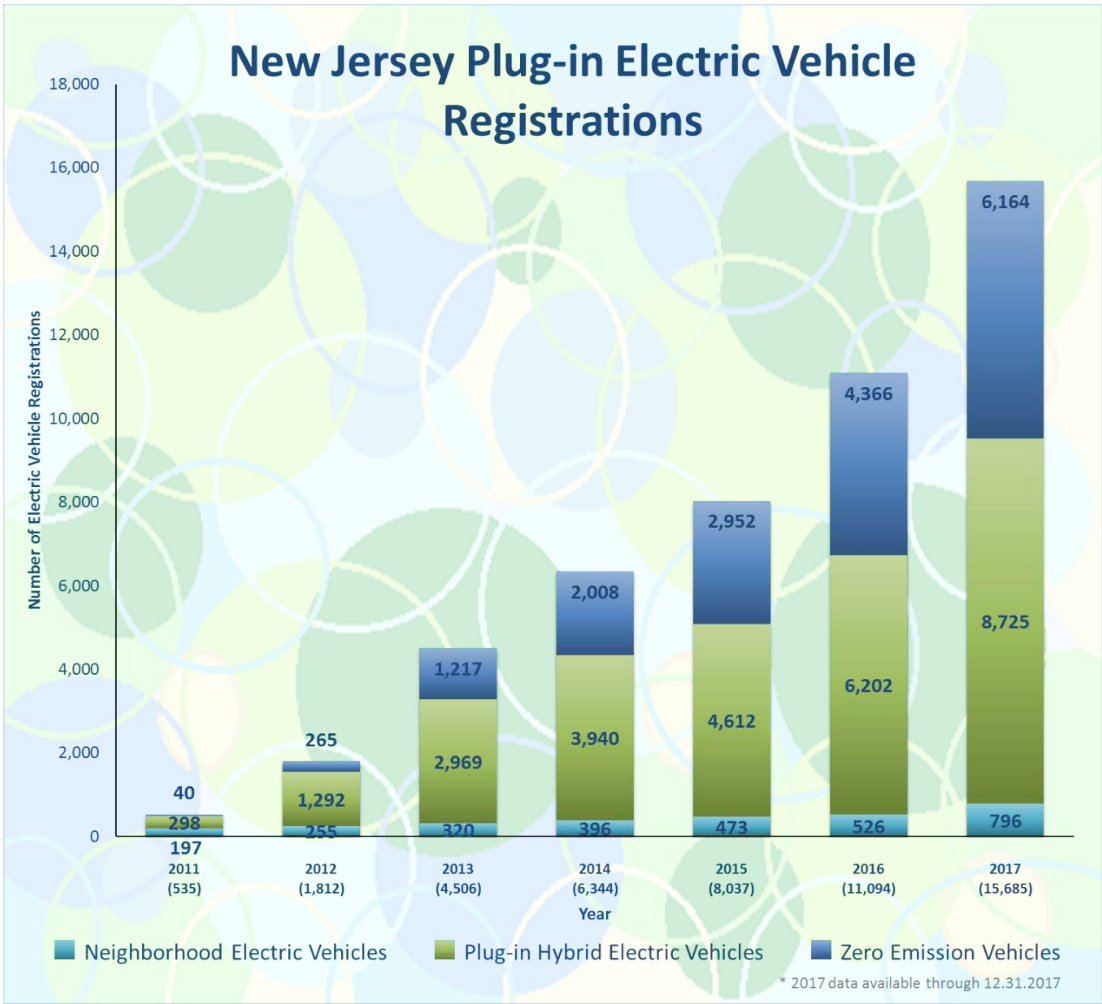
New Jersey State Electric Vehicle Initiatives

New Jersey's Clean Car Program

New Jersey's Clean Car Program (N.J.S.A. 26:2C-8.15 et seq.) requires automakers to produce and deliver for sale a certain percentage of ZEVs in the state. The ZEV requirements ramp up beginning in Model Year 2018, and automakers will need to offer a greater number of electric vehicles to comply with the regulation.

As of December 2017, there were 15,685 Battery Electric Vehicles and Plug-in Hybrid Electric Vehicles registered in New Jersey. A few short years ago, in 2011, there were only 535 EVs registered in the State. New Jersey's EV registrations have grown more than 25 times in only six years.

New Jersey Plug-In Vehicle Registrations 2011 - 2017

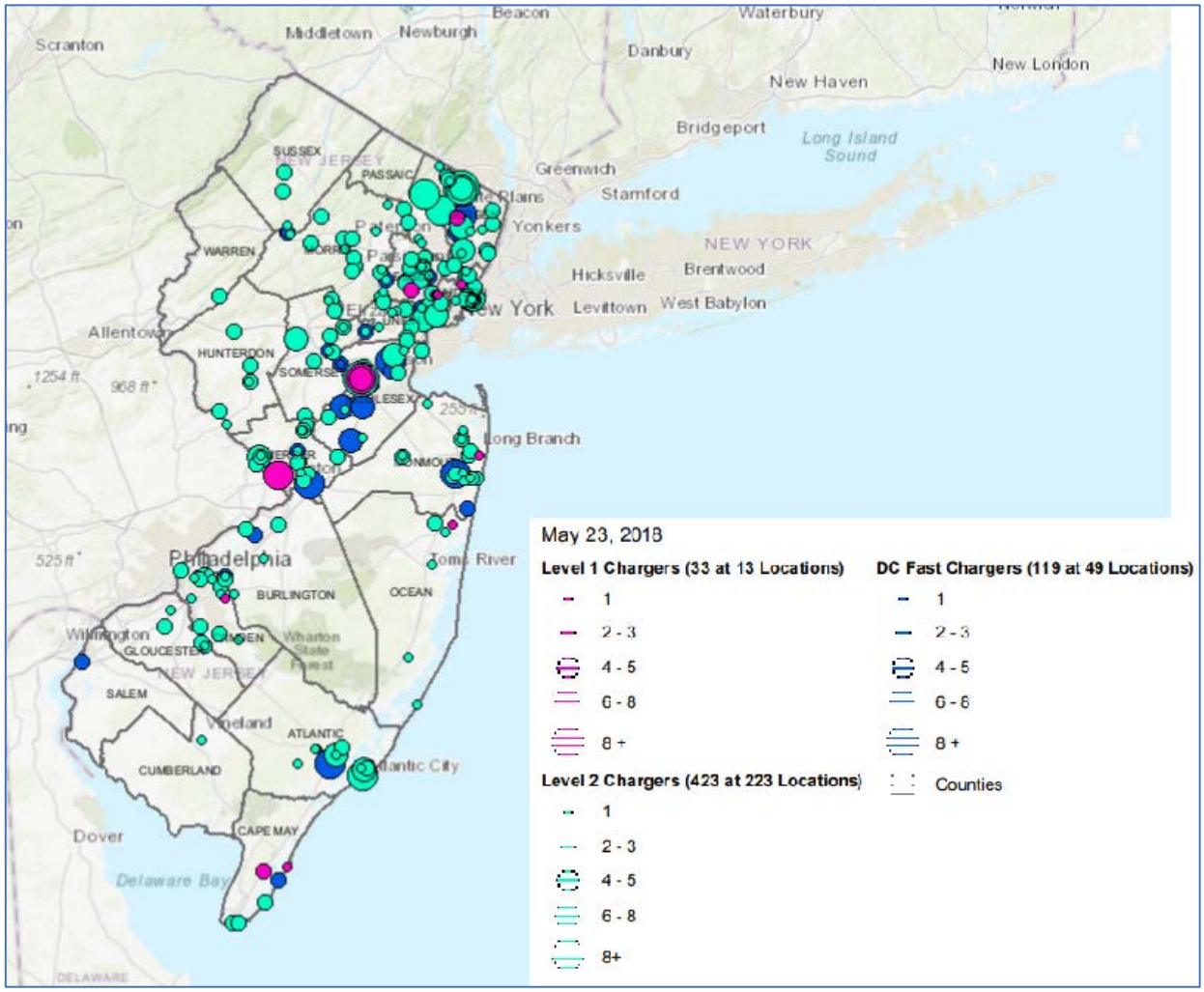


Source: http://www.drivegreen.nj.gov/electric.html

Public Charging Infrastructure

New Jersey's network of charging stations continues to grow. New Jersey has 517 public charge points (or plugs) at 220 locations. That includes publicly-accessible DC fast charging stations, with 102 public fast chargers at 42 locations. About 95% of the state falls within a 25-mile radius of a fast charger, many along major highways.

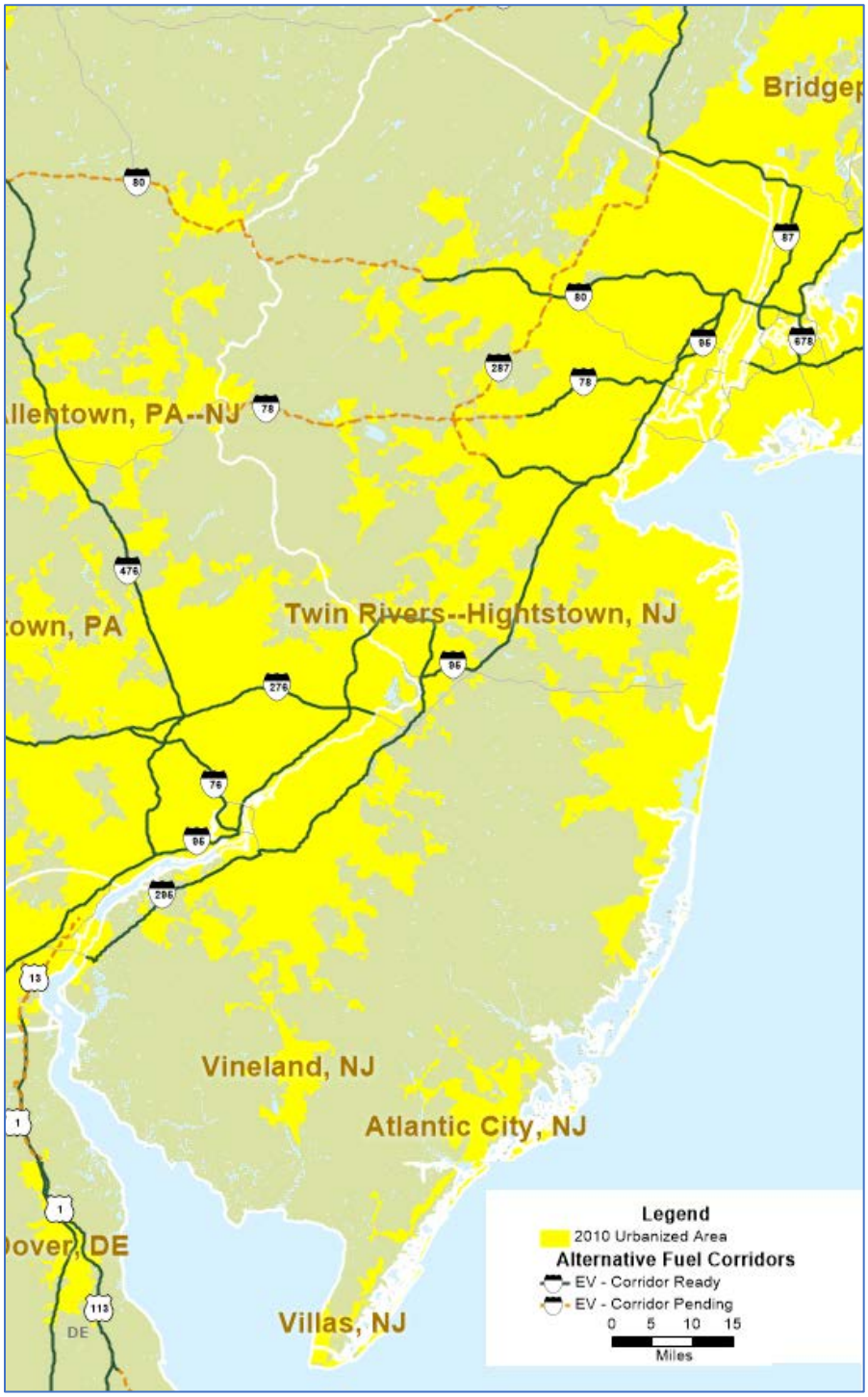
Publicly Accessible EV Charging Stations in New Jersey



Source: NJDEP

In response to DEP's application, the Federal Highway Administration has designated five NJ highways as "Electric Vehicle Corridors" where DC fast chargers allow worry-free electric travel: I-95, I-295, and sections of I-80, I-78, and I-287. Those highways connect to EV Corridors in neighboring states and throughout the Northeast and Mid-Atlantic region.

Federally-Designated Electric Vehicle Corridors



Source: https://hepgis.fhwa.dot.gov/fhwagis/ViewMap.aspx?map=Highway+Information|Electric+Vehicle+(EV-Round+1+and+2)

Multistate Collaboration

New Jersey is engaged in several multistate and regional collaborative efforts to speed adoption of electric vehicles and build out a robust charging network statewide and throughout the region.

Multi-State Zero Emission Vehicle Memorandum of Understanding. In May 2018, Governor Murphy signed the State Zero-Emission Vehicles Programs Memorandum of Understanding (MOU). Through the MOU, New Jersey works collaboratively with other leading states to support the deployment of zero-emission vehicles as part of the Multi-State ZEV Task Force. By signing the MOU, New Jersey joins New York, Vermont, Connecticut, Rhode Island, Oregon, Massachusetts, Maryland, and California in committing to coordinated action to ensure the successful implementation of ZEV programs. Collectively, the states identify joint cooperative and individual actions to build a robust market for ZEVs. http://www.nescaum.org/documents/zev-mou-9-governors-signed-20180503.pdf

Northeast Corridor Regional Strategy for Electric Vehicle Charging Infrastructure. In May 2018, states on the East Coast from Virginia to Maine, released the "Northeast Corridor Regional Strategy for Electric Vehicle Charging Infrastructure" to advance public and private investments in electric car charging and increase the use of electric cars throughout the region. The regional strategy is the result of a multi-state effort by twelve states and the District of Columbia, and incorporates input from automobile manufacturers, utilities, electric vehicle charging companies, and others. Announced by the Northeast States for Coordinated Air Use Management (NESCAUM), which facilitated the effort, the regional strategy offers a vision for electric vehicle charging infrastructure investment and provides a compilation of recommendations to ensure public and private funding decisions are strategically integrated. http://www.nescaum.org/documents/northeast-regional-charging-strategy-2018.pdf

'Drive Change. Drive Electric.' Launched in March 2018, this initiative represents a unique public-private partnership between auto manufacturers and Northeast states to advance consumer awareness, understanding, consideration and adoption of electric vehicles. The campaign showcases to drivers and passengers the convenience, affordability, technology, sustainability and power performance of EVs. https://driveelectricus.com/

Transportation and Climate Initiative. New Jersey is a founding member of the Transportation and Climate Initiative (TCI), a regional collaboration of 11 Northeast and Mid-Atlantic states and the District of Columbia that seeks to improve transportation, develop the clean energy economy and reduce carbon emissions from the transportation sector. TCI supports the deployment of clean vehicles and fueling infrastructure in TCI states to maximize the economic opportunities and emissions reductions that these vehicles bring to the region. States share best practices and engage with experts and other stakeholders on policies to enable the adoption of cleaner vehicles in the region. http://www.transportationandclimate.org/

New Jersey State Incentives for Electric Vehicles and EV Infrastructure

State Sales Tax Exemption. New Jersey exempts battery electric vehicles and fuel cell electric vehicles from state sales and use tax. The tax exemption, which applies to the sale, lease or rental of both new and pre-owned vehicles, is permanent and does not sunset, providing sustainability and certainty to consumers and fleet administrators. http://www.drivegreen.nj.gov/zev.html

Exemption From Bi-Annual Emission Inspections. Battery electric vehicles and fuel cell electric vehicles are exempt from bi-annual Motor Vehicle Commission inspections, since these vehicles have no internal combustion engines and no tailpipe emissions.

It Pay$ to Plug In – New Jersey's Workplace Charging Grant Program. In June 2016, in collaboration with the Board of Public Utilities, DEP launched *It Pay$ to Plug In – New Jersey's Workplace Charging Grant Program,* implementing one of the Council's 2014 recommendations. The grant program helps employers offset the costs to purchase and install EV charging stations for employee use. Eligible applicants can be reimbursed up to $5,000 per Level 2 charging station. The program has been popular and highly successful, approving nearly $850,000 to fund 186 charging stations throughout the state. *It Pay$ to Plug In* has exhausted its initial funding, and has a waiting list of $405,000 worth of projects. DEP has received preliminary approval for $3.6 million in federal funding to restart the program, and to add eligibility to downtown areas, leisure destinations, public colleges and universities, and major travel corridors. http://www.drivegreen.nj.gov/programs.html

NJ Charging Challenge – Electrify Your Workplace. NJDEP recognizes NJ employers that are making their workplaces "EV-Ready" by providing workplace charging for their employees. The top three winners of the annual contest receive awards at the Governor's Environmental Excellence Awards ceremony. http://www.drivegreen.nj.gov/programs.html

Green Pass Discount. Battery electric and plug-in hybrid electric drivers qualify for the Green Pass Discount, which provides a 10 percent discount on the off-peak rate on the New Jersey Turnpike and Garden State Parkway. http://www.njta.com/toll-calculator

HOV Lane Access for Hybrid Electric Vehicles. Typically, only vehicles with 3 people or more can use the NJ Turnpike's High Occupancy Vehicle (HOV) lane. However, drivers of qualifying hybrid engine vehicles can use the stretch of HOV lane from Interchange 11 (in the Township of Woodbridge) to Interchange 14 (in the City of Newark), regardless of the number of passengers, during peak hours. http://www.njta.com/travel-resources/roadside-assistance-turnpike

Streamlined Permitting for Residential Charging. DEP worked closely with the NJ Department of Community Affairs (DCA) to streamline the permitting process so that homeowners can quickly and easily install home chargers. DCA determined that the installation of residential charging equipment is considered "minor work" under state codes and rules. This means that the homeowner or electric contractor need only provide verbal notification to the local code enforcement agency prior to starting the installation. The permit application must then be subsequently filed within five days of the notification. DCA's action eliminated a waiting period for approval of a permit that could have been as long as three weeks. See the *Homeowner's Guide to EV Charging Stations* at

http://www.state.nj.us/dca/divisions/codes/publications/pdf_other/homeowners_guide_electric_vehicles_charging_stations.pdf

Volkswagen Settlement. In late 2015, Volkswagen (VW) publicly admitted it had secretly and deliberately installed a defeat device – software designed to cheat emissions tests and deceive federal and state regulators – in nearly 583,000 VW and Audi branded diesel vehicles sold or leased to American consumers. The excess NOx emissions from these vehicles harmed public health and the environment.

In response to complaints filed by the U.S. Department of Justice and the attorneys general of several states, including New Jersey, courts have approved a series of partial settlements resolving some aspects of the case. Under the settlements, New Jersey is expected to receive $72.2 million toward projects that reduce NOx pollution to offset the excess NOx emissions caused by VW's actions. New Jersey intends to use the maximum allowable 15% of the settlement fund for charging infrastructure for light duty electric vehicles.

New Jersey issued a solicitation for project proposals, and received a wide range of proposals totaling nearly $390 million in projects. DEP will issue a draft Beneficiary Mitigation Plan to summarize how New Jersey proposes to use the $72.2 million mitigation fund, and will invite public input on how best to invest in projects that support improved air quality, cleaner transportation and healthy communities. http://www.state.nj.us/dep/vw/.

NJ Board of Public Utilities EV infrastructure Stakeholder Process. The BPU launched an EV Infrastructure Stakeholder Process in late 2017. The BPU requested and accepted the Regulatory Assistance Project Report (RAP Report) entitled "Getting from Here to There: Regulatory Considerations of Transportation Electrification" and directed staff to initiate an Electric Vehicle Infrastructure stakeholder process. The RAP Report addresses the potential increase in the availability of Plug-In Electric Vehicles on the road and the associated opportunities/challenges facing utility regulators and electric utility companies. The RAP Report is available on the BPU website at http://nj.gov/bpu/pdf/reports/RAP-NJ-BPU-electricvehicles-policymemo-may2017.pdf.

The BPU Stakeholder process sought input on the following questions:

- Do EVs fall under the definition of demand side management and energy efficiency as set forth at N.J.S.A. 48:3-51 and/or N.J.S.A. 48:3-98.1.d.?
- Should owners and operators of electric vehicle supply equipment (EVSE) that provide electric vehicle charging service be regulated as electric utilities? Are operators of EVSE reselling electricity or providing a charging service?
- What is the present status of EVs and EV infrastructure in New Jersey?
- What EV/EV infrastructure developments can be expected in the short/medium term under a Business as Usual scenario?
- What goals for EV Infrastructure should be established?
- What role should the Board, other government agencies; electric utilities, non-governmental organizations and the private market have in addressing EV/infrastructure adoption?

All public comments for the BPU stakeholder process have been posted at: http://www.bpu.state.nj.us/bpu/agenda/stakeholdercomments.html**.**

BPU staff will prepare a report on the EV Infrastructure technical and policy issues including potential EV tariffs and rate designs to the Board in 2018. The EV Infrastructure Report will include and address the comments that were submitted through the stakeholder process as well as staff recommendations.

EV Ride and Drive Events. NJDEP will be rolling out a series of Electric Vehicle Ride & Drive events later in 2018. Ride and Drives provide consumers with the opportunity to test drive multiple EV models and to interact with EV owners, experts and enthusiasts. The events have been proven to be a successful, interactive way to educate the public about EVs and to spur vehicle sales.

Legislation Under Consideration in the New Jersey State Legislature Related to Electric Vehicles and Charging Infrastructure (as of June 7, 2018)

BILL #	SUMMARY
Cross-cutting bills	
A3734/ S612	Dedicates first $300 million from the Regional Greenhouse Gas Initiative for electric vehicle programs.
A1223/ S1793/	Establishes 13-member Clean Vehicle Task Force to recommend ZEV implementation.
A3688/ S1975	Establishes State goals for adoption of plug-in electric vehicles and electric vehicle charging infrastructure; directs DEP and various other State agencies to develop programs to achieve those goals.
Infrastructure bills	
A3687/ S2252	Establishes a statewide public electric vehicle charging system.
A114/ S2255	Provides corporate business tax credit and gross income tax credits for purchase and installation of certain electric vehicle charging stations. Credits expire after 7 years. Only Level 2 and 3 charging stations allowed.
A1396/ S1994	Exempts electric vehicle charging systems from real property taxation. Board of Public Utilities to provide certification.
A1371/ S606	Encourages municipalities to plan for the development of electric vehicle charging infrastructure pursuant to the "Municipal Land Use Law."

A1376/ S3471	Permits an electric utility to operate a public charging station as a regulated service in severely underserved markets. Directs that public charging station providers will not be regulated as utilities and will not charge membership or service fees to users.
A1445	Directs installation of electric vehicle charging stations at service areas on State's toll roads. Specifically, (1) New Jersey Turnpike, (2) Garden State Parkway, and (3) Atlantic City Expressway shall ensure that charging stations are located in at least five percent of parking spaces if total lot size is at least 100 spaces.
A1030/ S2421	Requires community associations to allow installation of electric vehicle charging stations. Restricts homeowners' association from restricting EV charging station. Allows an association to install an EV charging station.
A1455/ S711	Provides corporate business tax credit and allows gross income tax reduction for purchase and installation of electric vehicle charging stations.
A3075/ S597	Encourages development of public electric vehicle charging infrastructure in redevelopment projects.
A4005/ S594	Allows 50 percent credit against societal benefits charge to electric or gas public utility customers who install and maintain publicly available zero emission charging stations. Exclude hydrogen stations.
A2719/ S717	Requires NJDOT to establish a fast charger in the north, central, and south areas of the NJ Turnpike as a pilot.
A2718/ S718	Requires NJDOT to undertake a pilot program to offer 3 alternative fuel stations at public, private, and government-owned or operated fueling stations.
Vehicle bills	
A1032	Provides sales and use tax exemption for sales of plug-in hybrid vehicles. (Current tax exemption is only for pure electric.)
A1363	Establishes DEP Rebate program up to $5000 per vehicle for purchase of fuel-cell, EV, CNG and plug in hybrids.
A3847/ S2382	Directs BPU to allocate $100 million/yr. for three years for EV rebates (up to $5000 per vehicle).
A1364	Provides gross income tax credit to persons purchasing or leasing alternative fuel vehicles. (Similar to A1363 but include leasing for at least 30 months.)
S148	Exempts from sales tax for two years certain highly fuel-efficient vehicle and energy efficient appliances
S721	Changes allowable width of school bus to accommodate electric models.
A2940 S723/	Authorizes use of electric school buses by changing width.
A3830/ S2436	Directs BPU to develop and implement electric school bus pilot program.

IV. SUMMARY OF TESTIMONY

(Note: Summaries are listed in order of speaker testimony.)

Catherine R. McCabe,
Commissioner, NJDEP
Welcome and Opening Remarks

I want to thank the members of the Clean Air Council for inviting me to provide opening remarks at my first Council hearing. I would like to acknowledge:

- Sara Bluhm, the Council chair
- John Valeri, Council vice-chair
- Michael Egenton, today's hearing chair and
- Dr. Leonard Bielory, the hearing co-chair

I want to thank the speakers who join us today, including representatives from New Jersey's municipalities and state agencies; universities; planning organizations; research institutions and New Jersey businesses. You have advised my predecessors over the years on a wide range of important and emerging air quality issues, including power plant pollution, interstate transport, air toxics, mobile sources, cumulative impacts and climate change. I look forward to your advice on clean transportation. You are leaders in clean transportation and we are fortunate to have your input. I also welcome all of you in the audience who made the trek to Trenton to join us today. I hope we will hear from some of you this afternoon during the open public comment period.

At its 2014 Public Hearing, the Clean Air Council explored the relationship between alternative transportation strategies and air quality. Given the increase in electric vehicle availability to the public, and the success of the *It Pays to Plug in* Workplace Charging Grants Program, it is appropriate to revisit the recommendations from the 2014 hearing, with a particular focus on Zero Emission Vehicles. Transportation is the largest source of ozone precursors in New Jersey, and nearly half of our greenhouse gas emissions come from the transportation sector. More than a quarter of the state's particulate pollution also comes from the transportation sector. As such, it's clear that our current reliance on fossil-fueled transportation is a threat to air quality, human health, and a healthy climate.

In the past, stationary sources like power plants and industrial smoke stacks were the main sources of air pollution in the New Jersey. While we continue to reduce emissions from stationary sources, we must redouble our efforts to address pollution from the transportation sector. Zero emission vehicles are a vital part of the future of clean transportation. Battery electric vehicles and plug-in hybrid electric vehicles are now readily available for purchase, with more choices on the way.

Today's EVs offer more than 200 miles of range on a single charge, and come in a wide selection of vehicle types, from sedans to minivans to SUVs, to accommodate consumer needs. With more than 40 models from nearly every major automaker, over 800,000 Americans have made the switch to electric transportation. Beyond available options for the public, there are now viable and growing markets for electric transit buses and school buses, electric pickup trucks and delivery

trucks, and even electric long-haul trucks. It's an exciting time to be planning for clean electricity as a transportation fuel.

I am pleased to report that New Jersey has a suite of measures currently in place to encourage the use of electric vehicles. Several of these initiatives implement previous recommendations from the Council.

- In June 2016, in collaboration with the Board of Public Utilities, DEP launched the *It Pays to Plug In* Workplace Charging Grant Program. This program has been highly successful, approving nearly $850,000 to fund 186 charging stations throughout the state. *It Pays to Plug In* has exhausted its initial funding, and has a waiting list of nearly half a million dollars' worth of projects.

- In 2017, DEP received preliminary approval for two federal grants totaling $3.6 million for EV chargers in communities, workplaces and along highways. These grants will fund approximately 570 additional chargers.

- New Jersey is one of nine states that adopted California's Zero Emission Vehicle standard, requiring automakers to deliver for sale an increasing number of battery electric vehicles and plug-in hybrid electric vehicles over time.

- New Jersey recently signed the ZEV Memorandum of Understanding, joining other Northeast states which have adopted the California Zero Emission Vehicle program in developing and implementing a wide range of strategies to increase EV sales. This is particularly critical at a time when the Federal Government is working to roll back national vehicle emission standards.

- Our state sales tax exemption for zero emission vehicles eliminates the 6.6% sales tax on the purchase of a new EV.

- The Department of Community Affairs streamlined the permitting process for home chargers, making it faster and easier for EV drivers to have a charger installed at home.

- New Jersey's EV owners are exempted from emissions testing requirements, and eligible for off-peak toll discounts on the NJ Turnpike and Garden State Parkway. These measures are consistent with recommendations from the Council in its 2014 report.

- In 2016, DEP created a recognition program to honor employers who have made their workplaces "EV-ready" by installed charging stations for employees. And we added an award for EV readiness to the annual Governor's Environmental Excellence Awards. These programs implement one of the Council's 2014 recommendations.

- New Jersey signed on as a beneficiary to the Volkswagen Settlement, which will bring $72.2 million to the state for clean vehicle projects that reduce NO_x emissions. Under the settlement, up to 15% of the funds can be used for light duty EV charging infrastructure. We intend to use the full 15% for EV charging.

- EV registrations in the state increased from about 500 in 2011 to nearly 16,000 in 2017. That's impressive market expansion in only six years. Our network of charging stations is also growing – New Jersey has 517 public charge points at 220 locations. That includes a network of DC fast charging stations, with 102 public fast chargers at 42 locations. About 95% of the state falls within a 25-mile radius of a fast charger. The Federal Highway Administration has designated five NJ highways as "Electric Vehicle Corridors" where fast chargers allow worry-free electric travel. Those highways link up with EV Corridors in neighboring states and throughout the Northeast and Mid-Atlantic region.

However, there are still challenges that need to be addressed to transform New Jersey's transportation sector. EVs only account for about one percent of all light-duty vehicles in New Jersey, and generally have a higher sticker price than comparable conventional vehicles. We need to do more to build out a network of charging infrastructure to reduce range anxiety, and to educate consumers on the benefits of EVs.

We need to consider the opportunities provided by the new generation of electric trucks, buses and other medium-duty and heavy-duty vehicles. And we need to ensure that poor and minority communities, which have borne way more than their fair share of environmental pollution, share meaningfully in the benefits of transportation electrification.

I look forward to testimony today that will address these challenges. Again, I'd like to thank the Clean Air Council for conducting this hearing, and I thank the speakers and audience members who have come to provide perspective on this vital and timely issue. I look forward to today's testimony and I look forward to the Council's report and recommendations.

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Brian Platt,
Office of Innovation, Jersey City Mayor's Office
Urban Opportunities for Electric Vehicles

Jersey City is seeking to install EV charging infrastructure throughout the city in an effort to inspire private ownership of EVs and also to begin to transition the municipal fleet to electric power. Private EV ownership is challenging in urban areas as many residents live in apartment buildings or walk-up brownstones without private, dedicated parking spaces at which EV charging infrastructure could be installed. We are seeking to install publicly available chargers on city streets and on city property to be available for those that have or want to purchase an EV but do not have sufficient access to chargers.

We will also install EV charging infrastructure at certain municipal facilities in an effort to allow for the procurement of EVs for municipal use. We applied to the NJDEP for VW settlement funds for 6 electric powered garbage trucks. Diesel powered garbage trucks produce the highest levels of harmful pollutants and spend a considerable amount of time on city streets, and we have targeted this operation for the transition because of the highest potential reduction in neighborhood level pollution.

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Matt Solomon,
Northeast States for Coordinated Air Use Management (NESCAUM)
Moving Toward Zero Emissions in the Northeast

NESCAUM is the association of air quality control agencies of the states of Connecticut, Massachusetts, Maine, New Hampshire, New Jersey, New York, Rhode Island, and Vermont. It was created by the New England governors in 1967, and later joined by New York and New Jersey. We provide our member states with technical and policy analysis on regulatory issues. We have been helping our member states to act collaboratively for decades to address state and regional air quality, climate, and transportation problems.

Like New Jersey, most of the NESCAUM states (plus Oregon and Maryland) have adopted California's ZEV Program requirements. These are in effect in CA and 9 other states, roughly 28% of the US vehicle market. Automakers in these states must sell increasing numbers of BEVs, PHEVs or FCEVs through 2025. Because the requirement is defined in terms of credits, not cars, and because automakers may trade credits from state to state, we can't say for sure exactly how many vehicles will be required across all of the ZEV program states, but the total number of ZEVs sold for compliance will likely be in the range of 300,000 to 2.2 million by 2025.

NESCAUM is currently facilitating a multi-state governors' effort to advance the market for zero emission vehicles (ZEVs). Nine states are working together to identify and remove barriers to ZEV adoption. While it has been a ZEV state since 2007, New Jersey finally joined the ZEV Task Force with Governor Murphy's signature in March of 2018. New Jersey currently ranks 45th among the states in EVSE outlets per registered vehicle.

Examples of successful infrastructure programs are in place in many Task Force states including Maryland (http://energy.maryland.gov/transportation/Pages/incentives_evserebate.aspx), Massachusetts (https://www.mass.gov/how-to/massevip-workplace-charging), New York (https://www.nyserda.ny.gov/All-Programs/Programs/ChargeNY), and Rhode Island http://www.energy.ri.gov/transportation/ev/charge-up.php).
Examples of successful purchase incentive programs are in place in many Task Force states and include Connecticut's CHEAPR Electric Vehicle Rebate Program offering $5,000 for FCEVs, up to $3,000 for BEVs, and up to $2000 for PHEVs, with over $5,000,000 awarded since 2016; Maryland's Excise Tax Credit for up to $3,000, linked to Battery Size. PHEVs are eligible (http://www.mva.maryland.gov/About-MVA/INFO/27300/27300-71T.htm); Massachusetts' MOR-EV program, offering up to $2500 for BEV and FCEV and up to $1500 for PHEV, with over $12,000,000 awarded since 2014 and a $20M cumulative commitment (https://mor-ev.org/) and New York's Drive Clean Rebate for Plug-in Electric Cars, offering up to $2000 per vehicle (https://www.nyserda.ny.gov/All-Programs/Programs/Drive-Clean-Rebate)

The Task Force states are also working to expand consumer awareness through joint efforts such as the new Drive Clean, Drive Electric campaign (https://driveelectricus.com/). This multimedia outreach initiative is supported by the Task Force states and all of the major automakers. Individual states can also drive awareness as Massachusetts is doing with its successful Mass Drive Clean program (http://www.massdriveclean.org/).

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Melissa Miles,
Ironbound Community Corporation
Electrification for All

The electrification of vehicles (EV) is an important step that New Jersey can take to curb the emissions of greenhouse gases in the transportation sector, a major contributor to the state's overall emissions. Clearly the focus in the move towards expanding the capacity of New Jersey's cities to support EV is focused on passenger vehicles. While remaining a crucial step, the focus on passenger vehicles denies access to many poorer, urban residents to benefit directly from the move towards EV. Facing the cumulative impacts of emissions from the waste sector, energy sector, and the Port of NY/NJ, reducing emissions from the transportation sector in cities like Newark, requires a move nuanced approach.

Newark is considered by the EPA and the NJDEP to be an environmental justice community of concern. This means that we are under the burden of the cumulative impacts of a wide range of pollutants from many mobile and non-mobile sources. We suspect that EV as it pertains to passenger cars will not have a widespread impact in a place like Newark due to reasons like: income disparities (with people in wealthier cities), lack of access to buy EV vehicles at local dealerships, less emphasis placed on creating charging ports by the municipal government, community concerns that this type of technology is a response to and promoting gentrification and others.

For Newarkers, particularly those in the East and South Wards, the real burden is trucks. Waste trucks, construction sector trucks, delivery vehicles, and drayage trucks transit our streets numbering hundreds hourly. Although they contribute less GHG emissions overall than cars, the co-pollutants including black carbon and particulate matter that accompany diesel emissions are of particular concern to our community. ICC as a member of the Coalition for Healthy Ports (CHP) has advocated for a turnover of the oldest, dirtiest trucks that serve the Port of Newark for nearly a decade. Our coalition as part of the Moving Forward Network (MFN) has made publicly available many studies about the impact of living close to roadways frequented by diesel trucks. We know that $PM_{2.5}$ is much higher in our community than in the suburbs that would most benefit from vehicle electrification as it now stands. This makes the current focus on passenger vehicles an environmental injustice.

While we would like to see our bus fleets electrified, as well as education about and access to electric passenger cars made a reality in Newark, our primary concern is the Port and waste trucks that pollute our community with impunity and with no real benefit that matches the disparity in the burden we bear. As Newark and cities like it suffer the most from vehicle pollution, we must be the first to reap the benefits of any efforts to diminish its impact.

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Mike Hornsby,
New Jersey Board of Public Utilities
NJBPU's Electric Vehicle Infrastructure Stakeholder Process

In August 2017, the BPU directed Staff to establish an informal stakeholder proceeding to examine issues related to the increasing demands of electric vehicles on the electric distribution system. Staff conducted meetings, solicited and received feedback from stakeholders. Key stakeholder comments included:

- Charging station operators should not be regulated as public utilities or to be considered as "reselling" electricity.
- EVs are far more efficient than conventional vehicles.
- EVs are essential to meet GHG reduction goals and a substantial increase in EV charging opportunities is needed to support EV adoption.
- Accelerated efforts by utilities in various aspects of electric vehicle charging, is essential. Rate Counsel advised against most utility involvement.
- EV charging, particularly managed charging, can bring economic benefits to all ratepayers due to greater distribution system utilization.
- Technologies are rapidly evolving and so to must the BPU.

A draft report will be presented to the Board at their April 2018 agenda meeting. The Clean Air Council should engage with the Board and the DEP to help shape state policy on electric vehicles and infrastructure.

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Jeffrey Perlman,
North Jersey Transportation Planning Authority
Getting Ready: Alternative Fuel Vehicle Readiness Planning at the Local Level

In 2017, the North Jersey Transportation Planning Authority (NJTPA) partnered with three pilot municipalities, the Township of Montclair, the Town of Secaucus and Woodbridge Township to develop local readiness plans to facilitate the use of electric and natural gas vehicles in those communities. The plans, completed earlier this year, consider how municipal regulations and infrastructure can be improved to advance the use of alternative fuel vehicles, including a review of local zoning and land use ordinances, permitting requirements and potential locations for infrastructure.

The NJTPA also developed an *Alternative Fuel Vehicle (AFV) Readiness: A Guidebook for Municipalities* to assist communities throughout New Jersey to prepare for and support increased AFV usage in the municipality. The guide describes the benefits and challenges of various AFVs and fuel types including electric, natural gas, and hydrogen fuel cell. The guidebook also details the steps municipalities can take to plan for AFVs and it offers a broad range of recommended actions such as zoning and parking code changes, infrastructure investments and education outreach.

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Dale Hall, Peter Slowik
International Council on Clean Transportation
Electric Vehicle Charging Infrastructure and Incentive Design Best Practices

We applaud the efforts by the New Jersey Department of Environmental Protection to increase electric vehicle sales in the region. ICCT research finds that growth in the electric vehicle market requires coordinated action by many players. Local, state, and utility stakeholders can reduce consumer barriers by means of policy, consumer incentives, charging infrastructure, and awareness campaigns. The ICCT has conducted deep research on each of these focus areas and beyond. Specifically, we believe that the findings in the following studies would be particularly useful for the annual report:

- Expanding the electric vehicle market in U.S. cities (2017): https://www.theicct.org/publications/expanding-electric-vehicle-market-us-cities
- Emerging best practices for electric vehicle charging infrastructure (2017): https://www.theicct.org/publications/emerging-best-practices-electric-vehicle-charging-infrastructure
- Principles for effective electric vehicle incentive design (2016): https://www.theicct.org/publications/principles-effective-electric-vehicle-incentive-design
- Literature review of electric vehicle consumer awareness and outreach (2017): https://www.theicct.org/publications/literature-review-electric-vehicle-consumer-awareness-and-outreach
- Expanding access to electric mobility in the United States (2017): https://www.theicct.org/publications/expanding-access-to-US-electric-mobility
- Sustaining electric vehicle market growth in U.S. cities (2016): https://www.theicct.org/leading-us-city-electric-vehicle-2016

We're glad to follow up here to share some additional materials as requested by the Council during the Q&A following our presentation.

In particular, it was requested that we and share our recent research that catalogues the menu of electric vehicle policies and their implementation across U.S cities. That can be found in our 2017 white paper - "Expanding the electric vehicle market in U.S. cities": https://www.theicct.org/sites/default/files/publications/US-Cities-EVs_ICCT-White-Paper_25072017_vF.pdf

Table 2 on page 16 shows the 43 policy actions identified, and their implementation across the 50 most populous metropolitan areas. I have also separately attached this table to this email. As shown, several markets in the Northeast had implemented about 15 to 25 actions in 2017.

We also received a question regarding the insurance and maintenance costs of electric vehicles compared to their gasoline counterparts. AAA recently issued a report that outlines the various driving cost components for different vehicle types, including electric vehicles: https://newsroom.aaa.com/auto/your-driving-costs/ (the report is also attached).
It is well known that electric vehicles have significantly lower operating costs than their gasoline counterparts, primarily due to their lower fueling and maintenance costs. AAA finds that the per-

mile maintenance costs of electric vehicles are about 6.5 cents/mile, whereas a comparable gasoline vehicle would pay about 8 cents/mile. To our knowledge, insurance rates for electric vehicles vs. gasoline models have not been explored in as much depth, but groups like AAA are starting to do so as shown in their report. We expect more robust data on insurance rates to be available in the future as electric vehicles become a greater percentage of the overall vehicle market.

We're glad to follow up with additional resources or to help answer any questions. Please do not hesitate to contact us. Thank you again for the opportunity to participate in today's public hearing.

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Axel Carrión[(a)] and Michael McDonald, Sr.[(b)],
[(a)]**Director of State Public Affairs, United Parcel Service and** [(b)]**Director of Maintenance & Engineering Sustainability, United Parcel Service**
The Future of Reduced Emissions; It's a Collaborative Public-Private Partnership

UPS has been a leader in the area of alternative fuels and sustainability since the 1930's starting with a Walker electric vehicle. Through trial and error with our real world rolling laboratory, we are able to test our vehicles and infrastructure every day in the field with a variety of platforms. Today UPS has over 9,000 alternative fueled vehicles that have traveled over 1 billion miles. However, in order to achieve this result, public-private partnerships have been critical. With lower gas prices and incremental costs, fleets are dependent on incentives provided by states in order to make the economics of deploying these vehicles a reality. While prices for equipment are slowly declining, infrastructure costs associated with zero emission vehicles has remained roughly the same. In fact, some could argue electric rates are on the rise. If New Jersey wants to be a leader in zero emission vehicles, it must form public-private partnerships to incentivize their use.

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Hilary Leifsen,
Sustainability Developer, IKEA Purchasing Services (US), Inc.
Zero and Near Zero Emissions Heavy Duty Vehicles: A Shipper's Perspective

While there are a number of commercially available zero and near-zero emissions vehicle solutions available on the heavy-duty vehicle market, there remain a number of hurdles to full adoption by fleets. As a shipper who does not own any truck assets, IKEA Transport relies on our network of carriers to help us achieve our sustainability goals. In the past we have participated in pilot tests of innovative technology, like electric class 8 trucks used to move containers from ports. We also keep close track of the amount of alternative fuels currently being used on our shipments. However, a lot of challenges still remain including price, availability of fueling infrastructure, and performance concerns. Despite these challenges, a number of opportunities in both the public and private sector exist to accelerate the transition to zero and near-zero emission vehicles.

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Robert May,
New Jersey Coalition of Automotive Retailers, Inc.
NJ CAR's Perspective on the Future of EV Sales in New Jersey

At present, sales of ZEVs account for just three tenths of one percent (0.3%) of New Jersey's new car market—only 1,900 ZEVs were sold in 2017. New Jersey's Clean Car law requires 4.5% of all vehicles delivered by manufacturers for sale in New Jersey, in 2018 alone, must be ZEVs and the mandate only becomes more daunting in future years. How can we meet these mandates, based on current ZEV sales?

The New Jersey Clean Air Council can help by recommending:

1) Revisions to the New Jersey Clean Car law to require that ZEVs be "sold or leased" or "placed in service" before an automaker can earn credit towards it clean car mandate (A1223);
2) Government put its money where its mouth is and offer real financial incentives—like extending Sales Tax exemptions beyond pure ZEVs to include a partial exemption for hybrid and other advanced technology clean cars; and
3) Enactment of legislation providing for the imposition of a social benefit charge on utility bills to fund cash-on-the-hood incentives (S2382) and encourage investment in ZEV infrastructure (S2252/A3687).

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Steve Douglas,
Alliance of Automobile Manufacturers
Auto Alliance Update and Recommendations for ZEV Market Development

Car companies currently offer 40 zero emission vehicle (ZEV) models. They come in every shape and size from small car to large car, SUV to minivan, in 2WD and AWD, with shorter ranges and longer ranges, from luxury to economy, and everything in between. These vehicles are fun, safe, reliable, and convenient. But this is just the beginning, many more models are coming in the next few years. However, with all of this, few people seriously consider an electric car (e.g., ZEVs represent less than one percent of new vehicle sales in New Jersey).

In order to develop a sustainable ZEV market, New Jersey must develop and implement a detailed, comprehensive, governor-signed plan that includes incentives, infrastructure (both electric charging and hydrogen), simple low-cost fueling options, state fleet purchases, etc. All state agencies should be involved, and all actions should consider consumer awareness and equity. Finally, the BPU and utilities must be fully engaged.

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V. STATE AGENCY MODERATED PANEL

Christine Weydig - Port Authority of New York and New Jersey

In 2009, you announced a ten-year strategy to reduce emissions from goods movement. Was electrification part of that plan? If so, how did you engage your tenants – the terminal operators?

The ten-year plan was released in 2009. It was a plan to improve air quality, and was not prescriptive with respect to methods or technologies. So, it did not explicitly address electrification.

There are some operational issues associated with electrification, including battery durability, duty cycle, and charging infrastructure. In some cases, drivers (who are contractors) do not want to put money into new equipment. There are no incentives for doing so, and it can cut into potential bonuses for additional jobs completed.

There have been some successful demonstration projects by terminal operators, including electrification of airline ground support equipment.

Are there any plans to install charging stations at airport parking lots?

They are already more than 20 chargers at three major airport parking lots (two in New York).

PANYNJ recently partnered with Jet Blue at JFK airport to electrify airline ground support equipment. The kickoff meeting occurred this week. They are working on something similar at Newark.

PANYNJ is looking into an FAA grant for low-emission equipment with partner airlines.

How do you coordinate your EV strategy with other agencies?

In NY, PANYNJ coordinates with the NY Power Authority regarding Jet Blue and the Metropolitan Transportation Authority. We are working with Newark regarding conversion of airport buses.

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Andrew Swords - New Jersey Department of Transportation

As the number of EVs on the road rapidly increases, we will need to be strategic about the siting of publicly-accessible charging stations. What opportunities does NJDOT see to help address "range anxiety" by installing charging stations on DOT-controlled property such as rest areas and park and rides?

The NJDOT is open to exploring opportunities for siting charging stations. NJDOT has only two rest areas in the state; one on I-80 in Knowlton and the other on I-295 in Deepwater. Both of these are subject to federal oversight and as such, siting of charging stations at these locations would be subject to USDOT (FHWA) approval. With respect to Park & Rides, it should be noted that the NJDOT leases many of its parking spaces from private entities and as such, the siting of charging stations at these locations would need to be approved through the private property owners. Funding for the installation of charging stations should be addressed by the private sector, (e.g. TESLA charging stations business model). There is, as always, the concern of a lack of commonality among EV manufacturers with respect to their proprietary charging interfaces.

Signs indicating that a charging station is nearby would help alleviate range anxiety & encourage consumers to buy an EV. What issues would need to be addressed to allow DOT to deploy signs along highways and at exits?

In March 2018, the Federal Highway Administration (FHWA) completed their second round of designations for their Alternative Fuels Corridor Program, which aims to create a national network of alternative fueling and EV charging infrastructure. FHWA approved NJ's nomination of Interstates 78, 287 and 295 as electric vehicle charging corridors. In 2016, Interstates 95 and 80 in NJ were approved as EV charging corridors. FHWA encourages states to install signs along designated corridors and at exits.

"Logo signs" could be an opportunity for highway signs to indicate the locations of public EV chargers. Logo signs are the ones that indicate "Gas – Food – Lodging". A charging station host would contact DOT and ask to be included on a sign. DOT would put the site host in touch with an outside vendor. There is an application process and a fee.

A separate issue for DOTs is "sign clutter". Because there is a limit to how much information motorists can process while driving, there can be issues when the get overcrowded, or when there are too many in one place.

What opportunities do you see for transforming your agency's light-duty and heavy-duty vehicle fleet from fossil fuel to electric?

EVs would need to achieve the same performance metrics as those vehicles in our current fleet to be an effective alternative. Concerns regarding the limitation of EVs as replacement fleet vehicles are: range, charging times, cost of EVs, cost of electric charging infrastructure, and vehicle maintenance.

Is there a plan to make up revenue from lost gas tax?

This is an important issue that is "on the radar" of DOTs across the country. The I95 Corridor Coalition is investigating the potential for alternatives. The Transportation and Climate Initiative is looking into policy options as well. NJDOT will continue to monitor this issue.

Are you thinking about future autonomous cars?

DOT has an internal working group considering issues related to connected and autonomous vehicles. The I95 Corridor Coalition has a working group as well. The next state long-range transportation plan will address connected and autonomous vehicles.

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Steven Jenks - NJ TRANSIT

What role can your agency play to help speed the transition to electric transportation?

NJ TRANSIT is the third largest public transportation agency in the U.S. The agency has been gradually electrifying since 1910, beginning with commuter rail. Another push for electrification came about in 1980s. Our goal is to eventually electrify rail, light rail and buses to the extent technology allows us to meet our transportation system requirements.

Our current microgrid project includes EVs to support our resiliency goal. We are thinking in terms of "mobile resiliency".

Do you see any future EVSE installations at rail locations?

NJ TRANSIT is currently installing six Level 2 chargers at the headquarters parking garage, to be completed by September.

There are EV chargers in several parking lots near rail stations.

- Nexus parking lots near Hamilton Station and Trenton Station
- Municipal and private parking decks near several NJ TRANSIT train stations (12 at NJT-owned lots and 37 at privately-owned lots.)

NJ TRANSIT is evaluating additional options. It will be important to balance EV-parking versus non-EV parking, and to consider potential future improvements in battery range when planning infrastructure.

What issues would need to be addressed to enable incorporation of electric buses into NJ TRANSIT's bus fleet?

NJ TRANSIT has 16 bus garages. We are looking at electrification, but it would require significant capital and operations costs. For example, the average electrical load at a bus garage is 250 – 750 KW. Upgrading a bus depot to all electric would triple or quadruple the power needs at that depot. Maintenance on buses is usually done on parts that are common between fuel types, so there would not be a savings there. Training would be required for technicians.

NJT would like to pilot a few projects. For example, NJT would like to get 8-10 electric buses in Camden.

It will be important that any electrification efforts satisfy NJ TRANSIT's core mission.

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Jason Flint - New Jersey Office of Weights and Measures

The New Jersey Office of Weights and Measures ensures that a gallon of gas pumped into a car is actually a gallon of gas. Do we need to implement measures to ensure a kilowatt of electricity purchased at a charging station is actually a kilowatt of electricity? If so, please describe the steps that would have to be taken to ensure consumer protection in this area.

The Office of Weights and Measures is responsible for testing and inspecting commercial devices. We would have jurisdiction over chargers that require payment, not home chargers or free chargers.

The method of sale and price comparison are crucial, as are pricing for additional services like parking fees.

There are currently no regulations in place that specifically address testing and inspection of EV charging stations. New Jersey adopted NIST Handbook 44: Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices. Handbook 44 concerns inspection and testing of commercial devices. Handbook 44 has a temporary code for EV chargers; when it is finalized, it will be adopted.

The Office of Weights and Measures is currently vetting equipment vendors for testing and inspection.

What opportunities do you see to coordinate with other agencies?

We haven't worked with other agencies on EVs yet. We are involved with CNG fueling stations, and we are watching developments in hydrogen fuel for fuel cell vehicles.

What opportunities do you see for transforming your agency's light-duty and heavy-duty vehicle fleet from fossil fuel to electric?

We have a varied fleet, with a lot of heavy-duty vehicles. We would have to work with some technical experts to transition medium/heavy-duty vehicles to electric. A funding source would be important.

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VI. PUBLIC COMMENTS

Kevin Miller, Chargepoint

Transportation electrification is an unprecedented opportunity for New Jersey to achieve a wide range of environmental, economic development, energy, transportation, and environmental justice goals. This is largely due to the fact that electric vehicles (EVs) are leading to a transportation paradigm shift in which drivers will primarily "refuel" their vehicles when they arrive at, rather than on their way to, a destination. For example, EV drivers typically charge their vehicles at home (60%) and at work (30%).

The EV charging market in New Jersey is growing and dynamic, and there is no one static business case for the EV charging industry. Publicly available EV charging stations are primarily owned and operated by a variety of "site hosts" that participate in the competitive EV charging market. Site hosts provide EV charging services for a variety of reasons: offering a valuable employee benefit; attracting new tenants and customers; electrifying public transit fleets; and many more. The EV and EV charging markets are constantly shifting and will be impacted by on-going improvements in technology, business models, and services.

ChargePoint recommends that the NJ Clean Air Council consider prioritizing: (1) setting high-level and flexible transportation electrification goals and avoiding prescriptive mandates; (2) maintaining innovation, competition, and site host customer choice of EV charging equipment and services in any new proposed programs; (3) further developing vehicle incentives, which is a key driver of consumer behavior; (4) expanding support for workplace charging, which is highly correlated with greater vehicle adoption; (5) updating statewide building codes to ensure that new parking spaces have the necessary conduit and wiring in place to dramatically decrease installation costs; and (6) reducing barriers for residents to install home charging in multifamily buildings.

* * * * *

Ashley-Lynn Chrzaszcz, ChargEVC

In my oral testimony on behalf of ChargEVC, I mentioned a few statistics and stated the benefits of electrified transportation for the state of New Jersey. These are explained in greater detail in the study. As such, I would like to submit two documents to be included in the official record on behalf of ChargEVC. The first is the Roadmap, which was released in September of 2017 and states impactful actions New Jersey must take to make the electrification of transportation a reality. These recommendations are backed up by the ChargEVC Study, which was released in January of 2018, entitled "Electric Vehicles in New Jersey Costs and Benefits: The Opportunities, Impacts, and Market Barriers to Widespread Vehicle Electrification in New Jersey." Should you require any further information, we would be happy to provide it.

*Note: See CAC website for report entitled, "*A Roadmap for Vehicle Electrification in New Jersey:

Market Development Strategy and High Impact Initiatives" *and for report entitled, "*Electric Vehicles in New Jersey, Costs and Benefits: The Opportunities, Impacts, and Market Barriers to Widespread Vehicle Electrification in New Jersey*".*

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Norah Langweiler, NJ Work Environmental Council

Good afternoon, Council. Thank you for allowing me to speak. I'm Norah Langweiler, campaign organizer for Jersey Renews at the New Jersey Work Environment Council. Jersey Renews is a coalition of 60 organizations committed to state-based action on climate change that was founded in January 2017 in recognition of the urgency of our climate crisis, and partially in response to a lack of leadership at the federal level. We are a broad coalition that includes labor, faith, environment, community, and health organizations pushing for increased investment in clean energy infrastructure, reduced greenhouse gas emissions, and good, family-sustaining jobs. We have held events in Camden, Montclair, New Brunswick, Little Falls, Jersey City, Trenton and we're planning additional events this year. More than 1,000 people have signed our petition demanding state action on climate.

As you know, nearly 50% of greenhouse gas emissions in New Jersey come from the transportation sector; light-duty automobiles, like a standard family car, are the dominant source of transportation emissions, but heavy-duty vehicles, like diesel trucks for industrial or commercial use and buses for public transportation, are also a significant source of emissions. Particulate matter from the transportation sector contributes to poor air quality and negatively impacts residents' health.

I am here today to ask that you bring forward more good policy to support the electrification of public transportation.

Every traveled mile converted to electric is 70% cleaner than a gas-powered mile. Increasing the number of electric vehicles on the road is a crucial step to meeting the state's emissions reduction goals.

According to the American Lung Association's *2017 State of the Air Report*, eleven counties in NJ received a failing grade on air quality. New Jersey residents, particularly those in urban areas, are subject to high concentrations of greenhouse gas emissions and air pollution, resulting in higher rates of asthma and other respiratory illnesses. In New Jersey, one in 13 people have asthma. So we must recognize that we have a problem, from a climate perspective, and with regard to public health.

Buses, particularly older ones, drive at low speeds in highly populated areas all day, pushing diesel emissions and particulate matter directly into communities. Transitioning our public fleet of buses and cars will improve the air quality of urban areas where these vehicles are most put to use and shows that the state will lead the way on the transition to a clean energy economy. Converting buses to electric can help to meet emissions reduction goals and improve air quality,

achieving multiple goals at once. New Jersey Transit must invest in electric buses to improve our communities' health and ensure a clean energy future.

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Emily Wier, Greenlots

Thank you, Chair Bluhm, Hearing Chairs Egenton and Bielory, and members of the Council for the opportunity to provide public comments on zero emission vehicles in the State of New Jersey. My name is Emily Wier, Associate for Policy and Market Development for Greenlots. Greenlots is a leading provider of grid-focused electric vehicle charging software and services. The Greenlots network supports a significant percentage of the DC fast charging infrastructure in North America, including deployments in New Jersey. Greenlots' smart charging solutions are built around an open standards-based focus on future proofing while helping site hosts, utilities, and grid operators manage dynamic electric vehicle charging loads.

Greenlots is a board member of and has been deeply engaged with the ChargEVC coalition, which is comprised of industry partners including environmental organizations, NJ CAR, and utility companies who came together in 2016 around the need for a comprehensive electric vehicle charging program in New Jersey. Through the convening process of ChargEVC, there has been consensus across a diverse group of organizations that electric vehicle adoption will provide benefits for ratepayers, the environment, and support economic development. This type of cooperation across diverse organizations is unique to New Jersey, and is a testament to the consumer demand driving electric vehicle adoption. As part of this coalition, we have been supporting legislation development that would further these aims – Senate Bill 1975.

New Jersey has significant opportunity and potential for growth of electric vehicles. This growth can yield net savings for ratepayers and benefits to the electric grid, including optimizing grid load to improve cost efficiency, reduce wholesale electricity rates, and facilitate grid resiliency.
New Jersey's utilities are in a unique and powerful position to help drive the investment in light-duty electric vehicle charging, in a similar way to what they have done for many years with energy efficiency and conservation programs to the benefit of their ratepayers. At this early stage of the market, ownership and operation of charging infrastructure—including charging stations—is an appropriate and in many respects necessary role for the utility in accelerating the market.

There are additional reasons for utilities to deploy charging infrastructure. Utilities have existing customer relationships with ratepayers, electric vehicle drivers, and potential electric vehicle buyers, and can provide information to ratepayers about electric vehicle benefits. A core competency of the utility is to provide safe and reliable service, which is important for the safe operation of electrical equipment. Utilities can ensure electric vehicle load integration is done deliberately and with careful planning, maximizing benefits to the grid, which then can be passed on to all ratepayers. Utilities can provide a framework for installation of charging infrastructure statewide, ensure that electric vehicle charging is affordable and can help advance equity particularly in low to moderate income communities.

Greenlots also would like to emphasize the importance of public electric vehicle charging infrastructure, and that public fast charging in critical to driving electric vehicle adoption and meeting the state targets as currently outlined in Senate Bill 1975. Public charging is critical not only to overcome range anxiety but also to provide charging—and therefore buying—opportunities for drivers who do not have at-home charging options or require public charging to augment at-home charging. A combination of different charging options to meet various use cases can help present electric vehicle drivers with the resources to feel confident in their electric vehicle purchase. That is why the objective to implement adequate public charging infrastructure will be a necessary component to meeting the state's overall electric vehicle adoption targets.

Greenlots is committed to growing the market for electric vehicles and electric vehicle charging in New Jersey and beyond. We look forward to continued engagement on this important topic. Thank you.

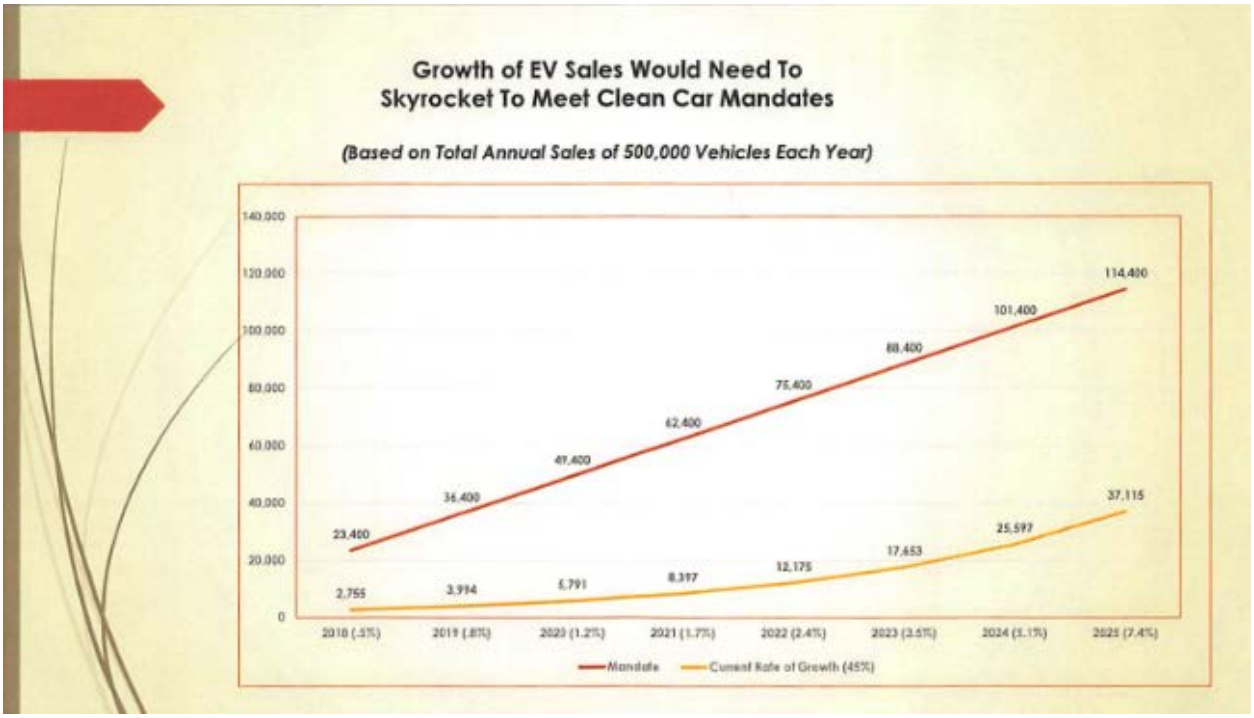
* * * * *

Robert May, NJ CAR

There's no doubt: clean car mandates imposed by State and federal law have given rise to new, more fuel efficient and environmentally friendly motor vehicles. But, the sad fact is that alternative technology vehicles still account for just a small piece of the new car market in New Jersey. The trend for alternative fuel vehicle sales has been disappointingly stagnant ..... in 2008, New Jersey new car buyers purchased just 10 zero emission vehicles. Last year, ZEV sales reached 1,900 units, a 45% increase over 2016-- the best year-over-year increase in EV sales EVER in New Jersey, by far.

That's progress. But ZEVs still currently account for just three tenths of one percent (0.3%) of the new car market in New Jersey. And, this year, New Jersey's Clean Car law requires that 4.5% of all vehicles delivered by manufacturers for sale in the Garden State must be ZEVs. That's 24,000 vehicles; more than 12 TIMES the number sold last year. And that's just the start.....the ZEV sales mandates ramp up exponentially from there.

Take a quick look at this slide. The bottom line projects the number of ZEVs that could potentially be sold if we continue last year's incredible 45% growth.



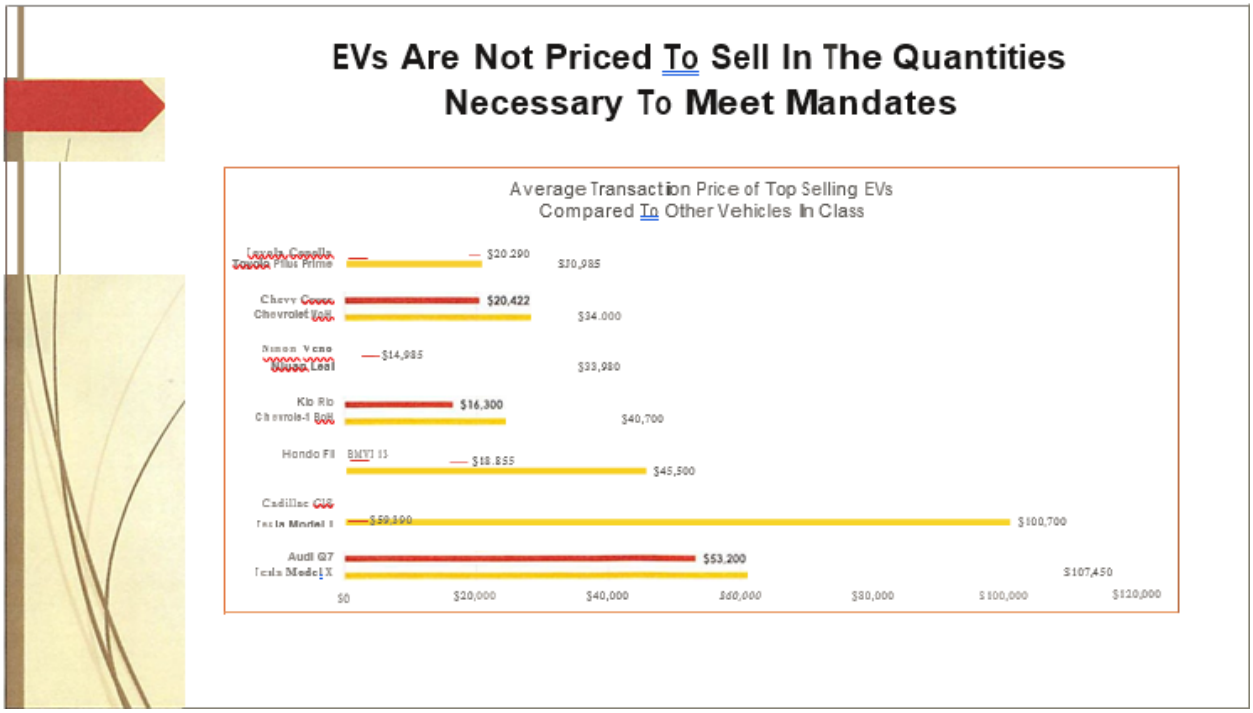
EVERY YEAR through 2025. Now look at the very steep top line. This shows growth in the number of ZEVs mandated to be sold each year in New Jersey.

We estimate that the existing clean car mandates will require that dealers sell more than 550,000 ZEVs in New Jersey between 2018 and the end of 2025. Even with 45% growth every year, we will remain well behind the number of vehicles that are mandated to be sold.

Now, there is some good news. There are currently about 40 plug-in electric vehicles available on the market right now and there are more than 60 new models scheduled to be introduced between 2018 and 2021 by various manufacturers.

Naturally, new car dealers want to sell all these cars and more. That's what they're in business to do. But, let's face it, dealers want to sell what consumers want to buy. And, right now, consumers do not want to buy ZEVs at anywhere near the numbers mandated. This is a major concern for new car dealers and it is compounded by the fact that available ZEV product is not priced right.

Take a look at this slide and you'll see the problem. This table shows the gap in price between internal combustion engine -- or ICE -- vehicles and comparable EVs. Now, we all know that battery and manufacturing prices for EVs are coming down, for sure. But not fast enough. And there is another legal structural issue that compounds the problem: New Jersey's Clean Car law doesn't actually require automakers to place ZEVs in service; it simply requires manufacturers to "deliver" clean cars for sale.



This "delivered for sale', mandate allows automakers to earn their clean car credits by simply dumping ZEVs on dealer lots in New Jersey. If manufacturers can game the system by simply delivering cars to dealers, they have no real incentive to equip or price ZEVs to sell. Unsold clean car inventory, in turn, does nothing to clear the air in New Jersey and unsold inventory imposes a heavy financial burden on New Jersey new car dealers.

These financial and structural legal issues have impeded ZEV sales. But, so has the lack of existing infrastructure. Right now, New Jersey only has about 500 charging stations spread throughout the State. That's compared to an estimated 3,500 gas stations offering more than 20,000 pumps. Clearly, we have a long way to go to alleviate range anxiety.

Infrastructure needs to be dramatically expanded. Park and rides, municipal parking lots, shopping malls, commercial office complexes, big box stores, grocery stores, convenience stores, restaurants, and virtually any place where individuals park vehicles for an extended period of time are prime locations for charging stations. Building and facility owners need to know: (1) there is current demand for charging stations; (2) demand is growing; (3) electric charging stations are an amenity that consumers will come to expect, just like a public restroom, complimentary wi-fi, free coffee or a water cooler; and (4) offering charging facilities is and will be increasingly good for business. It's a marketing tool and business differentiator that can produce real benefits to any business' bottom line.

Since New Jersey's Clean Car Law was enacted more than a decade ago, NJ CAR has warned that it is going to be difficult to grow the ZEV market from where it is today to where it must be in 2025 and beyond. We need an aggressive game plan to offer consumer incentives and build a robust charging infrastructure.

NJ CAR is pleased to be working with other EV stakeholders as part of a group called ChargEVC to help develop that game plan. ChargEVC is a coalition made up of a diverse group of organizations including technology companies, utilities, environmental groups, community advocates and others. ChargEVC's mission is to design and promote policies that boost EV sales that will lead to greater environmental and economic benefits.

I can tell you this: if State and federal regulators, elected officials, automakers and public utilities pull together to address the most pressing infrastructure and affordability challenges, franchised new car dealers in New Jersey and across the country will be relentless in promoting, selling, and delivering electric vehicles to more and more consumers.

For our part, NJ CAR has partnered with EV advocates and we are developing innovative training and marketing strategies to enable neighborhood new car dealers to meet and grow EV customer demand.

Working through ChargEVC and Plug-In-American, NJ CAR has invested in an EV Salesperson Training and Certification Program to ensure dealerships and dealership sales personnel are properly trained and prepared to address the unique needs of EV consumers. We'll be partnering with other EV stakeholders to create ride-and-drive and hands-on experiences to introduce EV-curious buyers to the full range of exciting new product making its way in to the marketplace.

There's a lot going on and dealers and automakers are busy preparing to meet growing EV demand. But we have a lot of work to do, and the New Jersey Clean Air Council can help by recommending:

1. Revisions to the New Jersey Clean Car law to require that ZEVs be "sold or leased" or "placed in service" before an automaker can earn credit towards its clean car mandate, pending before the General Assembly as Bill A1223.
2. Government put its money where its mouth is and offer up real financial incentives -like extending sale tax exemptions beyond pure ZEVs to include a partial exemption for hybrid and other advanced technology clean cars; an
3. Enact legislation providing for the imposition of a social benefit charge on utility bills to fund cash-on-the-hood incentives (82382) and to encourage investment in ZEV infrastructure (82252/ A3687).

Thank you for the opportunity to share NJ CAR' s perspective on the future of EVs in New Jersey.

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Jeff Tittel, Sierra Club

The New Jersey Clean Air Council is holding a public hearing on Zero Emission Vehicles. The Council is accepting testimony at this hearing that will begin at 9:30 am at the N.J. Dept. of Environmental Protection, 401 E. State Street, Trenton, NJ 08625. New Jersey Sierra Club Director Jeff Tittel released the following statement:
“Electric vehicles are the technology of the future and show we can move this country forward with an automobile that has zero emissions. EV’s would not only drive our economy forward, but would help create more jobs, save us money on gas and clean our air. A fully electric vehicle uses electricity

to power a battery. This means no gasoline, no dirty oil changes, and no internal combustion engine. New Jersey needs to do more to promote electric vehicles and most importantly charging stations. We need to pass legislation, create programs, and encourage our state to become electrified.

"Governor Murphy has pledged to join other leading states in signing the State Zero-Emission Vehicles Programs Memorandum of Understanding (MOU). This multi-state compact aims to put 3.3 million electric vehicles on the road. This will help us send a very clear signal to the auto industry and to the White House: we will work with other states and move forward on electric vehicles. We need to accelerate the passage of this legislation that sets an important goal of 330,000 EVs on the road by 2025. This locks us in to that goal and requires the DEP to plan for it. We only have about 12,000 now. We also need right-to-Charge legislation allowing people to use private charging stations. We also need to develop the high-speed charging network and have utilities provide for charging stations in areas where the market won't initially reach.

"New Jersey needs to pass legislation and fund programs that advance electric vehicles in our state. We need to create a charging network that allows people to drive through New Jersey without range anxiety. We need to offer opportunities for people to buy EVs of all communities, including those of modest means through rebates or 'cash for clunkers' programs. We can tax luxury, gas-guzzling vehicles or a carbon tax on fuels to pay for rebates. We can also electrify our ports to reduce air pollution in these overburdened areas. We need the BPU and DEP to work together on programs that advance EV's in New Jersey. We can use the $141 million for the Volkswagen settlements to jumpstart EVs, especially by helping people of modest means to buy EVs with rebates.

"Thanks to rebates and tax credits, decreasing prices in EV technology, and the much cheaper price of electricity vs. gasoline, the cost of owning and operating an electric vehicle is now notably lower than that of many conventional vehicles. There are currently more than 20 fully electric and plug-in hybrid vehicles available at US dealerships. GM is discussing new models and some states want to phase out gasoline-cars altogether. New Jersey must continue to support the sale of electric vehicles, install charging stations, and commit to a more sustainable transportation future if we want to meet California's goals. Building codes should require new buildings to be EV-ready and state and municipal fleets should be electrified, especially buses. We need time of use rates for electricity and smart-charging to reduce stress on the electric grid as well as interoperability standards that ensure ease of use and payment of public chargers."

"People like this new technology that is cheaper and greener, however; there is 'range anxiety.' This is why we need a network of charging stations statewide to make people more comfortable with buying and using these electric vehicles. We should be doing more such as requiring new developments to have charging stations. We also need to retrofit existing developments to implement charging stations. New Jersey is one of the best states to utilize electric vehicles since most of our energy is already carbon-free. Electric vehicles not only reduce greenhouse gas emissions from cars, but can help stop future drilling, pipelines, and oil bomb trains.
"In 2016, U.S. EV sales rose 37 percent over 2015, with well over half a million Americans now driving plug-in cars. According to the American Lung Association, every year, pollution from passenger vehicles collectively costs the 10 ZEV states about $24 billion in health, including 220,000 lost work days, 109,000 asthma exacerbations, hundreds of thousands of other respiratory health impacts, and 2,580 premature deaths. In New Jersey, the Zero Electric Vehicle (ZEV) program saves

our state $4.6 billion in health care costs associated with smog and soot pollution caused by passenger vehicles.

"We also need to be sure that charging networks and incentives are targeted to communities that have received a disproportionate share of pollution, especially minority and low-income communities. This will help create jobs and move our state forward with an automobile that has zero emissions and decrease fossil fuels. The biggest source of air pollution and greenhouse gases in our state comes from automobiles, which is why we need to increase electric vehicles to clean our air. We need to install plug-in stations along with providing things like zip cars, ride shares, and taxis to encourage EV's that everyone can afford.

"One of New Jersey's biggest source of air pollution is from cars and trucks. Our air pollution levels are dangerous for smog and ozone and we must reduce as much pollution as we can from cars and trucks. Electric vehicles will not only help reduce air pollution from traffic, but emissions from refineries, drilling oil, and transportation. These cars are not only for the independent driver, but it will make us energy independent. By increasing electric vehicle sales, it will help car dealers in selling more fuel-efficient cars, help New Jersey companies who are part suppliers for these car parts, and even bring in new companies since we may be the first state on the east coast to implement these practices.

"With ZEVs we can create thousands of jobs, provide infrastructure around the states for EVs, and allow us to become to leaders in EV technology. Implementing a successful EV system in New Jersey will mean less money sent out of state for petroleum, more in-state jobs, better vehicles for your constituents, less carbon pollution, and cleaner, healthier air. We can see the benefits of clean air and clean jobs if we build a state-wide network of charging stations, create green jobs, save people money on gas, and reduce air pollution. We need New Jersey to drive into the 21st century by becoming a leader in clean car technology."

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Gregory Gorman, Sierra Club

The NJ Senate S1975 (SCS) seeks to establish State goals for adoption of 330,000 registered plug-in electric vehicles by 2025. Sierra Club's Drive Electric Campaign, initiated October 2015, set a goal of deploying 503,732 Zero Emission Vehicles in New Jersey by 2025. Only 2,494 ZEV's were registered mid-2015 in New Jersey. NJ Spotlight recently reported that approximately 14000 Plug-in Vehicles are now registered in New Jersey. Progress has been made, but to achieve these goals requires significant acceleration!

S1975 (SCS) takes a stride by requiring at least 40 percent of all State owned light duty vehicles shall be plug in electric vehicles by 2025, but more can be done. NJ Transit operates 3,727 buses. There are over 200 companies operating school buses. Major NJ employers ranging from hospitals, transportation and logistics firms, grocery chains, and major manufactures all maintain fleets of heavy- and light duty trucks and automobiles. Counties and local governments similarly maintain smaller fleets of vehicles for a variety of purposes. What I suggest is you **establish mandates and incentives to electrify fleets.**

By focusing on fleets, EV providers will benefit by the rapid demand increase for EVs which will ultimately lower vehicle costs for individuals. Demand for charging facilities both in the work place and delivery destinations will proliferate rapidly. By availing employees and others to use the charge stations will encourage their adoption of privately owned EVs. As Fleet managers purchase EVs, charge stations, and EV support services, savvy entrepreneurs will develop strategies to expand markets to service individual consumer demands. A program focused on electrifying fleets leverages business investment, stimulates innovation, and jump starts EV deployment.

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Kenneth Frank, Citizen's Climate Lobby

I am a member of the Citizen's Climate Lobby, which is "a non-profit, nonpartisan, grassroots advocacy organization focused on national policies to address climate change." Thank you for convening this public hearing on an issue so critical to reducing greenhouse gas emissions and air pollution.
My comments and recommendations are as follows:

1. While it is impressive that the State of New Jersey and other cooperating agencies are doing a lot of excellent work on this issue, I believe there is a large information gap among the buying public. To help rectify this situation, the State Website and the NJDEP Website need to do a much better job in making clean car, and especially zero emission vehicle (ZEV) information visible to the public. In the case of the DEP website for example, a clean vehicle and/or and ZEV "button" should be added to the left-hand column of the DEP home page. This button should lead to a web page with all relevant information in one place.

2. Both speakers representing the auto industry cited this study[i] as a reason why they would be unable to meet ZEV mandates. The study concluded the following: *Californians are not deciding they don't want PEVs. Rather, they remain to a great extent unaware of PEVs and anything about them. California households by the millions are simply not engaged in any transition to PEVs*. This is also true in the State of New Jersey. It is my opinion that the State agencies and non-profits must be more proactive in communicating the benefits of zero emission vehicles (see comment #1 above, as an example). Having once worked in the electric vehicle (EV) program at NJDEP, I often received calls asking if zero emission vehicles are exempt from NJ State Sales Tax. When I told them yes, these callers indicated that the car dealer provided no information regarding this incentive and they did not know how to find this information on the DEP website. Besides lack of awareness of ZEV's and their benefits in general, the sales tax exemption remains largely unknown among the residents of NJ. I would also suggest that the State consider a "point of purchase" plan for the Sales Tax, instead of having the buyer fill out paperwork.

3. While NJ government and non-profit agencies surely can do more to educate the public about ZEVs, **the primary and most important educators** must be the auto industry and the auto dealers. I noticed that the key part (i.e., the "solutions") of the UC Davis study referenced by the auto industry speakers, was not mentioned by either speaker. Here are the study recommendations verbatim:

Anyone serious about instigating a sustained transition of road transport to electric drive should undertake several science-based actions:

- *Market the electric-drive transition: Social marketing to promote the need for and value of a transition to electric drive automobiles;*
- *Market electric-drive vehicles and supporting services: Traditional marketing by automakers, electricity providers, and charging infrastructure suppliers of their products and services;*
- *Create connections: Social media activities connecting people of similar motivations to own and drive PEVs;*
- *Create real PEV experience: Ride and drive events and the use of PEVs in shared mobility and vehicle rental applications;*
- *Create virtual PEV experience: Enhanced and customized information and virtual PEV experiences through websites and mobile apps;*
- *Engage the whole sales chain: Automobile dealer education and motivation programs;*
- *Measure to manage: Ongoing tracking of the impact of these activities on consumers and PEV sales.*

4. It is clear that the auto industry is implementing little to none of the recommendations above. In order to achieve success, these recommendations must be carried out. To date, the auto industry has chosen not to markets ZEVs as they do all of their other classes of conventional vehicles. Without the same level of marketing engagement, the sales of ZEVs, of course, will fail to reach the necessary numbers.

5. It is also no secret that the dealers are doing a very poor job in selling EVs. This article details many of the issues: "US Auto Dealerships Are Bad at Selling Electric Vehicles, Study Finds"[ii].
Among the findings:

- Dealerships hadn't customized the sales process for EVs
- Electric cars often weren't available on the lot to view or to test drive
- EV ownership information, via sales staff or marketing materials, both in-store and online, was lacking.

A more critical reason that dealers are resisting, may be that:

Industry insiders and those who follow the business closely say that dealers may also be worrying about their bottom lines. They assert that electric vehicles do not offer dealers the profits that gas-powered cars do. They take more time to sell because of the explaining required, which hurts overall sales and commissions. Electric vehicles also may require less maintenance, undermining the biggest source of dealer profits: their service departments.[iii]
Nonetheless, there are a few dealers who have been successful in selling EVs. In a small town in Canada, a dealership sells the most EVs in Canada[iv]. Here are some reasons why:

The owner credits the dealership's success to:

- having many models on the lot
- training staff knowledgeable about electric cars

- paying staff salaries instead of commissions and letting prospective customers test-drive the cars for several days
- the dealership has also donated chargers to local businesses, helping to encourage demand.

These are recommendations that the auto dealers of NJ can implement, if they want to.
In conclusion, the auto industry and the dealers hold the key to success and must take the recommendations above seriously. The State can assist with providing better information to the buying public.

Thank you for the opportunity to provide comments and recommendations.

[i] https://its.ucdavis.edu/blog-post/automakers-policymakers-on-path-to-electric-vehicles-consumers-are-not/ "Automakers and Policymakers May Be on a Path to Electric Vehicles; Consumers Aren't"

[ii] https://www.greentechmedia.com/articles/read/us-auto-dealerships-are-bad-at-selling-electric-vehicles-study-finds#gs.3Z4A75U

[iii] https://www.nytimes.com/2015/12/01/science/electric-car-auto-dealers.html

[iv] https://www.canadianmanufacturing.com/sales-and-marketing/chevy-dealership-in-tiny-quebec-town-sells-most-evs-in-canada-190033/

* * * * *

Dan Udovic, Processor Innovations Corporation

I am a physicist, professional engineer, and part-owner of a 40-year-old NJ engineering firm that designs instrumentation and hybrid power systems for industry and the military.

I am also the Deputy Director of INETS, Stevens Institute's Center for Intelligent Networked Systems, on matters relating to Energy, Power, and Control Systems.

INETS has recently performed analyses and submitted companion reports to the NJ BPU that quantify the well-to-wheel energy efficiency and CO_2 emissions of NJ plug-in electric vehicles compared to other commodity light duty vehicle technologies.

I will submit updated copies of these reports, if requested, by the Clean Air Council.

My testimony is as a Professional Engineer who wishes to assist NJ government and legislators to identify and incent those clean energy technology deployments that have the highest probability of reducing global warming and health-damaging emissions caused by gasoline and diesel-fueled vehicle travel.

The title of your April 12, 2018 public hearing was

Zero Emission Vehicles: Clearing the Air.

Your companion one-page write-up description stated that the goal of the hearing was to re-evaluate the

hurdles and potential solutions to achieving widespread use of electric vehicles, and to make recommendations to the Commissioner of the NJ DEP.

Six key takeaways that I wish to convey through this testimony are:

1. The term "zero emission vehicle" should not be used

(a) to exclusively describe "battery electric vehicle", or

(b) to reference battery electric vehicles that have been grid-charged[1]

Two other important ZEV technologies also exist:

(a) CNF-powered Fuel Cell Electric Vehicles[2], and

(b) CNF-powered Internal Combustion Engine Vehicles,

neither of which has yet received adequate attention by the State as a possible superior alternative to costly and otherwise unnecessary increases in grid electric power, energy, and transmission capacity, and NJ nuclear plant retirement deferral at ratepayer expense, in order to further support what is becoming legislated Battery Electric vehicle adoption[3].

2. Of the three alternative zero-emission vehicle technologies cited above[4], it is my professional opinion that:

CNF-powered Internal Combustion Engine ZEVs comprise the least expensive, most comprehensive, and fastest path to meeting all categories of travel needs, while achieving

zero/net negative-emissions and beneficial air-scrubbing[5],

not just in NJ, but throughout the world, over the coming decade.

3. **The NJ BPU and the NJ DEP should not incent EVSE battery charge station build-out unless these stations deliver electricity produced by zero-emission energy sources**.[6]
Plug-in Battery Electric vehicles **cause CO_2 emissions** whenever fossil-fueled power plants are used to grid-charge their batteries.[7]
Plug-in Battery Electric vehicles **do not cause CO_2 emissions**, if charged using electricity from clean energy power sources (on-grid or off-grid) such as nuclear, solar PV, wind turbine, and hydroelectric power systems.

4. The State should incent power plant owners to

upfit existing fossil-fueled grid power plants to co-produce Carbon Neutral Liquid Fuels (CNLFs)[8] while generating electricity.

Were this done, net emissions from NJ power plants and ICE (Internal Combustion Engine) vehicle travel would decrease over time and NJ's three costly-to-operate nuclear power stations could be retired in a phased manner as we move towards a 100% renewable energy hybrid grid.
Each dollar spent to achieve this would have greater impact than further incenting battery electric

vehicle purchase.

5. Cumulative vehicle emission reduction in NJ can be significantly greater (> 2.8x - 3.6x) by executing and promoting a

> NJ "Cash-for-Guzzlers" program that incents low fuel economy ICE vehicle replacement by high fuel economy **Hybrid** vehicles, rather than further incenting Plug-In Battery Electric vehicle purchase.
>
> To demonstrate this, I will use the "well-to-wheel" fuel economy and "CO_2 emissions/mile" characteristics of three technology flavors of 2018 Hyundai Ioniq vehicles[9], together with the expected sales volume of each vehicle type, to compute the total emissions reduction attributed to that vehicle type, as a consequence of retiring and replacing an equal quantity of older gasoline-fueled vehicles.

The three Hyundai Ioniq vehicle technologies on the market and their stated "tank-to-wheel" fuel economies are:

Model	Battery Size (Kw-hr)	Range (miles)	Tank-to-Wheel Efficiency (miles/GGe)	Retail Price	Fed Tax Credit	NJ Sales Tax Savings
Plug-in Electric	28.0	124	136	$29,950	$7500	$2020
Plug-in Hybrid	8.9	29+601	52	$24,950	$4543	$0
Hybrid	1.8	690	58	$22,200	$0	$0

Table 1: Comparison of Three Competing 2018 Ioniq Electric Vehicle Technologies

However, because the Ioniq Plug-in Electric vehicle is grid-charged (@36.1% efficiency) by NJ's mix of nuclear, NG, and renewable energy power sources, the vehicle has "Well-to-Wheel" efficiency of 49 miles/GGe[10], and causes power plant CO_2 emissions at the rate of .135 lbs. of CO_2/mile of vehicle travel.[11] (See Table 2.).

In comparison, the average light duty gasoline-fueled vehicle on the road today has 22 mpg fuel economy, with the light duty vehicle CAFE (Corporate Average Fuel Economy) standard requiring this to improve to 54.5 mpg fuel economy by 2025.

Model	Battery Size (Kw-hr)	Range (miles)	Well-to-Wheel Efficiency (miles/GGe)	CO_2 Emissions (lbs./mile)	Retail Price	Gov't Subsidies
Plug-in Electric (Solar-charged)	28.0	124	136	0	$29,950	$9520
Plug-in Electric (Grid-charged)	28.0	124	49	0.135	$29,950	$9520
Plug-in Hybrid (Grid-charged)	8.9	29+601	52	0.356	$24,950	$4543

Hybrid	1.8	690	58	0.309	$22,200	$0
Average Gasoline Car	0	250	22	0.814		$0

Table 2: NJ Grid-charged 2018 Ioniq Electric Vehicle "Well-to-Wheel" Efficiencies and Emissions

New vehicles are typically bought to replace older (hopefully, gasoline-fueled) vehicles. Assuming a one-to-one correspondence between new vehicle purchased and old gasoline vehicles retired, the expected CO_2 emissions averted by replacing an existing 22 mpg gasoline vehicle with each of the available electric technology Ioniq vehicles is listed in Table 3.

Model	Battery Size (Kw-hr)	Range (miles)	Well-to-Wheel Efficiency (miles/GGe)	CO_2 Emissions (lbs./mile)	Emission Savings (lbs./mile)	Retail Price
Ioniq Plug-in Electric (Solar-charged)	28.0	124	136	0	0.814	$29,950
Ioniq Plug-in Electric (Grid-charged)	28.0	124	49	0.135	0.679	$29,950
Ioniq Plug-in Hybrid (Grid-charged)	8.9	29+601	52	0.356	0.458	$24,950
Ioniq Hybrid	1.8	690	58	0.309	0.505	$22,200
2025 ICE Car	0	620	54.5	0.329	0.485	??

Table 3: NJ CO2 Emission Reduction per 22 mpg ICE Vehicle Replacement by Ioniq Vehicle

Table 3 shows that replacing an average 22 mpg gasoline-fueled vehicle with taxpayer-subsidized (-$7500 - $2020 = -$9520) Ioniq Plug-in Electric vehicle will avert either

0.814 lbs./mile[12], or
0.679 lbs./mile[13]

in CO_2 emissions, depending on whether the battery electric vehicle is charged by solar panels, or by NJ electric grid.

Table 3 further shows that if the gasoline vehicle is instead replaced by unsubsidized, lower cost (-$7750) Ioniq Hybrid vehicle, then

0.505 lbs./mile[14]

in CO_2 emissions is still averted as a consequence of hybrid car use.

Table 3 strikingly reveals that although solar-charged Ioniq Electric vehicles produce no CO_2 emissions, and each Ioniq Hybrid vehicle produces 0.309 lbs. of CO_2 emissions per mile traveled, as long as NJ market demand for the lower cost Ioniq Hybrid is greater than market demand for the higher cost Ioniq Plug-in Electric by factor greater than

(.814 lbs./mile)/.505 lbs./mile) = 1.61,

the total CO_2 emissions averted due to higher volume replacement of gasoline vehicles by Ioniq Hybrid vehicles, compared to Ioniq Plug-in Electric vehicles, would result in greater cumulative CO_2 emission reduction in New Jersey.

In a free market where the purchase of one technology is not incented over another by government, we would expect the more affordable $22,200 Ioniq Hybrid with 690-mile range and 5-minute refuel time to enjoy higher sales volume than its $29,950 Ioniq Electric vehicle counterpart, having 124-mile range and 0.5 - 4.5-hour battery recharge time.

Despite costly government incentives to persuade consumers to purchase Plug-in Electric vehicles rather than less expensive Hybrid vehicles, the range and refuel-time superiority of the Hybrid vehicle over its plug-in electric counterpart, has caused 2017 car shoppers to prefer Hybrid vehicles over Plug-in Electric vehicles by a 4.5 to 1 factor.[15]

Assuming that this consumer Hybrid/"Plug-in Electric" technology preference ratio persists going forward, **sales of non-incented Hybrid vehicles will**

avert 2.8 to 3.6 times[16] more NJ CO_2 emissions

than achieved through sales of incented Plug-in Electric vehicles.

It is important to note that in order to fully benefit from the $7500 Federal Tax Credit available from the purchase of a Plug-in Electric car, a NJ resident must have at least $67,000 in yearly income[17].

Consequently, one would expect lower income NJ residents to purchase less expensive hybrid vehicles rather than shorter range, higher cost, and longer refuel-time all-electric vehicles, subsidized by a $7500 tax credit for which they do not qualify.

If the State's goal is to minimize the GHG and health-impacting emissions that occur due to transportation sector energy use, then it is far more effective to retire as many low fuel economy gasoline engine vehicles as possible by-passing legislation that

exempts new Hybrid car purchase from sales tax[18] rather than continuing the exclusive sales tax exemption that now exists for Plug-In Electric vehicle purchase[19].

More gas guzzler vehicles would be retired, causing a greater than 3-fold increase in averted CO_2 emissions over that achieved by already-incented Plug-in Electric vehicle sales.

6. Technology already exists to locally produce compressed hydrogen throughout New Jersey without CO_2 emissions. Such H_2 availability is needed to enable the widespread adoption and use of hydrogen-powered fuel cell and ICE zero-emission vehicles in the State.

To advance this goal, Stevens Institute's INETS has applied to ARPA-E for $4M of $8M needed to implement a two year zero-emission H_2 **production** and *consumption* demonstration project[20] having two deliverables:

(a) **a Solar-Powered Direct Pressurization Electrolyzer for Local H_2 Production, and**
(b) *a Companion IC Engine GenSet Conversion Technology for Zero Emission Upfit of 1.2 Billion IC Engine Vehicles* .

The **bold** deliverable will allow suburban and rural NJ residents to install and use solar PV panels to locally produce compressed H_2 (with no companion CO_2 emissions), for

(a) rapid homeowner refueling of fuel cell electric vehicles, purchased or leased from Toyota, Honda, and Hyundai[21]
(b) zero-emission charging of Plug-in battery electric vehicles (on demand, 24/7), using on-site hydrogen-upfitted low cost commodity gensets, and
(c) on-site CHP consumption, throughout any length electric grid outage.

The *italicized* deliverable will enable NJ manufacturers to produce and sell low cost upfit kits for worldwide conversion of up to 1.3 billion passenger vehicle, truck, locomotive, farm tractor, tanker ship, and tug boat engines (and gensets) to zero emission hydrogen operation, and **the training of the Certified Technicians** to perform these conversions.[22]

1Use of this terminology suggests that travel in grid-charged battery electric vehicles do not cause upstream CO_2 emissions.

2CNF is the scientific community acronym used to denote "Carbon Neutral Fuel". The term "Carbon Neutral Fuel" can refer to a variety of gaseous, liquid or solid energy fuels or energy systems which have no net greenhouse gas emissions or carbon footprint. One class of CNF is any gaseous H_2 that is produced by methods that do no generate companion CO_2 emissions. Example production methods that use different feedstocks are electrolysis of water, and McAlister emission-free methane cracking.
The acronym CNLF denotes "carbon-neutral liquid fuel". One class of CNLF is synthetic liquid fuel produced using either nuclear or renewable energy to hydrogenate waste carbon dioxide recycled from power plant flue exhaust gas, or derived from carbonic acid in seawater.

3In this testimony, I will be comparing three electric vehicle types being sold to consumers:
(a) Plug-in Electric: Denotes an externally-charged all-electric drive train vehicle. All motive power is provided by onboard batteries. Each gasoline-gallon-equivalent (GGe) of lithium-ion battery capacity included with the vehicle adds $8250 (@$250/Kw-hr) to its base price, and nearly 500 lbs. to its mobile weight, with increasingly negative impact on resulting EPA miles/GGe fuel economy. For example, the 2018 Ioniq Plug-in Electric vehicle features a 28 Kw-hr battery (_ $7000), 124 miles range, and weighs 3164 lbs. Doubling battery capacity to 56 Kw-hrs. (+$7000), increases vehicle weight by 13.2% (+419 lbs.) to 3583 lbs., and vehicle range to 219 miles (1.77x its original 124 mile range), (b) Plug-in Hybrid: Denotes an externally-charged hybrid (electric+ICE) drive train vehicle, typically equipped

with less battery capacity than its Plug-in Electric version (8.8 Kw-hrs. vs 28 Kw-hrs., for the Ioniq vehicles), at less cost and weight, but at less all-electric driving range. However, by incorporating a liquid-fueled internal combustion engine (ICE) within the design, the vehicle's driving range is greatly extended (e.g., 29 miles electric, + 621 miles ICE for the Ioniq Plug-in Hybrid), at good combined fuel-economy, and (c) Hybrid: Denotes a hybrid (electric+ICE) drive train vehicle with significantly smaller battery (1.8 Kw-hr, for the 2018 Ioniq Hybrid) than its competing Plug-in Electric and Plug-in Hybrid versions. All motive and battery energy originates from on-board liquid fuel that directly powers the vehicle's IC engine and indirectly charges the battery via kinetic-to electric
energy conversion from regenerative braking and normal engine alternator operation. A properly designed hybrid vehicle can achieve higher "well-to-wheel" fuel economy than Plug-in Electric or Plug-in Hybrid versions, whenever the Plug-in vehicle is grid-charged (See Table 3 of this testimony.). Hybrid vehicles consume liquid fuel supplied by existing gas station infrastructure. There is no need to increase fossil fuel-powered grid capacity or to plan, permit, build, and deploy the high-power output battery charging stations needed to sustain Plug-in Electric vehicle adoption.

4Battery Electric, CNF-fueled Fuel Cell, and CNF-fueled Internal Combustion Engine

5 See Appendix A. which demonstrated that internal combustion engines, upfitted for powering by H_2, actually cleaned the air of respiratory-damaging pollen and small particulates during engine operation.

6 This position is consistent with the Internal Revenue Service policy not to allow a federal 30% tax credit to be taken for any battery system used with solar PV, if these batteries are charged by grid electricity, rather than solar PV-supplied electricity.

7The present day NJ electric grid obtains roughly half its electricity from clean nuclear power plants. The other half is produced primarily by CO_2-emitting fossil NG power plants. It is important to note that CO_2-emissions per mile traveled caused by grid-charged plug-in electric vehicles will nearly double upon NJ nuclear power plant retirement in the not too distant future.

8 Metrol$_R$ (See http://metrol-hydrogen-fuel.com/metrol-movie-8-min/), for example, is a carbon neutral liquid
fuel capable of replacing gasoline and diesel fuels for powering NJ's existing population of light duty and heavy transport ICE vehicles.

9The Hyundai Ioniq has won the 2018 distinction of being the highest fuel economy vehicle currently being sold in the United States.

100.36 x 136 miles/GGe = 49 miles/GGe

11New Jersey already incents plug-in electric vehicles over competing technologies by declaring them NJ Sales Tax exempt, based on their EPA designation as 100% Zero Emission Vehicles ("Tank-to-Wheel"), even though they are not when gridcharged. At $29,950 retail price, residents who purchase the Ioniq Plug-in Electric vehicles save $2000 in Sales Tax than otherwise occurs when either of the other two technology Ioniq vehicles are purchased.

12.814-0 = .814

13.814-.135 = .679

14.814-.309 = .505

15See slide 16 of KPGM's Global Survey at https://assets.kpmg.com/content/dam/kpmg/xx/pdf/2017/01/
global-automotive-executive-survey-2017.pdf

164.5/1.61 = 2.8 times, if solar-charged; 4.5/1.34 = 3.6 times, if grid-charged.

17 A U.S. taxpayer, filing as a head-of-household with $67,000 of income, who took his standard deduction and personal exemption, owed $7500 in Federal Income Tax for tax year 2017. If he bought a battery-electric vehicle that year, he receives a $7500 credit for that purchase, and has no federal tax liability. This loss of $7500 U.S. tax revenue is a government incentive cost incurred by all U.S. taxpayers.

18This would increase the affordability of fuel efficient, lower emission Hybrid vehicles to low income families.

19primarily available to high income NJ residents.

20INETS is currently soliciting funds from clean air stakeholders to satisfy its $4M cost share obligation, as proposed to ARPA-E.

21 The Solar-Powered Direct Pressurization Electrolyzer dissociates wastewater to locally produce compressed H_2 without CO_2 emissions. No interconnection to the electric grid is needed. Travel in H_2-powered electric vehicles, when fueled by this H_2 production system, is zero-emission, "well-to-wheel".

22 A confidential copy of INET's ARPA-E concept paper is available for viewing at
http://greenapollo.net/arpa_concepts . Call and I will provide the necessary login credentials to access.

Appendix A.
PRESS RELEASE (1999)
CONTACT:
D.K. Harrison
American Hydrogen Association
http://www.clean-air.org
(480) 827-9815 Fax: (602) 967-6601

Second top prize in two years goes to a hydrogen project. Arizona State University (ASU) East Campus' "Capstone Project", completed by fifteen graduating students, with assistance from Professor Roy E. McAlister as their hydrogen-technology mentor, won the "Grand Prize" during the Society of Manufacturing Engineers International WESTEC competition on March 22, 1999 in Los Angeles, California.

Capstone scholars Matt Armstrong, Todd Bunger, Juan Calderon, Conrad Gonzales, Ernesto Gonzales, Weston Henry, Robert Smith, Robert Hyatt, Cris Kersey, Eddie Mose, Melissa Muir, Celeste Paecheco, Larry Rowley, James Stevens, Devin Wheeler, and Rebecca Wood-Dittemore won the international competition by innovating and manufacturing a Hydrogen Conversion Kit for Forklifts. This ZE-LIFT Hydrogen Conversion Kit proved that a common forklift using hydrogen fuel actually cleaned the ambient air inside close buildings for true "Minus Emissions".

At the competition in the Los Angeles Convention Center the judges learned how the students achieved minus emissions without a catalytic reactor. The ZE-LIFT Hydrogen Conversion Kit was found by the Boeing Company to provide safer, more reliable, and more economical forklift operation with the bonus of cleaning the industrial atmosphere for better worker productivity and improved quality assurance of manufactured parts and assemblies.

The 1999 ASU Capstone Team noted that the hydrogen minus-emission engine technology that had won the Grand Prize the previous year in a lawn mower application had allowed them to tackle a more sophisticated engine, and that all engines - from lawnmowers to locomotives could benefit by being converted to hydrogen.

A hearty" Well Done" is extended to these emerging engineers who were sponsored by the American Hydrogen Association (AHA).

Z-LIFT HYDROGEN CONVERSION KIT

TEST RESULTS

Mode	HydroCarbons	Carbon Monoxide	Nitrogen Monoxide
Ambient Air to Engine	28 ppm HC	0.0 ppm CO	1.0 ppm NO

Table 4: **AMBIENT AIR TEST**

Mode	HydroCarbons	Carbon Monoxide	Nitrogen Monoxide
Idle	16 ppm HC	0.00 ppm CO	1.0 ppm NO
Full Power	3 ppm HC	0.00 ppm CO	2.0 ppm NO

Table 5: **FORKLIFT ENGINE WITH UNTHROTTLED AIR AND HYDROGEN OPERATION**

Mode	HydroCarbons	Carbon Monoxide	Nitrogen Monoxide
Idle	219 ppm HC	27,000 ppm CO	410.0 ppm NO
Full Power	206 ppm HC	7,300 ppm CO	105 ppm NO

Table 6: **USING GASOLINE IN THE SAME ENGINE**

Shed Test with Contaminated Air

Conducted by: Arizona State University

Vehicle Owner: American Hydrogen Association (Geo Test Vehicle)

Part 1 Vehicle Demo: http://www.youtube.com/watch?v=tRYj23Ond3g Part 2 Vehicle Demo: http://www.youtube.com/watch?v=Wv-RT0ZIGso

Shed Test Contaminated Air Baseline Measures

29 PPM HC	0.00 PPM CO	2.0 PPM NO
Hydrocarbons	Carbon Monoxide	Nitrogen Monoxide

Geo Three-Cylinder Engine with Gasoline

Ambient Intake: Contaminated Air	29 PPM HC	0.00 PPM CO	2.0 PPM NO
IDLE	219 PPM HC	27,000 PPM CO	412 PPM NO
Exhaust: Increase Contaminants	190 PPM	27,000 PPM	410 PPM
FULL POWER FP @ 4,000 RPM	208 PPM HC	7,400 PPM CO	109 PPM NO
Exhaust: Increase Contaminants	179 PPM	7,400 PPM	109 PPM

Geo Three-Cylinder Engine with Hydrogen

Ambient Intake: Contaminated Air	29 PPM HC	0.00 PPM CO	2.0 PPM NO
IDLE	16 PPM HC	0.00 PPM CO	1.0 PPM NO
Exhaust: Minus Emissions (Cleaned the Air)	13 PPM	Zero	1 PPM
FULL POWER FP @ 4,000 RPM	3 PPM HC	0.0 PPM CO	2 PPM NO
Exhaust Minus Emissions (Cleaned the Air)	26 PPM	Zero	Zero

Tests Performed (1999) by International WESTEC Competition Winners from ASU

* * * * *

Joel Levin, Plug In America

Thank you for the opportunity to provide written testimony to the NJDEP Clean Air Council. Plug In America is the nation's leading independent consumer voice for accelerating the use of plug-in electric vehicles (PEVs) in the United States to consumers, policymakers, auto manufacturers and others. Formed as a non-profit in 2008, Plug In America provides practical, objective information collected from our coalition of plug-in vehicle drivers through public outreach and education,

policy work and a range of technical advisory services. Our expertise represents the world's deepest pool of experience of driving and living with plug-in vehicles.[1]

Plug-in electric vehicles can provide significant benefits to drivers in the service territory of the associated utilities, the electric grid, and to the state of New Jersey. We recognize New Jersey's goals of affordability and equity, and have a number of suggestions regarding infrastructure, awareness and heavy-duty vehicles.

By rejoining the Multi-State Zero-Emission Vehicle (ZEV) partnership, New Jersey will commit to a target of approximately 330,000 PEVs on the road by 2025. This is the target specified in S. 1795 (Smith and Greenstein). Achieving this goal will require infrastructure, education and outreach, and commitments by state and local governments.

We respectfully offer the following comments with the current and future electric car driver in mind. Our comments are structured in the following manner:

1. **Affordability**
    a. How can the state address the affordability gap between electric vehicles and comparable conventional vehicles?
    b. What incentives have been the most effective?
    c. Are different strategies needed to encourage EV adoption by New Jersey residents, businesses and governments?
2. **Infrastructure**
    a. How can the state grow the charging station network to attract and sustain EVs?
    b. What policies, programs and incentives have been effective in other states and municipalities?
    c. What are the barriers and options for EV charging in urban areas, and for apartments and condominiums?
    d. How can we ensure that new and existing buildings are "EV-ready"?
    e. How can we future proof our investments to accommodate developing technologies such as high-speed charging and fuel cells?
3. **Awareness**
    a. How can the state raise awareness of the availability and benefits of EVs?
    b. What outreach and education strategies have been most effective?
    c. How can the State's fleet "lead by example"?
4. **Equity**
    a. How can the state ensure that low-income communities and communities of color share in the benefits of clean transportation?
    b. How can EVs be used for transit, ride-sharing and other mobility solutions?
5. **Heavy-Duty Vehicles**
    a. How can the state help to expand medium-duty and heavy-duty EV markets?
6. **Consumer Protection**
    a. How can we ensure an optimal experience for EV drivers?

[1] More information available at: www.pluginamerica.org

Overview

The PEV market is quickly growing. From December 2010 through March 2018, U.S. consumers have purchased nearly 765,000 electric vehicles,[2] with sales expected to accelerate as new vehicle makes and models become more widely available. Nearly every major auto manufacturer has announced plans for the manufacture and sales release of a PEV model by 2020.[3] New Jersey had 6,219 battery electric vehicles (BEVS) and 10,496 plug-in hybrid electric vehicles (PHEVs) registered from January 2011 through December 2017.[4] As well, many electric vehicles from neighboring states visit New Jersey. There are over 30,000 PEVs on the road in New York, and over 12,000 in Pennsylvania. These residents often come to New Jersey's sites, attractions, and beaches, and PEV infrastructure will enable them to continue visiting the Garden State.

This growth is rapid, but the market is still at the early adopter phase. The 200,000 PEVs sold in 2017 represent just over 1% of the light-duty vehicle market.[5] The truck and SUV market does not yet have significant numbers of PEV options, and accounted for about 2/3 of the light-duty vehicle market in 2017. For the car market, PEVs were closer to 4% of sales in 2017.

1. Affordability

New Jersey has a number of tools to address the affordability gap between electric vehicles and comparable conventional gas vehicles. The state's sales tax exemption is a valuable incentive for PEV sales, as it is easy to administer, applies to all non-government buyers, and functions as a point-of-sale incentive. Plug In America strongly supports continuation of this credit. As battery prices continue to decline, it is still necessary to support and incentivize drivers to make the switch to driving electric, as making the switch to drive electric involves a lifestyle change. Instead of fueling up at the gas station, consumers will charge up at home or at the workplace, and sometimes along highway corridors. Financial incentives such as the NJ sales tax exemption are critical to move the market from the early adopters to the mass market stage. The sales tax exemption also serves as a "cash on hood" incentives, as the savings are available immediately and do not depend on the buyer's tax liability.

Other financial incentives may include excise tax exemptions or reductions, or bulk purchases to achieve discounts. The used PEV market will continue to grow as vehicles come off of old leases. It may be appropriate to consider incentives for such vehicles as well.

New Jersey may want to consider different incentives for local governments. Volume purchases or low-interest loans may be appropriate tools.

Even though businesses may have the resources to purchase such vehicles, and the economic rationale of operational cost savings, they may face challenges from rate structures. Utility rate

[2] Vehicle count based on *Inside EVs Plug-In Sales Scorecard*, https://insideevs.com/monthly-plug-in-sales-scorecard/.

[3] http://www.plugincars.com/carmakers-commitment-electric-cars-brand-brand-review-130155.html

[4] Alliance of Automobile Manufacturers, Advanced Technology Vehicle Sales Dashboard at https://autoalliance.org/energy-environment/advanced-technology-vehicle-sales-dashboard/.

[5] Total light-duty vehicles sales in 2017 were approximately 17.25 million, according to Automobile Magazine, January 4, 2018. http://www.automobilemag.com/news/u-s-auto-sales-totaled-17-25-million-calendar-2017/.

modifications to reduce demand charges (such as by considering not just the magnitude but also the *timing* of peak demand) can make PEVs a better option for businesses.[6]

2. Infrastructure

To sustain a PEV market, New Jersey will need not just PEV chargers, but a *network* of PEV chargers. There are many such stations in New Jersey, but a clear picture of the total charging network is difficult to find even for government officials.[7] Once an individual purchases a PEV, there are tools such as PlugShare to find chargers.[8] However, those who do not have a PEV are generally unaware of the existing charging infrastructure.

New Jersey would benefit from a centralized database of the existing charging stations (such as on a state agency website), increased signage for stations (including interstate signs advertising charging stations at exits), and a greater network of charging stations.

A network should include high-powered DC Fast Charging (DCFC) stations for inter-city travel (supporting both the CCS and ChaDeMo standards), Level 2 charging for intra-city travel and at destinations where customers may spend 1-4 hours (such as malls and stadiums), and both Level 1 and Level 2 charging at longer-dwell destinations such as workplaces, hotels, and Multi-Unit Dwelling buildings (apartments and condominiums). Level 1 charging should not be underestimated; it is inexpensive to deploy, and can recharge a PEV with around 30 miles of range in a typical 8-hour workday. This will replenish the charge used by most typical commutes.

To create this network, New Jersey may consider investments by utilities in "make-ready" infrastructure, coordination among state agencies with road resurfacing or electrical infrastructure upgrades, grants or loans to companies seeking to install such infrastructure, and building code modifications to encourage "PEV-ready" parking lots.

Plug In America believes that utilities should be allowed to invest in and install PEV charging infrastructure, especially for DC fast charging stations (DCFC). The installation of DCFC stations are higher upfront investments than some small workplaces, multi-unit dwelling units and disadvantaged communities can likely afford. The increased off-peak sales of electricity can allow reductions in rates for non-PEV owners, thereby providing an economic justification for utility investments. As well, the pollutant emission reductions have a quantifiable value.

Utilities should be allowed to own and operate charging stations as they are well equipped to handle the repair and maintenance of the stations in a timely manner. A driver needs the certainty that when he/she pulls up to a charging station, the driver can get a charge. Utilities have the manpower and operational capacity to repair charging stations quickly, providing charging certainty. Utilities are also best equipped to know which distribution feeder lines can support a DCFC station or a highly utilized public Level 2 station.

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[6] See http://www.raponline.org/wp-content/uploads/2016/05/rap-lazar-demandcharge-rap2015-12-10.pdf for discussion of non-coincident peak demand.

[7] Communication with former NJ Commissioner Richard Mroz.

[8] www.plugshare.com

Utilities will also need to know the location of all stations, for maintenance and upgrades of their distribution systems. A Level 2 PEV charger may have a peak demand of 7.2 kW, possibly doubling the home's prior peak demand. Consequently, some utilities offer a small rebate to PEV owners, on top of Federal and state incentives, simply for telling the utility that they have bought a PEV and installed a charger.[9]

Aggregate PEV demand on the grid will not be significant for several years even with continued annual growth of 30%+. A PEV penetration rate of 100% of the light-duty fleet corresponds to an increase in electricity demand of about 25%. So, in the nearer term, 20% of the fleet being PEVs would result in only about a 5% increase in annual electricity demand; if managed intelligently, this load can be met with no increase in system peak demand. However, it can still be useful to consider grid needs when deploying the charging infrastructure. Several measures can mitigate adverse grid impacts and even provide grid benefits:

- About 85% of PEV charging occurs at night, during off-peak electric hours. The more off-peak energy is sold to charge PEVs, the more efficiently existing utility assets are used. This puts downward pressure on electricity rates, leading to cheaper prices for all ratepayers. [10] Time-of-use rates can reward vehicles for charging at this time.
- PEVs can also be a source of potential load control. Many PEV owners are open to load control programs, such as letting the utility or a third party turn PEV charging on and off as needed, as long as it does not prevent the charge from finishing by a specified time.[11] Going a step farther than load control is pulling energy from idle PEVs at peak load times via "vehicle-to-grid" (V2G).
- Finally, PEVs can make the integration of renewables easier. PEV loads are generally during low demand times (and can be moved around with TOU rates and other tools), making it easier to justify the addition of renewable power sources that cannot be ramped. [12]

Owner-occupied single-family homes account for about 58% of the housing in the U.S.[13] The other 42%, renters and those in multi-unit dwellings, will on average have a more difficult time installing PEV chargers. Providing solutions for such residents is a priority for expanding the PEV market. The "new construction" market can be addressed by building code changes, to require a certain number of PEV chargers in a parking lot (or at least the conduit to permit installation of such chargers). Existing buildings are more expensive to modify. Installation of PEV infrastructure should be coordinated with resurfacing of the parking lot, to reduce trenching costs. Level 2 chargers are faster but more expensive to install; these will likely to require residents to move their vehicles once fully charged. Level 1 chargers are slower but inexpensive to install, so a building

[9] For example, the Salt River Project's EV Community program at http://www.srpnet.com/electric/home/cars/secure/EVsignup.aspx.

10 Available here: https://pluginamerica.org/wp-content/uploads/2016/11/PEV-Incentive-Review-October-2016.pdf

11 Tal, Gil. 2016. Plug-In Electric Vehicle Multi-State Market and Charging Survey http://www.epri.com/abstracts/Pages/ProductAbstract.aspx?ProductId=000000003002007495

[12] (INL) Anonymous, Idaho National Laboratory. 2013. How do PEV owners respond to time-of-use rates while charging EV project vehicles http://avt.inl.gov/pdf/EVProj/125348-714937.pev-driver.pdf and (INL) Anonymous, Idaho National Laboratory. 2015 (a). Residential Charging Behavior in Response to Utility Experimental Rates in San Diego http://avt.inel.gov/pdf/EVProj/ResChargingBehaviorInResponseToExperimentalRates.pdf

[13] 2013 American Housing Survey, at https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=AHS_2013_C01AH&prodType=table.

can install as many as needed without requiring residents to move their vehicles. Level 1 chargers can handle daily commuting distances, but would take multiple days to replenish a fully large battery (such as 60 kWh or more). A combination of both may be suitable.

Plug In America suggests that building codes require all new construction of parking lots or garages to be PEV-ready.

Future-proofing the investments requires considering the most likely developments. For example, it is highly likely that higher charging speeds will become common, based on statements from multiple manufacturers. This requires laying conduit that can support 350 kW charging, and/or developing regulations to allow on-site stationary energy storage to facilitate fast charging.

3. Awareness

There are numerous means to raise awareness of the availability and benefits of PEVs. Plug In America has conducted or supported such programs in numerous states. Dealer trainings are important, since automotive dealers are most people's point of contact when purchasing a new vehicle. A state web site can also be influential.

The most effective means of publicizing the availability and benefits of PEVs are direct exposure to the vehicle, such as at Ride and Drive events or at workplaces. Plug In America runs National Drive Electric Week every year, with multiple Ride and Drive events giving people the opportunity to see and drive a PEV.

Workplace charging has been shown to greatly increase PEV adoption. Employees see the PEV chargers, see their colleagues driving the vehicles, and have an opportunity to discuss the benefits of the technology. A comprehensive list of the workplaces that have participated in the U.S. DOE Workplace Charging Challenge includes major companies such as Amazon, American Electric Power and affiliates, Bayer, Coca-Cola, DirecTV, Facebook, SAP, dozens of universities, NASCAR, Zappos, Verizon, and hundreds more.[14]

State fleets can lead by example, particularly those state vehicles that are highly visible. For example, state park vehicles might be PEVs. There are also excellent opportunities to help local jurisdictions purchase PEVs, as most NJ residents will see a city vehicle more often than a state vehicle. PEVs are an especially good option for vehicles that are heavily utilized, since the low cost per mile (for both fuel and maintenance) can offset the higher purchase price.

Plug In America has also led education and awareness campaigns in several states. For example, we led the work in Massachusetts through the MassDriveClean program, which involved a series of ride and drive events and awareness raised through various media outlets. We would be happy to tell NJDEP Clean Air Council more on these campaigns.

[14] https://energy.gov/eere/vehicles/workplace-charging-employer-partners

4. Equity

Electric vehicles generally cost more than conventional vehicles at present, though battery prices are declining, and PEVs are largely found in the new-vehicle market. These vehicles are not inordinately expensive; the Plug In America vehicle tracker shows a host of new PEVs selling in the $20-30k range: the Mitsubishi i-MiEV sells for $22,995, Toyota Prius Prime sells for $27,100, the Ford Focus Electric sells for $29,170, and the Nissan LEAF sells for $32,450. Even so, these prices are beyond the reach of low- and moderate-income residents. However, this does not mean that they are bereft of the benefits.

Most importantly, the air quality benefits do not accrue to the owner or driver of the vehicle. They accrue to those who live near the roads and highways where the vehicle is driven. Everybody who breathes air benefits from reduced air pollution, not merely the driver. This is the *primary* benefit of clean transportation: cleaner air.

As well, there are numerous opportunities for PEVs in low- and moderate-income areas. These ideas include PEV car-sharing, PEV ride-sharing, PEVs owned by community groups or institutions, and electric transit. Replacing diesel buses with electric buses offers tremendous reductions in pollution and offers savings in operating costs.

New Jersey can also consider incentives for the resale of used PEVs. A used PEV can range anywhere from $4,000 to $15,000, which approaches the selling price point for millions of the middle and low-income Americans.[15] Many states have policies that will also provide an additional purchase incentive for low-income consumers.

5. Heavy Duty Vehicles

At present, the heavy-duty PEV options are well represented in buses, with numerous companies offering a variety of products. Some of these have fast-charging options; some have large enough batteries to cover hundreds of miles a day before needing to recharge.

Less well represented are work vehicles, delivery trucks, and specialty vehicles. Some of these exist in the utility space, but their numbers are small and so their economies of scale are not great. New Jersey can partner with other states in volume purchases and purchase commitments, which will help scale up the necessary manufacturing technology.

6. Consumer Protection

Key consumer protection issues include the following as listed below. These principles should be strictly adhered to:

a) Open Access – This is defined as the ability to get a charge at any public charger - including L1, L2 and DCFC - either via a credit card swipe or mobile app to enable the charge. PEV drivers should never be stranded at a public charging location where they cannot actually charge.

[15] https://www.autotrader.com/best-cars/7-great-used-plug-in-and-electric-vehicles-251956

b) Transparency – The price of a charge should be clear when the PEV driver connects to the charger. This price should also be reported in mapping API so that drivers can select a charging station even before they reach a charging station.
c) Interoperability - This is a key principle for the entire charging infrastructure ecosystem. Currently, many companies have their own card or key, which means drivers must either join multiple "clubs" or risk being unable to charge.
d) Mapping data - all electric vehicle service providers (EVSPs) should provide mapping data for charging locations, including costs for charging (both in and out of network).
e) Signage – There is a critical need for charging station signage, from highway visibility down to the last several hundred feet where the charging station is. While the charging station may be listed on a smartphone, car navigation, or web-based maps, the stations are still challenging to locate as the physical hardware is not that large. Directional signage installed on streets around the stations would help immensely, and also reduce consumer range anxiety.

On behalf of the thousands of current PEV drivers in New Jersey, and the tens of thousands more that will soon choose to drive electric, we thank you for the opportunity to provide these comments. We look forward to working with the PSC. Please send any questions to Peter O'Connor, Policy Specialist, at poconnor@pluginamerica.org.

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VII. LIST OF ACRONYMS

2WD	-	Two-Wheel Drive
AAA	-	Automobile Association of America
AFV	-	Alternative Fuel Vehicle
AHA	-	American Hydrogen Association
ALA	-	American Lung Association
API	-	Application Program Interface
ARPA	-	Advanced Research Projects Agency
ASU	-	Arizona State University
AWD	-	All-Wheel Drive
BEV	-	Battery Electric Vehicle
BPU	-	Board of Public Utilities
CAC	-	Clean Air Council
CAFE	-	Corporate Average Fuel Economy
CCS	-	Combined Charging System
ChaDeMo	-	A DC Charging Standard for Electric Vehicles
CHP	-	Coalition for Healthy Ports; also, Combined Heat and Power
CNF	-	Carbon Neutral Fuel
CNG	-	Compressed Natural gas
CNLF	-	Carbon Neutral Liquid Fuels
CO	-	Carbon Monoxide
CO_2	-	Carbon Dioxide
COPD	-	Chronic Obstructive Pulmonary Disease

DC	-	Direct Current
DCA	-	(NJ) Department of Consumer Affairs
DCFC	-	Direct Current Fast Charge
DEP	-	(NJ) Department of Environmental Protection
DOE	-	(U.S.) Department of Energy
DOT	-	(NJ) Department of Transportation
E-Bikes	-	Electric Bicycles
E-Scooter	-	Electric Scooter
EPA	-	(U.S.) Environmental Protection Agency
EV	-	Electric Vehicle
EVSE	-	Electric Vehicle Supply Equipment
EVSP	-	Electric Vehicle Service Provider
FAA	-	Federal Aviation Administration
FCEV	-	Fuel Cell Electric Vehicle
FHWA	-	Federal Highway Administration
GGe	-	Gasoline Gallon Equivalent
GHG	-	Greenhouse Gas
GM	-	General Motors
H_2	-	Hydrogen
HC	-	Hydrocarbons
HOV	-	High Occupancy Vehicle
ICC	-	Ironbound Community Corporation
ICCT	-	International Council on Clean Transportation

ICE	-	Internal Combustion Engine
INETS	-	Intelligent Networked Systems (Center at Stevens Institute of Technology)
KW	-	Kilowatt
Kw-Hr	-	Kilowatt-hour
L1	-	Level-1 Charger
L2	-	Level-2 Charger
LBS	-	Pounds
MFN	-	Moving Forward Network
MOU	-	Memorandum of Understanding
MPG	-	Miles Per Gallon
NASCAR	-	National Association for Stock Car Auto Racing
NESCAUM	-	Northeast States for Coordinated Air Use Management
NG	-	Natural Gas
NIST	-	National Institute of Standards and Technology
NJSA	-	New Jersey Statutes Annotated
NJT	-	New Jersey Transit
NJTPA	-	New Jersey Transportation Planning Authority
NO	-	Nitrogen Monoxide
NO_x	-	Nitrogen Oxides
PANYNJ	-	Port Authority of New York and New Jersey
PEV	-	Plug-in Electric Vehicle
PHEV	-	Plug-in Hybrid Electric Vehicle
PPB	-	Parts Per Billion

PPM	-	Parts Per Million
PV	-	Photovoltaic
RAP	-	Regulatory Assistance Project
RPM	-	Revolutions Per Minute
SAP	-	Systems, Applications, and Products (a software applications company)
SCS	-	(NJ) Senate Committee Substitute
SUV	-	Sport Utility Vehicle
TCI	-	Transportation Climate Initiative
TOU	-	Time-Of-Use
UPS	-	United Parcel Service
V2G	-	Vehicle-To-Grid
VW	-	Volkswagen
ZEV	-	Zero Emission Vehicles

VIII. ADDITIONAL RESOURCES FOR ELECTRIC VEHICLES

Listing of the URLs below is for informational purposes only. The NJ CAC is not affiliated with any of the listed organizations nor does inclusion of these organizations imply endorsement or recommendation of any products, vendors, or services. The NJ CAC does not control or guarantee the accuracy, relevance, timeliness or completeness of third party information. The listing order of the links below is not intended to reflect their importance.

https://news.nationalgeographic.com/2017/09/electric-cars-replace-gasoline-engines-2040/

https://www.energysage.com/electric-vehicles/101/pros-and-cons-electric-cars/

http://evroadmapconference.com/

https://environmentmassachusettscenter.org/sites/environment/files/reports/MA%20Plugging%20In%20Feb18_0.pdf

https://fresh-energy.org/electric-vehicles-good-for-public-health-and-the-planet/

https://www.afdc.energy.gov/uploads/publication/pev_charging_healthcare.pdf

http://repository.cmu.edu/cgi/viewcontent.cgi?article=1504&context=dissertations

https://www.theicct.org/sites/default/files/publications/Expanding-access-electric-mobility_ICCT-Briefing_06122017_vF.pdf

https://www.portlandoregon.gov/bps/article/619275

https://www.iea.org/publications/freepublications/publication/EV_PHEV_Roadmap.pdf

https://www.clippercreek.com/charging-times-chart/

https://www.clippercreek.com/cost-charge-electric-vehicle/

https://www.clippercreek.com/evse-rebates-and-tax-credits-by-state/

https://www.afdc.energy.gov/laws

http://www.state.nj.us/dep/cleanvehicles/cvl.htm

http://www.transportationandclimate.org/northeast-electric-vehicle-network-documents

http://www.nescaum.org/topics/zero-emission-vehicles

http://www.njtpa.org/planning/regional-studies/environment/air-quality/alternative-fuels-vehicles

http://www.state.nj.us/dep/cleanvehicles/njlev_forms.htm

http://www.drivegreen.nj.gov/programs.html#nj1

http://www.state.nj.us/treasury/taxation/pdf/other_forms/sales/st4.pdf

https://www.epa.gov/greenvehicles

IX. HISTORY OF THE CLEAN AIR COUNCIL

2017 What Can Be Learned from Low Cost Air Quality Monitors: Best Uses and the Current State of Technology

2016 The Clean Power Plan: Impact on New Jersey (not released)

2015 Air Pollution Knows No Bounds: Reducing Smog Regionally

2014 Reducing Air Emissions Through Alternative Transportation Strategies

2013 Addressing the Adverse Effects of Climate Change on Air Quality

2012 Transportation and Small Sources of Air Pollution: Challenges and Opportunities to Achieve Healthier Air Quality in New Jersey

2011 The Cumulative Health Impacts of Toxic Air Pollutants on Sensitive subpopulations and the General Public

2010 Vision for the Next Decade: Air Quality and Pollution Control in New Jersey

2009 Electricity Generation Alternatives for New Jersey's Future: What is the Right Mix for Improving Air Quality and Reducing Climate Change?

2008 Improving Air Quality at Our Ports & Airports—Setting an Agenda for a Cleaner Future

2007 Improving Air Quality through Energy Efficiency and Conservation: The Power of Government Policy and an Educated Public

2006 Indoor Air Quality

2005 Air Pollution—Effects on Public Health, Health Care Costs, and Health Insurance Costs

2004 Fine Particulate Matter in the Atmosphere
- Health Impacts in NJ
- Need for Control Measures

2003 Moving Transportation in the Right Direction

2002 Innovative Solutions for Clean Air

2001 Air Quality Needs Beyond 2000

2000 Air Toxics in New Jersey

1999 The Impact of Electric Utility Deregulation on New Jersey's Environment

1998 CLEAN AIR Complying with the Clean Air Act: Status, Problems, Impacts, and Strategies

1997 Particulate Matter: The proposed Standard and How it May Affect NJ

1996 Clearing the Air Communicating with the Public

1995 Strategies for Meeting Clean Air Goals

1994 Air Pollution in NJ: State Appropriations vs. Fees & Fines

1993 Enhanced Automobile Inspection and Maintenance Procedures

1992 Impact on the Public of the New Clean Air Act Requirements

1991 Air Pollution Emergencies

1990 Trucks, Buses, and Cars: Emissions and Inspections

1989 Risk Assessment - The Future of Environmental Quality

1988 The Waste Crisis, Disposal Without Air Pollution

1987 Ozone: New Jersey's Health Dilemma

1986 Indoor Air Pollution

1985 Fifteen Years of Air Pollution Control in NJ: Unanswered Questions

1984 The Effects of Resource Recovery on Air Quality

1983 The Effects of Acid Rain in NJ

1981 How Can NJ Stimulate Car and Van Pooling to Improve Air Quality

1980 (October) Ride Sharing, Car– and Van-Pooling

1979 What Are the Roles of Municipal, County, and Regional Agencies in the New Jersey Air Pollution Program?

1978 How Can NJ meet its Energy Needs While Attaining and Maintaining Air Quality Standards?

1977 How Can NJ Grow While Attaining and Maintaining Air Quality Standards?

1976 Should NJ Change its Air Pollution Regulations?

1974 Photochemical Oxidants

1973 Clean Air and Transportation Alternatives to the Automobile and Will the Environmental Impact Statement Serve to Improve Air Quality in NJ?

1972 The Environmental Impact on Air Pollution: The Relationship between Air Quality, Public Health, and Economic Growth in NJ

1971 How Citizens of NJ Can Fight Air Pollution Most Effectively with Recommendations for Action

1970 Status of Air Pollution From Mobile Sources with Recommendations for Further Action

1969 Status of Air Pollution Control in NJ, with Recommendations for Further Actions

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