POLICY CONSIDERATIONS | MARCH 2021

Fuels Institute

Proposals to Ban the Sale of Combustion Engine Vehicles

The quest to reduce emissions from the transportation sector (air pollutant and greenhouse gas emissions) has led some countries, and regions within countries, to consider policies to ban the sale of vehicles equipped with internal combustion engines (ICE). These regions represent more than 50% of global light duty vehicle sales. Such policies seek to accelerate the transition of the vehicle market to rely exclusively on vehicles which produce zero tailpipe emissions, such as battery electric vehicles and fuel cell electric vehicles.

In an effort to help policymakers and affected stakeholders better understand the potential effect of such initiatives, and to plan in advance to mitigate potential negative implications and to take full advantage of positive ones, the Fuels Institute has identified the following considerations which it believes are critical to address when crafting and implementing a ban on the sale of ICE vehicles. These considerations are presented in three categories: Environmental Impact, Market Readiness and Consumer and Stakeholder Impact. By presenting these considerations, derived from the input of a diverse set of stakeholders, it is the hope of the Fuels Institute to prompt robust and comprehensive discussions about the various options available to policymakers to pursue successful policies that balance the various needs of the market.

ENVIRONMENTAL IMPACT

What will be the cradle-to-grave (lifecycle) environmental impacts of the policy?

If the primary objective of these initiatives is to reduce the emissions profile of the transportation sector, a comprehensive cradle-to-grave analysis looking at the environmental impacts of the policy would provide policymakers with invaluable insight. Such an analysis could identify areas that deserve additional attention when crafting a policy in order to take advantage of positive attributes associated with the transition to zero emission vehicles (ZEVs) and to mitigate negative ones. To be most informative, the analysis should include at a minimum:

- The production, use, maintenance and disposal of the vehicles and parts being developed to comply with the policy as well as those being replaced, along with their associated energy components. The assessment should differentiate between vehicle classes and their use and consider how the policy might affect fleet turnover and total miles traveled within each class. For example, if the policy accelerates or slows the rate of new vehicle sales, this will affect the useful life expectancy of legacy vehicles and their related emissions.

- All phases associated with the production, transmission, maintenance and distribution of transportation energy used by ICEVs and ZEVs. This would include the exploration, production and transport of raw materials used in the manufacture of liquid fuels, electricity and hydrogen; the conversion of those raw materials to a form of energy that is consumed by a vehicle; the transmission, distribution and ultimate delivery of that energy into a vehicle, including construction and maintenance of required infrastructure; and the consumption of that energy and its associated emissions.

- The lifecycle performance of a vehicle and its energy source should be considered as a connected system, evaluating the overall impact of a vehicle and its "fuel" to provide a more holistic perspective to policymakers.

In addition to the fundamental elements of a lifecycle analysis listed above, consideration should also be given to the impact of such policies on research and development investments directed to improve the efficiency and emissions profile of ICEVs and liquid fuels. Since these vehicles will remain in operation for decades beyond the effective date of a sales ban, how might the policy affect the emissions profile of these vehicles and fuels and how might further improvement be supported?

MARKET READINESS

How might the vehicle manufacturing industry be able to produce enough qualified ZEVs to satisfy demand?

To transition its capabilities to produce only qualified ZEVs, the vehicle manufacturing industry must undergo significant change. The policy should consider the ability of the industry to manufacture affordable vehicles and transition effectively to comply with the effective date of the sales ban and determine what manner of government support might be required. Elements to consider should include:

- To determine if the industry will require government assistance (including the type of assistance and duration it might be required), it will be important to understand what vehicles will need to be produced. Questions to be answered include:
    - Will the policy affect the light-duty, medium-duty and heavy-duty vehicle sectors or just a subset of these?
    - For each sector included in the policy, how many ZEVs will need to be produced to satisfy demand leading up to and including the effective date?
    - What is the anticipated market share of each unique ZEV powertrain (i.e., battery electric, fuel cell electric, etc.) within each affected market sector?

- Some of the materials required to produce ZEVs are not required for vehicles powered by combustion engines. Consequently, their supply chains are not as fully developed. How might the industry be able to source sufficient volumes of the critical materials needed for ZEV production and how might the government be able to assist? What might be the trade-related implications associated with acquiring these materials?

- Manufacturing BEVs will eliminate the need for significant production streams within the manufacturing process, which could displace a large percentage of the existing labor force. How can the policy mitigate the consequences of displaced workers?

Will BEV charging and/or hydrogen refueling infrastructure be able to satisfy consumer demand for transportation energy?

Consumers must have reliable access to transportation energy. To support the expansion of vehicle charging and appropriate refueling infrastructure, policymakers must understand the following and create policies to support the needs of consumers:

- How much infrastructure is needed to support the number of vehicles being introduced into the market and where must it be located? This evaluation should take into consideration the actual number of facilities determined necessary by market evaluation as well as that perceived by potential drivers' as required, which could be a much larger number of facilities.

- If the policy is designed to include light-, medium- and heavy-duty vehicles, how should the infrastructure develop to support each use case scenario? For example, light-duty drivers may recharge an electric vehicle at home, office or at a retail establishment. However, a medium- or heavy-duty vehicle may rely upon a depot charging facility or an in-market facility for longer distance routes.

- What type of infrastructure will be needed, by when and at what capacity? For light-duty electric vehicles, charger speed capabilities and overall capacity will vary greatly by location being serviced (i.e., home, office parking structure, grocery store, fast food restaurant, convenience store) and overall demand will grow as the share of electric vehicle owners with access to secure, off-street parking begins to normalize with the population. A similar scenario will materialize for hydrogen refueling stations depending on the type of vehicle being serviced. Understanding what will be required will help the market determine an appropriate deployment strategy to most effectively service consumers.

- Who should be responsible for building the infrastructure? What is the appropriate role for vehicle manufacturers, government agencies, utilities, retail businesses, others? How might infrastructure deployment be funded? How can public and private efforts to build infrastructure be best coordinated to minimize duplicative installations while recognizing and servicing gaps in deployment?

- How might the availability of transportation energy for vehicles that run on electricity be assured during power-disrupting events (i.e., hurricanes)? What type of backup systems will be required to satisfy demand during power outages and to support regional evacuation events?

How might electricity generation and transmission systems best prepare for the additional demand?

A significant share of the non-combustion engine vehicle market is assumed to be powered by electricity. Understanding the relationship between this new source of demand and the current state of the electricity generation and transmission sector will be essential to developing and communicating a comprehensive policy that ensures consumers have reliable access to transportation energy while not compromising their access to electricity for other daily requirements.

- As the market transitions to greater reliance on electric vehicles, what are the estimated changes in electricity demand associated with the market growth of this segment? What is the expected pace of demand growth over time and what incremental changes must be made to the electricity systems to evolve with the vehicle market? How might these changes vary by region and how might the various utilities (i.e., investor owned

utilities, public utilities, rural electric cooperatives) servicing these regions best prepare to satisfy consumer demand? What adjustments must be made to the existing systems, how long might this take, how much might this cost and how will it be funded? How might the policy assist such evaluation and preparation?

- How might the utility sector best prepare for spikes in demand associated with periods of peak charging? How might drivers of electric vehicles be encouraged to incorporate responsible and predictable charging behavior into their daily activities to reduce spikes in demand that might challenge the efficiency of the electricity system? How might the policy encourage and support development of technologies/services/billing practices to protect the system from unpredictable spikes in demand (i.e., battery storage, distributed energy, time-of-use rates)?

- As reliance on electricity for transportation increases, how might policy be crafted to support efforts to reduce the environmental footprint of the electricity generation and transmission sector while supporting a potential increase in capacity to satisfy demand?

CONSUMER AND STAKEHOLDER IMPACT

How might such policies affect consumers, especially those individuals located in economically depressed or rural communities?

Access to affordable and reliable transportation is critical and the transition to ZEVs will affect consumers very differently, depending upon their circumstances. Understanding the travel needs of different communities can help policymakers mitigate negative consequences for any segment of the population, especially those living in economically depressed and rural communities. Some key elements to consider when crafting policy include:

- Many residents in lower income neighborhoods may not have access to secure, off-street parking and therefore may not have the option to recharge a vehicle at home. In addition, for both lower income and rural communities, ZEV market growth could be slower than in other markets which could affect charger deployment strategies. How might the policy ensure that deployment of infrastructure provides reliable and affordable access to recharging facilities for these consumers?

- Many traditional refueling locations have equipment that is nearing the end of its expected useful life. As such policies will require the market transitions away from ICE vehicles, it may not be possible to generate a return on the investment in new equipment required to keep these facilities operational, especially in lower income and rural communities. As a result, some facility owners may choose to close these locations permanently. With ICEVs expected to remain in operation for decades, how can policies be crafted to ensure residents in these communities have equitable access to transportation energy?

- Lower income consumers often rely upon the used vehicle market for their transportation needs. As ICE vehicles are phased-out, how might their relative value in the used vehicle market change and how might the market for used ZEVs develop? What impact might this have on lower income consumers? If vehicles become less affordable for these consumers, how will extending the useful life of their vehicles affect their total cost of ownership? In addition, how might extending the life of older ICE vehicles affect the overall emissions objectives of the policy? What can be done to mitigate these potential consequences?

- As the market transitions away from liquid fuels, the economics of producing and delivering fuel to consumers will change. How might this affect affordability of fuel for consumers driving ICE vehicles? Likewise, as demand for electricity to power new ZEVs increases, how might that affect affordability for electricity both for transportation, residential, industrial and commercial uses?

For sectors of the market that have invested significantly in infrastructure and systems to support the traditional transportation energy market, how might a policy to transition to ZEVs address potentially stranded assets and negatively affected labor sectors?

The legacy transportation fuel system is extensive and affects stakeholders in a wide variety of economic sectors. How these are affected and what transition opportunities are available should be of significant interest to policymakers. The following major sectors, among others, are likely to be affected by a transition to ZEVs:

- Petroleum Industry – The United States consumes 390 million gallons of finished gasoline and 169 million gallons of diesel fuel every day. The industry that produces, distributes and delivers this energy employs millions of workers, supports hundreds of thousands of businesses and has billions of dollars invested in infrastructure. As ICE vehicles are phased-out and demand for these products decreases, how might the policy provide opportunities for these workers and businesses to transition and repurpose exiting assets?

- Agricultural Communities – Federal policies developed to support biofuels were designed in part to support

farming economics. The United States blends a significant volume of ethanol and biomass-based diesel, demand for which would phase out along with petroleum as ICE vehicles are replaced with ZEVs. How might the policy provide opportunities for the U.S. farming and biofuels sectors to repurpose existing assets and open new markets for agricultural commodities?

- Vehicle Sector – Beyond the manufacture of vehicles, an entire industry has been built to support and service ICE vehicles. A transition to ZEVs, most of which have far fewer moving parts and require less maintenance, will eliminate the need for many of these businesses and associated jobs. How might the policy provide for the technical training and new employment opportunities for these displaced entities and workers?

For government programs that rely upon fuel taxes for revenue, how might these funds be replaced as the market transitions away from fuel sales?

According to the U.S. Energy Information Administration (EIA), in December 2020 sales of gasoline and diesel fuel generated tax revenues for federal, state and local governments equal 22% of the average retail price, resulting in an average of $0.484 and $0.570 per gallon, respectively. Because the majority of revenues are assessed on a fixed cents-per-gallon basis rather than as a percent of the sale, these values were consistent with the revenues generated from fuel sales over the past 15-plus years.

- Of the revenues collected for fuel excise taxes, the Federal Highway Trust Fund receives $0.183 and $0.242 from each gallon of gasoline and diesel sold, respectively. (The Federal Leaking Underground Storage Tank Trust Fund receives $0.01 per gallon.) The assessment has frequently struggled to generate sufficient revenues to satisfy the needs of infrastructure construction and maintenance. A transition away from liquid fuels will eventually eliminate this source of funding, although the need for infrastructure construction and maintenance will continue. What mechanisms can be implemented to generate revenues to fund the nation's infrastructure needs and how might they affect consumers and various sectors of the transportation economy?

- Federal, state and local government agencies rely upon fuel taxes for purposes beyond the Highway Trust Fund. Based upon EIA's data, in December 2020 these additional fees generated $0.30 and $0.327 per gallon of gasoline and diesel fuel, respectively, for other programs. How might these agencies replace lost revenue following the transition away from liquid fuels?

What might be the overall costs and/or savings associated with implementation of the policy?

Banning ICE sales likely will significantly affect the economy and these effects should be carefully considered when crafting policy.

- Consideration should include societal costs incurred by the government, various affected stakeholders and consumers, as well as the economic opportunities created by the transition to ZEVs.

- Anticipated benefits of the policy, including the economic value of avoided GHG emissions, should be compared with associated costs to provide policymakers with an opportunity to consider provisions that may balance benefits with costs.

SUMMARY

The transition from the current transportation market to one that will rely exclusively on ZEVs is a significant undertaking with far reaching implications for the economy as a whole, as well as individual consumers and families. Only by seeking a comprehensive understanding of the potential opportunities and challenges associated with such efforts can policymakers devise strategies to successfully achieve their objectives in the most efficient and equitable manner possible. The considerations outlined in this paper represent a starting point and the Fuels Institute encourages policymakers and stakeholders to continually ask questions in order to develop the best solutions possible.

About the Fuels Institute

Founded by NACS in 2013, the Fuels Institute is a nonprofit tax-exempt social welfare organization under section 501(c)(4) of the Internal Revenue Code. We are dedicated to evaluating issues affecting the vehicles and fuels markets. We commission comprehensive, fact-based research projects that are designed to answer questions, not advocate a specific outcome. Our reports address the interests of industry stakeholders—from business owners making long-term investment decisions to policymakers considering legislation and regulations that affect these markets.

John Eichberger | Executive Director
jeichberger@fuelsinstitute.org | (703) 518.7971

Jeff Hove | Vice President
jhove@fuelsinstitute.org | (703) 518.7972

Amanda Appelbaum | Director, Research
aappelbaum@fuelsinstitute.org | (703) 518.7974

Donovan Woods | Director, Operations
dwoods@fuelsinstitute.org | (703) 518.7973