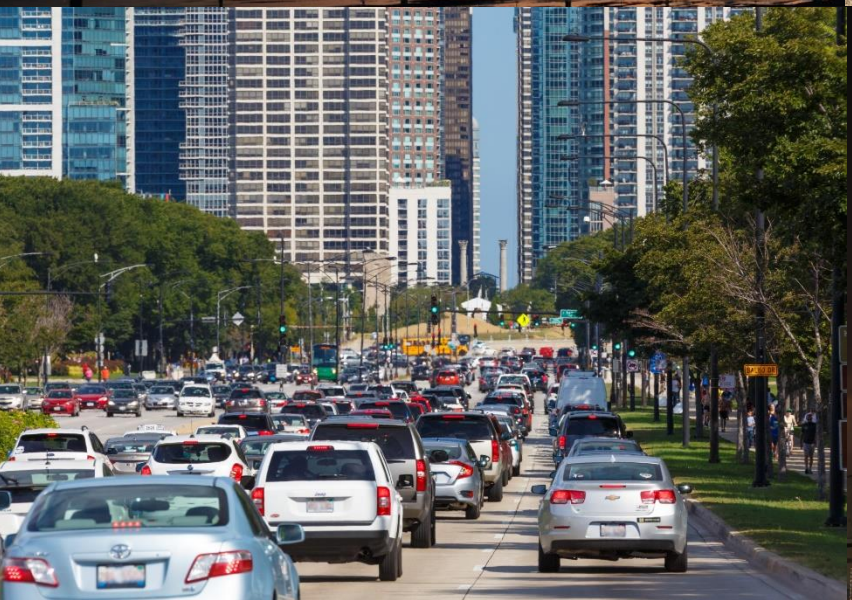
OurEnergyPolicy

American Energy Independence and the Transportation Sector

An OurEnergyPolicy Roundtable

November 2020



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November 2020

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Foreword from OurEnergyPolicy

As part of our mission to facilitate substantive, responsible dialogue on a variety of energy policy issues relevant to policymakers and the American public, OurEnergyPolicy (OEP) held a webinar on U.S. energy independence in June 2020, the sixth installment in our Energy Leaders Webinar Series. The United States' goal to reach self-sufficiency in our petroleum consumption and reduce our dependence on foreign supply is a decades-old ambition and one that is still relevant today.

Yossie Hollander, Co-Founder and Chairman of the Fuel Freedom Foundation, was our featured webinar speaker. He was joined by moderator Karen Wayland, CEO of kW Energy Strategies and former Deputy Director for State and Local Cooperation at the U.S. Department of Energy. Hollander is also the founder of OEP, although OEP is strictly non-partisan with funding and programmatic activities that are separate from those of the Fuel Freedom Foundation. OEP does not have or endorse any specific political, programmatic, policy, or technological agendas, but rather seeks to encourage dialogue representative of viewpoints from across the energy sector.

We received strong interest from our community to continue the energy independence conversation in a roundtable format. In August 2020, we convened a group of energy leaders with extensive experience in government, non-profit organizations, academia, law, and industry to dive deeper into the issues and topics presented in the webinar. We are grateful to our participants for their involvement.

This paper is a summary of the issues explored in the roundtable discussion. We have done our best to highlight points of consensus and to represent all sides of issues where our participants held differing views. Over the years, OurEnergyPolicy has brought together thousands of energy professionals from across the country to discuss, share, and drive forward smart energy policy solutions to help address the challenges presented by our changing world. We intend this summary to serve as a resource for policymakers and stakeholders working on transportation and energy independence.

Executive Summary

The United States' transportation sector is overwhelmingly fueled by products derived from crude oil—a total of 91% of our transportation sector is oil-dependent as of 2019.[i] And even with domestic oil production at an all-time high and imports the lowest in decades, the United States is still a net importer of oil and dependent upon global oil prices.

The oil crisis of the 1970s underscored oil's importance and led to the U.S. goal of "energy independence." The United States has made significant gains since then but has not yet fully achieved this goal. Since oil is an international commodity with very little competition, the United States is exposed to price manipulation from the Organization of Petroleum Exporting Countries (OPEC), as well as Russia and other countries. While global prices may be low currently, they will likely rise with new demand resulting from developing economies.[ii]

The goal of "energy independence" (perhaps better termed as "energy security") is not necessarily to become 100% import-independent; it is to diversify the sources of the United States' energy supply for national security and to ensure that Americans have access to affordable and reliable transportation fuel options. In this context, the roundtable examined alternatives to oil and discussed policy solutions to promote competition and fuel diversity in the transportation sector. To support national security and insulate the economy against price shocks, it is in the best interest of the United States to diversify the ways in which we power our transportation sector and work to more fully achieve "energy independence."

Alternative options for powering the transportation sector include electric vehicles, natural gas-based fuels, hydrogen, and biofuels. As with oil, each alternative has challenges that must be addressed if it is to meaningfully impact the U.S. transportation sector. While the electric vehicle (EV) industry is growing, there are questions as to the extent it will disrupt oil markets in the coming decades due to limitations on EV growth, uncertainty in oil demand growth forecasts, and the more than 20-year life of the average internal combustion engine vehicle. Natural gas is plentiful, cheap, and scalable, but its increased use as a transportation fuel may not be aligned with climate goals. Biofuels are an economical solution today, but their growth is also limited by many factors—including available land. Hydrogen faces challenges of infrastructure development and deployment. Petroleum demand is expected to grow globally and will still have a role in the United States—both as a fuel (as long as internal combustion engines are on the road), and as a raw material for uses such as petrochemical production.

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[i] U.S. Energy Information Administration, "Use of Energy Explained, Energy Use for Transportation," June 2, 2020, https://www.eia.gov/energyexplained/use-of-energy/transportation.php.

[ii] S. Dale and B. Fattouh, *Peak oil demand and long-run oil prices 2018*, Oxford, UK.: The Oxford Institute for Energy Studies, https://www.oxfordenergy.org/publications/peak-oil-demand-long-run-oil-prices/.

There are many options that could reduce U.S. dependence on petroleum in the transportation sector and encourage competitive markets. Examples include incentivizing flex-fuel vehicles, enacting a carbon tax, and providing government funding for research and development of new technologies in the transportation sector. Both government regulations and private sector actions have a role in advancing the transportation sector. Market-based solutions are important since private investors have control over the capital needed to deploy technologies at scale. The role of government, in this context, is to set the "rules of the game" on which the private sector is operating. Technology agnostic policies are favored by many as they drive innovation and competition for the best outcomes.

Reducing U.S. dependence on crude oil for transportation requires more than just increasing domestic oil production. It requires a broader approach that reexamines the ways we power transportation and ensures competitive markets for a variety of transportation fuels.

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1 - Introduction

Energy independence has been a goal of the United States since the 1970s oil crisis, when wars in the Middle East triggered petroleum export interruptions that rocked the U.S. economy with gasoline shortages and price spikes. The oil crisis made clear how dependent the U.S. economy was on oil and oil prices. Even in the absence of shortages, high oil prices reduce overall economic demand, can lead to market volatility and inflation of other products and services, and can trigger recessions.[1] Since the 1970s, the United States has eliminated nearly all petroleum from the electricity sector,[2] reduced reliance on petroleum in the chemicals sector, improved vehicle fuel efficiency, converted the heavy truck fleet to diesel, diversified import sources, and has become one of the top three producers of oil.[3] In 2019, the United States saw record domestic oil production, the lowest level of petroleum imports since 1996, and the lowest net petroleum imports since 1954, according to data from the U.S. Energy Information Administration.[4]

However, the United States' transportation sector is still overwhelmingly fueled by products derived from crude oil—with 91% of the transportation sector being oil-dependent as of 2019.[5] Even with domestic oil production at an all-time high and imports the lowest in decades, the United States is still a net importer of oil and is still dependent upon global oil prices. Since oil is an international commodity with very little competition, the United States is exposed to price manipulation from the Organization of Petroleum Exporting Countries (OPEC), as well as from Russia and other countries. While global prices may be low currently, they will likely rise with new demand resulting from developing economies.[6] Protecting the oil flow consumes roughly 16% of our defense budget,[7] and U.S. foreign policy (e.g., in the Middle East) is still captive to foreign oil interests.

To support national security and insulate the economy against price shocks, it is in the best interest of the United States to diversify the ways in which we power our transportation sector and work to more fully achieve "energy independence." OurEnergyPolicy convened a roundtable discussion of ten energy leaders from government, non-profit organizations, academia, law, and industry, in order to examine these issues and offer insights into potential solutions.

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[1] Federal Reserve Bank of San Francisco, "What are the possible causes & consequences of higher oil prices?" https://www.frbsf.org/education/publications/doctor-econ/2007/november/oil-prices-impact-economy.

[2] Fuel oil is still used as a fuel for back-up generation.

[3] U.S. Energy Information Administration (EIA), "Frequently Asked Questions" April 1, 2020, https://www.eia.gov/tools/faqs/faq.php?id=709&t=6.

[4] EIA, "Oil and petroleum products explained: Oil imports and exports," April 27, 2020, https://www.eia.gov/energyexplained/oil-and-petroleum-products/imports-and-exports.php.

[5] EIA, "Use of Energy Explained, Energy Use for Transportation," June 2, 2020, https://www.eia.gov/energyexplained/use-of-energy/transportation.php.

[6] S. Dale, and B. Fattouh, *Peak oil demand and long-run oil prices 2018*, Oxford, UK.: The Oxford Institute for Energy Studies, https://www.oxfordenergy.org/publications/peak-oil-demand-long-run-oil-prices/.

[7] Securing America's Future Energy, "The Military Cost of Defending the Global Oil Supply," Sept. 21, 2018, http://secureenergy.org/wp-content/uploads/2020/03/Military-Cost-of-Defending-the-Global-Oil-Supply.-Sep.-18.-2018.pdf.

2 - Energy Independence: Defining & Framing the Issue

Even though the United States now produces a large share of the petroleum it consumes, and is far less dependent on imports than it was in the 1970s, many of the original problems of import dependency remain. Even if the United States were to stop importing petroleum completely, we would still be dependent on global oil prices. Price decline bankrupts our oil industry, and price spikes trigger economic recessions. What is the solution and which aspects of energy independence matter the most? Participants offered several points:

Focus on energy *security*, not energy *independence*. Energy independence was a political slogan coined by U.S. President Richard Nixon at the height of the first oil embargo, and every president since then has pledged energy independence, except for President Donald Trump, who has focused on energy dominance.[8] However, focusing on energy *security*—the aim of combining multiple sources of energy supply to ensure national security—might get to the heart of our current goal more than "energy independence." Our goal is not necessarily to be 100% import-independent; it is to be less reliant on foreign countries that may not have U.S. interests in mind.

Focus on what American consumers care about—affordable, secure, and reliable energy access. Consumers do not particularly care where their fuel comes from. What they do want is cheap and reliable gasoline/energy. One participant recalled waiting for an hour in long lines to get gasoline during the 1970s oil shortages, saying, "We felt completely out of control." Access to fuel affects transportation, commercial activity, and daily tasks for millions of Americans. When OPEC and Russia manipulate global oil prices, this affects U.S. oil prices and the control that Americans have over their day-to-day lives.

Weigh the tradeoffs as we consider alternatives that can further reduce our oil dependency. If we move away from an oil-based transportation sector to an electrified transportation sector powered by renewable energy, we need to consider whether we are trading one dependence for another. China dominates supplies of rare earth minerals that are used to produce batteries, solar panels, and wind turbines. From an energy security standpoint, becoming dependent on lithium and other critical minerals for our energy needs could be as dangerous as our oil dependency. In addition, the United States is not 100% independent of imports in other industries, such as computer technology, cell phones, aircraft, and pharmaceuticals. What are the reasons for becoming completely energy independent? A focus on alleviating the negative consequences of import dependency rather than becoming fully "energy independent" may be a better goal.

Focus on energy independence in combination with our other energy goals. Why do we want energy independence? For some Americans, other goals for our energy sector take higher priority.

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[8] Justin Worland, "President Trump Says He Wants 'Energy Dominance.' What Does He Mean?" *Time Magazine*, June 29, 2017, https://time.com/4839884/energy-dominance-energy-independence-donald-trump.

Many want zero-carbon energy to alleviate the consequences of climate change. They want more (and better) transportation choices, especially for underserved communities. They care about health impacts from pollution. They care about keeping transportation dollars in-state to fuel the local economy. They want resilient energy systems that can withstand global economic turmoil of many kinds. Focusing on how to reach all these goals together may be a better approach than focusing on energy independence in isolation. Reducing U.S. dependence on global oil prices likely requires more than just increasing domestic oil production. It requires a broader approach that reexamines the ways we power transportation and ensures competitive markets for a variety of transportation fuels.

3 - Oil Alternatives

Electric Vehicles

Electrifying the transportation sector has become a popular path forward in recent years. From an environmental standpoint, electric vehicles (EVs) are a much better option than internal combustion (ICE) vehicles, one participant said. Due to coal retirements over the last few years, electricity sector greenhouse gas emissions have gone down drastically. Because of this, and because electric motors are much more efficient than internal combustion engines, EVs have a better carbon footprint than ICE vehicles, largely irrespective of where in the country the electricity is coming from. However, countries that produce the lithium and other minerals that we need for batteries and other energy technologies have a poor environmental track record. We may eventually need to confront this issue.

It is forecast that EVs will soon reach price parity with ICEs,[9] and the sector is growing. However, there is disagreement as to how much growth we can expect by 2030 or 2050, and how much that growth will disrupt oil markets due to limitations on EV growth, uncertainty in oil demand growth forecasts, and the more than 20-year life of the average ICE vehicle. Under a best-case scenario, one-third of the cars in the world will be electric by 2050,[10] according to EV market modeling from the Fuel Freedom Foundation. However, we are well under the curve right now, so EV penetration in 2050 will likely be lower. Challenges that EVs must still address include insufficient range, development of charging infrastructure, and increased demand on the electricity grid. A study from the National Renewable Energy Laboratory estimates that increased electrification, largely from EVs, has the potential to increase electricity demand by 38% by 2050.[11] Several participants said they expect only a slow continuation of existing trends; there may be an increase in the number of EVs on

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[9] C. McKerracher et al., *Electric Vehicle Outlook 2020*, Bloomberg New Energy Finance, https://about.bnef.com/electric-vehicle-outlook/.

[10] Fuel Freedom Foundation, "What cars will we be driving in 2050?" accessed September 3, 2020, https://www.fuelfreedom.org/cars-in-2050/#toggle-id-1.

[11] Trieu Mai et al, 2018, *Electrification Futures Study: Scenarios of Electric Technology Adoption and Power Consumption for the United States*, Golden, CO: National Renewable Energy Laboratory, NREL/TP-6A20-71500, https://www.nrel.gov/docs/fy18osti/71500.pdf.

the road in 10 years but only a small change in terms of what percentage of the entire vehicle fleet is electric. This may change slightly due to government policies, but with the time required to make infrastructure changes and turn over the existing fleet, change will likely take longer than people expect. Population growth is not likely to drive sales as only a small population increase is expected in the United States by 2030.

Participants made the following points:

Electric vehicles are not likely to take significant market share from oil. Although the EV industry is growing, global transportation fuel demand is also increasing as more and more people drive, a result of the rise in per capita gross domestic product (GDP) and a higher standard of living. As a result, transportation demand will continue to grow significantly, and it will not all be met by EVs. Even with large changes in the growth of the EV industry, a transition of the whole transportation sector to electric is likely to be incremental. There are still some regulatory hurdles (through the U.S. Environmental Protection Agency) that may need to be overcome for widespread electrification of vehicles, and turnover of the vehicle fleet will take time.

EVs cannot replace all uses for oil. Besides personal transportation, oil is also needed for commercial purposes such as shipping, air travel, and the production of petrochemicals—uses that do not currently have available or economical alternatives. Furthermore, older ICE vehicles will remain on the road for more than 20 years, even when the majority of new cars sold are electric. ICEs will be especially important in rural areas and/or areas that do not have as much access to charging stations. The overall penetration of EVs could depend on how quickly we build out the expensive and necessary charging infrastructure.

EVs are entering the market quite rapidly now, and most new cars on the road could be electric in 2030 (a contrasting view). A differing view is that technology adoption doesn't happen linearly—it happens very slowly and then, all of a sudden, goes quickly. By 2030, there could essentially be a phase shift where most new cars (passenger vehicles and light- and mid-duty vehicles) are electric vehicles. We are already seeing signs of growing momentum for the EV industry. Some countries in Europe have banned internal combustion engines by 2030 or 2035, and some areas of the United States are following suit; automakers are adjusting their production lines accordingly. As of now, there are only a few electric vehicle producers, and most produce small vehicles. However, we may soon have electric sport utility vehicles (SUVs) and multiple electric SUV and truck models to choose from. The vast majority of new passenger vehicles in coming years will be electric, and in 10 years or so, EVs may be the majority of all new vehicles. In addition, commercial fleets are shifting to electric. Pepsi, which operates one of the largest vehicle fleets in the United States is transitioning to an all-electric vehicle fleet, as are many other large companies.

Whether EV industry growth is fast or slow over the next 10 years, it is not likely to be an adequate replacement for all uses of oil. In terms of total transportation and total vehicles on the road in the United States and worldwide, oil will still have an important role in the near future.

Natural Gas

Even if the transportation fleet largely electrifies, liquid fuels will still be used for existing internal combustion vehicles, for aviation, petrochemicals, and agriculture. Natural gas is a cheap, plentiful, and scalable transportation fuel with, often, a lower price than oil. Reliance on oil price alone has proven to be detrimental to the industry. An additional revenue source from natural gas in transportation could protect the fracking industry from oil price swings. Participants gave the following viewpoints on the potential of various applications for natural gas:

Compressed natural gas is a valuable, potentially high-margin product that could be utilized much more than it is now, especially in the diesel market. It also has wider uses; for example, Egyptian taxis can run on both gasoline and compressed natural gas,[12] and there is a push by some to extend this technology to all new vehicles.

Ethanol can be made from natural gas. A study by Resources for the Future[13] indicates that with new technology and the current low costs of natural gas, ethanol could be produced from natural gas at a cost well below the cost of gasoline and of ethanol produced from corn. If natural gas-derived ethanol were to hit the market, flex-fuel vehicle owners could have the choice of purchasing gasoline, biofuel ethanol, or natural gas-based ethanol.

Outside of the transportation sector, natural gas can compete in the residential, commercial, and industrial sectors. We should ask ourselves: What is the most effective way to get the most reliability from our energy system? We might want to focus on achieving energy source diversity in several sectors combined, rather than in just the transportation sector.

Introducing more natural gas into the transportation sector may not be aligned with current climate goals. In contrast to the previous points, a participant said that the national conversation has largely moved on from natural gas as a transportation fuel. On the state level, many people are talking about how to take natural gas out of buildings, although, there may still be a role for it on the global level. As a first step in the policymaking process, the United States might want to determine how long it will continue to manufacture ICE vehicles before deciding how many resources to invest in natural gas as an alternative transportation fuel. The issue of natural gas-powered vehicles is one of policy and public opinion, not of technical feasibility.

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[12] Tarek El-Tablawy, "Egypt to Require New Cars to Run on Natural Gas, Sisi Says," *Bloomberg*, July 12, 2020, https://www.bloomberg.com/news/articles/2020-07-12/egypt-to-require-new-vehicles-to-run-on-natural-gas-sisi-says.

[13] A.G. Fraas, W. Harrington, and R.D. Morgenstern, *Cheaper Fuels for the Light-Duty Fleet*, 2013, Washington, D.C.: Resources for the Future, https://media.rff.org/archive/files/sharepoint/WorkImages/Download/RFF-DP-13-28.pdf.

4 - Policies

Policies to Encourage Competitive Markets

Participants suggested several policies and approaches to encourage competitive fuel/transportation markets. The natural gas boom is an example of a private sector success. Although the government was involved to some extent in early development of fracking technologies, refinement and commercialization were driven by risk-taking entrepreneurs and private companies. Policies should encourage competitive markets and innovation, so as to enable similar advances. Local policies should be considered and not only federal ones. Participants suggested the following options:

Incentivize Flex-Fuel Vehicles: Enact/continue policies that encourage the production of flexible fuel (flex-fuel) vehicles, such as a mileage credit to automakers. Flex-fuel vehicles can run on gasoline or a blend of up to 85% ethanol and 15% gasoline. There are a large number of flex-fuel vehicles on the road already, and the cost of making a flex-fuel vehicle is comparable to making a gasoline vehicle. Ethanol on the market today is produced from corn kernels, yet there is also the potential for it to be commercially produced from other plant sources or from natural gas.

Support Research and Development: Many of the challenges in the transportation sector could be solved through research and development programs such as those at the U.S. Department of Energy. For example, the department's Energy Storage Grand Challenge is tackling issues regarding recycling and producing a secure supply of critical minerals needed for batteries—used both for electric vehicles and for the electric grid.

Enact a Carbon Tax: Some participants suggested that putting a price on carbon could be a strong, first policy step if a main objective for diversifying the fuels market is to enable lower-carbon alternatives. A purpose of a carbon tax is to internalize—in the price of energy generation—the negative externalities to society that come from greenhouse gas emissions. As producers of carbon-intensive energy sources (such as oil) pay a carbon tax, lower-carbon energy sources (biofuel, hydrogen fuel cell vehicles, electric vehicles, etc.) are brought up to a level playing field by cost. A carbon price could drive oil companies to find uses for carbon and to advance carbon capture and sequestration technologies. This could be appealing even to those whose approach is to use as few policy interventions as possible, but issues remain, such as what should be done with the generated revenue.

In terms of decarbonization goals, China, India, and countries in Southeast Asia are expanding their energy demand at such a high rate that the United States' advances in reducing carbon emissions could be overshadowed by the carbon footprint of other countries. This doesn't mean that the United States shouldn't work to decarbonize energy use as quickly as possible, but it does serve as a reminder that the U.S. does not operate in isolation from the rest of the world, and that many countries and regions have larger populations than the United States and Europe. In terms of climate change, global challenges require global solutions.

Importance of Government Policies v. Private Sector Actions

Although there has been government funding for fracking and electric vehicle technologies, the growth in these industries has been significantly advanced by the private sector. Are government regulations or private sector actions the more important source of change in the transportation sector? Participants provided various perspectives:

- **There should be a balance of government regulations and private sector actions**. Market-based solutions are important, especially since private investors have control over the capital needed to deploy technologies at scale. However, some form of intervention by the government will be necessary.

- **Government sets the rules of the game board on which the private sector is playing.** The issue of regulation may be better framed as a question of the government's role rather than as a question of more or less government involvement. Government should set rules in a way that is aligned with public policy goals, and there is opportunity for governments at every level to improve the rules. Many rules/policies were designed 100 years ago and are outdated, and poorly designed starting rules/policies can undermine larger policy goals.

- **Set stable government policies that allow the private sector to have confidence in what the rules are going to be.** Establish those policies in a way that accomplishes our societal objectives, offers long-term consistency, and that minimizes the effort by the government to pick winners and losers.

- **Focus on incentives and promoting investment rather than mandates.** The more that policies can be technology-neutral and drive innovation and competition, the better the outcomes will be.

- **Government can have a role as an investor**. Many of the changes in the electricity sector right now may be happening from investor or consumer pressure, but government has, and can continue to have a role in advancing and supporting new technologies. As an example, the U.S. Department of Energy provides support through government-funded demonstration and deployment projects, often cost-shared with private industry companies, as well as through government-funded loans.

Most participants said they favor private sector action over government regulation but said that government still has a role.

5 - Conclusion

In 2020, the U.S. transportation sector is still oil dominant despite having made great progress in reducing our overall foreign oil dependency. Becoming more “energy independent” today—in terms of not only supply but global prices, as well—will require more than simply reducing imports or producing more oil domestically. It will require diversifying our energy sources beyond oil in the transportation sector. Momentum is behind the growing electric vehicle industry, although opinions differ as to how much market penetration will be likely by 2030. Natural gas-based products might also be a promising alternative transportation fuel.

Because of the COVID-19 pandemic, the oil and gas industry has cut back on its exploration and capital spending. One participant of our roundtable discussion predicted that as a consequence, by 2022-2024, we’ll probably have a major price spike, assuming that the economy has recovered, and that the rebound brings back demand. High oil prices could increase demand for ICE alternatives, especially electric vehicles, but the extent to which less established alternatives, such as fuel cell vehicles, would benefit is unclear. Enacting a Green New Deal or other federal policy could also change the picture, but technologies that are likely to succeed are those that can compete.

In the near-term (2020-2030), we may see only small changes in the makeup of the transportation sector, or there may be some surprises. Regardless, energy independence and energy security are factors to consider in our long-term energy goals for the stability and day-to-day well-being of Americans.