United States House of Representatives
Select Committee on the Climate Crisis

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"Cleaner, Cheaper Energy:
Climate Investments to Help Families and Businesses"

Questions for the Record

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1. **Ms. Jaffe, the Build Back Better Act makes it cheaper for Americans' next car to be an electric vehicle. More EVs on the road will reduce demand for oil. How would reducing demand for oil protect U.S. national security interests?**

For the last five decades, the world has experienced economic swings and geopolitical conflicts centered around the oil and gas commodity price cycle. In multiple periods historically dating back to the 1970s but including more recently, 2006-2009 and 2012-2015, rising global economic growth has been accompanied by a sharp rise in the price of oil, which in turn, created discontinuities and financial crises that have jeopardized U.S. national interests, economic health, and the well-being of lower income Americans. On all three fronts - energy markets, financial markets, and energy geopolitics – the geopolitical and economic outcomes of wild energy market oscillations have become intolerably high. We have seen multiple global financial meltdowns accompanied by rising social and economic inequity. The investment cycle in energy production capacity has tended towards a pro-cyclical pattern, contributing to greater volatility that intersects with geopolitical risk in increasingly cataclysmic ways. In 2008, oil prices hit $147 a barrel and U.S. economic growth fell precipitously. Over 3.6 million American jobs were lost between December 2007 and January 2009.

Attenuating the cycle in global oil demand by decoupling oil use from economic growth is the best way to prevent this kind of repeating crises from occurring over and over again. Multiple studies have shown that countries with lower energy consumption to GDP ratios experience less inflation-induced GDP losses. Reducing the oil intensity of the U.S. transport sector protects both individual consumers and the overall economy.[1] Achieving fuel diversity by adding more EVs to the U.S. transport sector is one major way to reduce the oil intensity of the U.S. economy and thereby insulate the U.S. economy from sudden, adverse oil price shocks and geopolitical leverage. Energy efficiency standards is another way.

[1] Mahmoud El-Gamal and Amy Myers Jaffe, Oil, Dollars, Debt, and Crises, Cambridge University Press, 2010

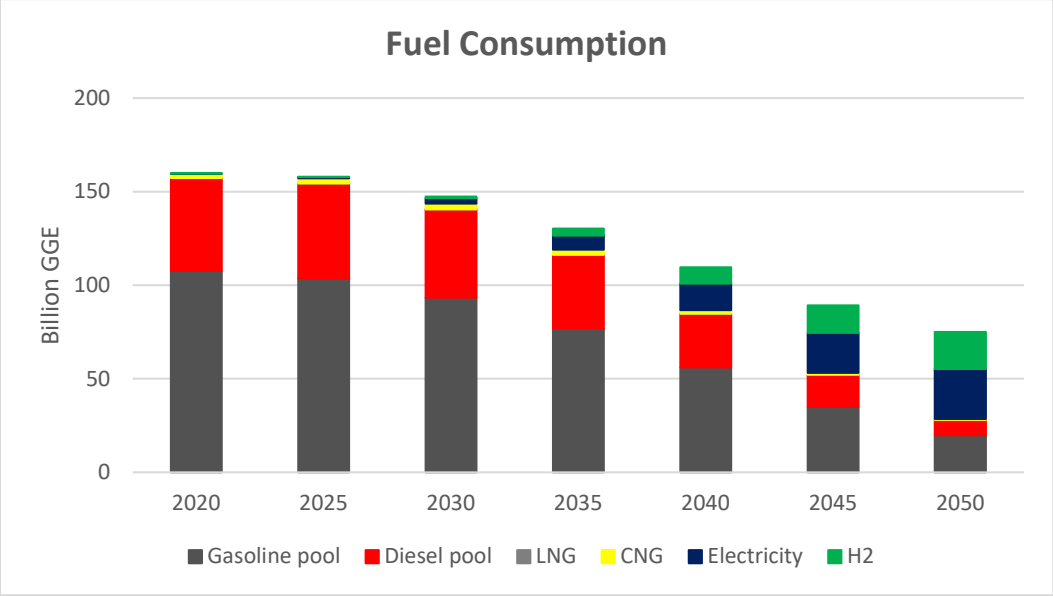
Continuing to maintain oil intensity in our transportation sector gives an opening to oil producing countries to interfere with the U.S. election process by undertaking temporary oil market supply cutbacks in hopes to boost U.S. gasoline prices to try to influence economic health and thereby election outcomes. Oil producers are similarly incentivized to try to raise oil prices to discourage U.S. environmental legislation by creating a false narrative that environmental regulation will lead to rising gasoline prices. Such misinformation confuses the issue because, of course, basic supply demand principles are clear: Less demand for gasoline will lead to lower prices, not "cause" higher prices. The less demand there is for oil and the more decoupled road fuel is from high dependence on oil, the more elastic the price of fuel will be; that is, consumers will have more power to shift among different diverse fuel sources. The more decoupled economic activity is from oil, the less monopoly power OPEC has in markets.

EVs are an effective tool to reduce OPEC market power and to decouple the U.S. economy from the ill-effects of oil price shocks. U.S. oil production is millions of barrels a day too low to meet U.S. domestic demand for road fuel. Even if U.S. oil production could recover to over 12.9 million b/d seen in November 2019, up from 11.6 million b/d currently, U.S. domestic oil supply would still fall short of covering current U.S. oil demand of roughly 20 million b/d. Adding electric vehicles to U.S. fleets would bring U.S. oil demand closer in balance with demand. The U.S. currently allows the exports of gasoline and diesel fuel. U.S. refined product exports average around 5 million b/d/.

EVs, by reducing U.S. domestic oil demand, would bring U.S. oil use and production into closer balance. Exported surpluses increase competition globally to lower world oil prices. As other countries also increase EV sales, the need for oil globally will also be reduced and the oil intensity of the global economy will fall, further adding further to energy security and reducing the market power and geopolitical influence of OPEC and Russia.

Recent calculations by UC Davis Institute for Transportation Studies (ITS-Davis) highlights the potential of electric vehicles to lower U.S. oil use. The study of low carbon transition for cars and trucks in the U.S., by Lew Fulton, Marshall Miller, and Qian Wang, estimates that EVs could reduce U.S. gasoline consumption from 103.7 billion gallons of gasoline equivalent (billion GGE) in 2025 to 56 billion GGE by 2040 or the equivalent of a reduction of one million barrels a day of oil equivalent. Diesel use could drop from 50.6 billion GGE to 29 billion GGE by 2040, or the equivalent of 460,000 barrels a day of oil equivalent. (See Figure 1 below).

Figure 1



Source: Energy Futures Program, UC Davis

2. There is a global competition to build the vehicles of the future. How would incentives for domestic manufacturing of clean vehicles help the United States compete and how would that bolster our ability to protect our national interests?

Leading in energy and vehicle innovation ensures that the U.S. military and space programs have a technological edge over geopolitical rivals and lowers the cost of addressing climate change. It has spurred new markets, industries and companies in the United States in recent years.

Without public funding and related political leadership to guide optimal outcomes, the United States could fall behind other nations that have well-developed, national initiatives such as China and Europe. A U.S. failure to address the challenge of the emerging race in manufacturing of smart and clean vehicles would be analogous to the United States opting to ignore the risks that the Soviet Union's superiority in space in 1957 might have threatened America's national security. Imagine today if the United States had inferior access to satellite and other kinds of sophisticated defense related aerospace technologies. That is, in effect, what it would mean if the United States does not address China's efforts to dominate the new digital energy and vehicles market with its own brand of smart drones, cyber surveillance technologies, and automated vehicles and electric networks that will not only underpin future economic trade in clean energy products, but also boost their relative capability in asymmetric warfare technology. The U.S. Pentagon has recognized this future and began funding research in automated machines and vehicles in 2004.

The U.S. Pentagon began funding an effort on the development of autonomous vehicles in 2002. Since then a new geostrategic race to dominate critical digital technologies for automation and electric mobility has begun in earnest. While most Americans think of such products as the latest in experimental commercial endeavors by Waymo to foster ride hailing services in self-driving cars in places like the suburbs of Arizona and efficient drone and electric AV delivery by Nuro or UberEats, major militaries are now competing in the spheres of autonomous vehicles and drones, tapping artificial intelligence, machine learning, and massive data analytics, to gain an edge in asymmetric warfare. The U.S. Congress set a goal that by 2015, "one third of the operational ground combat vehicles of the U.S. military be unmanned."[i] That deadline has come and gone but now the United States faces intense competition in this space from China.

China's industrial policy is aimed to deliver a range of technologies that will dominate the future global economy, including 5-G networks, solar panels, battery storage, electric and autonomous vehicles, drones, and commercial robotics, high performance computing/artificial intelligence applications, and high-speed rail. Many of these technologies are fundamental to superiority of weapons systems. Since Beijing first announced its Science and Technology initiative in 2006, it has launched the world's fastest supercomputer and become the world's largest drone manufacturer.

China's unparalleled size as the world's largest consumer country gives the country an economic and strategic advantage. The size of China's online shopping industry now totals over $1 trillion. Its car market is also the world's largest. China produced 72 percent of the world's lithium-ion batteries in 2019, while U.S. manufacturing accounted for only 9 percent. China dominates the market for production of battery chemicals, cathodes, anodes, and battery cells.

China hopes to utilize its consumer spending power to attract innovative companies and to attain top status in critical strategic industries in clean energy. Innovative U.S. companies ranging from those that with technologies to 3D print cars to makers of advanced materials have shifted to China after failing to find public funding in the United States.

China has been particularly aggressive targeting smart, connected vehicles technology including self-driving cars and has engaged in espionage against U.S. companies to gain access to American technological knowhow. The dual use nature of the technology raises the stakes, as well as vulnerability to cyber-attack. U.S. Justice Department officials have focused on the problem of intellectual property theft, but it is not sufficient to close the door to Chinese intellectual property theft. What is needed is an affirmative strategy that paves a positive response to how the public sector can promote the superiority of America's technological edge and broader the participation of more American workers in the process. For its part, China is focused on winning the race to install 5-G networks in its major cities, in part so it can attract self-driving automotive industries that might be reluctant to miss out on the opportunity to pilot their wares more quickly at scale. The United States currently lags behind.

Domestic advanced vehicle manufacturing must be part and parcel of any effort that the United States makes to maintain its economic, military, and diplomatic stature as a global world power. The global electric vehicle market, estimated at $162 billion in 2019, and is projected to hit $1 trillion by the late 2020s. It is hard to fathom how the American car industry can remain globally competitive without a large push to participate in this growing sector.

Recognizing the importance of advanced vehicles to future economic competitiveness and security, the European Union, worried about future dependence on China for its clean energy future, has committed to a $1 trillion initiative to create an internationally competitive battery supply chain, including mining, recycling, and manufacturing to its own shores. France and Germany have announced a $5 billion to $6.7 billion consortium of automobile and energy firms to enhance Europe's electric car battery manufacturing capability. The European Union will be providing public subsidies. Even with the COVID-19 pandemic, European leaders are emphasizing European stimulus packages will support the planned shift to clean energy. The European Council reaffirmed that the roadmap for economic recovery will feature the green transition and digital transformation with a "central and priority role in relaunching and modernizing our economy."[ii]

The United States needs a concerted effort to ensure that its car industry remains internationally competitive and is producing the vehicles that will be demanded in global markets in the coming years. Given large interventions in domestic advanced automobile industries by governments of all other major economies, it behooves the United States to keep pace to avoid the risk of not only further job losses in the sector, but also a deterioration of its supremacy in manufacturing and utilizing advanced, automated vehicles for national defense purposes.

3. **Some of the climate investments in the Build Back Better Act could also help us meet our short-term energy needs, such as providing incentives to capture methane emissions from fossil oil and gas production. We're expecting high natural gas prices in many parts of the country this winter. Should Congress encourage oil and gas companies to stop methane leaks?**

Methane leaks are wasteful and environmentally damaging. It is critical that methane leakage into the atmosphere be ended to reduce U.S. greenhouse gas emissions, and specifically methane emissions, in line with targets set forth at the 2021 Glasgow climate meetings. In some cases, methane emissions result from poor maintenance of equipment. In other situations, routine flaring and venting stems from poor or sloppy corporate planning, where oil fields are brought online without consideration of proper coordination to an evacuation strategy for the associated gas (eg it is either just assumed it will be "ok" to flare or vent gases that have no transport access or market uptake despite rules to the contrary or companies fail to find an alternative solution when there is an unexpected delay in construction transport infrastructure).

Either way, it is inexcusable to literally burn natural gas into the sky as a routine operation, regardless of whose fault the transportation bottleneck is. The sky should not be used as a garbage dump for natural gas to allow private companies to make money producing associated oil. Companies are looking increasingly at other options for stranded natural gas production such as connecting it to impromptu data centers or transportation fuel applications to find outlets for gas that is lacking buyers.

Colorado has already implemented strict regulations on methane requiring oil and gas companies to find and fix methane leaks and to install technologies to limit or prevent emissions at existing operations. PHMSA and Department of Interior should follow suit. Companies operating in Colorado have had no difficulty complying with these stricter rules, which cover not only production wells but also tanks and performance standards for pipelines. Technologies including sensors, infrared cameras on drones, and

satellite imagery are being used by industry to identify sources of leaks. The use of these technologies creates jobs and improves environmental practices.

Methane leakage from oil and gas operations is an important source of greenhouse gas emissions in the United States. Methane emissions from the energy sector is recorded at 267.6 million metric tons of CO2 equivalent in 2019, according to EPA estimates. However, recent scientific studies indicate that this estimate is likely too low.[iii] Federally-mandated methane restrictions from the U.S. oil and gas sector could reduce the methane emissions equivalent to 920 million metric tons of CO2 between now and 2035. Some of that methane (roughly 41 million tons annually) could be captured and sold to consumers, helping lower energy costs to households and businesses. Some of the largest U.S. natural gas companies, such as EQT and Apache, are already moving to end methane leakage, meaning their operations will already be compliant with any new federal restrictions. It is desirable for the rest of the industry to take this path to preserve access to European and Asian liquefied natural gas markets where requirements for certification of low carbon intensity are becoming more prevalent.

4. **Do you agree that fossil fuel production companies should be responsible for preventing pollution from the production infrastructure they build? And should those same companies also be responsible for appropriately decommissioning energy infrastructure they build and remediating any environmental impacts?**

Taxpayers should never be saddled with the cost of appropriately decommissioning energy infrastructure and remediating environmental impacts instead of the companies that generated the profit from operating that infrastructure.

Stronger assurance regulations are needed to deal with an increasing burden of decommissioning liabilities. Congress should support Interior's proposed fitness to operate standard for evaluating potential lessees based on companies' environmental and safety records, as well as credit worthiness to sustain liabilities that might accrue following an accident like the one seen last year in Newport Beach, California, involving facilities of a highly leveraged, indebted private oil company. All companies should be required to underwrite adequate bonding for accidents and decommissioning as part of their licensing and permitting process. Increasing bond requirements will become increasingly imperative as the energy transition gains pace and more fossil fuel facilities reach retirement age. Bankruptcy should not be the mechanism oil and gas leaders and their investors use to bypass the business costs of winding down operations.

5. **Why might it make sense to increase royalty rates on oil and gas production within federal lands and waters?**

U.S. oil and gas development on federal lands is structured on concessionary terms where private investors carry the risk of exploration and the government is shielded from that risk, collecting instead fixed royalties and taxes. Under this system, the investor is left with all of the windfall if oil prices rise significantly, but equally all of the downside if prices collapse. Currently, U.S. royalty rates are 12.5% for onshore leases and $18.7% for offshore leases, depending on depth.

Consideration of the appropriate level of royalty rates is a function of a number of factors, including the competitive standing within the global market for fiscal terms for exploration and production opportunities. U.S. exploration companies consider the overall potential internal rate of return (IRR) that can be achieved in capital investment across a variety of geographies and locations. The size of potential resources, political and currency risk, and the competitiveness of overall fiscal terms influence an exploration company's decision to select one opportunity over another. Federal royalty rates are just one element that determines the attractiveness of a U.S.-based resource play to potential drillers.

To answer the question of whether it might make sense to increase royalty rates on oil and gas production within U.S. federal lands and waters, the goals to that increase must be considered. Trade-offs between competing 'intentionalities' need to be considered. An increase in royalty rates can be used to achieve the following aims:

1) To increase federal government revenue
2) To adjust U.S. fiscal terms in alignment with global levels
3) To ensure the federal government is better compensated during periods of high oil prices and plentiful windfalls
4) To discourage development of marginal acreage and incentivize capital investment only in the most prospective regions
5) To slow down oil and gas development by raising costs to investors

On a commercial basis (not considering other goals), the optimal level for royalties on U.S. federal lands should reflect a level (when combined with other taxes and charges) that is competitive with fiscal terms offered globally. Too high a royalty rate could prompt exploration companies to shift capital spending to other countries with more competitive terms for exploration. Too low a royalty rate compared to international locations means the U.S. federal government is "leaving money on the table" so to speak and has room to increase its take. It should be noted that royalties are just one element of exploration fiscal terms.[iv]

In assessing the benefit of changes in the level of royalties for oil and gas development on U.S. federal lands, it is important to consider the purpose of the change. If the federal government is considering a royalty increase to improve revenues from its leasing programs but wants to do so in a manner that promotes optimum development of core producing areas, it should consider a sliding scale approach that varies the royalty rates based on resource potential and level of oil prices. A variable royalty rate that would increase in times of high oil prices would allow the federal government to garner more revenue in a manner that would have less negative impact on the level of investment. For example, a higher royalty rate could be borne easily in markets where oil prices surpass $70 or $80 a barrel than in markets where oil prices are averaging $30 or $40 a barrel. Some international fiscal regimes are structured around a sliding scale of royalties and taxes that are tied to changing level in oil prices. Generally speaking, higher royalty and tax rates for exploration and production could also serve to discourage investment in marginal, low prospective production regions.

References Page

[i] Brown, Meta, "Driverless Cars, Analytics and Tough Standards for 21st Century Innovation," *Forbes*, August 29, 2015, https://www.forbes.com/sites/metabrown/2015/08/29/driverless-cars-analytics-and-tough-standards-for-21st-century-innovation/#68cd340445a6

[ii] A Roadmap For Recovery: Towards a more resilient, sustainable and fair Europe, https://www.consilium.europa.eu/media/43384/roadmap-for-recovery-final-21-04-2020.pdf

[iii] Jeffrey S. Rutherford et al, *Nature Communications*, August 2021 https://www.nature.com/articles/s41467-021-25017-4

[iv] https://www.boem.gov/sites/default/files/oil-and-gas-energy-program/Energy-Economics/Fair-Market-Value/2018-GOM-International-Comparison.pdf