United States House of Representatives
Select Committee on the Climate Crisis

Hearing on June 30, 2021
"Transportation Investments for Solving the Climate Crisis"

Questions for the Record

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The Honorable Kathy Castor

1. **Mr. Van Amburg, your testimony makes it clear that with the right Congressional investments, we can deploy significantly more zero-emission vehicles. Similarly, the 2035 Transportation Report from the University of California Berkeley finds that that there are "no insurmountable barriers" to significant scale-up of EV supply chains. The report also highlights the potential for recycling to improve materials efficiency and create jobs. How is the electric vehicle industry responding to supply chain challenges around critical minerals, and how can we strengthen electric vehicle supply chains and support American workers?**

Chair Castor, thank you very much for the question. Several of these topics were raised during the hearing on "Transportation Investments for Solving the Climate Crisis" and CALSTART and its nearly 300 member companies are very involved in the underlying issues.

First, there is no more critical supply chain issue than the production and manufacturing of energy storage – batteries– in the United States. CALSTART believes this needs to become a strategic priority for the nation and the Biden Administration has signaled strong intent here. This manufacturing also needs to take place at the core level of the battery cell, which is the fundamental building block of batteries and where the core value of the battery lies. Currently most cells are manufactured in Asia, predominately China, South Korea and Japan, and Europe has been investing heavily and will become a major manufacturing center over the next decade.

The U.S. is not keeping up, despite the fact that some companies, such as Tesla, are producing packs at large volumes and are committing to manufacture cells, and the US Department of Energy has outlined key steps to succeed[1]. As part of directing focus and funding to this need, CALSTART has formed the non-partisan **US Battery Leadership Initiative**[2] to secure the nation's long-term competitiveness in this critical supply chain component via effective federal policy and investment. Some of the core priorities of the Initiative include:

[1] https://www.energy.gov/articles/fact-sheet-biden-harris-administration-100-day-battery-supply-chain-review
[2] https://calstart.org/securing-americas-leadership-in-battery-technology-and-supply-chain-operations/

- *Investment in Battery Innovation:* The US has been a leader in developing new battery chemistries and designs and needs to remain at the forefront of this dynamic and rapidly changing industry segment. We call for:
    - Materials Research: **$2.3B** for early-stage research and development on battery electrodes, electrolytes, cells and chemistries at U.S. Department of Energy (DOE).
    - DOE National Lab Consortium: **$2B** to establish DOE-led Battery Manufacturing Laboratory Consortium, modeled after the Grid Modernization Laboratory Consortium.
    - Industry-Led Manufacturing Institutes/Hubs: **$500M** to create industry-led manufacturing innovation institutes modeled after the Manufacturing USA innovation institutes.

- *EV Battery Manufacturing Incentives*: We must do more than just create the next generation of technologies, we must manufacture them in America to reduce costs and control supply chain disruptions as well as create leading-edge US jobs. We support:
    - Battery and EV Component Supply Chain Manufacturing Grants: **$5B over 10 years** for 1:1 cost share match with private sector for establishing or enhancing battery and EV component supply chain manufacturing facilities
    - Investment Tax Credits:
        i. Passing the "American Jobs in Energy Manufacturing Act of 2021" introduced by Senators Debbie Stabenow (D-MI) and Joe Manchin (D-WV) to reauthorize the 30% Section 48C investment tax credit (ITC) for EV battery manufacturing, assembly lines, and facility buildout and retooling.
        ii. Creating a 30% ITC to support EV battery manufacturing equipment-level investment by firms of all sizes to bolster participation in and competitiveness of a strategic domestic supply chain.
    - Direct DOE Loans: Expand the DOE Advanced Technology Vehicles Manufacturing (ATVM) Program to emphasize that projects supporting the light-duty and medium- and heavy-duty vehicle EV supply chain are eligible for direct loans.

- *EV Battery Workforce Development*: We must both plan a smart and just transition to these new technologies but train and support American workers to take on these critical jobs. We outline these steps:
    - Training: **$100M** to create new training programs to target workers that have lost jobs because of the clean energy transition underway
    - Standards: **$100M** to develop industry standards to ensure battery manufacturing workers are fully trained and qualified across the EV battery value chain.

The timing for these actions is critical, as the industry is poised on the cusp of the emergence of a next generation of battery technologies, such as solid-state batteries, that can become the basis for a renewal of American manufacturing leadership in the battery technologies the world will need next.

As a second point to address your question, managing the full life cycle of batteries and other electric drive components is an important consideration that is a key part of the manufacturing process and the rich value proposition of these products. Batteries are not simply "manufacture and recover" products. The life cycle of batteries is a complex one, from the core raw materials (which we will discuss later), to the first life in a vehicle or other use, to its second life re-use potential in other applications, such as grid storage, micro-grid power and back-up power, to its eventual re-conditioning and finally recycling/materials recovery.

It's important to note that a battery pack can power a car, truck or bus for over a decade while still retaining 70-to-80 percent of its capacity. This means that while it may no longer be as valuable as a vehicle component, it can perform other and multiple on-going valuable roles. For example, these can include providing off-grid renewable energy storage during high-production periods or providing home storage combined with solar (for example, Nissan has designed Leaf vehicle batteries to be re-purposed for a second life[3]).

Different battery chemistries – the core material combinations from which they derive their storage capabilities – have different re-manufacturing, re-use and recycling needs. At this point, most energy storage is based on lithium as a core material, combined with other valuable materials. Several CALSTART member and other companies are focusing on this space not as a waste issue but as a valuable part of the full electric vehicle industry supply chain. For example, members Redwood Materials[4] and Li-Cycle[5] have both invested in facilities to make batteries a fully "closed loop" supply chain, able to retrieve, recycle and recirculate 95 percent or more of raw materials such as cobalt, copper and nickel from end-of-life cells.

Third, concerns have been raised surrounding sourcing of strategic materials, such as rare-earth minerals, for the EV supply chain. It is certainly appropriate to raise these issues – indeed, if we had at the beginning of fossil fuel use been more questioning of the massive impacts caused from sourcing, extracting, transporting, distributing and burning petroleum products we might have avoided today's climate crisis. That said, some of the issues raised during the recent Select Committee hearing were based on old or out-of-date information on materials being used and their sources. As component and battery volumes increase, the EV industry is refining product designs for cost and sourcing issues to reduce or render some of the concerns moot.

For instance, while it is true that China controls a significant supply of some key rare-earth materials used in some common electric motor designs (permanent magnet motors), the industry is responding in several ways. The U.S. was until the 1980s a major supplier of these minerals; several companies are investing in this process again domestically, either in raw or recovered materials. U.S. allies, such as Australia, are also emerging as strong alternative producers.[6] Several manufacturers are already shifting to other motor designs that greatly reduce the use of such materials or are not dependent on them, such as using alternative metals in the motor

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[3] https://global.nissanstories.com/en/releases/4r

[4] https://www.redwoodmaterials.com/

[5] https://li-cycle.com/?gclid=Cj0KCQjw6s2IBhCnARIsAP8RfAhUcXIbrRxfXiCP8ed94QQJGYiW9AdVLbto-JM0fJ3vXqzO_UAkKYMaAuwlEALw_wcB

[6] https://www.cnbc.com/2021/04/17/the-new-us-plan-to-rival-chinas-dominance-in-rare-earth-metals.html

windings or AC induction and switched reluctance designs, which in many cases are strengths of U.S. manufacturing.

When it comes to strategic sourcing of materials for batteries, the shift may be occurring even faster. Tesla has recently announced plans to eliminate cobalt in its batteries, which has the additional benefit of reducing cost.[7] Lithium is a material for which the supply chain is diverse, including Australia, Argentina, Bolivia and Chile. The U.S. itself actually has some of the largest world reserves of lithium and focusing on sustainable extraction and processing practices for U.S. assets should become a major focus. Indeed, there are also opportunities for re-use and re-purposing of U.S. tin and other mines to lithium production, giving mining communities new jobs and economic life. North Carolina's Piedmont Lithium[8] is one example of this innovative approach.

Finally, CALSTART would stress that one of the most powerful enablers of building a strong electric vehicle supply chain and U.S. jobs is to build and support the domestic market for these vehicles and place a priority on American production and use. We strongly recommend, and the Select Committee's Majority report has supported in its recommendations, the enactment of a point-of-sale purchase incentive for commercial vehicles, through a "grant-in-lieu-of" design in the tax code or directly. Such an incentive would jump-start the domestic market for these vehicles, justify industry investing in production, maintenance and infrastructure and create a supply chain representing thousands of U.S. jobs.

2. **Mr. Van Amburg, you testified that electric vehicles can act as resources for our electric grid, highlighting a way in which transportation decarbonization can support electricity decarbonization. Electricity decarbonization is also critical to transportation decarbonization. Recent analysis from BloombergNEF confirms what many other studies have shown: that electric vehicles produce significantly less carbon emissions than conventional fossil-powered vehicles on a lifecycle basis, and that the gap will only grow as more clean energy is deployed. Do you agree that electric vehicles are significantly less polluting than conventional vehicles? Will the carbon intensity of electric vehicles continue to decrease as we transition to a net-zero electricity sector and expand American battery manufacturing?**

Thank you, Chair Castor, for this question. There are multiple elements to it, so let me begin with the issue of decarbonization. Yes, multiple research studies have confirmed that over their full life cycle, electric vehicles are significantly lower in carbon emissions than conventional internal combustion engine vehicles.[9] [10] According to the most recent study from the International Council for Clean Transportation (ICCT), the reduction is 60-68 percent lower than combustion vehicles in the United States, 66-69 percent lower in Europe and lower in all other regions even today. This even includes cases in regions where power production is heavily coal-based.

[7] https://www.theverge.com/2020/9/22/21451670/tesla-cobalt-free-cathodes-mining-battery-nickel-ev-cost
[8] https://piedmontlithium.com/
[9] https://theicct.org/publications/global-LCA-passenger-cars-jul2021
[10] https://www.transportenvironment.org/what-we-do/electric-cars

Electric vehicles will also continue to improve in their ability to drastically reduce carbon over time. The reason for this is relatively simple: the electrical power grid is rapidly decarbonizing worldwide, including in the United States. Besides the critical emissions reduction imperative, simple economics are also accelerating this change. It is now cheaper to install renewable solar and wind power production than to operate fossil fuel power plants for nearly half the world's power production, and this is increasing yearly.[11]

Several factors are involved. The electric vehicle powertrain is significantly more efficient than an internal combustion powertrain in turning energy into work[12]; studies see this as from between two and a half to five times more efficient. The core fuel is lower in carbon than conventional fuels and is becoming increasingly decarbonized over the next two decades (several jurisdictions, including California, have set goals of fully decarbonized grids by 2045[13]). The full life cycle is lower in carbon, including materials, manufacturing, operation and recovery. Importantly, in operation these vehicles have zero tailpipe emissions and are also lower in overall criteria, or smog-forming, emissions. This is a critical issue for equity in terms of the ability of large scale deployments of electric vehicles to significantly and quickly reduce emissions impacts on low income and communities of color which have traditionally born a disproportionate burden of transportation emissions. Zero emission commercial vehicles in the goods movement sector can be a particularly powerful strategy for this result.

The second part of your question is just as important. Zero emission (electric drive) vehicles can be a significant enabler and supporter of a deeply and fully decarbonized grid. This is true for a variety of reasons.

Providing connections and power to electric vehicles creates an entirely new user base across which to spread fixed costs in the utility industry. Over time this should lead to stabilized or even reduced costs to consumers because of a much broader customer base.

Electric vehicles, especially commercial vehicles at fleet sites, such as bus yards and truck depots, often benefit from locating energy storage on site to buffer the grid from peak demand loads as well as to store cheaper or renewable energy, such as from solar arrays, during off peak times. Creating a network of these distributed storage and generation assets, also known as distributed energy resources (DER), are critical elements for a modernized grid. They provide not only distributed storage to collect renewable energy during production peaks (such as during peak daytime solar hours) while also providing greater resiliency and stability to the grid by having backup and additional short-term generation assets, as well as ancillary services such as voltage stabilization. Utilities are only just starting to explore and integrate these assets. They could have been powerful tools to help manage impacts on the grid from recent freezing weather and fire events induced by climate change extreme weather.

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[11] https://www.bloomberg.com/news/articles/2021-06-23/building-new-renewables-cheaper-than-running-fossil-fuel-plants

[12] https://www.nrdc.org/experts/madhur-boloor/electric-vehicles-101

[13] https://www.npr.org/2018/09/10/646373423/california-sets-goal-of-100-percent-renewable-electric-power-by-2045

The vehicles themselves can also be powerful sources of a renewable grid strategy. Several electric bus manufacturers are offering optional two-way power transfer technology in their buses to enable vehicle-to-grid (V2G) capabilities. Navistar's IC Bus is actually providing this V2G capability as a standard feature.[14] Manufacturers see this capability as a powerful emerging feature. Ford has excited the world with its new electric F-150 Lightning pick up truck. In addition to its enticing range (230 miles standard) and field power generation (multiple power outlets), it also has the capacity to power a home for up to three days from its battery pack. Ford is planning to also introduce technology to allow homeowners to use the truck as a buffer to store abundant renewable electricity when it is cheap and use it during higher cost periods.[15] EVs will be a core enabler and asset of a modernized, resilient and renewable grid.

3. **Mr. Van Amburg, your testimony highlights incentives that will support deployment of zero-emission vehicles. For decades, the U.S. tax code has provided the oil and gas sector billions of dollars in subsidies. For example, oil companies have been able to write off "intangible drilling costs" since before World War I. These subsidies have a high cost for Americans—nearly $650 billion in 2015, according to a report from the International Monetary Fund. How does Congressional support for the deployment of zero-emission vehicles create benefits for all Americans?**

Chair Castor, this is an important topic, thank you for raising this. The fossil fuel industry continues to benefit from substantial incentives, subsidies, tax benefits and other support that are no longer aligned with smart policy for climate, air quality or the future of U.S. jobs. It is worth pointing out one continuing source of undocumented subsidy that comes via the deployment of thousands of American men and women in the armed forces to patrol and protect oil supply lines worldwide, a risky and costly endeavor.

On the electric vehicle front, incentives to jump-start the electric vehicle market would have significant direct benefits for Americans domestically via:

- Cleaner local air quality immediately due to zero emissions from the tailpipe;
- More quickly stabilizing the worst climate impacts that we are already facing, and
- Creating a new generation of jobs in design, engineering and manufacturing throughout the supply chain, including hyper-local jobs in installation and maintenance of recharging and refueling infrastructure that would take place directly in our communities and towns.

One state's example is quite illustrative on this issue. California has established policies to require electric vehicles and also instituted significant investments for purchase incentives, infrastructure installation and manufacturing support. There has been a direct correlation between these policies and investments and the growth of companies and jobs manufacturing and supporting these components, vehicles and their service in the state.[16]

America benefits strategically, as well. Electric vehicle technologies have become the new high ground for global competition as most major economies, in particular China and the European

[14] https://www.busandmotorcoachnews.com/ic-introduces-electric-school-bus-in-2-week-tour/
[15] https://media.ford.com/content/fordmedia/fna/us/en/news/2021/05/19/all-electric-ford-f-150-lightning.html
[16] https://calstart.org/calstart-california-zev-jobs-study/

Union, are investing heavily in this technology via purchase incentives, production support and infrastructure deployment. The U.S. needs to invest to maintain global competitiveness in this strategic technology. America has long led the world in inventing leading technologies in electric drive, including core components of energy storage batteries. But then we have ceded manufacturing leadership to other nations. We cannot afford to let this continue.

When it comes to clean air, electric vehicles are overall significantly cleaner even including powerplant emissions and have zero emissions from the vehicle themselves.[17] As electricity production becomes increasingly based on renewable energy, this gap and benefit only increases.

4. **Mr. Van Amburg, recent analysis from the Congressional Budget Office finds that a $100 annual fee on electric vehicles would cover less than 2% of the shortfall in the Highway Trust Fund, confirming that EV fees are not a solution to the shortfall. Furthermore, a report from the Institute of Transportation Studies at the University of California finds that an annual electric vehicle fee of $100 could decrease EV sales by 24%. Given the health, environmental justice, and climate benefits of zero-emission vehicles that you identified in your testimony, do you agree that Congress's near-term focus should be on incentivizing, rather than disincentivizing, EV adoption?**

This is an important and misunderstood issue, Chair Castor, and worth discussing. While Congress needs to address the Highway Trust Fund shortfall, this is more of a structural issue with the fund itself that is not at all related to electric vehicles. It will also not be addressed by penalizing electric vehicles with a flat fee not related to their impact. Quite frankly, the approach is a distraction being used by some as a way to delay or disincentivize electric vehicles.

There are several approaches that could work better. The Trust Fund is currently funded through fuel fees applied by paying at the pump. Rather than levy a flat fee on an EV, one could instead create more of an apples-to-apples situation and apply the equivalent per gallon Trust Fund fuel tax converted to electricity or hydrogen at the point of charge or refueling. This would at least treat EVs equally, and not unfairly.

An even more equitable way to restructure the Highway Trust Fund might be to allocate costs by use and impact. Vehicles driving more miles, and causing more impacts by weight, emissions and climate and energy impacts, could pay more than those causing fewer impacts. In any event, the Trust Fund is broken; it needs a structural fix, not a distraction that is not a fix. We support real solutions.

But to return to your core question; yes, CALSTART and its nearly 300 member companies and agencies wholeheartedly agree that now is the time to be investing in and growing the EV market and supply chain, and its resulting benefits to America. We have worked closely with this Select Committee to highlight the key areas of highest focus where these investments can do the most good:

- Purchase incentives for electric vehicles (battery electric and fuel cell electric) that use the right tool to support the right market segment, from passenger cars (tax credits), to

[17] https://www.eea.europa.eu/highlights/eea-report-confirms-electric-cars

transit buses (though structural changes in the FTA purchase formula and through grant programs such as Low and No Emissions) and for commercial vehicles (point-of-sale incentives, as called for by President Biden[18] [19]);

- Infrastructure investments for passenger cars, transit buses and commercial vehicles both via the tax code and through accelerated grant programs, including funding clean fuel corridors through the Federal Highway Administration[20]; and
- Funding via the Department of Energy and the Department of Commerce for continued technology improvement, innovation, deployment validation and manufacturing support.[21]

In summation, these investments and incentives, proven out in the laboratories of the States and in other regions of the world, make up a powerful portfolio of progress for the United States to jumpstart the domestic electric vehicle industry. They will create a powerful economic driver for a new generation of jobs, focus clean air action and faster outcomes in communities most in need of them, and make the nation globally competitive and a net exporter of the advanced technologies and products the world will need for the decades of the climate battle to come.

[18] https://calstart.org/administrations-2022-budget-request-reflects-calstarts-recommended-cash-payment-incentive-option-for-medium-and-heavy-duty-commercial-vehicles-may-28-2021/

[19] https://calstart.org/broad-coalition-calls-on-congress-to-act-june-17-2021/

[20] https://calstart.org/zero-emission-commercial-vehicles-and-infrastructure-prioritized-in-federal-surface-transportation-bill-may-26-2021/

[21] https://calstart.org/letter-to-congress-national-zero-emission-truck-coalitions-stimulus-recommendations/