Summary:

- Prior to the COVID-19 outbreak, America was showing early signs of a longer-term shift toward electric vehicles, but this trajectory is now in jeopardy, as is the health of the US auto sector more broadly.

- Despite their continued popularity, growth of electric vehicles is hampered by lack of supporting infrastructure, such as charging stations. In the US, there is an anticipated need for 9.6 million EV chargers by 2030, with only 78,000 available as of March 2020.

- Robust federal investment in EV infrastructure provides an opportunity to support broad economic recovery while realizing valuable environmental and public health benefits.

- Federal investment of $5 billion in EV infrastructure development and innovation would support approximately 65,000 jobs in the near-term.

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The American auto sector has not been spared from the economic damage of the COVID-19 pandemic. Production has been suspended in domestic and most international markets, while Ford, GM, and Tesla have shifted factories to make medical ventilators. And although many companies have paid full wages during the production stoppage, tens of thousands of US auto workers are expected to be laid off in the coming weeks.

Prior to the outbreak, America was showing early signs of a longer-term shift from fossil-fueled to electric-powered vehicles. Though they account for less than 1% of the current US vehicle market, EVs have grown at an average annual rate of nearly 30% in recent years, while battery and overall EV vehicle prices have fallen steeply. COVID-19 has deflated expectations for 2020, with global EV sales projected to drop 43%, and the development of many new EV models has been put on hold because of hesitation among companies to invest in new product lines.

Despite these setbacks, demand for EVs is still high, with few alterations to long-term sales projections. However, a key bottleneck in industry growth is the lack of supporting infrastructure. As part of the response to the ongoing economic downturn, the federal government should finance deployment of charging infrastructure in cities and along the National Interstate Highway System. Deploying charging infrastructure will be an expansive and complex process, with installations as large as multi-vehicle stations or as small as home battery systems. We recommend deploying approximately 2,000 stations at US highway rest stops, as well as approximately 139,000 individual chargers on surface streets and parking areas in US metro areas. The deployments outlined in this paper would cost approximately $5 billion and create or support approximately 65,000 jobs.

Federal investment in EV infrastructure is a promising opportunity for Congress to support economic recovery while realizing environmental and public health gains. The transportation sector is the largest source of greenhouse gas emissions in the US, at roughly 30% of total emissions, half of which come from passenger vehicles. Air pollution, to which cars are a major contributor, kills an estimated 90,000 Americans per year, and has been found to contribute to COVID-19 mortality as well.

Congress has taken unprecedented action to stem the tide of joblessness and economic devastation. By adding robust investments in EV infrastructure to these efforts, the US can ensure it maintains global competitiveness in the automotive industry and provide immediate and sustained economic stimulus with climate and public health co-benefits.

THE NEED FOR EV CHARGING INFRASTRUCTURE

EVs require their own dedicated infrastructure, which is markedly underdeveloped in the US given the industry’s growth projections. There is an estimated need of 9.6 million charging ports to support the EV fleet by 2030, 120 times the number currently available. This infrastructure bottleneck currently limits the useful travel range of existing EVs, with many highways having no chargers at all. Fear of not having the necessary charge to travel far enough — or “range anxiety” — reduces the rate of EV adoption and is one of the largest barriers for consumers. Although 95% of trips are shorter than 30 miles, consumers still list range anxiety and a low availability of charging stations as a barrier to purchasing an EV. In most of America, EV owners have limited access to charging at home, at their workplaces, or on many highways, making EV ownership a more difficult prospect and discouraging potential buyers.

The lack of EV infrastructure in urban and suburban areas has also limited how quickly the EV market can grow. Homeowners are six times more likely nationally to own an EV, in part because 43 million American households rent and may not have a reliable place to access charging. If renters do not have reliable access to charging, they will be effectively locked out of the EV market. Public street charging construction efforts have failed to address this need because of the litany of local code requirements and land-use conflicts with citizens’ groups over street space, leaving many with no way to charge their vehicles. Workplace charging
has become more prevalent, but still greatly lags demand for EVs. Similar to landlords, commercial interests do not have the incentives to pay for construction and maintenance of EV charging.

Congress has rightfully identified this infrastructure need, but has been unable to pass substantial legislation to develop greater access to electric vehicle charging on America's highways. America's Transportation Infrastructure Act of 2019 (ATIA, S.2302) attempts to address the lack of demand by providing $1 billion in grants over five years for EV infrastructure projects along predetermined highway corridors. This bill, while a significant first step, does not go far enough to address the rapidly growing need for EV infrastructure. Robust federal intervention can ensure the burgeoning EV sector is not hindered by a lack of supporting infrastructure and can directly and indirectly support American economic recovery.

### DESIRED POLICY OUTCOMES

| Total Spend: $5B | Job Creation: 65,000 |

In total, these proposals amount to approximately $5 billion in federal spending and would create an estimated 65,000 jobs in construction, civil and electrical engineering, and the automotive sector, as well as supporting all businesses that depend on reliable infrastructure and a burgeoning electric vehicle sector. The long-term necessity of EV infrastructure to meet demand would lay the foundation for economic growth and sustained blue and white collar employment in rural and urban regions.

The federal government should pass legislation to build out EV charging infrastructure at highway rest stops, which would greatly extend the range EV owners could drive. However, commercial activity at new publicly-owned rest stops was limited by federal law in 1960 in order to protect small businesses in the days of the early interstate system. (Rest stops that predated the law, including many in the East Coast and Midwest, were grandfathered in and today contain both thriving businesses and EV charging stations.) Congress should lift the ban on commercial activity at rest stops, or alternatively, exempt EV infrastructure specifically from the ban.

By leveraging the extant rest stop infrastructure, the government can circumvent other bureaucratic steps required to conduct the necessary work of scoping, deciding upon, and acquiring land as well as coordinating with private entities to complete construction. These stops are operated and maintained by state governments and many are placed in areas without otherwise existing commercial or private activity to create a dependable network across the US. By building EV infrastructure at rest stops, a great deal of the location-related burden of infrastructure development is already taken care of, a barrier to public and private EV charging buildouts.

In addition to the $1 billion in competitive grants ATIA allocates to predetermined highway corridors and lifting the ban on EV infrastructure, Congress should allocate $1.1 billion to expand construction of modern EV fast-charging infrastructure to all of the 2,000 rest stops across the United States. Additionally, Congress should allocate $1.5 billion over five years to support the ongoing operation and maintenance costs of the infrastructure projects in conjunction with the states' transportation departments responsible for currently maintaining the rest stops.
Urban, Suburban, and Workplace EV Infrastructure

**Spend: $1.33B**
**Job Creation: 17,316**

EV charging infrastructure construction and maintenance is most often falls to states, cities, counties, and towns. Congress should fund development of EV charging stations on public, residential, and workplace curbsides, streets, and parking lots, and it should do so in coordination with other local government entities in order to rapidly distribute funding and provide economic stimulus.

First, the alternative fuel vehicle refueling property tax credit, which expired in 2017, should be made permanent. This tax credit provided $1,000 for charging equipment installed at a residence and up to $30,000 for business installations of alternative fuel infrastructure. Making these tax credits permanent would cost approximately $332 million between 2019 and 2027, which could support as many as 11,000 chargers on corporate property or 332,000 residential EV chargers. This policy addresses both residential and commercial development of EV infrastructure, partially addressing the general need for EV chargers in essentially all settings and ensuring private projects also receive sustained federal support.

In order to best coordinate action and provide federal stimulus, Congress should also develop a new dedicated grant program for the construction of EV charging stations within the Department of Energy’s Clean Cities Program, which is part of the Vehicle Technologies Office. Within the Clean Cities Program, Congress should authorize and fund a $1 billion grant program to be administered over the next 5 years for EV charging infrastructure needs in participating cities. Clean Cities, which encompasses nearly 100 local coalitions and nearly 16,000 stakeholders, focuses on the deployment of cleaner fuels, advanced technology vehicles, and alternative refueling infrastructure and could be leveraged to distribute funding for EV charging station projects that address the growing need in urban and suburban areas. By taking advantage of already existing programs, Congress could ensure the funding is released more quickly, providing near-term economic stimulus around the nation.

**Innovation Funding and General Policy Support for EV Infrastructure**

**Spend: $1.05B**
**Job Creation: 13,650**

There are several ways Congress can support technological innovation and make EV charging infrastructure more affordable and better functioning, and to generally support EV infrastructure development for highway, urban, suburban, and workplace settings.

First, Congress should authorize robust R&D funding for innovative vehicle technology, including EVs and charging infrastructure, with specific emphasis on reducing the cost of fast charging. Direct current fast chargers (DCFC) use up to 500 volts of direct current to supply 80 miles of range within minutes, and extreme fast chargers (XFC) could fully charge an electric vehicle in under ten minutes, significantly improving convenience of charging EVs for customers and making EVs comparable to internal combustion engine vehicles. However, DOE has found that widespread DCFC and XFC use requires research into better and more affordable batteries and vehicle electrical components able to withstand much higher electrical loads. Authorizing $1 billion in DOE funding for research into electrification technology, to be administered over the next five years, will help address challenges of vehicle electrification and fund research in fast charging infrastructure necessary to unlock further vehicle electrification and improve the EV ownership experience.

Similarly, Congress should increase annual funding of the Vehicle Technologies Office (VTO) within the DOE’s office of Energy Efficiency and Renew-
able Energy. In January, the DOE announced up to $133 million in new and innovative advanced vehicle technologies research. Of this, up to $36 million was set aside for technology integration — including demonstration projects for EV charging stations. We recommend an additional $50 million specifically for new and innovative EV charging station demonstration projects.

**CO-BENEFITS FOR CLIMATE AND PUBLIC HEALTH**

Direct support of critical EV infrastructure will also create substantial climate and pollution-related co-benefits. Today in America, even electric vehicles powered by the most carbon-intensive energy sources are cleaner than the typical vehicle on the road — producing the same carbon dioxide as an 88mpg vehicle and no tailpipe air pollution. If more EV owners feel comfortable traveling longer distances, the air pollution and carbon dioxide that would have been emitted from those trips in a traditional vehicle can be abated. While an EV charger does not reduce emissions on its own, it enables low-carbon and low-pollution EVs to play a larger role in the transportation sector.

The climate and health benefits of EV deployment accrue quickly. Replacing all passenger vehicles on the road today with EVs would slash US annual transportation carbon emissions by 25%. The air pollution benefits would be even greater, reducing total US emissions of carbon monoxide by 30% and nitrous oxide by 25%. This pollution reduction translates to preventing an associated economic loss of nearly $143 billion because it avoids 15,750 premature deaths from air pollution.

COVID-19 has heavily impacted the burgeoning electric vehicle sector, but these effects need not be permanent. With a federal signal in the form of an exemption or lift of the commerce ban, implementation of a specific kind of infrastructure, and substantial support for EVs, both industry and consumers can respond by further investing in EVs. This provides an opening for exploration of further electrification, potentially opening the door to new kinds of technological innovation for non-car vehicular electrification. For $5 billion, the United States can jump start necessary infrastructure development, put Americans to work, stimulate the economy, mitigate climate change, and save American lives.
ENDNOTES


17. The National Economic Bureau estimates that $1 billion in national investment in “highway infrastructure projects” will create or support up to 13,000 jobs per year. Using this standard of job creation, a $4.98 billion federal investment would support as many as 64,800 jobs

21 The State of California spent an average of $517,000 for construction and $317,000 in annual operations costs for similar public EV charging projects. $2.6B reflects these costs for 2,000 EV chargers
24 The Rocky Mountain Institute found that a level 2 commercial charger cost as much as $7,210. Assuming these costs, $1B would fund 139,000 chargers
29 MIT research demonstrated that vehicle pollution is responsible for a quarter of pollution-related premature deaths. EPA pollution data indicates that passenger vehicles are responsible for 70% of vehicle pollution, suggesting that 70% of deaths from vehicle air pollution would be avoided from vehicle electrification, preventing 15,750 premature deaths at a VSL of $9.1 million