Technical Comments of
The BlueGreen Alliance

to the
U.S. Environmental Protection Agency and the National Highway Traffic Safety Administration

RE: Technical Comments on the Impact on Jobs, Manufacturing, and the Economy of the Notice of Proposed Rulemaking on the Safer Affordable Fuel-Efficient Vehicles Rule for Model Years 2021-2026 for Passenger Cars and Light Trucks

Docket No. NHTSA-2018-0067; EPA-HQ-OAR-2018-0283

October 26, 2018

Strong, long-term fuel economy and GHG standards have been shown to be good for American jobs and the economy. A rollback of these standards would detrimentally affect technology investment, consumer spending, job growth, and U.S. manufacturing leadership, particularly in the economically critical automotive sector.

The U.S. auto industry has undergone a dramatic recovery

The U.S. automotive industry has undergone a dramatic recovery over the past decade. Simultaneous with the implementation of strong standards, the automotive industry has brought back hundreds of thousands of jobs that are helping revive American manufacturing, while the industry has achieved record sales and returned to profitability.[i] The increased innovation and investment in the auto industry under forward-looking fuel economy and GHG standards has been critical to the automotive recovery and the strength of U.S. manufacturing as a whole. In short, the recovery has not only been simultaneous with the implementation of two rounds of stronger fuel economy and greenhouse gas standards, but has also been aided by them.

As of 2018, jobs brought back in motor vehicle and parts manufacturing accounted for more than 35 percent of all net manufacturing jobs restored since the recession.[ii] The auto industry has added more than 730,000 direct jobs since mid-2009, nearly 340,000 of these in manufacturing. This represents 54 percent growth since the recession low point in 2009.[iii] This does not include jobs added in critical automotive materials such as aluminum, steel, rubber, and glass. These numbers also do not include

indirect and induced jobs or other benefits to surrounding communities, as these manufacturing jobs indirectly support millions of additional jobs throughout the economy.[iv] In addition to auto manufacturing, over 2 million Americans are currently employed at auto and parts dealers across the United States—the highest level ever.[v]

Benefits of the existing and augural[vi] standards: economic modeling consistently shows employment and GDP gains

Since 2010, numerous studies doing economic modeling of the standards have projected that strong fuel economy and vehicle GHG standards would increase jobs and grow gross domestic product (GDP). These forward-looking studies find that the standards increase jobs through two major pathways: (1) through the auto manufacturing sector as requirements for new, added, and upgraded content drives enhanced investment in manufacturing and need for labor, and (2) more broadly, across the economy as consumers save on fuel and re-spend those savings.

Studies done between 2010 and 2012—including EPA's Regulatory Impact Analysis in August 2012—predicted manufacturing employment growth in the range of 50,000–100,000 additional jobs by 2025-2030 as a result of each phase of the standards, and several hundred thousand added jobs economy wide.[vii]

Combining studies done across separate phases of the standards and updating them with newer (and lower) gas price projections, the Union of Concerned Scientists estimated in 2017 that 650,000 jobs would be created in the United States by 2030 as a result of the current standards.[viii]

More recently, Synapse Energy Economics' 2018 macroeconomic modeling found current federal and state vehicle standards for model years 2017-2025 are projected to result in positive GDP and employment impacts in both the short and long term. Under the two scenarios modeled by Synapse, the vehicle standards result in positive GDP impacts throughout the study period. Under the first scenario, the annual GDP increases reach $9.5 billion in 2025 and $14.3 billion in 2035. Under the second scenario, annual GDP benefits amount to $13.6 billion in 2025 and $16.1 billion in 2035. [ix], [x] In the study, Synapse also found the existing standards would add more than 100,000 jobs in 2025 and 250,000 jobs in 2035.

In a study, "Economic Effects on U.S. Automakers and Suppliers of Retaining or Weakening 2025 National Program Fuel Economy Standards," done for the investor group Ceres, industry experts Alan Baum and Dan Luria found that the existing standards also help protect U.S. automakers' profits and market share under a wide range of gas price scenarios, including when gas prices are low and consumers buy larger vehicles.[xi] By contrast, freezing the standards at 2020 risks misaligning U.S. automaker products with consumer preferences should gas prices rise and puts their profitability at risk. In this case—where U.S. standards are low and gas prices rise—the Detroit Three—automakers GM, Ford and the U.S. operations of FCA—would lose market share to Asian and European companies that must maintain a set of fuel-efficient vehicles to successfully sell in foreign markets with higher standards and fuel prices. This situation is reminiscent of the damaging market share loss of the Detroit Three in the early 2000s.

Baum and Luria project that under current standards, the Detroit Three will *grow* their profits by $22.3 to $10.6 billion under a range of gas prices ranging from $2.08 to $4.74 per gallon in 2025 (the U.S. Energy Information Agency's low and high price scenarios). By contrast, should standards drop, Baum and Luria project a $660 million annual profit loss under a $4.74 per-gallon scenario. In short, automakers are in a better position by meeting the existing standards because they are poised to grow profits at all gas prices, versus taking a risky bet on lower standards and unknown future gas prices that could generate large profit losses.

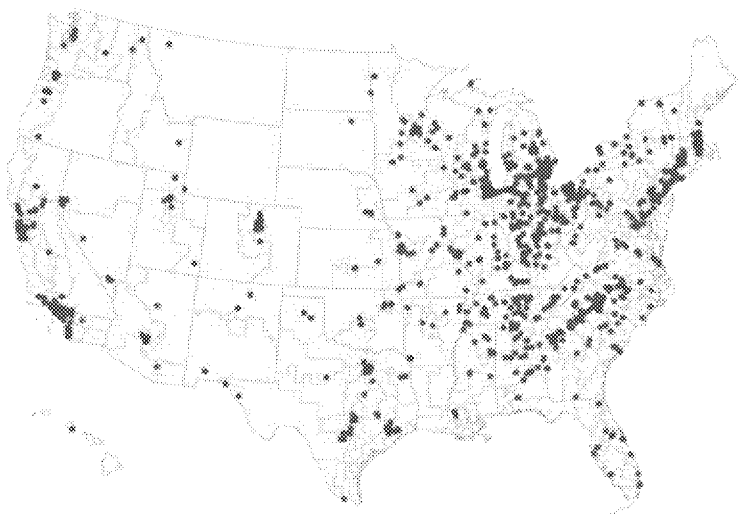
Maintaining the standards—even under relatively low gas prices—would also boost the vast network of suppliers—and their nearly 900,000 workers—because strong demand for fuel-saving technology would continue. Under a rollback of the standards, Baum and Luria estimate that suppliers would lose approximately $20 billion in orders.[xii] Baum and Luria utilize far lower technology costs (and lower vehicle sales) in their analysis than do the agencies in the NPRM. Utilizing the agencies' cost assumptions, suppliers would lose over $100 billion in orders over the same time period.[xiii]

Studies of impact show gains from standards, risks of rollback

While economic modeling has consistently predicted gains, studies looking at actual recent changes in auto sector investment, jobs, and manufacturing show these economic dynamics in action and suggest stepping away from globally leading standards could put all these gains at risk.

Today, within a vibrant and growing U.S. automotive sector, hundreds of thousands of American jobs are connected to fuel economy innovation, investment, and manufacturing. In a 2017 report, *Supplying Ingenuity II*, the BlueGreen Alliance and the Natural Resources Defense Council (NRDC) identified U.S. manufacturers of the specific technologies identified by the agencies and National Academies of Sciences as contributing to meeting fuel economy. The study found more than 288,000 American workers building the technologies that improve fuel economy for today's innovative vehicles, in over 1,200 factories and engineering facilities in 48 states.[xiv]

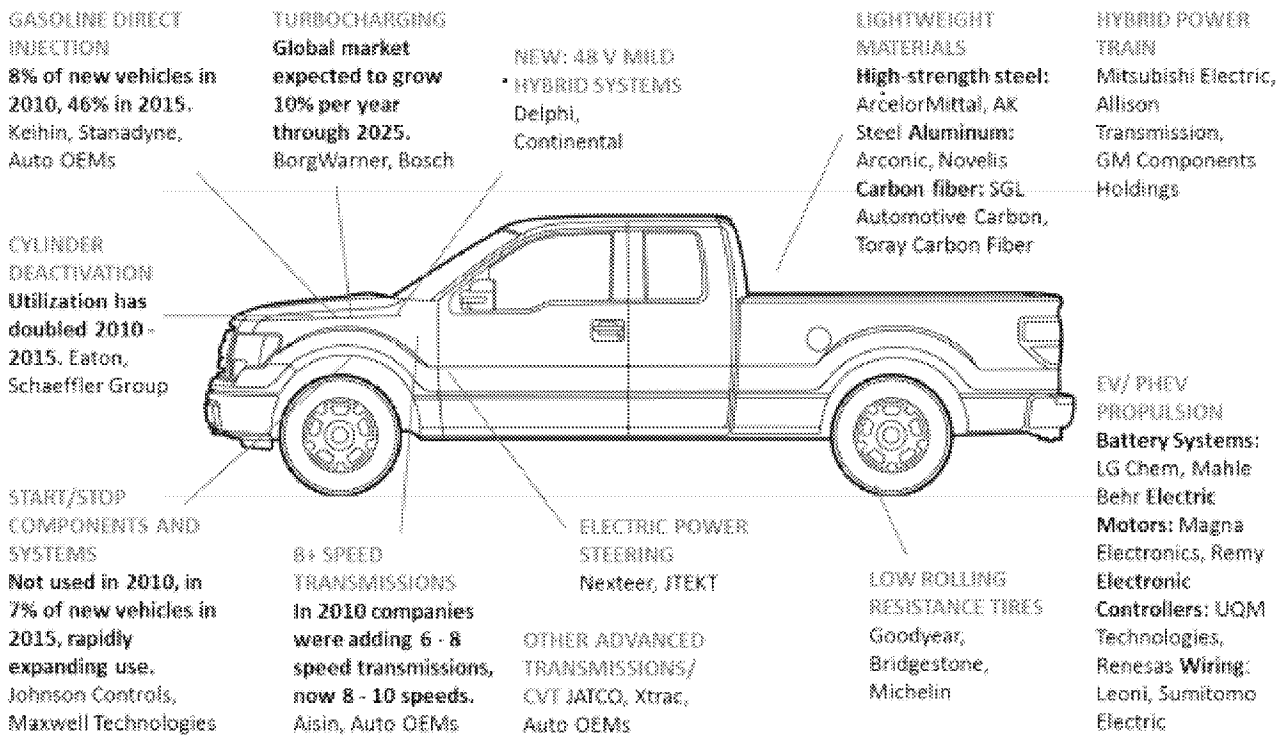
Figure 1: Suppliers of Fuel-Efficient Vehicle Technology – More Than 1200 Facilities Nationwide[xv]



Innovation is taking place across all the major types of technology in every region. For example, while Indiana has long been a leader in heavy-truck manufacturing and is host to diesel engine and heavy-duty transmission innovators, it is also home to innovation in hybrid- and electric-drive technology. Similarly, California is seeing growth in auto assembly, steel mills in Ohio are bringing back jobs developing and producing cutting-edge automotive materials, Texas is producing the components that make SUVs cleaner and more fuel efficient, and South Carolina is building advanced gasoline engine technology and electric vehicle batteries.

The study found two and a half times as many facilities—and nearly twice as many jobs—building fuel-efficient vehicle technology in 2016 than in a similar study done in 2011.[xvi]

Figure 2: Examples of U.S. Manufacturing of Fuel-Efficient Vehicle Components



Note: Many additional U.S. manufacturers produce each of these technologies. Indicators of growth are drawn from agency, industry, and press reports.

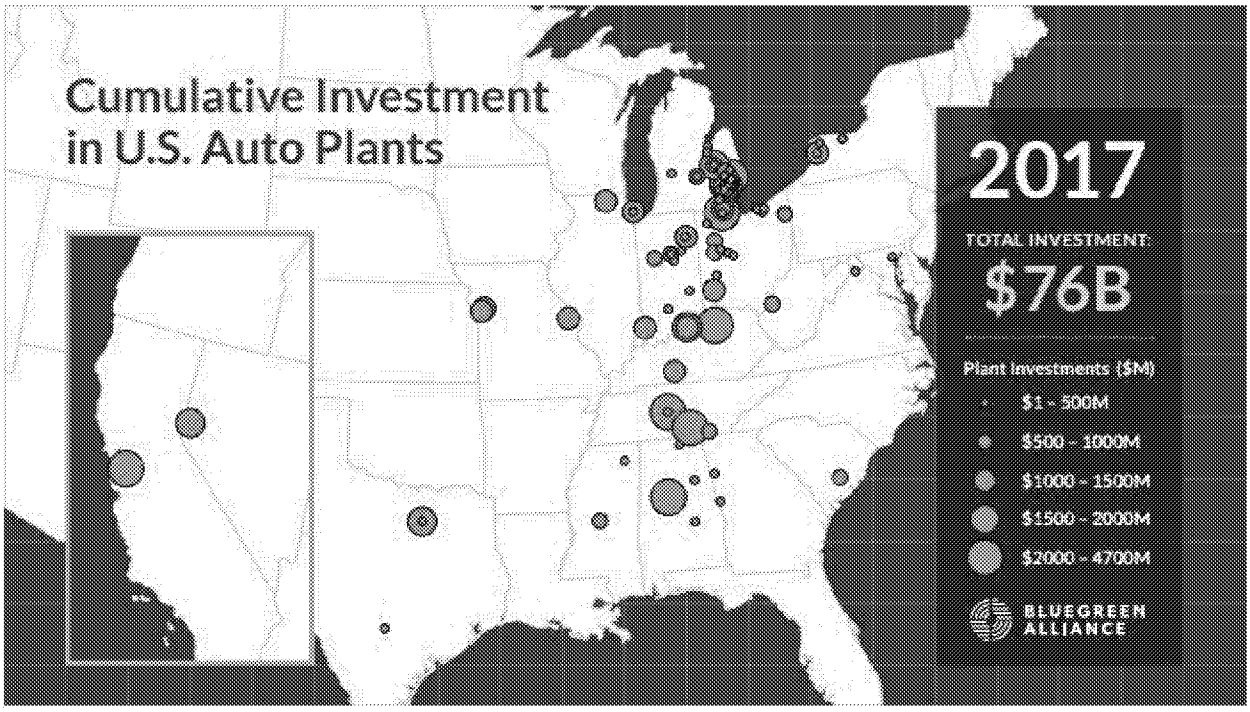
Using a very different methodology that involved directly surveying automotive industry employers, the *2018 U.S. Energy and Employment Report* found more than 476,000 employees across several occupational categories working in some capacity with components that increase fuel economy for vehicles.[xvii] This includes just over 300,000 workers in manufacturing and professional services (such as engineering) when those occupations are broken out alone.[xviii]

In the same report, 23 percent of automotive suppliers stated that 100 percent of their revenue came from technology that improves fuel efficiency.[xix] This is 6 percent higher than the previous year's report.[xx]

The motor vehicle parts industry is the nation's largest manufacturing sector—directly employing more than 871,000 workers. The automotive supplier industry has grown nearly 19 percent since 2012 and generates approximately 2.4 percent of the U.S. GDP.[xxi]

Studies of the auto sector also show enhanced investment to meet the standards. Looking at the automakers themselves, the BlueGreen Alliance's report *Driving Investment*, found that since 2008, U.S. automakers have invested approximately $76 billion in facilities across the country, completing 258 investments at 100 factories, with an additional 42 investments at 37 facilities underway or promised through 2020.[xxii] Similarly, according to the Center for Automotive Research, between 2009 and 2017 automakers announced $119.5 billion in investments in North America—two thirds of that investment, $87.6 billion, has been or is planned to be invested in the United States.[xxiii]

Figure 3: Cumulative Investments in U.S. Auto Assembly, Engine, and Transmission Plants, 2008-2017



While some of this investment in the nation's automotive plants is business as usual, a significant portion of this investment represents added or enhanced investment in the innovative products and manufacturing processes specifically developed to meet commonsense fuel economy and GHG standards.[xxiv]

These investments include, for example:

- Five sequential investments by Ford totaling over $1 billion in two Ohio engine plants, as the company introduced and rolled out the innovative, efficient, and popular down-sized turbocharged EcoBoost engine across its vehicle fleet.

- Large investments at assembly facilities making pickup trucks and SUVs as assemblers moved to innovative, lightweight mixed material bodies and frames. Investment at these plants included major changes to manufacturing processes and robotics aimed at facilitating the handling, forming, and joining of lighter, stronger materials and spurred significant joint innovation with suppliers.[xxv]
- Repeated investment at transmission plants as the industry moved from investments in 6-speed transmissions in 2010-2012 to 8- 9- and ultimately 10-speed transmissions by 2015 and beyond.
- Major new investments in electric vehicles and propulsion systems, both in dedicated facilities and as lines are added in plants, which are also upgrading to manufacture more efficient gasoline vehicles.

Setting aside the increased demand for the advanced components and materials that go into the vehicles these factories produce, enhanced plant investments also mean enhanced purchases from tool and die and robotics firms, whose revenues have been running far above conventional levels in recent years and who face major declines should the pace of redesign in the industry slow.[xxvi]

Strong long-term standards have provided the certainty for major investments, while globally leading standards have encouraged investment to build the next generation of technology in the U.S. rather than, or as well as, in foreign markets. These reports show what this investment looks like on the ground and also show how, over the past decade, what are often described as regulatory costs have served as a much-needed reinvestment in American manufacturing and manufacturing communities across the nation. Unfortunately, the real world gains these studies document also underscore the equally real risks of stepping away from a continued strong trajectory of fuel economy improvement—and the innovation, investment, and growth that comes with it.

Agencies' proposal shows direct manufacturing job loss

In their NPRM, released August 2, 2018, the agencies propose eight regulatory options for a final rule, all less stringent than the current EPA and augural NHTSA standards. The agencies' "preferred option" halts increases in the standards entirely at 2020 levels.

The agencies' own analysis shows this change would result around $30 billion less *annually* in technology spending, an anticipated drop of more than 70 percent. The agency's analysis translates lower technology investment into lower revenues that in turn support 50,000 to 60,000 fewer auto sector job years in every year post 2021, by their calculation. [xxvii]

While we disagree with a number of the technology and cost assumptions the agencies make in their analysis to support this round of rulemaking, we agree the finding of job loss is directionally correct. In looking only at the near-term impacts of reduced production of advanced technology, however, the agency is likely understating the overall detrimental impacts of a rollback on the U.S. automotive sector and the manufacturing economy.

At a time when nations around the world are racing to capture the economic benefits of producing the next generation of cleaner and more efficient vehicle technology, stepping away from standards that provide the certainty that manufacturers need to invest in and build leading technology in the United

States puts the auto sector—and particularly domestic employment in the sector—in jeopardy, both in the short, medium, and long term.

Figure 4: Agencies' "Preferred Option" cuts Technology Spending and Labor Hours

Spending on Technology (Technology Costs) Beyond MY 2016 (in billions)					Domestic Labor Hours (1000s of Job-Years)			
	Standards		Change		Standards		Change	
MY	Baseline (Under current "augural" standards thru 2025)	Proposed (Under "preferred option" freezing standards in 2020)	Difference in $B	Percent change in technology spending	Baseline (Current "augural" standards)	Proposed (Preferred option)	Difference in job-years	Percent change in domestic labor hours
2017	$4 Billion	$ 2 Billion	- $2 Billion	-41%	1170 (1,170,000)	1170	0	0%
2018	11	5	-6	-53%	1210	1200	-10 (-10,000)	-1%
2019	16	7	-10	-58%	1240	1220	-20	-1%
2020	25	10	-15	-59%	1260	1240	-30	-2%
2021	35	11	-24	-68%	1290	1240	-50	-4%
2022	40	12	-28	-70%	1300	1250	-50	-4%
2023	43	12	-30	-71%	1310	1250	-60	-4%
2024	44	12	-32	-72%	1310	1250	-50	-4%
2025	46	12	-34	-73%	1310	1250	-50	-4%
2026	48	13	-35	-73%	1310	1260	-60	-4%
2027	47	13	-34	-73%	1310	1260	-50	-4%
2028	47	13	-34	-72%	1320	1260	-50	-4%
2029	46	13	-33	-72%	1320	1260	-60	-4%
2030	45	13	-33	-72%	1320	1270	-60	-4%
Cumulative undiscounted reduction in technology spending 2017-2030			-350	Billion	Industry supports 50 - 60,000 fewer jobs starting in 2021			
Adapted from NPRM Table VII-5, Federal Register page 43265								

Over the past several months, a number of industry stakeholders have carried out analyses—using a variety of approaches—seeking to make independent estimates of the impact of a regulatory rollback. All show an industry in retreat from the investment, jobs, and competitiveness gains of the past decade.

For example, automotive suppliers see not just lower demand for their products in the near term, but stranded assets as they struggle to capture the benefits of the long-term investments in innovative technology they have already made. Meanwhile regulatory uncertainty and/or standards that would fall behind those in other key markets will undermine the attractiveness of the United States as a likely location of future investments in their sector.

A recent report from IHS Markit for the Motor and Equipment Manufacturers Association (MEMA) finds that "the proposal of zero percent increases year-on-year through 2026 would result in a loss of 67,000 direct automotive industry jobs" with a "full impact of 500,000 direct, indirect, and induced jobs by 2025, in comparison to the employment levels supported by the augural standards." [xxviii]

MEMA reports that job increases in the supplier sector since 2012 are in part attributable to long-term investments made to develop and manufacture technologies that comply with the standards.[xxix] The

costs and benefits of technology development are assessed by suppliers several years in advance and are made across the supply chain; including in manufacturing retooling, and in process innovation.[xxx] Suppliers have already planned for, and invested in, development and production of technologies designed for automakers to meet the standards through 2025.[xxxi] Stranded investments in the supplier industry would negatively impact the more than 871,000 Americans directly employed by automotive suppliers.[xxxii], [xxxiii] In addition, as discussed further below, should U.S. standards remain uncertain or significantly lag those of other nations, new investments are less likely to be made in the United States.

Similarly, the BlueGreen Alliance (working with the Union of Concerned Scientists) is currently completing research that models two different approaches to technology deployment to meet the standards and combines those findings with information on the domestic manufacturing facilities that produce these technologies. The report aims to generate a granular picture of the manufacturing and employment impacts of a rollback under both agency and alternate technology deployment and cost assumptions. Our preliminary results show tens of thousands of jobs at risk across each of several major vehicle subsystems and technology types.[xxxiv]

In September 2018, Synapse released an updated analysis of the current trajectory of the standards as well as the changes put forth in the proposed rule. They found the proposed rule would support 60,000 fewer job-years in 2025, and more than 125,000 fewer jobs years in 2035. Their models also indicate that flat lining of the standards in 2020 will reduce GDP and eliminate many of the anticipated economic benefits generated under the augural standards.[xxxv]

In short, sustaining competitiveness, investment, and job growth in the automotive sector—and by extension across U.S. manufacturing—requires strong long-term fuel economy and GHG standards in the United States. Stepping away from policy leadership will have real, tangible, and negative impacts on jobs and manufacturing in America.

Addressing additional questions raised by the Agencies

In the NPRM, the agencies asked for comment on several employment-related questions.

a. *What is the potential for changes in stringency to result in new jobs and plants being created in foreign countries or for current U.S. jobs and plants to be moved outside of the United States?*

The agencies ask in particular for comment on the impact of changes to the standards on domestic production of advanced automotive technology.

As discussed above, strong globally leading standards are critical to maintain and grow domestic content, and essential to head off potential threats to domestic manufacturing. Such standards have been shown to increase domestic investment and increase the likelihood of multi-national corporations to invest in manufacturing advanced vehicle technology in the United States. By contrast, a rollback will slow demand for these technologies in the United States, discourage companies from making their next investment here, encourage advanced technologies to emerge first—and take hold—in other markets, and put today and tomorrow's domestic manufacturing at risk.

As a key automotive suppliers association has laid out in their comments, the supplier sector has grown rapidly in the United States to meet the needs of the U.S. market under the existing standards. But they also see clear evidence of multinational companies "delaying, deferring, or cancelling plans for further U.S. investments" in the face of a possible retreat from continued fuel economy improvement in the U.S.[xxxvi] These jobs would likely be lost to countries in the EU or China where strong and certain vehicles targets remain.

Strong standards are critical to secure domestic manufacturing of advanced and emerging technologies. However, it is certainly true that the number of jobs created under the standards can be influenced by the type of manufacturing, tax, and trade policies that exist simultaneously and influence the amount of domestic investment and domestic content. As far back as 2010—in the report *Driving Growth*—the United Auto Workers, NRDC, and others highlighted the need to jointly incentivize long-term, globally leading standards and domestic manufacturing to ensure that the investments and jobs spurred by improvements to fuel economy would increasingly be located in the United States. That study predicted that raising fuel economy standards to 40 miles per gallon (mpg) by 2020 would add just over 100,000 U.S. manufacturing jobs, but that the final number could be as low as 49,000 or as high as 150,000 depending on how much of the technology was built in the United States.[xxxvii]

Further, we share concerns with labor and others that the U.S. risks losing a competitive race for the most advanced technology.[xxxviii] We are further deeply concerned that a rollback—especially if also coupled with an attack on California's authority to promote advanced vehicle policy—could aggravate this threat by driving additional technology investment overseas and be devastating to efforts to continue to strengthen the domestic supply chain in advanced conventional, hybrid, and electric technologies.

Particularly as the global industry shifts to increasingly electrified powertrain, it is essential that the United States maintain and increase its capability to produce these technologies domestically, and that fuel economy, GHG, manufacturing, and trade policies all support that trajectory.[xxxix] Much as the bipartisan agreement to raise fuel economy standards in 2007 went hand in hand with the establishment of programs focused on helping ensure investments to build a new generation of fuel-efficient technology were made in the United States. Strong standards that reach to 2025 and beyond are critical and will be even more effective for the economy if they are coupled with sound manufacturing and trade policies that support building critical advanced technologies here. However, increased investment in advanced technology in the United States will not happen if our markets for that technology lag the world, and our policies fail to provide sufficient certainty for investment.

Fuel economy and GHG emissions standards have spurred a revival in American global leadership in the invention and production of innovative fuel-efficient vehicles and technologies. Today, the United States remains in a position to grow and lead in capturing manufacturing and jobs across vehicle platforms and technologies into the future, but that future is at risk. China and the EU have set ambitious goals to meet even stronger fuel economy and GHG standards over the next decade. China and others have demonstrated their commitment to pursuing global technology leadership.[xl] Degradation of standards here in the United States would create a disadvantage for U.S. companies in a rapidly advancing global marketplace and cede American leadership to our competitors.[xli]

b. *Might the scale or direction of jobs findings change? Underlying assumptions, inclusion of multipliers and adjacent employment.*

Our comments above discuss in detail why a major weakening of fuel economy standards in years 2021-2026 will have significant, negative impacts on automotive employment, U.S. manufacturing, and the economy as a whole. Because these standards play such a significant role in driving investment in the industry and in U.S. manufacturers' global technology leadership, we do not see a problem with the agencies' primary focus on jobs impacts within the automotive sector, and we agree directionally with their results. The agencies have provided only a narrow assessment of potential job losses in the industry, however. The 50,000-60,000 jobs they describe represent job-years in direct automotive assembly and automotive components manufacturing. It does not include indirect—or what the agencies call "adjacent"—jobs further down the supply chain, such as in steel smelting or lithium mining—or induced jobs—those that come from autoworkers spending their paychecks and manufacturing companies paying taxes and purchasing office supplies.

In addition, the agencies' analysis likely further understates the jobs and economic losses of a rollback because it does not estimate risk to domestic assembly facilities and supply chains that go beyond near-term drops in demand and orders. As discussed in the section above, employment losses in the automotive sector are likely to be even greater should a rollback spur a shift in industry investment in today's advanced tech or major emerging technologies—particularly electrified vehicles and propulsion systems—abroad.

The agencies ask for comment on the value of an economy wide review of jobs impacts. While they are correct to note that economy-wide modeling would show a variety of impacts that ripple throughout the economy, such investigation would not likely result in significant new information. Macro-economic modeling of the standards has been done repeatedly and shows that the existing/augural standards result in overall net positive benefits for consumers, GDP, and jobs. That being said, additional steps may be possible to increase benefits and mitigate any economic losses wherever they may occur. However, these steps will be most beneficial if carried out as policies that are complementary to strong, soundly structured standards.

c. *Should employment impacts of the scale found be viewed as significant under full employment modeling?*

The agencies further ask for comment with respect to how the jobs impacts discussed in the rule should be viewed in the context of an economy that is close to full employment, or as might be viewed in general equilibrium modeling. Under a full employment framework, economists argue that policy changes do not create long-term net job losses or gains. Instead, they only move jobs around within the economy. While this may be true in the aggregate and in the long term, it is not inconsistent with significant distributional and welfare shifts in the short and medium term, and in this case a significant and economically damaging impact on a strategic industry, on manufacturing regions of the country, and on high quality jobs in American manufacturing.

The automotive industry is at the heart of U.S. manufacturing. It is the nation's biggest manufacturing sector and as such, changes in the domestic health and footprint of the industry ripple throughout American manufacturing. A healthy auto industry is not just a major source of employment, but also an enormous driver of R&D and innovation. It is the anchor of economic health for many other industries and for communities across the nation. Many jobs in auto assembly—and in parts of the automotive supply chain—are comparatively high-wage advanced manufacturing jobs carried out with good benefits, workplace safety, and workers rights on the job. These are precisely the type of jobs the United States needs to build more of—not undermine or shift away from.

As the report *Driving Investment* shows, enhanced investments in auto assembly, and investments throughout the supply chain, constitute major reinvestments in American manufacturing communities. Reducing essential investment—by rolling back strong, successful standards in a central and globally strategic industry that supports high-skill, high-wage jobs— is not a risk the nation needs to take.

---

[i] Natural Resources Defense Council (NRDC) and the Blue Green Alliance, *Supplying Ingenuity II: U.S. Suppliers of Key Clean, Fuel-Efficient Vehicle Technologies*, June 2017. Available online: https://www.bluegreenalliance.org/resources/supplying-ingenuity-ii-u-s-suppliers-of-keyclean-fuel-efficient-vehicle-technologies/.

[ii] All employment data in this section is from the U.S. Bureau of Labor Statistics. Available online: https://www.bls.gov/iag/tgs/iagauto.htm. Analysis and calculations by BlueGreen Alliance. Accessed October 25, 2018.

[iii] Ibid.

[iv] BlueGreen Alliance, *Driving Investment: How Fuel Efficiency is Rebuilding American Manufacturing,* January 2018. Available online: https://www.bluegreenalliance.org/resources/driving-investment-how-fuel-efficiency-is-rebuilding-american-manufacturing/.

[v] U.S. Bureau of Labor Statistics. Available online: https://www.bls.gov/iag/tgs/iagauto.htm. Analysis and calculations by BlueGreen Alliance. Accessed October 25, 2018.

[vi] EPA and NHTSA set coordinated standards in 2012 that laid out a trajectory of fuel economy and GHG improvement for the years 2017 – 2025. "Existing" standards refer to EPA vehicle GHG standards that run through 2025. NHTSA's promulgated fuel economy standards run only through 2021, and the term "augural" standards refer to the assumed NHTSA standards through 2025 that would be required to achieve the trajectory laid out in 2012.

[vii] Ibid, and U.S. Environmental Protection Agency (EPA), "Regulatory Impact Analysis. Final Rulemaking for 2017-2025 Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards," Assessment and Standards Division, Office of Transportation and Air Quality, EPA, 2012. Available online: https://nepis.epa.gov/Exe/ZyPDF.cgi/P100EZI1.PDF?Dockey=P100EZI1.PDF.

[viii] Union of Concerned Scientists, "Fuel Economy and Emissions Standards for Cars and Trucks, Model Years 2017 to 2025," June 2016. Available online: https://www.ucsusa.org/sites/default/files/attach/2016/06/Fuel-Economy-Standards-2017-2025-summary.pdf.

[ix] The Synapse report evaluated two scenarios: (1) an "Improved IU" scenario, which uses inputs and assumptions from Indiana University's most up-to-date scenario from February 2018, with corrections to observed analytical inconsistencies; and (2) a "Synapse" scenario that uses alternative input assumptions derived primarily from recent federal government sources. *See,* Synapse Energy Economics, *Cleaner Cars and Job Creation: Macroeconomic Impacts of Federal and State Vehicle Standards*, March 2018. Available online: http://www.synapse-energy.com/sites/default/files/Cleaner-Cars-and%20Job-Creation-17-072.pdf.

[x] Ibid.

[xi] Ceres, Baum, Alan and Luria, Dan, "Ceres Analyst Brief: Economic Effects on U.S. Automakers and Suppliers of Retaining or Weakening 2025 National Program Fuel Economy Standards," May 28, 2018. Available online: https://www.ceres.org/resources/reports/economic-implications-current-national-program-v-weakened-national-program-2022.

[xii] Ibid.

[xiii] 3 NHTSA, EPA, The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021–2026 Passenger Cars and Light Trucks, Table VII-5 at Federal Register page 43265.

[xiv] NRDC and the Blue Green Alliance, *Supplying Ingenuity II: U.S. Suppliers of Key Clean, Fuel-Efficient Vehicle Technologies,* June 2017. Available online: https://www.bluegreenalliance.org/resources/supplying-ingenuity-ii-u-s-suppliers-of-keyclean-fuel-efficient-vehicle-technologies/.

[xv] Figures 1 and 2 from NRDC and the BlueGreen Alliance, *Supplying Ingenuity II.*

[xvi] Ibid, and NRDC, National Wildlife Federation, and United Auto Workers, *Supplying Ingenuity: U.S. Suppliers of Clean, Fuel-Efficient Vehicle Technologies,* August 2011. Available online: https://assets.nrdc.org/sites/default/files/SupplierMappingReport.pdf.

[xvii] Energy Futures Initiative and National Association of State Energy Officials, *U.S. Energy and Employment Report*, May 2018. Available online: https://static1.squarespace.com/static/5a98cf80ec4eb7c5cd928c61/t/5afb0ce4575d1f3cdf9ebe36/1526402279839/2018+U.S.+Energy+and+Employment+Report.pdf.

[xviii] Energy Futures Initiative and researchers, from U.S.EER data, as discussed with BGA, NRDC. June 2018.

[xix] Ibid and Energy Futures Initiative and National Association of State Energy Officials, *U.S. Energy and Employment Report*, May 2018. Available online: https://static1.squarespace.com/static/5a98cf80ec4eb7c5cd928c61/t/5afb0ce4575d1f3cdf9ebe36/1526402279839/2018+U.S.+Energy+and+Employment+Report.pdf.

[xx] U.S. Department of Energy, "U.S. Energy and Employment Report," January, 2017. Available: https://www.energy.gov/sites/prod/files/2017/01/f34/2017%20U.S.%20Energy%20and%20Jobs%20Report_0.pdf.

[xxi] MEMA and The Boston Consulting Group, *Driving the Future: The Employment and Economic Impact of the Vehicle Supplier Industry in the U.S.*, January 2016. Available online: https://www.mema.org/sites/default/files/MEMA_ImpactBook.pdf.

[xxii] BlueGreen Alliance, *Driving Investment: How Fuel Efficiency is Rebuilding American Manufacturing,* January 2018. Available online: https://www.bluegreenalliance.org/resources/driving-investment-how-fuel-efficiency-is-rebuilding-american-manufacturing/.

[xxiii] Center for Automotive Research, *CAR Book of Deals 2017 Annual Review*, March 2018. Available online: https://www.cargroup.org/car-book-of-deals-2017-annual-review/.

[xxiv] BlueGreen Alliance, *Driving Investment*

[xxv] Ibid, and BlueGreen Alliance, *Backgrounder: Sound Vehicle Standards & Policies Drive Strong Job Growth*, August 2016. Available online: https://www.bluegreenalliance.org/wp-content/uploads/2016/08/Backgrounder-Vehicle-Standards-and-Jobs-FINAL.pdf.

[xxvi] Crain's Detroit Business, Chappell, Lindsay. "Tooling Companies Brace for a Crash," August 2, 2017. Available online: https://www.crainsdetroit.com/article/20170802/news/635381/tooling-companies-brace-for-a-crash

[xxvii] NHTSA and EPA, The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021–2026 Passenger Cars and Light Trucks, Table VII-5 at Federal Register page 43265.

[xxviii] MEMA, "RE: Notice of Proposed Rulemaking on the Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021-2026 for Passenger Cars and Light Trucks," October 26, 2018.

[xxix] MEMA, "RE: Notice of Proposed Rulemaking on the Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021-2026 for Passenger Cars and Light Trucks," September 24, 2018. Available online: https://www.mema.org/sites/default/files/resource/MEMA%20Testimony%20EPA%20NHTSA%20MTE%20Sept%2024%202018%20Final.pdf.

[xxx] MEMA, "MEMA Briefs White House on Supplier Role as Innovators in CAFE and Greenhouse Gas Technologies," November 6, 2017. Available online: https://www.mema.org/mema-briefs-white-house-supplier-role-innovators-cafe-and-greenhouse-gas-technologies.

[xxxi] MEMA, "RE: Request for Comment on Reconsideration of the Final Determination of the Mid-Term Evaluation of Greenhouse Gas Emissions Standards for Model Year 2022–2025 Light-Duty Vehicles; Request for Comment on Model Year 2021 Greenhouse Gas Emissions Standards." September 6, 2017. Available online: https://www.mema.org/sites/default/files/resource/MEMA%20Testimony%20EPA%20MTE%20Sept%206%202017.pdf.

[xxxii] MEMA and The Boston Consulting Group, *Driving the Future: The Employment and Economic Impact of the Vehicle Supplier Industry in the U.S.*, January 2016. Available online: https://www.mema.org/sites/default/files/MEMA_ImpactBook.pdf.

[xxxiii] MEMA, "Comments to the U.S. Environmental Protection Agency on Reconsideration of the Final Determination of the Mid-Term Evaluation of Greenhouse Gas Emissions Standards for Model Year 2022-2025 Light Duty Vehicles; Request for Comment on Model Year 2021 Greenhouse Gas Emissions Standards," Oct. 5, 2017. Available online: https://www.mema.org/sites/default/files/resource/MEMA%20Comments%20to%20EPA%20on%20Final%20Determination%20Reconsideration%20Oct%205%202017_0.pdf.

[xxxiv] BGA technical analysis, unpublished

[xxxv] Synapse, Ackerman, Allison, and Hall, *Giving Back Half the Gains: Macroeconomic Impacts of the Proposed Rollback in Federal Vehicle Standards,* September 25, 2018. Available online: http://www.synapse-energy.com/sites/default/files/Giving-Back-Half-the-Gains-17-072.pdf.

[xxxvi] MEMA, "RE: Notice of Proposed Rulemaking on the Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021-2026 for Passenger Cars and Light Trucks," October 26, 2018.

[xxxvii] NRDC, United Auto Workers, and Center for American Progress, *Driving Growth: How Clean Cars and Climate Policy Can Create Jobs.* March 2010. Available online: https://www.nrdc.org/sites/default/files/drivinggrowth.pdf.

[xxxviii] Jennifer Kelly, "Public Comments on Section 232 National Security Investigation of Imports of Automobiles, Including Cars, SUVs, Vans and Light Trucks, and Automotive Parts; Agency: United States Department of Commerce," United Autoworkers, 2018.

[xxxix] Ibid.

[xl] International Council on Clean Transportation, *2017 Global Update: Light-Duty Vehicle Greenhouse Gas and Fuel Economy Standards*, 2017. Available online: https://www.theicct.org/sites/default/files/publications/2017-Global-LDV-Standards-Update_ICCT-Report_23062017_vF.pdf, and Foreign Affairs, "Green Giant: Renewable Energy and Chinese Power," March/April 2018. Available online: https://www.foreignaffairs.com/articles/china/2018-02-13/green-giant.

[xli] MEMA, "RE: Request for Comment on Reconsideration of the Final Determination of the Mid-Term Evaluation of Greenhouse Gas Emissions Standards for Model Year 2022–2025 Light-Duty Vehicles; Request for Comment on Model Year 2021 Greenhouse Gas Emissions Standards." September 6, 2017. Available online: https://www.mema.org/sites/default/files/resource/MEMA%20Testimony%20EPA%20MTE%20Sept%206%202017.pdf.