Executive Summary

Eleven billion dollars ($11,000,000,000). That's how much money Ohioans spend on gasoline every year[9]. If only 5% of Ohio's gas-only vehicles were replaced with electric vehicles – even a combination of all-electric, plug-in hybrid, and extended-range electric – Ohio consumers would save nearly $600,000,000 annually. For every dollar spent on gasoline in Ohio, only 16.4 cents continues to circulate in the state economy, meaning that nearly 84 percent leaves Ohio immediately to pay for distributors, wholesalers, transportation, production, etc. Imagine what $600 million could do for Ohio if it were used to purchase or renovate homes, on entertainment, and education?

The result of this study asserts that this scenario is quite possible for Ohio by 2030, with many notable gains along the way. For Ohio to maximize the opportunities that electric vehicles present – jobs , a manufacturing boom, regional leadership – the state must encourage widespread acceptance of this new technology, and municipalities must prepare to serve their residential and commercial sectors which will soon embrace EV ownership in significant numbers.

As electric vehicle penetration grows it will be essential for the statewide automotive assembly cluster[10] (manufacturers of vehicles and parts) to adapt and support this evolving market opportunity. According to AECOM's analysis[11], a renewed focus on Ohio's auto industry emboldened by electric vehicles could have a tremendous ripple effect throughout the statewide economy.

- For every $1,000,000 of economic output (i.e., sales) in automobile manufacturing, the economy grows an additional $602,000 in ripple effects.
- For every worker added to auto manufacturing in Ohio there is an additional $836,400 generated in sales/output.
- The total economic impact per auto worker on the state is estimated at $1.31 million.
- Saving 100 auto jobs in Ohio generates $83.6 million in direct economic activity and $47.7 million throughout the rest of the state economy, a total economic impact of $131.4 million.
- For every 100 jobs added in the auto manufacturing sector, there are 275 jobs added in other parts of the state economy in support industries, service sectors, retail, etc.

> The net change from adding 1,000 EVs to Ohio is $1,320,000 in economic impact and supports 20 additional jobs paying $508,000 in wages.
>
> Source: IMPLAN, AECOM

Clearly, the economic benefit of electric vehicles to the State of Ohio will be so much greater if they are not only purchased by Ohioans, but also manufactured by Ohioans. The campaign to promote electric vehicles in Ohio is not just about "selling it" to the average consumer. It is about broader economic development and job creation on a statewide level, linked to the importance of Ohio's automotive industry (3rd in the nation[12]), including the manufacturers as well as suppliers who are embedded in communities across the state.

BACKGROUND

Clean Fuels Ohio (CFO) is a statewide non-profit organization dedicated to promoting the use of cleaner, domestic fuels and efficient vehicles to the transportation industry, government, and the general public. The organization provides technical support to transportation professionals, advocates for sustainable transportation energy policies, and serves as a resource clearinghouse for fleets, policy makers, and the public. CFO is headquartered in Columbus, Ohio and works extensively around the state in collaboration with local partners. CFO developed the Drive Electric Ohio initiative to spur the growth, adoption and deployment of electric vehicles and the electric vehicle industry in Ohio.

[9] Please see Table 1 in the appendix for the full calculation.
[10] Original Equipment Manufacturers (OEMs) as well as Tier 1, 2 and 3 suppliers
[11] The analysis used pre-recession (2007) data from IMPLAN to examine Ohio's optimal performance scenario
[12] "The Auto Industry in Ohio," Innovation Ohio.

In 2010, Clean Fuels Ohio and Ohio Department of Transportation began convening a statewide EV stakeholder group representing organizations engaged in diverse electric vehicle planning activities throughout Ohio. In September 2011, Clean Fuels Ohio was awarded $500,000, one of sixteen grants nationwide, under the US Department of Energy's Clean Cities Community Readiness and Planning for Plug-In Electric Vehicles and Charging Infrastructure program to conduct a study that would result in an electric vehicle readiness plan for the State of Ohio. The DOE's objective for this program is to reduce U.S. petroleum dependence and build the foundation for a modern and resilient transportation system that responds to emerging innovations in mobility systems[13].

The Electric Vehicle Readiness Plan for Ohio is the culmination of over two years of collaborative work of a large coalition, led by Clean Fuels Ohio, that has grown to over 200 stakeholders including all major electric utilities, state agencies, metropolitan planning organizations, automobile manufacturers, industry representatives, local governments, universities and research firms. These stakeholders have been assembled to provide work, support, technical information and feedback necessary to complete a detailed statewide EV and EVSE readiness plan and supporting resources. The stakeholder group determined that the two primary priorities of the statewide plan were (1) infrastructure planning, and (2) education and outreach.

The central focus of the Ohio EV readiness grant project involved creating a detailed EV readiness plan that would feature community readiness templates including those relating to permitting and zoning that can be readily implemented by communities of varying sizes and characteristics. This EV readiness plan has included work to evaluate EV market demand; assess grid and utility readiness; recommended updates to local zoning, code, and permitting policies that would streamline EV adoption; provide a targeted EV marketing plan, first responder safety training plan and educational activities for the general public and fleets.

METHODOLOGY

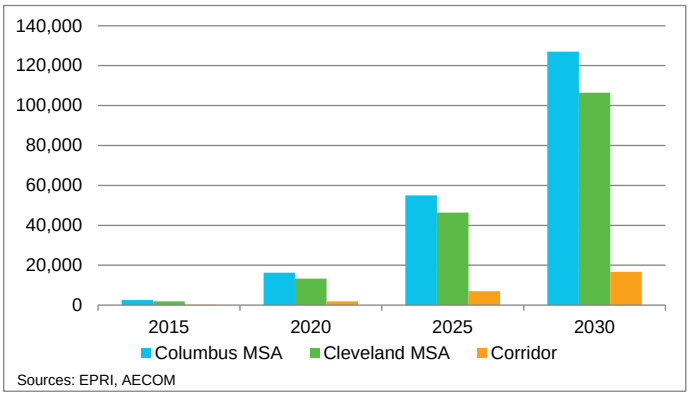
This report is the result of a full year's worth of research, data analysis and stakeholder engagement. Specifically, the consulting firm AECOM (retained by CFO for this project) examined the metropolitan statistical areas (MSAs) of Cleveland and Columbus, Ohio, and the I-71 corridor between them. While the figures in this report are specific to those areas, the process for deriving these results is intended to be replicable by other Ohio communities. A supplemental section also provides recommendations for municipal codes and permitting that are designed to be easily applicable to any Ohio community.

Additional research incorporated into this report was conducted by the Electric Power Research Institute (EPRI), Communica (a marketing firm), Governing Dynamic (a research firm), the University of Akron and the Ohio State University's Center for Automotive Research (OSUCAR), all of which were also contracted by CFO for this study. The statewide stakeholder groups were consulted throughout the process and provided vital feedback in the development of this report.

KEY FINDINGS

- **Driving Range:** Over 70% of drivers in the study areas of Cleveland and Columbus commute less than 20 miles round trip each day, and over 80% of drivers commute less than 50 miles, distances which are well within the range limit of even the all-electric vehicles on the market today.
- **Projected EV Ownership:** By 2030, ownership of all types of plug-in electric vehicles in the Cleveland and Columbus MSAs is projected to number over 250,000.

Figure 1: Projected Vehicle Ownership per MSA, EV and PHEV Combined



- **Residential Charging Station Demand:** By 2030, approximately 125,000 charging stations will have been installed at the homes of EV owners in the Cleveland and Columbus MSAs combined[14].
- **Non-Residential Charging Station Demand:** By 2030, the Cleveland and Columbus MSAs combined will need over 50,000 non-residential charging stations installed at workplaces and destinations[15].
- **Likely EV Owners:** Households with incomes $175,000 and above and fleet owners are likely EV candidates in the short term, with households in the $100,000 income range becoming EV owners by the early 2020s.
- **Grid Impact:** Based on projections showing that electric vehicles will not constitute a majority of on-road vehicles, increased demand for electricity due to electric vehicles will not outpace production capacity or the ability of the existing grid infrastructure to deliver power.

RECOMMENDATIONS

1. Prepare municipalities to enable a proactive approach to permitting

Focus funding and advocacy efforts on the communities predicted to have the highest number of early EV owners. Share the outcomes statewide to benefit all communities.

By 2030, 60% of Gates Mills households may have EVs, resulting in over 500 vehicles, but Parma is predicted to have close to 5,000 EVs within only 12% of its households.

2. Modernize the utility grid

Utilities should maximize planning opportunities over the next decade before EV ownership is widespread. The dawn of a new technology is a prime opportunity to examine transformer capacity and modernize the system.

Some communities will see more rapid EV ownership than others, which may impact local transformer capacity.

[13] "Clean Cities – Community Readiness Projects." Energy Efficiency & Renewable Energy. US Dept. of Energy. 09 Sept. 2011.
[14] This forecast assumes that half of EV owners will install at least a Level 1 charging station at home, while half will plug their vehicle into an existing outlet without an additional charging station.
[15] This forecast assumes a ratio of one non-residential charging station for every five electric vehicles.

3. Identify likely consumers statewide

Replicate the demographic analysis and EV adoption projections in this report for other Ohio MSAs including Cincinnati, Akron, Toledo, and Dayton, which will help prepare municipalities and support the utilities' need for information relevant to their infrastructure.

> Statewide EV adoption figures will be significantly larger when MSAs other than Cleveland and Columbus are taken into account.

4. Site charging stations strategically

Thoughtful and purposeful placement of charging stations within metro areas and across the state will encourage greater and faster EV adoption. Haphazard or unplanned deployment of charging stations could have the opposite effect, creating a chaotic approach that will deter an uninformed public wary to test a new technology.

> EPRI has identified 140 locations that would give 95% of all Ohio residents access to a charging station within 10 miles of home.

5. Commission a statewide economic impact study of the EV market in Ohio

Early indicators in this report demonstrate that electric vehicles can be a tremendous asset to Ohio's economic engine. A study focused on the economic impact and potential of electric vehicles could further refine the goals introduced in this report, and enable policy makers to create an environment welcoming to EVs and their statewide impact.

6. Educate consumers on the true cost and benefits of EVs

The results of the marketing study clearly demonstrate that while Ohioans are aware of electric vehicles, they are unaware of their competitive total cost of ownership and other benefits. Once consumers experience these vehicles and are provided tangible performance statistics, it is likely that more consumers will choose EVs for their next car.

7. Incentivize EV ownership

The State of Ohio and its utilities are alone among the five neighboring states in not providing any tax incentives, grants or rebates within the EV sphere – for vehicle purchase, manufacturing, research or equipment – meaning the state is not taking advantage of the job-creating engine that EVs and their supporting infrastructure can be. To demonstrate leadership and attract the robust resources that accompany EVs, the state must bolster its offerings or risk losing growth opportunities to neighboring states with policies and incentives that encourage EV adoption.

> According to a survey by Communica, 82% of commercial fleet managers say government incentives are necessary for transitioning to alternative fuel vehicles.

> Cleveland-based Eaton manufactures Level 2 charging stations in North Carolina and DC fast charging stations in Oregon.[17]

CONCLUSION

Ohio can realize significant short and long term benefits by accelerating the rate of EV ownership among its residents. In addition to helping advance the important national goal of energy security, the job creating opportunities are robust. As Ohio becomes more EV-friendly, and as adoption increases, the stage will be set for private sector investment in a variety of research, development and manufacturing opportunities that can leverage the range of Ohioans' skill sets – from manufacturing electric vehicles and charging stations to installing over 200,000 charging stations throughout the state, from conducting research on new battery technology to manufacturing EV batteries and components, and even creating business opportunities when those batteries still have capacity but can no longer perform for EVs. Ohio's jobs growth platform for the future will be based upon its ability to adapt to and embrace new technologies, and EVs are an important part of that platform.

This is an exciting time for Ohio. Its economy is faring better than the nation's, as is its employment rate[16]. The energy sector is experiencing a boom that includes Ohio, and the state is home to some of the best technical and automotive research institutions in the country, not to mention a legacy of automotive manufacturing expertise in virtually every community. Armed with the planning recommendations outlined in this report, Ohio's municipalities, clean fuel advocates, industrial leaders and legislative visionaries can propel the state into the electric vehicle movement's pole position.

[16] United States Bureau of Labor Statistics. December 2012 preliminary data lists Ohio's unemployment rate at 6.7%, while the national rate is 7.9%.
[17] "News Releases," Eaton Corp.