Daniel Sawmiller
1668 McCoy Rd
Columbus, Ohio 43220
dsawmiller@nrdc.org

March 9, 2021

RE: Electric Vehicle Manufacturing Opportunities in Ohio and Registration Fees

Dear Senator:

I am writing to urge your support of policies that will help to attract new manufacturing opportunities in Ohio's automotive supply chain while reducing emissions in our transportation sector; with immediate attention to Ohio's electric vehicle (EV) registration fees.

With electric vehicles expected to reach price parity with internal combustion engine vehicles by 2023 (**see Figure 1**), the global automotive supply chain is experiencing significant disruptions. This creates both risk and opportunity for Ohio as auto OEMs are not expected to maintain two separate supply chains, one for EVs and one for internal combustion engines.

It is imperative that we – as a state - become purposeful in our intent to attract this new industry, which includes understanding how various seemingly unrelated policy decisions could impact Ohio's ability to compete for these highly competitive manufacturing opportunities. Investment decisions are being made today by supply chain manufacturing companies, and once the facilities are sited, they will be cemented in those locations for decades. This requires Ohio lawmakers and other stakeholders to act quickly and with diligence so that Ohio's automotive legacy can continue well into the future.

As you know, Ohio is an automotive powerhouse with a significant automotive supply chain (**see Figures 2 and 3**). And our state has already made its mark in the growing battery materials supply chain by attracting the GM/LG Chem cell manufacturing joint partnership to Lordstown. Of the nearly 200 battery megafactories around the world, the overwhelming majority are in China. In fact, China currently dominates every aspect of the Lithium-Ion value chain (**see Figure 4**). This is critical to address as Lithium Ion is widely anticipated to be the leading battery technology for the foreseeable future. As I've noted, we must be purposeful in our attempt to attract these industry players to not only the United States, but to Ohio directly.

Of the 9 total megafactories planned in the US (of which only 3 are active), the $2.3B investment in Lordstown, Ohio gives our state a leg up in becoming a supply chain hub for the growing electric vehicle manufacturing industry. But the presence of that facility alone will not be sufficient to attract the rest of the supply chain; from the chemical processing, cathode and anode manufacturing and even recycling to completely close the supply chain loop inside Ohio. This supply chain transition to EVs will require billions of dollars of additional manufacturing investment, for which Ohio must compete globally (**see Figure 5**).

To better understand this opportunity, the Natural Resources Defense Council (NRDC) has worked alongside JobsOhio for the last year to analyze the key advantages that Ohio has, and the policy needs to support investment attraction activity for the state. A public report detailing our findings is forthcoming, but I'm writing now to highlight a simple step that can be taken today to start positioning

Ohio as an EV-friendly state which will serve to assist the investment attraction exercise that is underway.

Demand-side and supply-side policy incentives and protections can have a domino effect on domestic supply chain growth. There is a litany of examples of the types of policies that different countries have used to date, but one thing is clear: governmental policy on EVs correlates strongly with manufacturing market share (**see Figure 6**). Most immediately, Ohio can make a simple revision to its EV registration fees as a way to align Ohio policy with efforts to attract manufacturing investment.

Ohio's current EV registration fee levels ($200 for all electric vehicles, $200 for plug-in hybrids, and $100 for internal combustion engine hybrids) stand out as an outlier among states we must compete with for manufacturing opportunities domestically. By reducing these fees now, ***Ohio can take an important step to signal its desire to build on its automotive heritage by attracting the manufacturing supply chain of the growing electric vehicle market.*** This can be accomplished with a very minimal impact on Ohio road fund revenue as EV fees represent less than one percent of that revenue today. To maintain Ohio's outlying exorbitant EV fees, we would trade a small pot of road fund dollars for the greater good of positioning our state for success in its efforts to develop a battery materials manufacturing supply chain hub.

More than protecting our automotive industry legacy and the associated jobs, supporting electric vehicle adoption can help Ohio to reduce transportation sector emissions. Electric vehicles have a lower carbon footprint when compared to their internal combustion engine counterparts. Still, Auto OEMs desire to sell electric vehicles to their customers that have the lowest possible carbon footprint, which includes efforts to decarbonize their supply chains (**see Figure 7**). Ohio has the benefit of a quickly growing solar industry which can also serve as a key investment attraction asset, adding to Ohio's other advantages. These other advantages include but are not limited to: extensive history with auto supply chain industries, proximity to resources, manufacturers and end markets, proven logistics and infrastructure, and a highly skilled workforce (**see Figures 8 and 9**).

For these reasons, NRDC encourages you to take the immediate step of reducing Ohio's registration fees for electric vehicles to $100 for fully electric, $50 for plug-in hybrids, and $0 for internal combustion engine hybrids.

We also encourage you to continue exploring other policy opportunities to position Ohio as a leading state for the automotive supply chain of the future. I am available to discuss this with you further and would be happy to offer our lead researchers from Benchmark Mineral Intelligence to help you better understand the key drivers for attracting investment in the battery materials manufacturing supply chain.

Thank you.

Dan Sawmiller
Ohio Energy Policy Director
Natural Resources Defense Council
dsawmiller@nrdc.org
419.733.3145

Figures: Prepared by Benchmark Mineral Intelligence

Figure 1: EVs will reach price parity with ICE Vehicles as early as 2023

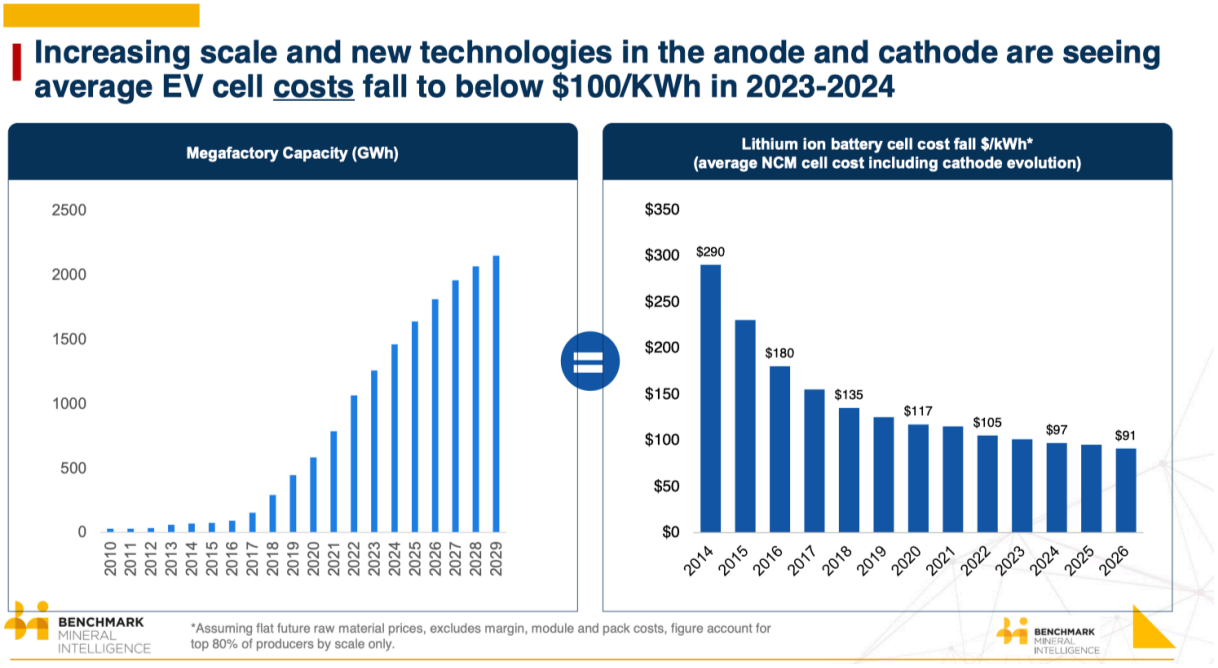


Figure 2: Ohio has a strong automotive supply chain with proximity to key markets

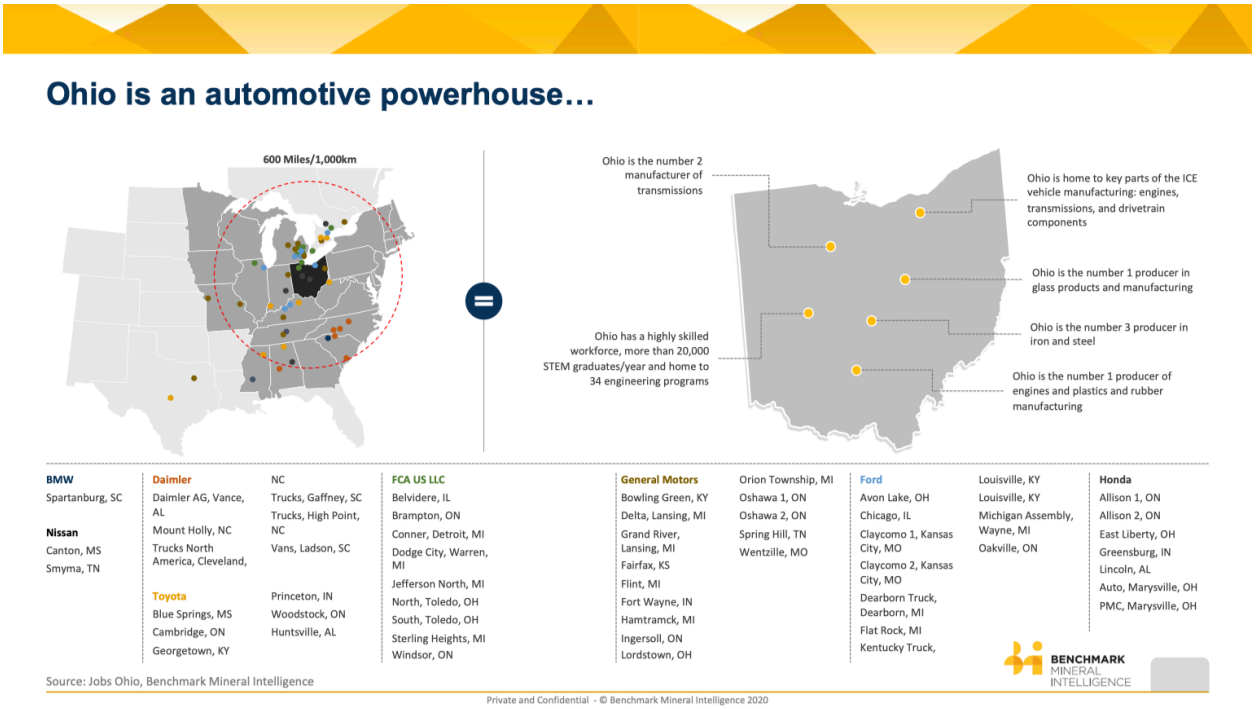


Figure 3: Ohio has a strong automotive workforce and supply chain presence

Ohio has the building blocks for a growth in EV manufacturing: The 2nd largest auto workforce in the US with a highly technical footprint

Additive Manufacturing

1. America Makes
2. University of Toledo Dynamic and Smart Systems Lab
3. NEO Additive Mfg Cluster
4. Mahoning Valley Innovation & Commercialization Center
5. Xavier University MakerBot 3D Printing Innovation Center
6. GE Additive Technology Center
7. Cincinnati State Technical & Community College Additive program
8. University of Dayton Research Institute
9. Ohio University Innovation Center
10. Edison Welding Institute
11. Sinclair Community College Additive Design Specialist program
12. The Ohio State University Center for Design & Manufacturing Excellence (CDME)
13. Air Force Research Lab (AFRL)
14. Case Western Reserve University Sears think[box]
15. Parker Hannifin Corporate Technology Ventures

Advanced Materials

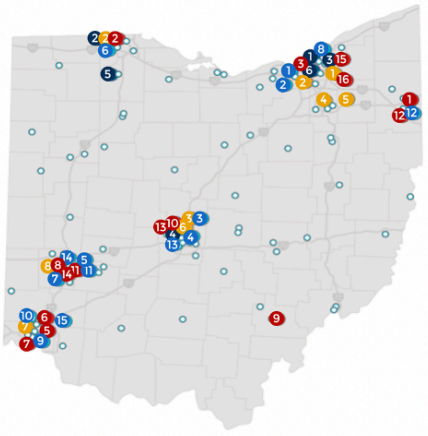
1. ASM international
2. University of Toledo Dynamic and Smart Systems Lab
3. PolymerOhio
4. The University of Akron National Polymer Innovation Center
5. Kent State Liquid Crystal Institute
6. The Ohio state University Center for Electron Microsopy and Analysis (CEMAS)
7. University of Cincinnati 1819 Innovation Hub
8. University of Dayton Research Institute

Automation

1. Cleveland State University: IoT Collaborative
2. University of Toledo Dynamic and Smart Systems Lab
3. Case Western Reserve University: IoT Collaborative
4. The Ohio State University Automation and Optimization Laboratory
5. Bowling Green State University Mechatronics Engineering Technology program
6. NEO Smart Devices and Systems (IoT) Innovation Cluster

Other

1. NASA Glenn Research Center [Li-ion battery development for the International Space Station]
2. Battelle Memorial Institute
3. PolymerOhio
4. Ohio Manufacturers' Association
5. Air Force Research Laboratory [Li-ion for military applications]
6. Center for Innovative Food Technology
7. FASTLANE-MEP
8. The Manufacturing Advocacy and Growth Network (MAGNET)
9. TechSolve
10. Southwest Research Institute
11. Sinclair Community College
12. Youngstown Business Incubator
13. Ohio Supercomputer Center
14. Emerson Helix Center
15. BRITE Energy Inovators



Colleges/Universities with engineering programs

Source: Jobs Ohio, Benchmark Mineral Intelligence

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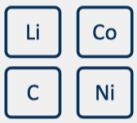
Figure 4: Billions of dollars will be invested in every stage of the EV supply chain

The US must compete for the billions of dollars in manufacturing investment the transition to EVs still needs



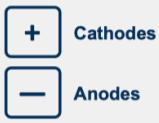
$50-70bn required
(split across lithium, cobalt, nickel, manganese)

Lithium (spodumene/brine producers)
- 26 producers (up from 16 in 2016[1])
- 48 new projects in pipeline

$15bn required

Nickel Sulphate
- 36 producers
- 13 expansion projects

Lithium Chemical Plants
- 69 producers (up from 25 in 2016[1])
- Increasing to 114



$40bn required

Cathodes
- 73 producers
- 11 new producers
- 49 expansion projects

Anodes
- 49 producers
- 54 expansion projects

$130bn planned

Cell Megafactories
- 88 current producers (up from 28 in 2016)
- 29 new plants
- 72 expansion projects

>$300bn committed

Full BEV light vehicle producers
- 54 producers, up from 31 in 2015 and a quadrupling of production

1. Excludes some small-scale Chinese producers
Source: Benchmark Mineral Intelligence and RHO Motion

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Figure 5: China has taken active policy steps to dominate the battery materials supply chain

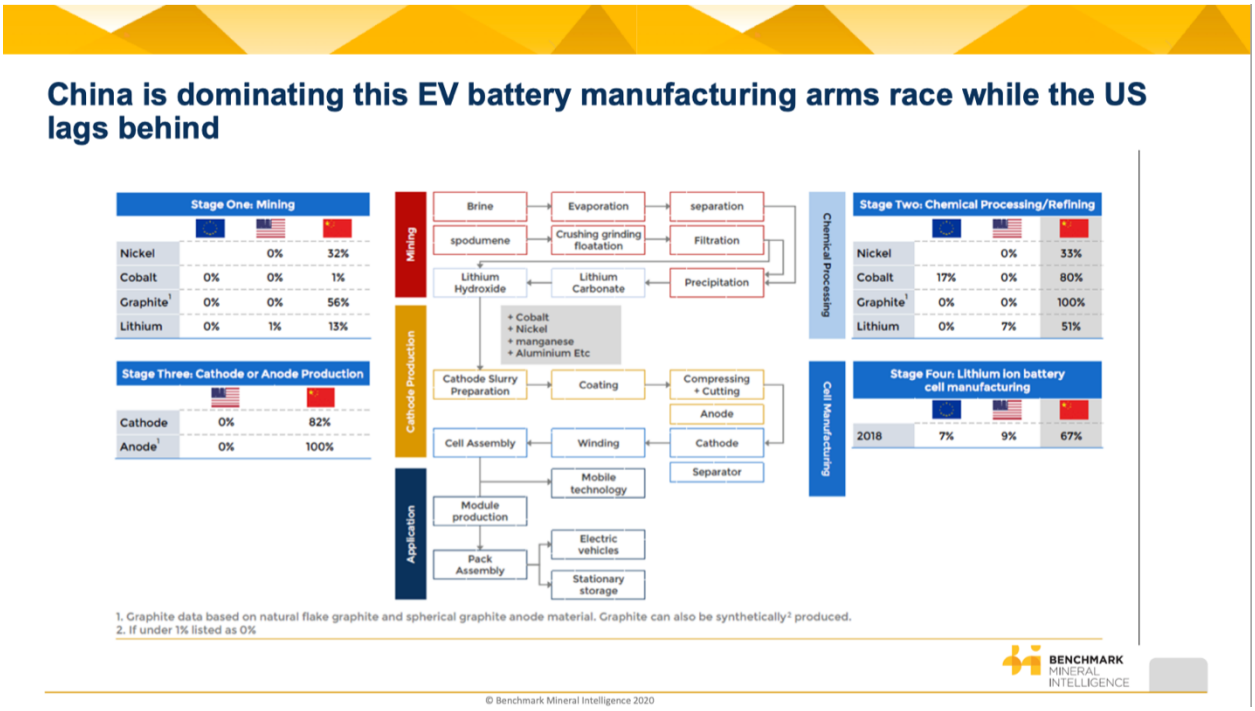


Figure 6: Demand and supply-side policies correlate with manufacturing market share

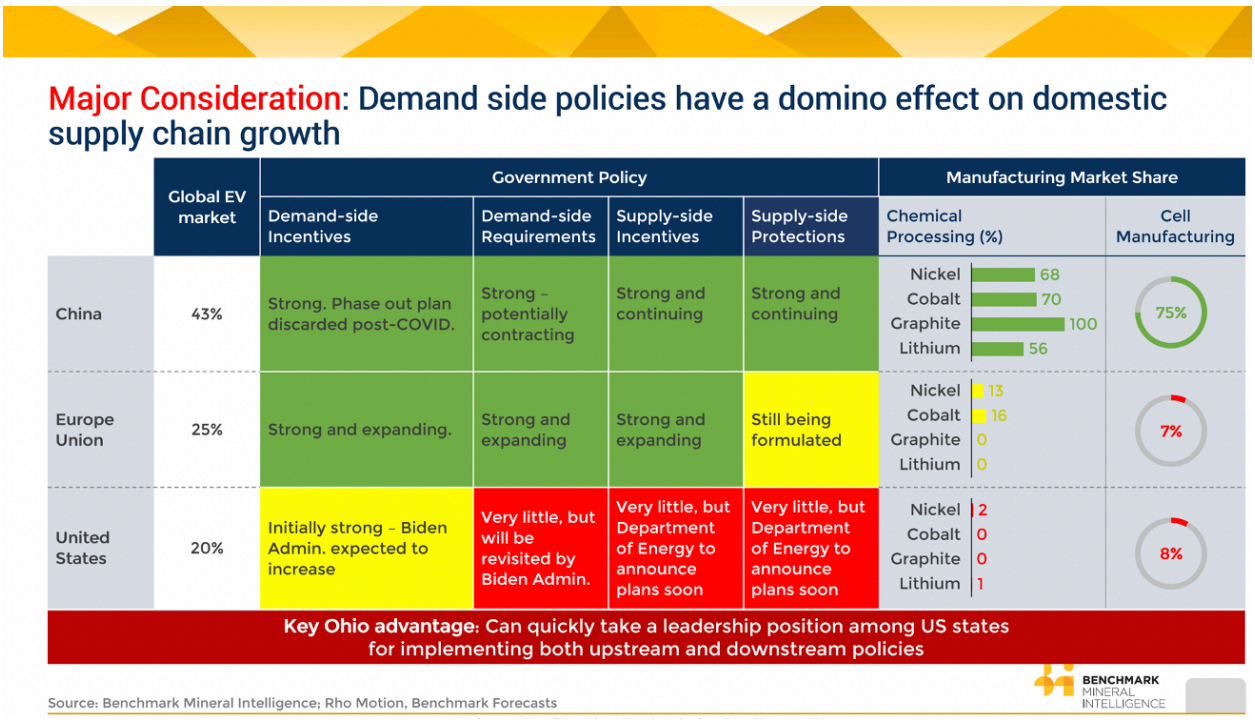


Figure 7: Auto OEM's are seeking to lower their carbon footprint with local renewable energy

Figure 8: Ohio has a number of key advantages that can be supported by sound policy

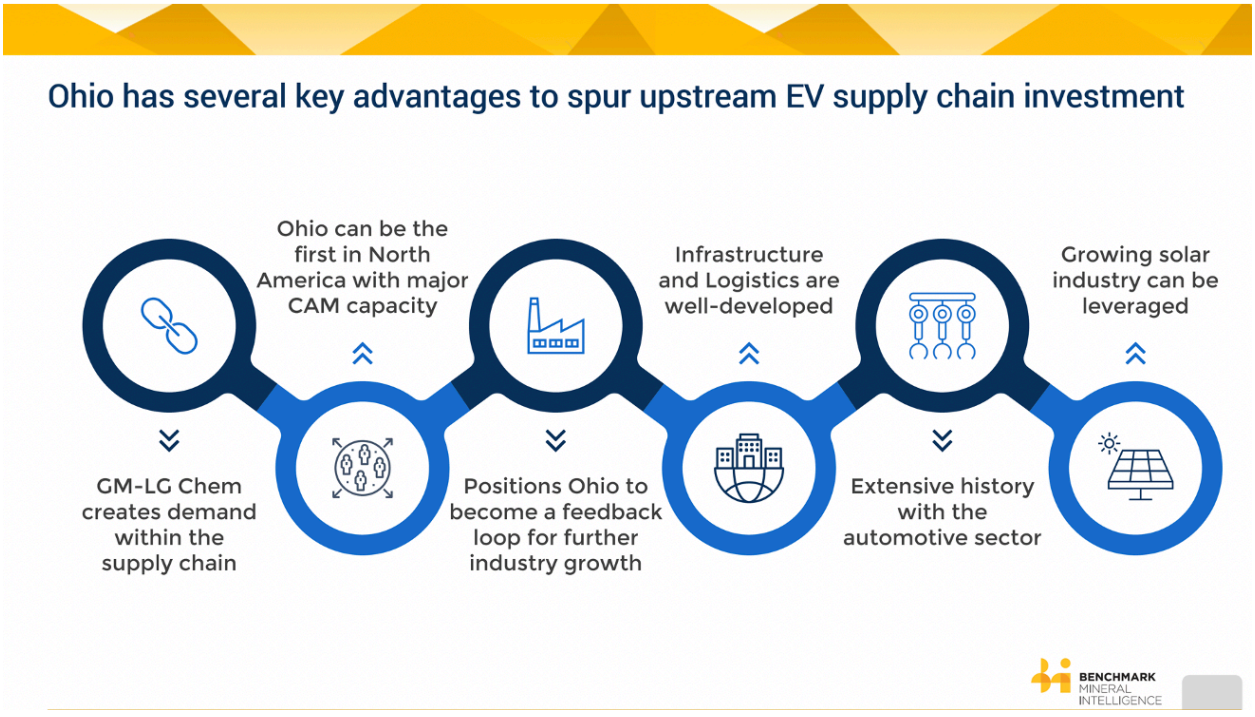


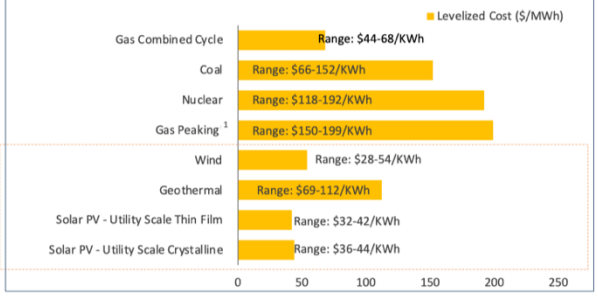
Figure 9: Ohio's growing solar industry offers cost-competitive local renewable energy to potential manufacturers in the EV supply chain

Electricity costs have a large influence on manufacturing OPEX so deployment of low-cost renewable energy has a direct positive impact

The Private Sector is Committed to Renewable Energy

RE100 is the global corporate renewable energy initiative bringing together businesses committed to 100% renewable electricity.

Unsubsidised Levelized Cost of Energy – renewables v conventional



LCOE measures total costs of building and operating a facility over its lifetime – renewables are beating fossil fuels. Over the past decade, solar PV costs have fallen by 85%. Utility scale renewable energy prices are now below coal and gas (even at unsubsidised rates).

Key objective: Promote growing state renewable energy pipeline to help attract EV supply chain investment

1. Assumes cost of $3.45/MMbtu
Source: Benchmark, Lazard

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