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The Roosevelt Project

Industrial Heartland Electric Vehicle Case Study Working Paper Series

The Transition to Electric Vehicles from the Perspective of Auto Workers and Communities

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The Transition to Electric Vehicles from the Perspective of Auto Workers and Communities
by Sanya Carley, David Konisky, Jennifer M. Silva, Shaun Khurana and Naomi Freel

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The Roosevelt Project
A New Deal for Employment, Energy and Environment

About the Roosevelt Project

The Roosevelt Project takes an interdisciplinary approach to the transitional challenges associated with progress toward a deeply decarbonized economy. The project aims to chart a path forward through the transition that minimizes worker and community dislocations and enables at-risk communities to sustain employment levels by taking advantage of the economic opportunities present for regional economic development. The first phase of the project involved an analytical assessment of cross-cutting topics related to the transition. The second phase of the project assesses the transition through the lens of four regional Case, working with local partners on the ground in the Industrial Heartland, Southwest Pennsylvania, the Gulf Coast, and New Mexico. The project was initiated by former Secretary of Energy, Ernest J. Moniz, and engages a breadth of MIT and Harvard faculty and researchers across academic domains including Economics, Engineering, Sociology, Urban Studies and Planning, and Political Science.

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The Transition to Electric Vehicles from the Perspective of Auto Workers and Communities

Working Paper #1

Prepared by Sanya Carley, David Konisky, Jennifer M. Silva, Shaun Khurana and Naomi Freel

In 2021, the Biden administration, in collaboration with the "Big Three" car manufacturing companies in the US, announced a goal to make half of all new vehicles sold in 2030 zero-emissions vehicles. New policy mandates that will require car manufacturers to shift to electric vehicle production have been lauded for their commitment to decarbonization and economic growth. However, little attention has been paid to how workers, community members, and plant managers envision this impending transition at the local level. Autoworkers in particular face uncertainty about the future of jobs that require the building of internal combustion engines (ICEs).

Understanding the perceptions, fears, and motivations of key stakeholders is crucial to implementing successful policy changes. Well-intentioned policies can fail if the populations they are intended to reach are left out of the policy-making process. In this moment of transition, we investigate how auto manufacturing communities perceive the impending electric vehicle transition, analyzing attitudes pertaining to the shift to electric vehicles held by autoworkers and community members who have been affected by plant closings in the industrial heartland of the Midwest. We examine whether those who work in automobile plants and live in the surrounding regions believe that this transition will affect them positively or negatively. As part of this effort, we also examine how these communities have been affected in past transitions and envision perceived future transitions.

Methodological Approach

In order to investigate our research questions, we conducted semi-structured focus groups in six cities across Michigan, Ohio, and Indiana. All six cities have the presence of automobile manufacturing, with assembly and parts plants that have evolved through the years; some cities have undergone recent electric vehicle manufacturing developments and others are still focused on automobiles with ICEs. We selected the six cities with the objective to have a range of representation across automobile manufacturing companies, small and large cities, and community demographics such as race and income. The cities are Detroit, MI; Flint, MI; Toledo, OH; Lima, OH; Lordstown, OH; and Kokomo, IN. We describe the six field site locations in greater depth in the section below. The research team partnered with Econometrica, based in Bethesda, MD to recruit participants and administer the focus groups.

We engaged three types of focus group participants: auto workers, both former and present; auto managers, both former and present; and community members who live near assembly and parts plants. To recruit participants, we engaged in multiple approaches. First, we reached out to community leaders in each location, as established through Roosevelt Project

team member networks, including those who work in the auto industry, local government officials, and other individuals and organizations who are well connected in the communities (e.g., business leaders, fire chiefs, and philanthropic foundation officers). Second, we engaged in snowball sampling, in which we asked focus group participants to suggest other individuals who may be willing to offer their experiences and perspectives. Third, we engaged in a range of information outreach efforts, including posting flyers in field site locations, making cold calls to individuals we were able to identify online, posting to Craigslist in the local area, and posting ads through social media such as through Facebook.

Upon learning about the study, potential focus participants completed an online five-minute interest survey in which they were asked to provide basic information such as the location of their residency, their connection to the automobile industry (if any), and basic demographic information. The research team reviewed this information to determine each individual's eligibility for participation in a focus group (e.g., in the right location, representing the correct type of participant). Upon determining eligibility, we contacted participants to schedule a focus group, and if the participant agreed to participate, we sent a confirmation email or text with the group date and meeting information.

We provided financial compensation to those who participated in our focus group sessions, as well as to those who helped us recruit additional participants. We modified the payment structure over time, after learning in the early months of recruitment (approximately early May, 2021) that the compensation might not be enough to elicit robust participation.

We conducted 67 focus groups across these six locations, with a total of 150 participants. We conducted all focus groups virtually via the Zoom platform. Focus groups and interviews lasted about an hour and were recorded with the consent of the participants. They were audio recorded and subsequently professionally transcribed.

Focus groups ranged in size from one to seven people (the one-person "groups" were conducted as semi-structured interviews using the same set of questions). In Table 1, we present the distribution of respondents across the field site locations. We had the most success recruiting autoworkers in Detroit and Lordstown, where we spoke to the most individuals overall as well, and limited success with autoworkers in Toledo and Kokomo. We were able to speak to more individuals in management in Detroit, with significantly fewer across all of the other cities. Lordstown yielded the highest number of community participants. In the analysis that follows, we generally do not report findings for specific locations, but instead report on major themes across the sites. We do remark on specific locations, however, when appropriate.

Table 1. Participants by Target Audience and City

Target Audience	Detroit, MI	Flint, MI	Toledo, OH	Lima, OH	Lordstown, OH	Kokomo, IN	Total
Current Autoworker	14	4	2	7	14	0	41
Former Autoworker	11	2	0	2	11	4	30
Current Auto Management	2	0	0	0	0	0	2

Former Auto Management	**15**	**0**	**1**	**0**	**4**	**2**	**22**
Community Member	**8**	**8**	**5**	**7**	**19**	**8**	**55**
Total	**50**	**14**	**8**	**16**	**48**	**14**	**150**

In Table 2, we present respondent socio-demographic characteristics. Our respondents tended to be slightly more male and middle-aged. Seventy-three percent of respondents were white and 15% were Black. Respondents represented a wide range in income and educational achievement.

In our focus groups and interviews, we investigated how participants perceived the shift to decarbonization, experienced plant closings, and considered how the EV transition affected their families, communities, and their futures. Our opening questions asked participants to reflect on the following topics: "Many automakers have announced plans to shift from traditional combustion engine cars to electric vehicles. What are your impressions of changes within the auto industry toward electric cars?" and "What are the resources that your community needs to successfully transition to electric car making?" We tailored our questions to the participants' different roles as workers, managers, and community members.

Table 2. Participant socio-demographics

Breakdown of Participant Demographics by Percent (number)			
GENDER		**AGE**	
Male	56% (84)	≤ 29	8% (12)
Female	41% (62)	30-39	14% (21)
Non-binary	1% (1)	40-49	22% (33)
Prefer not to say	2% (3)	50-59	21% (31)
RACE		60-69	17% (26)
White	73% (109)	70-79	9% (14)
Black	15% (22)	80-89	5% (7)
Hispanic/Latino	3% (5)	Prefer not to say	4% (6)
Other	5% (7)	**EDUCATION**	
Prefer not to say	5% (7)	<HS Diploma/GED	1% (1)
INDIVIDUAL PERSONAL INCOME		HS Diploma/GED	16% (24)
<$25,000	5% (8)	Vocational/Trade School or Certificate	5% (7)
$25,000-49,999	15% (23)	Some College, No Degree	22% (33)
$50,000-74,999	23% (35)	Associate's Degree	6% (9)

$75,000-100,000	19% (39)	Bachelor's Degree	25% (37)
>$100,000	22% (33)	Advanced Degree	22% (33)
Prefer not to say	8% (12)	Prefer not to say	4% (6)

We chose to conduct in-depth interviews and focus groups instead of a more traditional survey because we wanted to discover the relevant categories at work - that is, how people envision the transition to electric vehicles - rather than the "distribution of some larger population across categories that we have a priori chosen" (Luker 2010: 102). Through deep immersion in six communities, we were able to uncover how people construct and perceive plant closings, decarbonization, and future opportunities or fears. Crucially, whether we judge participants' perceptions as valid, factually correct, or sensible, they are nonetheless important to understand because people *act as if they are true* (Frye 2017), and can thus shape demographic change in a vast array of substantive domains, including marriage, divorce, fertility, political participation, and religious involvement (Johnson Hanks 2007). Furthermore, policies could fail to reach key populations if they make assumptions about the systems of meaning that underlie behavior (Mathur and Silva 2019).

Focus Group Locations

The study focused on six locations across Michigan, Ohio, and Indiana. In this section, we provide a brief summary of each site, including recent developments relevant to electric vehicles where appropriate. In Table 3, we present a few basic demographic statistics for each location, long with some plant-level information.

Table 3. Field Site Demographic Statistics and Plant Information

Location	Income	Population	Race	Plant	Employees	Rep/Invest
Lordstown, OH	$53,483	3,300	White: 93.4%; Black: 1.76%	GM Lordstown	N/A	Sold to Lordstown Motors

Detroit, MI	$31,283	672,681	White: 10.8%; Black: 77.3%; Hispanic: 7.84%	GM Hamtramck, FCA Mack	Hamtramck = 800 Mack = 4100 (projected)	Hamtramck $2.2 billion, Mack $2.5 billion
Flint, MI	$27,717	97,161	White: 37.4%; Black: 53.2%; Hispanic: 3.95%	GM Flint Assembly	5,597	$32 million
Lima, OH	$35,172	37,335	White: 63%; Black: 25.3%; Hispanic: 4.12%	Ford Lima Engine Plant	1,530	$500 million
Toledo, OH	$35,866	274,973	White: 63%; Black: 25.3%; Hispanic: 4.12%	FCA Toledo Assembly	7,000	$1.7 billion
Kokomo, IN	$43,588	57,497	White: 81.6%; Black: 9.51%; Hispanic: 4.0%	FCA Kokomo Engine Plant	1,094 (projected)	$400 million

Lordstown, OH

Lordstown is a village in Trumbull County, Ohio, located halfway between Cleveland and Pittsburgh. Lordstown has a population of 3,300 and is majority white (93.4%), with a

median income of $53,483 (Data USA, n.d.). The GM plant in Lordstown produced its first car, a Chevrolet Impala, on April 28, 1966 (DeMarco, 2019). Over the years, this facility produced other vehicles as well: the Vega from 1971-1977; the Pontiac Astre from 1975-1977; the Chevrolet Cavalier from 1982-1994 (DeMarco, 2019); and the Cruze from 2011 to 2019. In 2019, GM began closing operations of the plant. In 2020, GM then sold the plant to start up Lordstown Motors, which was beginning at the time to produce an electric truck called the Endurance (Domonoske, 2020). In addition to these developments, LG Chem began producing battery cells in Lordstown as part of a joint venture with GM, which will use the batteries for their electric vehicles that will be assembled at the Hamtramck plant in Detroit.

Detroit, MI

The city of Detroit has a population of 672,681 and median income of $31,283; the demographic makeup is majority Black, at 77.3% (DataUSA, 2018). Detroit is home to many automobile plants. In our analysis, we focus on three of the plants: GM Hamtramck, FCA Mack, and FCA Jefferson. GM Hamtramck is the only GM facility technically located in two cities: Detroit and Hamtramck. The GM Hamtramck plant was opened in 1985 and was slated to close in 2019, before GM decided to reorient the facility. GM announced in January of 2020 that it plans to invest $2.2 Billion into this facility to produce several different electric trucks as sports utility vehicles (SUVs), and thus become GM's first fully eclectic assembly plant (General Motors, 2020). The company has rebranded the plant "Factory ZERO" as an indicator of the manufacturer's commitment to EV production (LaReau, 2020). Before this announcement, the facility produced the Chevrolet Impala, Chevrolet Volt, Cadillac CT6, and the Buick LaCrosse, all of which have been discontinued (GM Authority, n.d.). GM also has a joint venture with LG Chem, who will produce the batteries in Lordstown, OH, for use in the GM Hamtramck produced electric vehicles.

FCA Detroit Mack was originally built as a stamping factory and was eventually sold to Briggs Manufacturing Company, which produced car bodies and frames for Plymouth and Ford (MotorCities Heritage Area, n.d.). Chrysler subsequently bought the plant in 1953 and used the stamping parts for a nearby Dodge manufacturing plant. Chrysler eventually built a new plant to produce engines, where they produced nearly 3 million engines between 1998 and 2012 (MotorCities Heritage Area, n.d.).

The FCA Detroit Jefferson plant, located on the north side of Detroit and directly across from the Mack plant, was built in 1991 to produce the Jeep Grand Cherokee, which it still produces to this day (Stellantis, 2021). In 2019, FCA pledged a $2.5 billion investment to expand the Mack and the Jefferson North Assembly plants to manufacture the Jeep Grand Cherokee L and a new plug-in hybrid model, as well as continue to produce the Ram 1500 Classic (Rufiange, 2018). This investment is projected to create 4,950 new jobs in the area (Noble, 2020).

Flint, MI

Flint has a population of 97,161 and a median household income of $27,717. The population is 53.2% Black and 37.4% white (DataUSA, 2018). Flint is a longstanding and historical site in American automotive manufacturing as the birthplace of GM. GM opened the first manufacturing facility in Flint in 1903, and the sit-down strikes of 1936-1937 in the city's manufacturing plants led to the recognition of the United Auto Workers (UAW). Flint is second to Detroit in terms of GM production volume, at one time employing 35,000 workers at over 18 plants (Bradsher, 1997). In 1999, GM closed the Buick City Factory in Flint, a plant originally opened in 1908 and one of the longest operating GM plants in history, which produced the Pontiac Bonneville and Buick LeSabre (Bradsher, 1997).

GM plant employment in Flint has been variable through the decades. In the 1940s, GM plants employed over 40,000 individuals in Flint, which grew to over 77,000 in the 1960s. By the 1990s, however, employment dropped to about 44,000 employees, and then subsequently declined to about 7,000 by the late 2000s. (Fonger, GM Weld Tool Center closing: General Motors history in Flint area has been full of highs and lows, 2019). This downward trend in employment, and GM's bankruptcy filing in 2009, have adversely affected economic conditions in Flint.

After GM's bankruptcy and the subsequent bailout of the automotive industry during the Great Recession, production continued at the Flint Assembly plant, although the majority of workers were temporary or hourly and total employment only totaled 4,450 (Fonger, GM to invest $150M at five Michigan plants, 2020). As of January of 2021, many of those hourly employees are being promoted to full-time status [CS3] in light of the $32 million dollar investment in Flint Assembly for future production of Chevrolet Silverado and GMC Sierra pickup trucks, in addition to another $150 million investment to "increase production" (Mersha, 2021).

Lima, OH

Lima is a small city in northwest Ohio with a population of 37,335 and a median household income of $35,172; the demographic makeup is 63% white (non-Hispanic) and 25.3% Black (DataUSA, 2018). The main automotive plant in Lima is the Ford Lima Engine Plant. The plant employs approximately 1,530 employees, 1,380 of whom are hourly employees (Ford, n.d.). The facility opened in 1957, and has previously produced the Ford Vulcan V6 engine, the 3.9-liter V8 used in the Thunderbird, as well as crankshafts for a variety of other Ford automobiles. As of 2015, following Ford's investment of $500 million for the retooling of the plant, it produces the 3.5- and 3.7-liter V6 engines as well as the 2.7-liter EcoBoost Nano (Ford Authority, 2020).

Lima has long served as an industrial hub in Ohio. The city's population increased from about 13,000 in 1860 to over 131,000 by 1900 (Long, n.d.) as it first manufactured wood, then transitioned to steel. The Lima Machine Works produced steel beginning in 1869 (Lima News Archives, 2020), then added the production of railroad cars in 1882. In 1910, Benjamin Gramm moved his truck part manufacturing company from Bowling Green to Lima; Gramm-Bernstein

Truck was awarded a contract by the Federal Government to build the prototype for the Army's heavy-duty truck (Lima News Archives, 2020). Government contracts continued in Lima, with United Motor Service, a subsidiary of General Motors, producing all of the motorized vehicles for the U.S. military during World War II (Lima News Archives, 2020).

Toledo, OH

Toledo is a mid-sized city in northern Ohio with a population of 274,973 and a median household income of $35,866. The demographic makeup is 57.4% white and 27.1% Black (DataUSA, 2018). The Toledo Assembly plant opened in 1903 and was the primary producer of the Willys Jeep utility vehicle during World War II and has two interconnected parts: Stickney and the Supplier Park South (Stellantis, 2021). Large recent investments include $700 million toward the production of the 2016 model year Jeep Wrangler and a $1 billion investment to retool and modernize the facility for production of the Jeep Gladiator (Stellantis, 2021).

There is also a machining plant in Toledo that began production in 1966. The Toledo Machining plant, owned by FCA, produces steering columns and torque converters for multiple plants across the country, as well as Mexico and Canada (Stellantis, 2021). The Toledo Machining will also soon produce the Power Electronics module for the plug-in hybrid Jeep that is being assembled at FCA Mack (Stellantis, 2021).

The Toledo FCA Assembly plant, originally acquired from Autolite in 1964 and subsequently converted for vehicle production in 1981, built the Jeep Grand Wagoneer until 1991 (Stellantis, 2021). This plant would eventually become one of the manufacturing hubs of the Jeep brand, with the Toledo Supplier Park built in 2005 to aid in the production of the Jeep Wrangler and Wrangler Unlimited. FCA announced in 2017 that it planned to invest $700 million into Toledo North's plant to produce the next generation Jeep Wrangler and discontinue production of the Jeep Cherokee (Stellantis, 2021). Toledo South's complex was to be refitted as well, with a $1 billion investment to produce the Jeep Gladiator, a pickup truck.

Kokomo, IN

Kokomo is a small city in north central Indiana with a population of 57,947, a median household income of $43,558; the population is 81.6% white and 9.51% Black (DataUSA, 2018). The Indiana Transmission Plant II, which is to be renamed the Kokomo Engine Plant, was constructed in 2002 and began production in 2003 (Stellantis, 2020). FCA pledged to invest $400 million into the transmission plant to retool the facility to produce the GMET4 engine, a four-cylinder engine that is offered in the Jeep Wrangler and Cherokee, effectively moving the production of this engine from Termoli, Italy, to Kokomo (Irwin, 2020). FCA has built transmissions in Indiana across four plants for more than eight decades, but this will be the first time that it will produce engines in Indiana (Irwin, 2020).

A second automotive plant in Kokomo is the Delco Plant #1, which was originally built in 1922 and purchased by Delco, an electronics part manufacturer, in 1954. Delphi Automotive Systems, a subsidiary of GM, purchased the plant in 1997. In 1998, Delco #1 closed and 675,000

square feet of the facility, the majority of the manufacturing space, was demolished. This led to a significant decline in employment in the area (Brugerman, Dziczek, & Cregger, 2012).

Analysis

We used the qualitative data analysis software NVivo 20 to process our data. The 67 focus groups were recorded by the interviewers, professionally transcribed, and subsequently uploaded into NVivo for analysis. Since the purpose of the focus groups was to better understand the perceptions and attitudes of the participants, a topic coding method was most appropriate for parsimoniously organizing the participants' responses. Topic coding is a type of concept coding method. Concept coding, sometimes also referred to as "analytic coding," is a set of approaches that use relatively simple and clear filtering mechanisms, allowing researchers to quickly categorize components of textual data (Saldana, 2013). The focus is on the application of more abstracted notions to subsets of the data. This indicates the degree to which these terms shift the focus from substance to theory (Saldana, 2013, p. 119).

We developed a list of possible topic codes both based on a literature review of publications about electric vehicles as well as an iterative review of the focus group transcripts. This resulted in a list of 155 possible codes that we applied to the data. Each topic code can be thought of as a k x 1 matrix populated with excerpts of text meticulously pulled line by line and story by story to capture different levels of the participants' experiences. We used the most often discussed topic codes to identify the themes in our data.

The most common topic codes that emerged from the focus groups were the following: Perceptions of the Labor Market, Stages in Energy Transition, Perceptions of Car Markets, Community Infrastructure, Perceived Role of Government, Technological Developments, and Education and Reskilling. Tables 4 and 5 display the frequency of these topic codes across different types of focus groups, both in terms of location and participant type (i.e., community leaders, managers, and autoworkers). Figure 1 displays the five themes that our analysis determined to be most important to understanding participants' perceptions about the shift to electric vehicles.

Table 4. Frequency of Topic Codes across Focus Groups by Study Location

Code Frequencies	**Lordstown, OH (11)**	**Detroit, MI (18)**	**Flint, MI (5)**	**Lima, OH (5)**	**Toledo, OH (3)**	**Kokomo, IN (8)**	**Mixed Cities (17)**	**Total (67)**
Perceptions of the Labor Market	81.8%	94.4%	80%	80%	100%	87.5%	94.1%	87.2%
Stage in Energy Transition	72.7%	90.9%	80%	80%	66.7%	100%	70.6%	89.4%

Perception of Car Markets	54.5%	72.2%	40%	100%	33.3%	62.5%	64.7%	61.7%
Community Infrastructure	90.9%	90.9%	80%	80%	100%	87.5%	70.6%	89.4%
Perceived Role of Government	36.4%	72.2%	40%	80%	100%	75%	58.8%	65.9%
Technological Developments	45.5%	55.5%	40%	60%	66.7%	37.5%	52.9%	51.1%
Education & Reskilling	81.8%	94.4%	80%	60%	66.7%	100%	82.4%	87.2%

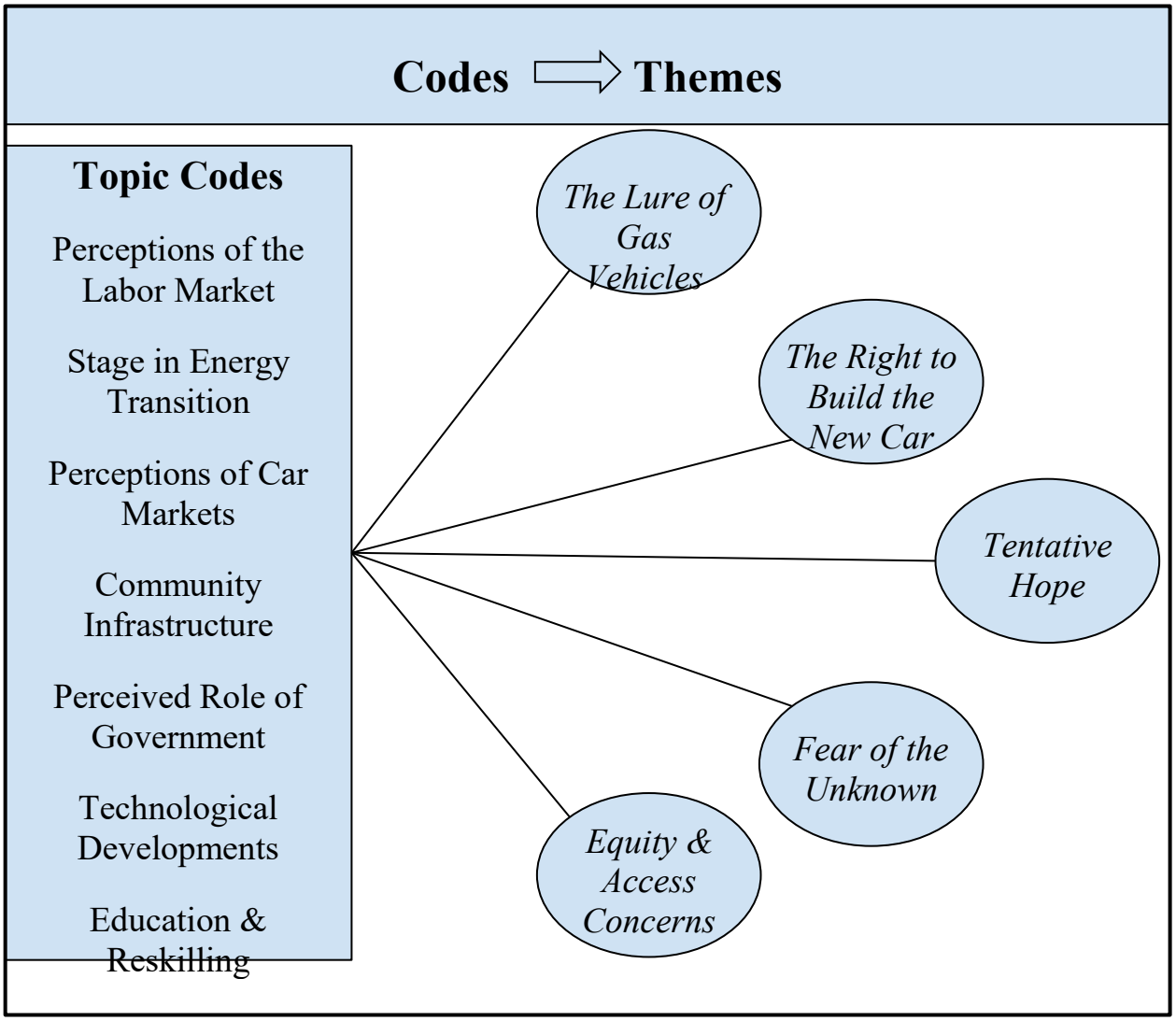
Table 5. Frequency of Topic Codes across Focus Groups by Participant Type

% of Focus Groups Discussing	**Community Leaders (25)**	**Managers (9)**	**Autoworkers (33)**
Perceptions of the Labor Market	76.0%	77.8%	75.8%
Stage in Energy Transition	92.0%	88.8%	90.9%
Perception of Car Markets	64.0%	77.8%	57.6%
Community Infrastructure	72.0%	88.8%	84.8%
Perceived Role of Government	80%	88.8%	30.3%
Technological Developments	48%	88.8%	36.4%
Education & Reskilling	80%	100%	81.8%

Our sample size does not allow us to draw robust inferences about differences in attitudes across study locations. We selected locations in part to capture variation on dimensions such as past transition, company affiliation, and other factors that may moderate the significance of these topics. After organizing the data into topic codes, thereby converting unstructured focus group

data into structured lists, we reviewed the matrices of coded text to evaluate for presence of consensus across participants and develop themes. Themes represent both what the participants think about the electric vehicle transition and what the electric vehicle transition might help us understand about the participants position in the process. Social analysis and cultural meanings participants bring, here to the electric vehicle transition, are important to informing processes and policies that impact local populations (Yin, 2015).

Figure 1. Topic Codes and Themes



Key Findings

The participants in our study understood the momentousness of decarbonization, with some characterizing the impending transition to electric vehicles as the next Industrial Revolution. At the same time, participants expressed a fear of the unknown, raising questions

about whether there will be a market for electric cars, about whether car companies and the government would overpromise and under-deliver, and about equity and access, whether in terms of public infrastructure, workforce development, or affordability. We also heard stark differences by the type of participants that we spoke with. For community members, leaders, and managers, a sense of tentative hope emerged about the possibility of agile development, new technological innovations, and community revival. For workers, however, the transition felt much more precarious: while workers believed that the car companies "owe" them a job in return for their years of hard work, they nonetheless seemed resigned to the notion that their loyalty would go unrecognized. They grudgingly accepted that electric vehicle production would be better than nothing at all, yet also feared they would be easily replaced and ultimately left behind.

In the following paragraphs, we begin by describing participants' perceived barriers to EV transitions, including: the lure of driving a "real" car where one can smell the exhaust and hear the engine roar; and the sense that the electric vehicle transition was coming too fast, especially given the lack of technology ad existing infrastructure, such as charging stations, that would enable widespread adoption of electric vehicles. We also delve into participants' concerns about equity - who will be able to afford an electric vehicle?; will public transit also benefit from an electric vehicle transition?; and will the least educated American workers be left behind? Finally, we examine divergent worldviews of participants who see hope and possibility for community rebirth through the development of new industries, versus the workers who feel abandoned by the car companies they helped build, even as they recognize there are no other alternatives.

The Lure of Gas Vehicles

Participants expressed concern that American consumers were not ready for the shift to electric vehicles. Older generations emphasized the strength, size, and sensory nature of gas vehicles, particularly the experience of smelling the exhaust and hearing the engine. In a Lima, Ohio, focus group, participants stated that "most people are in love with their cars" and explained that "what ma[kes] a car" is a "big engine" and "lots of horsepower." Doubting consumer desire for electric vehicles, one community member elaborated, "all these tiny little [EVs] that they were all inventing, didn't make the biggest hit in the United States because people like their big vehicles. And we continue to buy big trucks, SUV's, and all of that."

In Detroit, older members also reflected that it would take serious efforts to persuade them to invest in an electric car. As one Detroit manager explained, "I think it's going to be somewhat of a challenge to get old hats like me to believe that they can get into a car, make a trip and come back safely home. I think it's going to take some work there." While the "young kids" might quickly adapt to the need to find charging stations to plug their electric vehicles into when they are away from home, he worries that the "old hats" like him who grew up thinking that "a car is almost on empty if the needle says half of a tank" might have a harder time planning their charging schedule ahead of time. He continues: "There will be challenges for those. He doesn't know what to put in the trunk of his car. He doesn't know whether to put an electric cord in the

trunk of his car, he doesn't know if he should put an extra battery, or what. I think the older ones are going to suffer a little bit." This focus group also underscored the importance of having a car in American culture, wondering if young people in cities would be "more open" to "greener and more environmentally correct" forms of transportation. He concludes: "I have nieces and nephews that don't even care if they own a car or not. And for me like, oh my God, I have to have a car every minute. The car was life itself."

Other respondents commented on the way in which people operate their traditional vehicles as deeply ingrained within their lifestyles, and accompanied by a set of habits that simply cannot be broken. Driving to a gas station and fueling one's car, for example, are so habitual that some will struggle to come to terms with a change in this process: "I really think a lot of people will lose because they are so used to the old fashioned ways, like older generations. They would lose because I don't think that they would want to get all that into electric cars. They're so stuck in what happened, gas cars." In Lordstown, Ohio, community members also expressed discomfort about losing the "manufacturing mindset" that has long defined them. One group member explained how a traditional plant produces recognizable products so that "you're going to drive a truck off at the end." But electric vehicle production, on the other hand, feels like a "more sterile environment where you make computer chips or something like that than a manufacturing environment," and no one quite understands what production is "going to look like."

Fear of the Unknown

Participants also conveyed a sense of wariness and suspicion toward the speed of the transition to electric vehicles, fearing that car companies had committed to a rapid timeline that might not prove viable. They saw more "hype" than actual information and planning. Managers, for instance, noted that too many questions - about community infrastructure, workforce development, and organizational structures - have been left unanswered in the race toward an electric future. One manager from Toledo worried that "the electrification movement is moving faster than people thought it would." He explained that he was "not sold on it yet" due to his lack of knowledge, though accepted that "it seems to be the way of the future...it's just, they need to put more information out there on how this is going to work." This manager attributed the speed of the transition to competition between car companies, though also questioned if "they're all in cahoots with each other too," possibly at the expense of workers and consumers. He explains, "even as something simple as pulling into your garage and plugging in, if, you know, you got older homes, you're going to have to get the electrician to rewire different plugs to, uh, charge your car because they might, you know, older home might not be able to handle the Watts or, you know, charge, you know?" While "the conversations that everybody's having" revolves around a coming transition, he has heard less discussion about workforce development: " we have to prepare for that too. And I hope that the education and the training speeds up to catch up."

Participants used phrases like “a catch-22” or “a coin toss” to capture their ambivalence toward electric vehicles. Some felt more comfortable with the idea of a hybrid vehicle because “electric, just the infrastructure, having the necessary...quick charging stations is going to be so important because we rely on our cars so heavily,” said a Lima community member. Another Lima community member also worried about the lack of dependability of electric vehicles, especially during emergencies: “So if you need to get in your car to run away from a tornado, not going to happen, because electricity all went out. I’m trying not to be negative at all, but I think there’s just a lot of basic things that need to be taken care of before people will buy in.”

An autoworker in Detroit raised the issue of whether existing roads would even be able to withstand growing EV usage: “To give you an example, a current luxury sedan weighs 4,000 pounds, maybe, round numbers, rough average. The newest sedans weigh close to 6,000 pounds. The trucks, instead of weighing 6,000 pounds like a normal heavy-duty truck would weigh today, they're going to 9,000 pounds.” Another member of this group added, “Everybody here in the subdivision would need one or two chargers. A 200-volt charger or 80 amps each. What kind of wiring system does that take from Detroit Hudson to support that? Then subdivision after subdivision, that's a lot of infrastructure..to try to force the transition to work too rapidly and we're going I'm afraid people would want to go back to gas-powered cars.” Another autoworker from Detroit believed that many of the problems that would accompany the EV transition were not being openly discussed out of fear of halting progress: “I’m not trying to be negative but all you hear about is the positives of electric vehicles not using gasoline. But man, there’s a lot of other issues that they’re not talking about because they haven’t really solved those yet. They don’t want to kill the progress being made with electric cars as they are. So that’s my kind of take on this whole thing.”

This fear of the unknown was exacerbated by the perception that auto manufacturers were purposely withholding information from managers, workers, and consumers. A community leader who contracts with Detroit auto manufacturers expressed that a lack of knowledge about where auto manufacturers are in their stage of the transition to EVs creates challenges for other industries and educational programs to adapt: “And the other thing about what would be a barrier for this growth in our area? I really think that the automotive companies, including the battery makers and so forth, they're really going to have to explain what kind of skill sets they need in order to make this industry work. Is it going to be traditional mechanical and electrical engineers that are designing and building these vehicles, or is it some other skill set that's required? And I think that that's something that's got to be determined so that kids in high school right now that are considering a college career or a career path get out of the right road early enough so that they gain those skill sets and they're employable.” Another community leader in Detroit echoed this sentiment saying “We really aren't given much information at all. I think it's highly secretive at least from our perspective.”

Concerns about equity and access

Participants' fear of the unknown dovetailed with specific concerns about equity and access. These concerns centered on the future of workers and the availability and affordability of appropriately equipped electric grids, charging stations, and wattages available in people's homes. A large number of respondents expressed concern about whether their job will still exist in future years in the event that the manufacturing of an EV will require fewer assembly workers due to its fewer parts. One respondent explained: "[It's] scary because I think some people are going to end up being without a job because they probably won't need as much. But then again, it may need more than what we have now, so it's kind of scary with the unknown," mused a Detroit autoworker.

A similar concern was that the manufacturing of an EV would require specialized knowledge -- knowledge that the current employees did not possess. These respondents were dubious about whether their employers would provide opportunities for workforce training, and some assumed that they would simply be replaced by outside specialists. For example, a Flint autoworker explained: "I think that if they have to hire new people to retool it, they'll bring it. They'll try to bring in people from the outside contractors or something else like that. Or they'll set up a dedicated traveling team or something like that. What I would imagine if they don't already have those people on payroll. So, I think that there's quite a bit of possibility for a negative effect, negative impact on me and my family, my coworkers. There is also the possibility, it could be good for my community and it could be good for all of us. It's a coin toss." Here, one can observe both uncertainty about the future benefits of EVs for society as well as uncertainty about one's personal, professional development.

A Lima, Ohio, community member elaborated, "I think a lot of people don't realize today that some of the jobs that only took a high school diploma to get a job are now taking someone that may have a bachelor's degree." Similarly, a Flint community member shared, "I worry about the people who can't make that transition, I'm not worried about GM and Ford, you know, making a transition, they have resources. But I worry that we won't have enough resources in place or that we're not spending the time to get the right resources in place so that the people who have to make the transition can do that." A "spinoff" concern drew attention to how "the repair community, the mechanics, and the service stations are going to have to become sensitive to different parts of the automobile that they were never sensitive to before."

Participants also questioned whether everyday families would be able to purchase and maintain an electric vehicle. One Lima community member noted, "most families can afford an internal combustible vehicle. Will the electric used car be [so expensive] that [most families] will be able to afford it? I think those are all the factors you have to look at. Is the price point going to be so high that you can't effectively purchase a vehicle?" A Detroit community focus group participant asked, "And now what happens if you don't have a garage--you're a renter or something, where do you get [a high] amp charging station?" One Flint community member insisted that electrification should begin with mass transit rather than personal vehicles as a kind of test: "Those mass transit and public service entities, I would like to see them transition to show the benefits, the utility, et cetera first."

I earned the right to build that next car

A common sentiment expressed by many current autoworkers was a sense of bitter resignation that the transition to electric vehicles is both rapid and inevitable. Alongside this sense of inevitably unfolded deep worries that the transition will result in steep job losses, both because the manufacture and assembly of electric vehicles will require fewer people and workers with different and more advanced skill sets. Expectations about the impending changes to the size and composition of the auto workforce creates feelings of dread for some autoworkers, and specific worries that experienced workers, many of whom have given years to their companies, will lose their job and with it economic security for themselves and their families. Altogether, there is a belief that autoworkers have "earned the right to build the next car," but that this is unlikely to happen, leaving some with a sense of betrayal. Laid off workers in particular note that they are often not the ones being hired into new roles for electric vehicles since more highly-educated workers are needed. Although there is a recognition that they may lack the requisite training or skills, there nonetheless is a sense that a social contract has been broken.

Focus group participants frequently mentioned concerns about job losses as the transition to electric vehicles unfolds. A conventional wisdom has begun to set in that the production of electric vehicles--from the start of the supply chain through final assembly--will require fewer people. For some, there is also a belief that this will result in a decline in union jobs, which they believe may be the desired outcome for auto companies. A participant in a focus group of Detroit autoworkers asserted that UAW would be primarily impacted by the closing of engine and transmission plants:

> The vehicle assembly plants will have less labor involved. For every vehicle or two or three vehicle assembly plants, there is an engine plant that does nothing but make the engines. They're huge and they're very complex. It's all very expensive machinery. They have to cast the blocks and they're machining the engine blocks. There's a lot of work involved at these engine plants that are no longer needed. That plant, and it's all UAW, is not needed. Same thing for the transmission plants. Transmissions are fairly complex and there's machining and electrical on there. There's a lot going on in those transmission plants. Well, there's no more transmission in these cars. No engine, no transmission, no gas tank, and some of those chassis components. So that work is not needed, it's not in any of these new cars. What's replacing it are probably components built outside of UAW.

Alongside this fear of loss of union jobs, is a more general concern that current workers will not be hired for the new electric vehicle jobs. To illustrate, a former employer at the GM Lordstown plant reflected on the decision of General Motors not to convert the plant where he previously worked to electric vehicle manufacturing: "I was thinking about, I mean, for instance for us, I think that General Motors very easily could have retooled our plant and shifted towards the

electric, but I don't believe that they wanted to deal with us anymore. They didn't want to deal with the union anymore...I was reading an article not too long ago about the decrease in manpower needed to produce electric vehicles and it's around about 55% I believe, 55 or 60%, I might be wrong, it might be higher than that, but the workforce will reduce. It will be a big reduction in workforce." This same individual went on to say that after he lost his job at GM Lordstown, he was not able to find employment with the EV company that replaced the GM plant. He said: "And as far as job opportunities, I didn't have a job opportunity at Lordstown Motor Corp (an EV plant)."

Another former GM Lordstown worker talked about the frustration of not being prepared to compete for work in the EV sector, and how this lack of training left him feeling betrayed, having dedicated years of life, and his physical well-being, to manufacturing GM cars. He said: " I'm trying to work and do what I want to do for the rest of my life. I mean, it's not easy at 48. I'm not exactly coming out of college. And when I go to interviews, it's different, that's all...It's not where I want to be...And I think electric, I would have liked, you know, I have personal feelings that, you know, I felt I earned the right to build that next car. That's where I am on it. I mean, I earned it. I have knees that don't work now because of it because I gave my life to that company."

For other autoworkers, the adverse workforce effects of the transition to electric vehicles does not seem inevitable, but a matter of priority. That is, while workers filling roles in the current manufacturer of ICE cars may not currently have the skills needed to produce electric vehicles, they are willing learners and desire an opportunity for retraining and retooling. A current autoworker in the Detroit area commented: "So there's a lot of things and someone recently said you don't have to have a four-year degree to do good, you just need basic training. I think there's a lot to that. If you keep focusing on the top percentage of your high school class, you're going to lose the bottom percentage. So you got to treat the whole bunch equally and provide classes and education for their abilities."

Tentative Hope

Many focus group participants expressed guarded optimism about the transition to electric vehicles. This sentiment was most pronounced among community members and people serving in management roles within the auto industry, but also noted by some autoworkers. As an example, a community member from Lordstown, OH noted that he believes that the new Lordstown Motors facility in the area provides inspiration and hope for a community recovering from the shut down GM facility, which was a "sign of death." He describes his feelings when regularly passing the new Lordstown Motors operation: "I live in Lordstown, so I live a mile and a half from the plant. I pass by it every day--I ride my bike by it on every bike ride I go on. So, at the end of the day, you see this monstrous structure that two years ago, three years ago was like a sign of death. It was done. You know what I mean and now to have something come back and just even see the old Chevy sign, the Cruze sign that was on there replaced with Lordstown Motors sign. Just the hope that I think that brought is pretty tremendous.

In Lima, a community participant expressed faith in American industries to conduct thorough research and flexibly adapt their products to meet consumer needs: “I am all about agile management and agile development,” he stated. “And I think that this push for electric may end up with some other direction that will be better, because I do believe that the one thing in America that industry does, at least the industry that sustains itself, is that they develop, and they do R and D work. And so what they think the direction they may be going might start to slide off in another direction, and then another direction, and it will only get better. So I think industry that has good research and design will gain on what’s happening with this concept for electric cars.”

Some autoworkers expressed faith that the auto companies would help workers adjust to new roles, and that in the end, the transition would be a positive one. One current/retired worker captured this sentiment: “But I think it’s going to work out eventually, as long as people know what’s coming and can plan for it. I think that’s part of the job of the automobile builders. Is to help their people plan for this, give them some suggestions, introduction classes and stuff like that. I remember when GM was downsizing, we used to have retirement classes. To help people do a better job of planning their retirement. Maybe they could do the same for hourly guys, who knows?” Certainly, this feeling was not shared by all, or even by most, of the autoworkers that participated in the focus groups.

The optimism noted by many community leaders and company managers did not come without caution and recognition that the composition of auto plant jobs, and the skills required to fill them, might differ in substantial ways with adverse effects for the current workforce. Some managers believe that there will be an increase in non-assembly roles, but they also note that any such predictions about the composition of the future electric vehicle workforce are fraught with uncertainty. For example, a manager from one of the Detroit focus groups observed: “I know there's a concern that the union says, well, it's going to be fewer people assembling it. Well, yes and no. I think when you look at the whole supply chain, you may find in other areas, there's going to be jobs created, but it won't be in the assembly plant. It'll be somewhere else. But again, there'll be highly skilled people with, uh, data analysis and computer skills and whatever else it's required to, to make that transition more so than what we have today.” This view reflects an attitude that there will be winners and losers in the transition, without much regard for how those that come out adversely affected will cope.

Some community members were genuinely torn, and uncertain about what the transition to electric vehicles would mean for them and others serving in similar positions. When asked whether they were hopeful or worried about the transition, one person responded: “I think that, honestly, a little bit of both. It’s a little bit of you have a little anxiety about the jobs. And will they maintain the rate of pay that they currently have, the rate of family sustaining wages? That’s the concern. The hope is that maybe it will be better.” This individual continued by noting that the transition might bring new opportunities: “Maybe we’ll land a big battery factory or manufacturer or something like that. Again, I guess [redacted] was saying this, but we make stuff. That’s what we are good at here.” A member of the same focus group agreed with this

sentiment, responding: “I think there is concern both ways. There is a hope that things will get better. You bring different industry in, and then there’s the fear that you’ll lose the industry, you’ll lose good paying jobs, and how that impacts the city, how that impacts the county.”

This uncertainty was also noted by some autoworkers, who thought precisely predicting the nature of the change was extremely difficult. For some, there was a “gut feeling” that things would work out in the end, as long as there is good communication and inclusive planning and preparation. In Detroit, an autoworker shared: “[I]t’s going to be a big impact on a community, the community will change. Who knows, maybe some type of new manufacturing or assembly will come in. There’s all kinds of things going to happen. I think predicting exactly what the change is going to be will be a little difficult. I think predicting the effect on the assembly plant will be pretty easy. You know what’s going to go down and what’s not going to be there. But the way the community reacts, some people will move out, some people move in. There’ll be advantages around a place for different kinds of businesses. So really, I think everybody’s right, it’s going to have a big impact. But I think it’s going to work out eventually, as long as people know what’s coming and can plan for it.”

People’s degree of confidence seems to be shaped, at least in part, by perceptions of the scale and speed of the transition. A community leader from the Detroit area emphasized that the changes will be gradual rather than sudden, giving time for workers, auto companies, and communities to adapt/ S/he noted: “So, you know, again, that's, that's a transition period. I don't know what that's going to be like. I think it's going to take time. I wouldn't, uh, I wouldn't expect it to be a real problem because [the EV transition is] going to be evolutionary versus, you know, revolutionary where something happens really fast.” Compare that view with one from a current autoworker from Detroit who perceived that the transition from ICE cars and trucks to electric vehicles will be a massive transformation: “I mean, this is almost at the level of the original Industrial Revolution, if you would, in terms of how it can affect everybody in this country and other countries around the world.”

Conclusions

This study uncovers the beliefs and experiences of workers, managers, and community members in auto communities in the Midwest. While the shift to electric vehicles certainly presents opportunities for economic revival for American manufacturing, autoworkers and managers often perceive that these momentous changes in industry are being driven by hasty political and company commitments that have not fully reckoned with the challenge of building the technology and infrastructure necessary to turn lofty promises into successful implementation. While community members express excitement at the idea of rebuilding their local economies, they also feel that they lack the information needed to understand the potential effects on their workforce and physical environment. For workers, experiences of betrayal in past auto-manufacturing transitions leave many of them wary of car companies abandoning the very workers who built their industry. In the minds of workers, fears of another broken social contract pit environmental protection against their own economic sustenance, which may, in turn, affect the success of the electric vehicle revolution. There is a great deal at stake for workers and

communities, in terms of how they will respond politically, with grave implications for public trust and social and economic integration. At this critical moment, the voices of the people most affected by the coming transition should be foregrounded in discussions of policy change.

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