



CENTERING EQUITY IN CHARGING INVESTMENTS TO ACCELERATE ELECTRIFICATION

FORTH 2022

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1. Centering Equity in Charging Investments to Accelerate Electrification

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SUMMARY

This paper draws on research Forth conducted for the International Zero Emission Vehicle Alliance, past experiences, and a recent analysis for the State of Oregon to make the case for a “targeted universalism” approach for deploying public investments in charging infrastructure. We argue that directing public funds toward meeting the needs of those facing the greatest barriers to charging will support faster electrification of passenger transport. This paper describes charging use cases for public investment that center equity with the “targeted universalism” approach.



1.1 THE IMPERATIVE TO EXPAND CHARGING

Nations around the world are moving quickly to electrify passenger transport. Large investments in charging infrastructure will be required to reach full electrification of the transportation sector. Much of the investment in charging will be paid for by individual drivers through use fees over time or recovered through electric utility rates or other mechanisms. However, public investment is absolutely essential to jump-start the charging network, particularly until there is a critical mass of electric vehicles using this infrastructure. The U.S. Infrastructure Investment and Jobs Act (also known as the Bipartisan Infrastructure Law) includes \$7.5 billion over five years in funding for electric vehicle charging infrastructure.

Sufficient public charging infrastructure is essential to increase access to electric vehicles. A recent analysis by Atlas Public Policy [1] found over \$87 billion in charging infrastructure investment will be needed in the U.S. over the next decade, including \$39 billion for publicly accessible charging. In “2035: The Report,” researchers from the Goldman School of Public Policy at the University of California Berkeley estimate that up to 25% of EV drivers will rely completely on public charging infrastructure. The researchers project 5.2 million L2 and 900,000 DCFC public charging installations will be needed to support a future in which all new light-duty passenger vehicle sales become 100 percent electric in the U.S. by 2030. They conclude, “Providing equitable access to public charging infrastructure is crucial [2].”

2. THE CASE FOR CENTERING EQUITY

2.1 DEFINING EQUITY

The terms “equality” and “equity” are often used interchangeably in policy discussions. In fact, they are distinctly different concepts. “Equality” generally refers to treating people similarly. For example, a program that distributes a standard-size bicycle for free to every resident might promote equality. As illustrated in Figure 1, every resident receives the same treatment. However, not everyone starts from the same place nor benefits in the same way.

By contrast, “equity” refers to treating people in a way that recognizes their differences. Equitable solutions are those which are not necessarily the same, but which are just, aiming to ensure people receive what they need to be successful. Equity in decision-making accounts for the impacts of people’s current situations as well as their history and adjusts approaches in order to provide fully intended benefits.

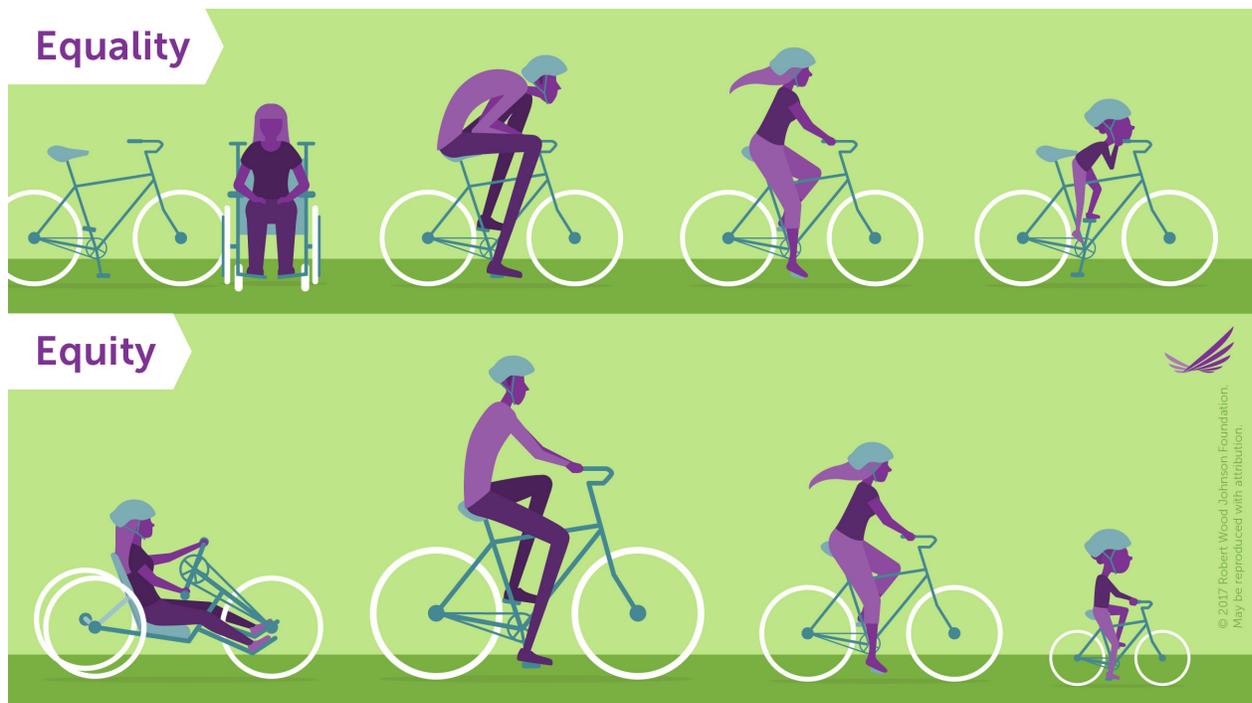


Figure 1: Visualizing equality and equity (Source: Robert Wood Johnson Foundation)

2.2 WHO NEEDS EQUITY AND WHY

We define “equitable access to charging” as “universal access to the necessary infrastructure to support the use of an EV.” To make access universal, drivers currently excluded from easy access to charging are the groups whose needs must be centered.

In the U.S., many populations are excluded from access to charging. Drivers who live in apartment complexes, for example, will have more barriers to affordable, convenient charging than drivers who own a single-family home with off-street parking. Drivers with lower incomes have a more difficult time financing the purchase of an electric vehicle and its required charging equipment. Private companies wishing to generate revenue from placing charging stations for public access may not locate them in communities where households report lower incomes.

The disparities in the U.S. mobility system as a whole, and charging in particular, are not a function of market forces alone. “Nor are they accidental. Transportation investments and planning in the U.S. have a long history of reinforcing patterns of inequality and exclusion, frequently on the basis of race. [As far back as the 19th century], expansion of railroads and the Oregon Trail brought wagon loads of settlers to live on land stolen from native Americans [3].”

The U.S. highway system is a 20th century example. In offering to pay state governments 90% of the cost of building highways, the U.S. government required states to build the highways through cities, razing large urban neighborhoods to make way for new travel corridors. This federal policy started with an urban planner in the 1950s named Robert Moses who “was a leading proponent of the idea that the best way to eradicate the supposed slums where Black people lived was to build highways through them [4].” The 35th International Electric Vehicle Symposium and Exhibition 2 neighborhoods destroyed were predominantly those where not only Black families, but also immigrants and people of color (BIPOC) lived. These BIPOC communities were forced to find new homes, farther away from the urban core and requiring longer commutes.

“Redlining” was another public policy designed to create racially segregated communities. To help carry out the U.S. government’s program to back home mortgages, government surveyors assessed lending risks by neighborhood. The surveyors looked at a number of factors, but the “primary driver of the grading system was the racial and ethnic makeup of the neighborhood’s residents [5].” Surveyors created maps and graded neighborhoods using a color code: green areas for “best”; blue for “still desirable”; yellow for “definitely declining”; and red for “hazardous [6].” The “redlined” areas were deemed credit risks because of the influx or presence of racial and ethnic minorities. It was common to see things like “a concentration of Negroes” and “a settlement of Mexicans” in descriptions of redlined areas [7].

These inequities continue to manifest in racial and ethnic disparities in common quality of life indicators like education, economic stability, distribution of transportation burdens and benefits, and others [8].

The authors recognize that all nations have their own history and patterns of exclusion and discrimination against specific groups. The ethnic, religious, cultural, racial, and economic identifiers differ from nation to nation. In this paper, we will describe use cases for U.S. communities facing higher barriers to charging access. In most, but not all cases, these are BIPOC communities. Throughout this paper, we will use the term “historically underserved,” in order to enable insights to be translated globally.



2.3 PROCESS EQUITY

Any path to equity must begin with process equity, i.e., ensuring that members of historically underserved communities have a leading role in determining equitable outcomes. International disability rights advocates are credited with creating the slogan, “Nothing about us, without us [9],” as a way to claim a seat at the decision-making table.

To begin the effort to ensure equitable charging infrastructure, a community-based needs assessment should be conducted. This assessment should be led by local, trusted organizations representing historically underserved community members in conjunction with technical EV experts. The State of Oregon provides an example of centering equity. To create its Transportation Electrification Infrastructure Need Assessment in 2021, the State of Oregon organized listening sessions with historically underserved community members and included those stakeholders’ feedback into the report and its recommendations [10].

Once the community-based needs assessment has concluded and the results have been shared, the community should then be included in the ideation and implementation of any solutions. To avoid misplacing public investment, community members must have a voice in shaping solutions. Remember our earlier analogy: from a policy perspective, it may seem that everyone in the community needs a bicycle, but from the community perspective, the view changes. Providing bicycles in communities where people cannot use them will result in the items being unused, or worse, put to misuse.

Centering equity and achieving process equity in making public investments requires communicating in ways designed to reach, connect with, and involve historically underserved groups. Depending on the communities, this could mean:

- **TRANSLATION**
Providing marketing, outreach, and education in multiple languages
- **PLAIN LANGUAGE**
Writing print and digital communications at a middle grade level and excluding jargon and acronyms
- **APPROPRIATE BRANDING**
Crafting materials that look culturally and visually relevant and of value
- **RELEVANT TECHNICAL ASSISTANCE**
Understanding what the audience needs and providing that help
- **PROXIMITY**
Meeting near or at residences, workplaces, or local community centers
- **REMOVING BARRIERS TO PARTICIPATION**
Providing childcare and compensating participants

2.4 TARGETED UNIVERSALISM

Targeted universalism is a framework for making public policy decisions. Conceived at the Haas Institute for a Fair and Inclusive Society at the University of California Berkeley [11], the framework seeks to find a way for future solutions to avoid the pitfalls and oversights of past approaches.

Universalism is one past approach used to reach a universal goal or solve a broad public need. Single-payer healthcare programs, public education, compulsory military service, and national savings or retirement programs are all examples of universalist public policies. This approach is grounded in equality—everyone gets the same thing.

Housing vouchers and food assistance programs for low-income people are examples of public programs designed with a targeted approach. Targeted policies aim to provide a benefit or service to members of an exclusive group. This approach is often used with the intent to address specific groups' needs, but can result in the perception of certain groups being favored.

The need for a third approach to policy making is summed up by the Haas Institute thusly:

Universal responses enjoy a degree of legitimacy in a diverse and pluralistic society, but they may also be viewed as unaffordable and overly ambitious, while also inadequate at helping those most in need. ... Targeted policies may be more efficient and less costly, but by targeting a particular group, these approaches are often viewed as unfairly helping one group over another, seeding hostility and resentment [12].

Targeted universalism is a different, hybrid, approach. In the institute's words:

Targeted universalism means setting universal goals pursued by targeted processes to achieve those goals. Within a targeted universalism framework, universal goals are established for all groups concerned.

The strategies developed to achieve those goals are targeted, based upon how different groups are situated within structures, culture, and across geographies to obtain the universal goal [13].

The targeted universalism approach centers equity to identify individualized solutions that meet the needs of historically underserved communities. It ensures that the universal goal is met by all groups, including the largest and most dominant ones, but not only the largest and most dominant ones.



2.5 APPLYING TARGETED UNIVERSALISM TO CHARGING INVESTMENTS

We can set a universal goal such as: “all drivers should have access to reliable, affordable, convenient charging that allows them to access electric vehicles.” With a targeted universalism framework in mind, market forces could be allowed to lead at large, spurred with public incentives. The largest public investment, however, is focused on meeting the goal for populations with the most barriers—who also tend to be less profitable communities not attractive for private investors. The targeted universalism approach deploys public investment strategically, pressing the levers needed to move each population, understanding that if the groups with the most barriers reach the goal, everyone will likely be able to.

Achieving electric mobility for everyone—including many of those with the greatest barriers—will require more than charging infrastructure alone. For people who do not drive, cannot afford to own a car, have no means to park a car, or who have disabilities or restrictions that do not allow them to drive, targeted solutions to create electric mobility will have to involve public transportation solutions, micromobility options (e.g., bicycles and scooters), and ride sharing services. For a targeted universalism approach to achieving total electrification of personal transportation, public investment will be needed in all of the above areas.



3. Opportunities for Centering Equity: Use Cases

This white paper explores targeted universalism only in its relation to public investments in EV charging infrastructure to serve passenger cars. This reflects, in part, the reality that for the vast majority of their travel. In the U.S. alone, for example, 90% of households own at least one car [14] and 87% of all daily travel in 2017 was by personal vehicle [15].

3.1 APPLYING TARGETED UNIVERSALISM TO CHARGING INVESTMENTS

Most early adopters of electric vehicles have been able to charge at home. Generally more affluent, the first EV consumers typically have a private, detached garage that they own. For them, home charging is easy and accessible. Many incentive programs have helped underwrite the costs for charging equipment for these drivers. While there are good reasons to incentivize home charging, such as a desire to encourage “smart” and managed charging that supports the grid, there is little social benefit or equity justification for underwriting the cost of charging equipment for affluent drivers in single-family homes. In contrast, historically underserved communities, especially renters as a subset of those communities, face many barriers to home charging. Funds would be better applied toward overcoming those barriers facing drivers who live in apartments or other settings where charging is more difficult.

Some promising approaches to increase equitable access to home charging in the U.S. include:

Focusing incentive programs on lower-income drivers with a specific effort to reduce information barriers as well as costs

Passing “right to charge” laws that include provisions allowing renters to install charging stations (as in legislation passed in Colorado and California)

Applying EV-readiness requirements to all housing, including affordable units or public/social housing

Directing public investments to installing fast chargers in public right of ways in dense neighborhoods where many residents lack off-street parking

Funding low-interest financing programs for low-income households to reduce the upfront cost of installing home charging infrastructure [16]

Equitable access to home charging for historically underserved communities must also address usage cost in addition to hardware and installation costs. Most U.S. utilities already have programs to help low-income customers avoid utility shut-offs. Utility incentives for home charging should begin with a focus on these customers. Many of these customers will be rightfully concerned about increasing their utility bill or risking a shut-off if they get an electric car. Utilities should work with them to clarify the lower total energy costs that would result from going electric, and the opportunity for total household savings. They should ensure that shut-off prevention programs and related supports also include EV charging costs.

In the U.S., utilities also help low-income homeowners weatherize their homes and make other efficiency investments. These programs should expand to provide information, hardware, installation, and incentives to include EV home charging.

3.2 CHARGING IN APARTMENTS

Historically underserved communities are very likely to live in apartments, also known as “multi-unit dwellings” (MUDs). Drivers who live in apartments face many barriers to EV charging.

Existing apartments, multi-family homes, condominiums, and other MUDs have barriers baked into their structures. In addition to space and parking lot limitations preventing installation of sufficient chargers, MUDs also face inherent complications such as power supply, load control, and billing. Reduced access to convenient home charging makes the decision to convert to an EV less likely—even when tax incentives or other programs might reduce the cost of purchasing a new or used EV.

As explained above in 3.1, building codes that require “EV ready” construction can help in the long run. Also, some U.S. jurisdictions have passed “right to charge” legislation that prohibit homeowner associations or landlords from arbitrarily blocking charging. However, all of these solutions remain, in general, most useful to high-income drivers.

An important reason to center equity when considering apartment charging investment is to ensure that this new infrastructure yields the intended benefits for the intended groups. For example, apartment charging infrastructure should be provided in a way that supports mobility options for current residents, rather than providing an amenity that might drive up rents and attract different tenants who wish to take advantage of that amenity. One promising way to ensure this is by pairing charging infrastructure with vehicle incentive programs, or with the provision of shared electric vehicles.

Demonstration projects by Forth [17] and other organizations in the U.S. [18] have shown that well-designed programs that place shared electric vehicles at affordable housing locations can provide useful local mobility services to residents and have a pathway to financial viability. With support from the U.S. Department of Energy (USDOE), Forth is now building out similar programs in dozens of locations across the U.S. and validating the model [19]. The charging infrastructure for such shared vehicles can also provide access for privately owned electric vehicles in the housing.

Additional equity-centering approaches for charging infrastructure in MUDs will:

- Provide robust hands-on outreach and technical assistance focused on lower income apartment managers and residents
- Ensure affordable charging rates
- Facilitate payment in forms that do not depend on a bank account or smartphone
- Proactively fund the installation of charging at existing MUDs with lower rents
- Install subsidized or low-cost rapid chargers—often utility or municipally owned—near MUDs and in high-density neighborhoods with lower-income, multi-family households

Right-of-way (ROW) charging can be another targeted approach to ensure charging access for people living in apartments. Public right-of-ways can include street surfaces, curbs, and sidewalks. Installing ROW charging has the potential to support both EV ownership and car-sharing where residents live in MUDs or park on the street.

Public investment directed toward placing chargers in right-of-ways should take care to do so equitably. It is important to ensure such charging stations do not end up located in one area based solely on the current adoption of EVs. In any communities where cars are allowed to park in the ROW for four hours or more, a percentage of those spots should provide charging.

3.3 CORRIDOR CHARGING

In the U.S., there has been a heavy focus on long-distance corridor charging between cities. While “range anxiety” may be an important psychological hurdle to overcome for widespread adoption of electric passenger vehicles, data show that few drivers regularly make long distance (more than 310 miles, or 500 km) trips. In fact, 95% of trips are 30 miles (48 km) or less [20].

The current criteria for corridor charging in the U.S. sets a guideline of locating chargers every 50 miles (80.5 km) within one mile (1.6 km) of the National Highway System [21]. Spacing chargers by distance only is an example of a universalist approach. A targeted universalist framework considers that 70% of vehicle trips take place in cities [22]. Therefore, dense urban areas should contain more charging infrastructure than rural corridors.

As presented above in 2.1.2, an equity-centered approach should engage historically underserved community members. Decision-making partnerships, translated surveys, and culturally competent outreach and education will surface the needs and travel patterns of local residents with the most barriers to charging. Armed with this information, corridor chargers can be placed where they will also conveniently serve local drivers most in need.

As only 5% of trips are long distance, state and federal planners should encourage locating rapid chargers close to amenities, apartments without charging, park and ride facilities, or other trip-generating facilities even if this means they are a bit further from the highway exit. Encouraging local access to corridor charging infrastructure and increasing the density of corridor charging in urban areas will ensure the chargers are used more frequently, improving the business case and reducing the need for public funding.

An equity-centering approach should also ensure that local residents—and others with limited access to home charging—can easily and affordably access this corridor charging. For example, rapid charging is generally expensive at US\$5 to US\$10 or more per charge, and sometimes more expensive than an equivalent trip in a gasoline car. For those who rely on rapid charging, however, system operators should consider offering an affordable monthly subscription plan (e.g., US\$25 per month) for unlimited charging. Texas-based CPS Energy provides an example. For a US\$96 annual membership, community members have unlimited access to the 57 chargers in its FlexEV Public Charging Program [23].





3.4 WORKPLACE CHARGING

From 2013 to 2017, the USDOE held a Workplace Charging Challenge to encourage 500 companies to offer employer-sponsored charging at work. In its 2016 report, the USDOE noted that individuals with workplace charging are six times more likely to purchase an EV [24]. Those early adopters of workplace charging, however, are high-income employees at: high-tech companies; hospitals and health systems; universities and colleges; federal, state, and municipal governments.

Many low-income workers live in MUDs and in densely populated communities without ROW charging. In order to meet their charging needs, they will require some form, perhaps multiple forms, of non-residential charging infrastructure. Workplace charging infrastructure could support this need, but only if the infrastructure is installed at locations where they work.

Low-income workers from historically underserved communities are less likely to: have convenient mass transit; be able to bike; or have the option to telecommute [25]. They are likely to have long commutes and are also likely to risk job loss if a late

bus or vehicle breakdown causes them to fail to show up for a shift on time [26]. It is reasonable to assume that if these workers have personal vehicles, they will be older, less reliable vehicles that use more fuel.

All of these factors make it even more valuable for them to be able to access affordable, reliable electric vehicles that are cheaper to operate and maintain. In order for workplace charging to effectively play a role in widespread adoption of EV use in passenger vehicles, investment must be made to support commuters who can benefit from the lower cost of EV operation and fueling, rather than those who can afford the luxury EV models.

A targeted universalism approach that centers equity will make charging at work easy for lower-income workers, including those in retail, hospitality, residential caregiving, etc. Public investment is needed to design programs that work for these employees—and their employers. Such programs must be proactive, including outreach to employers that depend on low-wage employees. They may need to include subsidies to make charging costs affordable. They also need to address how the chargers are presented and made available to employees to ensure that the chargers are accessible to all employees, not only management. Many trade workers (e.g., electricians, plumbers, installers, roofers, painters) can have multiple job sites in a day, and their job sites can include private residences. These workers will need public-access charging, such as ROW and corridor charging discussed in 3.2 and 3.3, respectively.

3.5 TAXI AND GIG DRIVER CHARGING

Commercial drivers use their vehicles much differently, and more heavily, than most. Drivers for gig services such as Uber, Lyft, Instacart, etc. as well as taxi drivers, can regularly drive hundreds of miles in a single day [27].

Their heavy vehicle usage means they potentially have much to gain from the lower operating cost of electric vehicles—and the planet has much to gain from reducing the emissions from these vehicles. However, it also means that these drivers must have ready and affordable access to rapid charging. Research shows that gig drivers often charge 2-3 times a day on rapid chargers, and 30% or more of activity at public chargers may be attributable to gig drivers [28].

Gig drivers also tend to disproportionately be low-income people of color, who often lack access to home charging or affordable car loans. Most financial institutions are reluctant to use self-employment

income in qualifying drivers for car loans, which further restricts access to electric vehicles.

One of the key charging investments that needs to be made early, particularly in larger urban areas, is rapid charging that can support gig drivers and taxis. This charging needs to be always open, located near major transportation corridors or destinations, have bathrooms and other basic amenities, and be available on an affordable basis for drivers using it daily. The best way to ensure affordability is to offer some form of subscription pricing such as the Electric Avenue unlimited rapid-charging plan for US\$25 per month offered by Portland General Electric [29].

If implemented well and kept open to the general public, rapid charging solutions targeting taxi and gig drivers can also serve apartment dwellers who lack easy charging access at home. It will also meet many of the needs of the broad urban community, with gig drivers serving as base load users, and everyday commuters and others using the charging on an as-needed basis (and paying a higher per-session rate). In this way, devoting investment toward rapid-charging infrastructure for gig and taxi drivers offers an excellent demonstration of the “targeted universalism” approach to attaining accessible charging for all.





3.6 RURAL AREA CHARGING

People living in rural areas are not, by virtue of that fact, “underserved.” However, many rural communities have suffered from loss of jobs, historic underinvestment, and other challenges for many years. Tribal communities and low-income rural communities of color in the U.S. are also examples of rural communities that have been underserved or victimized by past policies and investments, and whose needs should be centered as we invest in clean transportation technologies and charging infrastructure. By contrast, most rural charging investments to date have been designed to serve the needs of small numbers of long-distance travelers passing through, or of tourists visiting parks and other landmarks.

A targeted universalism approach will ask how we can best ensure that new charging investments reduce barriers for rural residents themselves and leverage charging investments to their benefit.

For example, rather than locating fast charging at a highway rest area isolated from local communities, perhaps it can be placed slightly off a freeway exit, adjacent to a local restaurant or shopping area. This might present a minor inconvenience for long-distance travelers, but make the infrastructure more useful to local residents and increase the chances that long distance travelers spend money in the community while charging. Also, as we have noted previously, the long-distance traveler will be rare; local users will provide more frequent use and a better business model for the charging provider.

Similarly, rather than prioritizing charging at a park trailhead, it may be preferable to put charging at nearby lodgings or services. Here, charging infrastructure will be more useful to locals and increase local spending by visitors. At a minimum, charging within parks can be leveraged to enable parks operators and employees to electrify their own vehicles and reduce their operating costs.

CONCLUSION

Transportation systems in the U.S. have been riddled with inequality for many decades. Those inequalities continue to impact the quality of life of historically underserved communities. Large public investments in charging infrastructure now underway in the U.S. and other nations create an opportunity to disrupt those historic patterns of inequality—if they are implemented with thoughtful intention. Otherwise, the electrification of transportation may cause further harm. We argue that a targeted universalism approach to charging investments will result in more equitable access to electric mobility, as well as faster and more efficient transportation electrification overall.

ACKNOWLEDGMENTS

We would like to thank the many staff members, project partners, industry stakeholders, and others who have helped to shape and guide our work on these issues over the past decade. Particular thanks are due to current and former staff members Zach Henkin, Eric Huang, Whit Jamieson, and Kelly Yearick. We thank Clarity Content for development support on this paper. We are also deeply grateful for the generous financial support of the U.S. Department of Energy for many of the projects mentioned here. All opinions are the sole responsibility of the authors.



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REFERENCES

- [1] L. McKenzie, N. Nigro, U.S. Passenger Vehicle Electrification Infrastructure Assessment, Atlas Public Policy, April 28, 2021, https://atlaspolicy.com/wp-content/uploads/2021/04/2021-04-21_US_Electrification_Infrastructure_Assessment.pdf, accessed on 2022-04-26
- [2] 2035: The Report, Goldman School of Public Policy University of California Berkeley, April 2021, <http://www.2035report.com/transportation/wp-content/uploads/2020/05/2035Report2.0-1.pdf>, accessed on 2022-04-26
- [3] J. Allen, Equitable E-Mobility, May 2019, 32nd Electric Vehicle Symposium (EVS32)
- [4] F. Evans, How Interstate Highways Gutted Communities—and Reinforced Segregation, History.com, <https://www.history.com/news/interstate-highway-system-infrastructure-construction-segregation>, accessed on 2022-05-09
- [5] J. Meisenhelter, How 1930s Discrimination Shaped Inequality in Today's Cities, NCRC, <https://ncrc.org/how-1930s-discrimination-shaped-inequality-in-todays-cities/>, accessed on 2022-05-09
- [6] T. Jan, Redlining was banned 50 years ago. It's still hurting minorities today, Washington Post, <https://www.washingtonpost.com/news/work/wp/2018/03/28/redlining-was-banned-50-years-ago-its-still-hurting-minorities-today/>, accessed on 2022-05-09
- [7] T-RACES, <http://t-races.net/T-RACES/holc.html>, accessed on 2022-05-11
- [8] A. Hanks et AL., Systematic Inequality, Center for American Progress, <https://www.americanprogress.org/article/systematic-inequality/>, accessed on 2022-05-11
- [9] M. Bristo, Nothing About Us Without Us, October 2017, MacArthur Foundation, <https://www.macfound.org/press/perspectives/nothing-about-us-without-us>, accessed on 2022-04-26
- [10] Listening Sessions Summary: Transportation Electrification Infrastructure Needs Analysis (The TEINA Study), Oregon Department of Transportation Climate Office, April 30, 2021, https://www.oregon.gov/odot/programs/documents/Climate%20office/TEINA_Listening_Sessions_Report.pdf, accessed on 2022-04-26
- [11] Other & Belonging Institute University of California Berkeley, <https://belonging.berkeley.edu/new-primer-targeted-universalism-opens-pathways-policy-innovation>, accessed on 2022-04-26
- [12] Targeted Universalism, <https://belonging.berkeley.edu/targeted-universalism>, accessed on 2022-04-26
- [13] Ibid 35th International Electric Vehicle Symposium and Exhibition 9
- [14] Pressure at the Pump: Electric Vehicles Can Be Part of the Long-Term Solution, National Consumer Law Center, March 2022, https://www.nclc.org/images/pdf/electric_vehicles/IB_Pressure_at_Pump.pdf, accessed on 2022-05-09
- [15] National Household Travel Survey Daily Travel Quick Facts, U.S. Department of Transportation Bureau of Transportation Statistics, May 2017, <https://www.bts.gov/statistical-products/surveys/national-household-travel-survey-daily-travel-quick-facts> accessed on 2022-05-09
- [16] Policies for a mature, flourishing, equitable EV charging ecosystem, Global Sustainable Mobility Partnership, November 2021, <https://forthmobiility.org/storage/app/media/Reports/211101-zev-alliance-policy-advicebrandedv12-1.pdf>, accessed on 2022-04-26
- [17] Community Carsharing, <https://forthmobiility.org/community-carsharing>, accessed on 2022-05-11 [18] LACI, <https://lincubator.org/mobility-pilots/#>, accessed on 2022-04-07
- [18] LACI, <https://lincubator.org/mobility-pilots/#>, accessed on 2022-04-07
- [19] Electric Car-Share Program Coming Soon to Rural Oregon, <https://www.govtech.com/fs/electric-car-share-program-coming-soon-to-rural-oregon.html>, accessed on 2022-05-11
- [20] National Household Travel Survey, U.S. Department of Transportation Federal Highway Administration, <https://nhts.ornl.gov/vehicle-trips>, accessed on 2022-05-11
- [21] National Electric Vehicle Infrastructure Formula Program Guidance, Federal Highway Administration, February 2022, https://www.fhwa.dot.gov/environment/alternative_fuel_corridors/nominations/90d_nevi_formula_program_guidance.pdf, accessed on 2022-04-07
- [22] Personal Transportation Factsheet, Pub. No. CSS01-07, Center for Sustainable Systems University of Michigan. September 2021, https://css.umich.edu/sites/default/files/Personal%20Transportation_CSS01-07_e2021.pdf, accessed on 2022-04-06
- [23] CPS Energy, <https://www.cpsenergy.com/en/about-us/programs-services/electric-vehicles/ev-charging-solutions.html>, accessed on 2022-04-06
- [24] Workplace Charging Challenge Progress Update 2016: A New Sustainable Commute, U.S. Department of Energy, https://afdc.energy.gov/files/u/publication/wpc_2016_progress_report.pdf, accessed on 2022-04-05
- [25] Transportation Needs of Disadvantaged Populations: Where, When, and How? FTA Report No. 0030, Federal Transit Administration, February 2013, https://www.transit.dot.gov/sites/fta.dot.gov/files/FTA_Report_No_0030.pdf, accessed on 2022-05-11
- [26] Overcoming Transportation Barriers: A Path to Self-Sufficiency, ICF International, September 2009, https://peerta.acf.hhs.gov/sites/default/files/public/uploaded_files/New%20Jersey%20Transportation%20Final_0.pdf, accessed on 2022-05-11
- [27] EV Charging for All: How Electrifying Ridehailing Can Spur Investment in a More Equitable EV Charging Network, RMI, June 2021, <https://rmi.org/insight/ev-charging-for-all/>, accessed on 2022-05-11
- [28] A. Jenn, Emissions Benefits of Electric Vehicles in Uber and Lyft Services, National Center for Sustainable Transportation, August 2019, <https://escholarship.org/content/qt15s1h1kn/qt15s1h1kn.pdf?t=pw4rht>, accessed on 2022-05-11
- [29] PGE, <https://portlandgeneral.com/energy-choices/electric-vehicles-charging/charging-your-ev>, accessed on 2022-04-06