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Federal and State Policy Drivers for U.S. School Bus Electrification

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Executive Summary

The half a million school buses in the United States provide education access for 20 million students. More than 90% of buses are powered by diesel fuel, which poses serious health and climate change concerns. In contrast, electric school buses offer emissions, resiliency, workforce and economic development benefits. Motivated by these benefits, federal and state policy have helped increase electric school bus adoption eight-fold from 2020 to 2022. Heightened interventions have led to more rapid growth in adoption, following slower deployments in the previous two years. More widespread policy activity also has helped expand adoption to all 50 states; Washington, D.C.; territories; and tribal areas, with financial incentives playing a key role. Momentum is expected to continue as additional incentives and fleet transition targets take hold while continued and enhanced equity provisions can help more underserved communities electrify.

Keywords: bus, electric vehicle (EV), federal, policy, state government

1. Introduction

1.1 About This Paper

Over the past five years, there has been a surge in federal and state policy action in the United States in support of school bus fleet electrification, with heightened activity in the past two years. This activity follows efforts in support of the U.S. transit bus fleet and is part of global transition to electrified transportation.

This paper examines the trends in U.S. policymaking at the federal and state levels and its role in driving the equitable adoption of electric school buses (ESBs). It focuses on the role of incentive programs, which have been key interventions, provides an overview of remaining adoption barriers and makes recommendations for future policy actions focused on equity.

1.2 World Resources Institute's Electric School Bus Initiative

World Resources Institute (WRI) established the Electric School Bus Initiative in late 2020, with its founding partner, the Bezos Earth Fund, with the aim of equitably electrifying the enterie school bus fleet by 2030. The ESB Initiative builds upon WRI's experience partnering with cities around the world to advance sustainable transportation systems, including extensive engagements on transit electrification and clean

power. It collaborates closely with school districts and other transportation providers, advocacy organizations, community groups, electric utilities, infrastructure providers, manufacturers, financing entities and policymakers across the U.S., guided by an equity framework [1].

2. The Case for Equitable School Bus Electrification

ESBs offer a cleaner and healthier ride for kids and communities, and the opportunity to address historic racial inequities and to normalize electric transportation for an entire generation. Where managed effectively, they can also help support a more resilient electricity system and offer economic development and workforce benefits. Electrifying school buses supports a decarbonized transportation sector, through direct emissions improvements and a shift from cars to public transportation. While school buses are predominately used in the U.S. and Canada, the vehicles operate worldwide for various transport needs. If carried out equitably, school bus electrification offers an opportunity to address the discrimination and exclusion that have traditionally created harm across the transportation and education landscapes, as well as energy, manufacturing and socio-economic systems [2].

In a typical school year, more than 20 million students in the U.S. rely on a school bus each day, taking more than seven billion combined trips [3][4]. Low-income students, Black students and children with disabilities rely on school buses disproportionately [5][6]. Some 60% of low-income students ride the bus to school, compared to 45% of non-low-income students [7].

While school buses provide important access to education and are among the safest vehicles on the road, diesel currently powers more than 90% of school buses in the U.S. [8][9]. The remaining 10% are powered by propane, gasoline and natural gas; less than 1% are currently electric. Diesel exhaust is harmful to students' physical health, putting them at risk for serious conditions like cancer and asthma, and is linked to negative cognitive development impacts, endangering students' academic progress and learning [10][11][12]. Given the ridership of school buses, theses health impacts are felt disproportionately among low-income, Black and disabled students. Diesel-powered buses also emit high levels of greenhouse gases like carbon dioxide, directly contributing to climate change, which has been shown to have a disparate impact on the health of people of color and is likely to exacerbate existing racial disparities across a broad range of health outcomes [13].

ESBs have zero tailpipe emissions of harmful air pollutants which reduces exposure to harmful emissions linked to health and cognitive development concerns. On a lifecycle basis, ESBs produce less than half the greenhouse gas emissions of both diesel and propane buses [14]. ESBs are the only school bus type for which emissions will decrease as our electricity system transitions increasingly to renewable energy sources. In some circumstances, ESBs offer the unique ability to support community resiliency through the deployment of vehicle-to-grid and vehicle-to-building technologies which also can be paired with on-site renewable energy and stationary battery storage [15]. As a high-visibility vehicle for students, ESBs can normalize electric mobility for an entire generation. Further, an equitable transition to ESBs can boost local economies and create thousands of meaningful, well-paying jobs in the U.S. that are part of a shift to a green economy, taking care to address shifts in employment [16].

2.1 Why the Transition to Electric School Buses Must Center Equity

The history of discriminatory and systemic racism in the U.S. has led to dramatic disparities in the transportation, housing, education and other systems, for many low-income, Black, tribal and Indigenous communities, other communities of color, and people with disabilities. This means, for instance, that nationally, people of color have disproportionately higher exposure to fine particulate matter pollution in the U.S., including more exposure to diesel vehicle exhaust, as Black and Brown communities have been concentrated closer to highways and other pollution sources [17]. As noted in the ESB Initiative Equity Framework, these disparities could impact which school districts can take advantage of the ESB opportunity, which students will have bus access or experience route changes, or who can access new grid technology [18]. Existing inequities could mean that well-resourced, often predominately white and higher-income communities have the capacity to realize a faster and easier transition to beneficial new technologies. The ESB shift could also exacerbate inequities internationally if old buses are exported to other countries,

precipitate the loss of maintenance and diesel bus manufacturing jobs and exacerbate inequities with mineral extraction and battery disposal.

2.2 Total Cost of Ownership for Electric School Buses

Currently, ESBs have higher upfront prices than other types of school buses, three times that of diesel buses on average, driven largely by the cost of batteries. Our most recent estimates show average purchase prices of $103,000 for a diesel bus and $364,000 for an electric bus and related infrastructure capital costs. However, ESBs have much lower maintenance and fuel costs over time [19]. Our research suggests that, compared to a new diesel school bus, a new ESB can, depending on circumstances, save an average of $6,000 every year on operational expenditures, for a lifetime savings of nearly $100,000 per bus [20]. We anticipate meaningful upfront price declines over the next decade as battery costs decline and the electric vehicle industry achieves efficiencies of scale in component markets and manufacturing such that the total cost of ownership (TCO), the combination of the initial purchase cost and costs over time, of an ESB is expected to equal that of diesel buses by the second half of decade [21][22][23][24].

3. Trends in U.S. Electric School Bus Adoption

ESB adoption grew slowly between 2014 and 2020, and surged from 2020 to 2022, expanding in the number of total buses and number of school districts and states. Trend data are based on WRI's tracking of ESB adoption [25].

In 2014, the first ESBs began serving students in three California School Districts: Kings Canyon Joint Unified, Escondido Union High and Gilroy Unified. These buses were funded by state-level incentive programs, except for the Gilroy bus which was funded by a private foundation and was previously a diesel bus that was repowered to electric. TransPower, Blue Bird and Trans Tech were the manufacturers of these early electric buses, respectively. These four buses covering three districts in California expanded to 410 buses by 2020 in 127 school districts in 15 states. California continued to be a leader in ESB adoption with the most ESBs of any state in each year, growing from 10 in 2017, 36 in 2018, 81 in 2019, and 214 in 2020, for a total of 347 ESBs in operation by 2020. This made up 85% of all ESBs nationwide. Other early adopter states (those with their first ESB before 2021) included Massachusetts, Minnesota and New York, all gaining their first buses in 2017. Virginia and New York were the only other states with more than seven ESBs in operation by 2020.

In 2021, ESBs in operation expanded to 2,043 buses in 358 school districts in 36 states. California remains the leader in ESB adoption, with 982 additional ESBs in operation between 2021-2022. Maryland, with 327 ESBs, and Florida, with 218 ESBs, also acquired significant numbers of new ESBs during this two-year period. From 2021 to 2022, 366 new school districts in 31 states adopted new ESBs. The 2022 award announcements for the Clean School Bus Program (CSBP) demonstrated huge leaps in ESB adoption, though these buses are still early in the procurement process. Including both CSBP and other funding awards made in 2022, there are 3,175 additional buses with funding awarded in 2022 alone that will be on the road soon. California received the most awards in 2022, totalling 553, followed by New York at 247. Ten other states have over 100 new buses awarded in 2022. The CSBP awards brought the first ESB awards to at least 15 locations (9 states, Washington DC, 3 territories and several tribal areas) such that there are ESBs in place or on their way in all 50 states.

ESBs have historically been more concentrated in the Western regions of the U.S. due to California's strong incentive programs. Before 2021, 94% of school districts with ESBs were in western states. But starting in 2021, school districts with ESBs were distributed more evenly across the US, with 36% in the West followed by 26% in the South, 21% in the Midwest and 16% in the Northeast. ESBs were initially most likely to be funded in suburban school districts, though this has shifted to rural areas after 2021 due largely to the high number of buses awarded to rural school districts prioritized under the CSBP.

By some measures, ESB adoption is happening equitably. ESBs are found in school districts with higher percentages of children eligible for free and reduced-price lunch, and with populations that are more heavily Black, Indigenous and people of color. For example, 46% of school districts with ESBs serve student populations where more than half of the student population is eligible for free and reduced-price lunch, when

these school districts are only 35% of the total across the US. ESBs also have served more students of color, as school districts in areas with 50% or more Black residents, Indigenous residents and people of color make up 8% of all school districts nationwide, but 51% of districts with an ESB before 2021, and 25% of districts with an ESB overall. These trends suggest that ESB adoption is happening equitably when looked at nationally, by serving school districts most impacted by the harmful effects of diesel school bus pollution.

4. U.S. Federal and State Policy Support for Electric School Buses

A surge in policy measures, at both the federal and state levels in the past few years, have supported greater and more widespread adoption of ESBs. As of the end of 2022, just over half of all committed ESBs with funding source data (n=2,544, 51%) have been supported by federal programs. Most of this was through the first round of the CSBP as well as the Diesel Emissions Reduction Act (DERA) and American Rescue Plan (ARP) programs. Approximately 2,424 ESBs (48%) with funding source data have been supported by state funding. The remaining 1% were financed by private donors or other local sources (N=4,996). There are an additional 10,000 repowered ESBs on order from a contract between bus dealer Midwest Transit Equipment and manufacturer SEA Electric, but not included in this analysis; other repowered ESBs are included in the data.

4.1 Federal Policy Measures

The most significant U.S. federal policy action included the creation of the CSBP to provide up to $5 billion for school bus electrification and other provisions within the Infrastructure Investment and Jobs Act of 2021 over five years. Additional support for ESBs came from DERA and the Inflation Reduction Act (IRA) of 2022. The ARP of 2021 also provided support [26]. Included in some of these measures were provisions for prioritizing support for low-income, rural and tribal communities.

Since the authorization of DERA (42 U.S.C. 16131 *et seq*.), initially created under the Energy Policy Act of 2005 (P.L. 109-58), the U.S. Environmental Protection Agency (EPA) has provided school bus rebates. However, of the 3,138 school buses funded under the DERA program in the last decade, only 30 have been electric (approximately 0.009% of total awarded buses), the first of which was funded in 2019 [27]. Overall success of the DERA program laid the groundwork for the CSBP (below).

In response to the COVID-19 pandemic, the U.S. Congress passed the ARP to provide additional funding for several federal programs, including $7 million authorized to EPA's DERA Program specifically for ESB rebates in underserved communities and tribal governments, which went toward funding 23 ESBs [28].

CSBP was created under the Infrastructure Investment and Jobs Act of 2021 (IIJA; P.L. 117-58) [29]. CSBP provides $5 billion in federal funding over five years to replace diesel school buses with alternative fuel school buses, with half of the funding designated specifically for ESBs and the other half for ESBs and other fuel types. In the first round of funding, EPA received over $4 billion in applications, 90% of which were requesting ESBs. EPA funded nearly $1 billion of these applications through its first rebate program, prioritizing schools in low-income, rural and tribal areas, and will open additional funding opportunities through 2026.

Moreover, additional support for ESBs is included in the IRA of 2022. ESB purchases and associated charging infrastructure are eligible for tax credits under the Qualified Commercial Clean Vehicle Tax Credit (Sec. 13403; 45W) and the Alternative Fuel Refueling Property Credit (Sec. 13404 30C), respectively [30][31]. Through the 45W credit, school districts may be able to receive up to $40,000 per ESB. The 30C credit provides up to 30% of the cost of each item of refueling property (i.e. each charger), for a maximum credit of $100,000. School districts are eligible to receive these tax credits despite their status as tax-exempt entities through direct pay options for elective payments (Sec. 13801). Included in some of these measures are provisions for supporting low-income, rural and tribal communities.

4.2 State Policy Measures

States have played a key role in electrifying school buses due to their authorities and funding programs across transportation, education and public utility regulation. States have focused varying amounts of attention to cleaning up school bus fleets. Most recently, Volkswagen Settlement funding has supported school bus

electrification in over half of the states. In 2022, new dedicated funding programs were developed in Colorado, Connecticut, Maryland, New Jersey and New York, adding to early efforts in California and Massachusetts. These were complemented by new fleet electrification requirements in Connecticut, Maryland, Maine and New York. The impact of these more recent measures will be seen in years to come.

4.2.1 Volkswagen Clean Air Act Civil Settlement

State action and funding for ESBs gained new momentum with the Volkswagen (VW) Settlement in 2016 and establishment of state trusts in 2017. The Volkswagen Settlement or the "Dieselgate" scandal resulted from the use of defective devices in Volkswagen and Audi diesel engines used to cheat on state and federal emissions testing, primarily on tests for NOx emissions. As part of the settlement, Volkswagen was assessed $2.9 billion in damages, which were placed into state environmental mitigation trusts with each affected state, tribe and territory designated as a beneficiary. Damages were determined by the number of violating vehicles sold in each state. States could then spend their awarded damages according to individually determined beneficiary mitigation plans (BMP).

The purchase of ESBs and associated charging infrastructure was one allowable use of funds, and many states designated this as a priority action or carve-out in their BMPs, often as the result of advocacy by groups such as the Clean Rides for Healthy Niños campaign [32]. Eligible buses replaced with VW settlement funds were required to be scrapped and be a 2009 engine model year or older [33]. As of March 2023, $615 million in state public funding has been awarded to ESBs across 28 states. Over a third ($213 million, or 35%) of this total state public funding for ESBs has come from VW funds. The state with the highest amount of VW settlement funds dedicated to ESBs has been Florida ($54 million) followed by California ($28 million), Virginia ($24 million) and North Carolina ($18 million). The VW settlement fund has thus been a crucial driver of state action and funding on ESBs, particularly for states outside of California or that may not have dedicated ESB programs or policies.

4.2.2 Recent Wave of State Legal and Regulatory Action

In the past two years, states have taken increasing action on ESBs. Legislative approaches vary, and have included actions setting the first state-wide fleet transition mandates, dedicating state funds through budget processes or creating new state funding programs, authorizing utility programs overseen by state public utility commissions, green schools legislation that may also include renewable energy deployment at schools, and addressing various state education statutes related to student transportation funding and lease terms [34]. Regulatory agencies have also acted through the adoption of the Advanced Clean Trucks (ACT) rule and infrastructure investments by utilities.

From 2021 through the current 2023 sessions, a total of 98 bills were introduced that impacted school buses. In April 2022, New York became the first state in the nation to set a state-wide school bus fleet electrification goal [35]. As part of legislation, New York enacted a requirement that all new school bus purchases and leases be zero emission vehicles (ZEV) by 2027, and all school buses in operation be ZEV by 2035. New Jersey created a new $45 million grant program administered by the Department of Environmental Protection to provide $15 million annually over 3 years for ESBs and associated charging infrastructure [36]. Colorado created a new $65 million ESB program administered by the Department of Public Health and Environment that has its first funding round in spring 2022 [37]. At least half of the funding must go towards low-income, urban or environmental justice communities. Maryland passed a school bus fleet electrification target which requires that all new school bus purchases and contracts must be electric by 2025 [38]. This is the earliest fleet electrification target set to date, although the bill does allow exemption language depending on supply chain availability and feasibility. In a separate bill, the Maryland legislature also established a utility pilot program for up to $50 million per investor-owned utility [39]. Connecticut passed a fleet electrification bill which requires that all school buses operating in the state be ZEV or alternative fuel vehicles by 2035, and all school buses operating in the state must be ZEV by 2040 [40]. The bill sets an earlier fleet electrification deadline for buses operating in environmental justice community. All school buses operating in such communities must be ZEV by 2030. Lastly, Maine passed a school bus fleet electrification bill requiring 75% of new school buses be ZEV by 2035 [41].

California has adopted two relevant rules that apply to school buses, the Advanced Clean Trucks (ACT) rule in 2020 and the Heavy-Duty Omnibus (HDO) rule in 2021 [42][43]. The ACT is a manufacturer sales requirement which requires that an increasing percentage of a manufacturer's sales of Class 2b – 8 vehicles within a state are zero-emission vehicles (ZEVs). This begins with, for Class 4 to 8 vehicles, 9% of sales beginning with model year 2024, 50% by model year 2030 and 75% by model year 2035. The HDO sets exhaust emissions standards for select engines and vehicles, reaching a 90% reduction in NOx emission by model year 2027. As of February 2023, six states (MA, NJ, NY, OR, WA, VT) have adopted the ACT. Two others (CO, NC) have active rulemaking proceedings, and other states may adopt in 2023 as well.

Outside of these actions, states have taken other executive action. One notable example is the participation of 17 states, the District of Columbia, and the Province of Quebec as signatories in a Multi-State Medium- and Heavy-Duty Vehicle (MHDV) Memorandum of Understanding (MOU). Signatory states to the MOU agreed to a nonbinding goal of 30% ZEV MHDV sales by 2030 and 100% ZEV MHDV sales by 2050 and agree to work together to reduce emissions from MHDVs and adopt policies to advance these goals. In 2022 an action plan was released outlining recommended actions for signatory states to take to further the goals of the MOU. These actions included recommendations for states to consider adopting the ACT, and to establish 100% zero-emission purchase requirements for school bus fleets by no later than 2040, and sooner for fleets operating in environmental justice communities [44].

4.3 Equity in Federal and State Policy

Policymakers have taken a few general approaches to embedding equity into ESB programs. Funding programs may identify priority districts to receive funding carveouts or prioritization for competitive grant programs. These priority criteria may include income data using students who qualify for free and reduced-price meal programs, census or other geographic data on household income within an area, air quality or pollution levels or according to demographic data including race,linguistic isolation or English-language learner status. Additional equity provisions include support for workforce training and equity-centered economic development. States also may use existing environmental justice definitions to identify priority funding areas. These existing definitions, which may be used to guide air quality and climate investments across a range of state programs, set priority areas for replacing and electrifying school buses. This may be seen through policies that set earlier fleet transition timelines for buses operating in environmental justice (EJ) communities. While critical to prioritize mitigating pollution in areas and communities overburdened, these initiatives must match any earlier transition deadlines with commensurate funding and technical assistance to help school districts in these areas to electrify so as not to further disparities and be done in consultation with EJ communities.

5. How Policy Has Helped Drive Adoption

State policies played an important role in launching the move to ESBs in 2014 and providing continued support through to current day. Recent federal policy support has increased the reach and impact of ESBs in areas that otherwise lack state support. In particular, federal investments have helped address the high purchase price of ESBs and bring total cost of ownership into parity, or better, with diesel buses. Because of this, over half of all committed ESBs have been supported by federal programs within the last few years. New state policies will play an increasingly important role in driving further adoption. This includes incentives, fleet transition targets and regulatory measures to the build out of charging infrastructure and the elimination of procurement barriers.

Since 2019, DERAand the ARP have helped finance 93 ESBs for 34 unique entities operating in 20 states. Entities in California and New York received funding to support the majority of new ESBs in 2019, but recent state policy measures have supported the procurement of ESBs in additional areas. Nearly three quarters of the buses financed through DERA and the ARP (n=69, 74%) received funding in the last two years. These recent awards have provided further ESB funding beyond California and New York to local entities in Massachusetts (n=13 buses), Pennsylvania (n=5), Rhode Island (n=5), Indiana (n=4), North Carolina (n=4), South Carolina (n=4) and others. Approximately half (n=46, 50%) of DERA- and ARP-funded ESBs are committed in school districts with a high population of non-white and/or Hispanic residents.

The CSBP, which announced its first awards in October 2022, has substantially increased the number of committed ESBs. CSBP awards have already supported the adoption of nearly half (n=2,451, 49%) of all ESBs that have been awarded, ordered, delivered, or are operating across the U.S. as of December 31, 2022 (n=4,996). The first round of awards supplied funding for ESBs to 387 unique entities in all 50 states, American Samoa, the District of Columbia, Guam and the U.S. Virgin Islands. CSBP awards supported the most ESBs to entities in California (n=179 buses), New York (n=172), South Carolina (n=164), Michigan (n=138), Texas (n=134), Georgia (n=127), Illinois (n=124), Louisiana (n=111), and Pennsylvania (n=108). For many states and territories, CSBP funding helped procure their very first ESBs. These newly-awarded areas included American Samoa, Arkansas, the District of Columbia, Guam, Idaho, Kansas, Kentucky, Louisiana, Nebraska, New Hampshire, Puerto Rico, South Dakota, U.S. Virgin Islands, West Virginia, Wisconsin and Wyoming. Forty-three percent (n=1,057) of CSBP-funded ESBs are committed in school districts with a high population of non-white and/or Hispanic residents.

6. Barriers to Continued Electric School Bus Adoption

6.1 Cost

The most typical barrier to ESB adoption that school districts and private fleet operators face is financial. As noted previously, currently, if the upfront cost of an ESB is unsubsidized, then the cost could be three times that of a diesel bus. There are other costs associated with transitioning to ESBs, including infrastructure deployment and workforce development. School districts with fewer resources and in low-income communities will have a harder time supporting the high upfront cost of the ESB transition. Without further subsidies, currently, the total cost of ownership over the lifetime of a bus is around $100,000 more for an ESB, although costs are expected to deline and repowers of existing buses can have a much lower upfront cost [45].

6.2 Infrastructure Deployment

Fleet managers and private contractors have primarily worked on diesel-powered school buses and do not have experience working with their local utilities to install electric charging infrastructure. The installation of the chargers, and the chargers themselves, have high associated costs for both the infrastructure and labor. School districts need to decide what kind of charging infrastructure works best for their route, including whether it is a Level 2 or DCFC charger, which requires route planning and coordinating with their electric utility ahead of ESB deployment. Further, some school districts may be interested in participating in a vehicle-to-everything (V2X) pilot program to build community resiliency in the event of an energy blackout. Bidirectional charging is typically associated with higher costs and while the V2X technology is promising, it is mostly only being deployed in pilot projects thus far. Additionally, some school districts face more challenges when ‘starting small’ by only deploying a smaller number of ESBs and associated charging stations, and then are forced to replan their operations when expanding their fleet.

6.3 Workforce Training

As stated above, the technology associated with ESBs is different than what fleet managers and operators have experienced previously. To ensure a just transition, school districts will need to provide workforce development and training opportunities to assist fleet operators with new route planning, charging timeline, maintenance requirements and driving instructions, among other things. One of the biggest operational differences between diesel-powered buses and ESBs is regenerative braking, which allows the energy that would have otherwise been lost during braking to help recharge the battery. Understanding regenerative braking would be beneficial for fleet operators to increase efficiency of their routes and lower energy consumption. However, workforce training and development is time and resource intensive to school districts that are already overburdened by day-to-day operations. Many of the existing federal and state funding programs do not include funding set aside for workforce development, which leaves school districts with a resource gap when transitioning to ESBs.

6.4 Education

The transition to an ESB fleet requires school districts to navigate a process that is entirely new. While there are record funding opportunities available to school districts to assist in the transition to electric, the process of finding and successfully applying for these opportunities can be difficult. In some instances, these funding opportunities conflict with school budgeting processes and require school districts to delay their transition to the following year. In these budget planning discussions, school districts will also have to engage in a fleet analysis to determine how many ESBs they need, establish charging infrastructure and possibly reassess their bus routes based on their charging schedules. School districts may be unaware that prior to submitting a funding application, they should first communicate with their local utility provider to understand their charging infrastructure needs and ideal charging time periods. Utilities can assist school districts in developing their charging station configurations and identify suitable charging equipment.

7. Recommended Solutions that Center Equity

If accomplished equitably, school bus electrification presents an opportunity to address some of the forms of discrimination and exclusion that low-income, Black, Indigenous and other communities of color face in the transportation, education, energy and manufacturing sectors in the U.S.

7.1 Incentive programs

Incentive programs are critical to alleviating the upfront cost burden of switching to ESBs. Given that not all schools have the same access to financial resources due to segregation, school boundaries, and budget policy, incentive programs must be tailored to under-resourced communities [46]. Incentive programs can center equity by including funding set aside for historically underserved communities. Funding agencies can provide additional technical assistance to the communities least likely to have capacity or technical knowledge to complete the application for the set-aside funds, or awareness of the program altogether. If there are not enough applicants to match the set-aside funding, the funds can be rolled into the next funding iteration, along with evaluating the outreach and technical assistance available to those communities. Similarly, extended application periods and streamlined processes can reduce complexity. Point-of-sale vouchers can more effectively lower the cost burden, particularly for school districts that do not have the capital to cover the upfront costs of an ESB and associated charging infrastructure. It can take months for school districts to receive grant funding or some types of rebates. It is ideal to avoid the need for upfront funding, especially for under-resourced school districts with competing financial priorities.

7.2 Utility Programs

Equitable design of utility programs is crucial to ensure that all school districts can benefit, particularly pilots that are meant to serve as data-gathering and experiential learning opportunities. Utilities can help ensure their programs are equitably distributed both through the aforementioned equitable incentive mechanisms, but also through their program's school district participant selection. A utility or a state's utility regulatory commission, legislature or other relevant body can require that a certain number of selected school districts be in historically-underserved communities instead of creating criteria for their programs that these communities, with limited resources and capacities, are unlikely to meet. Utilities can also provide utility inclusive investments, favorable rates and tailored fleet advisory services, all of which bring down costs and make necessary infrastructure upgrades accessible to underserved communities. Additional outreach to these districts to inform them of the opportunities and their benefits, coupled with technical assistance, can help ensure these districts have the same access to utility programs as their wealthier counterparts. Moreover, historic underinvestment in certain areas of the grid may require additional investments in grid upgrades to support the ESB transition [47].

Make-Ready programs accelerate the transition to electric vehicles by covering some or all the costs for electrical infrastructure on the utility side and/or the customer side of the meter necessary for charging station installation and operation [48]. They can provide higher incentive amounts or location-based mandates for disadvantaged communities to ensure charging stations are installed in priority areas. Regulatory commissions can also ensure that utilities are incorporating equity into their filings before approving them. Depending on the program, metrics used to identify filings aligned with equity goals can include dollars allocated, locations served, rate adjustments and others.

7.3 Training and Curriculum

As momentum builds towards a fully electric school bus fleet, an equitable transition will seek to retain existing workers in the school bus space and create new opportunities. Bus drivers, mechanics, technicians, transportation directors and more should be given the opportunity to be retrained to provide their skills to ESBs. Ensuring an equitable workforce transition will mean investing in the retraining of existing workers to adapt their skills for the new economy. Invest in both apprenticeship offerings and job training for existing school bus drivers and mechanics. Apprenticeship offerings can build a talent pipeline that prioritizes residents of historically underserved communities. Workforce development and training could include dedicated and ongoing technical assistance for existing school bus workers beyond limited initial training sessions offered by manufacturers. Moreover, there should be a priority to keep the jobs within the same communities as much as possible.

7.4 Community Engagement

Engaging communities and listening to the voices of those who have not historically been brought to the table is necessary to create trust and ensure that projects are supported by the communities in which they are to be carried out and meets the needs of the groups it attempts to serve. Thoroughly engaging and listening first to a community's priorities and needs can take time but is necessary for a project to reach its full potential and achieve sustained success. Stakeholder listening sessions, open comment periods, focus groups, developing relationships with trusted community leaders, transparency and collaboration can help foster effective community engagement. To collaborate involves not approaching a community with a set plan but working with key stakeholders and community representatives to co-develop a project or just to serve as a resource and provide them with the space to lead. Community engagement should mean providing funding to community leaders who are being engaged in this process to compensate them for their time and insights. It can also include funding grassroots organizations or schools committed to transitioning to ESBs that can then increase staff capacity, prioritization of time dedicated to the issue and ability to cover the costs associated with the ESB transition.

8. WRI's Role

WRI's Electric School Bus Initiative supported the enactment of the CSBP and provisions within the IRA and provides input and feedback on equitable implementation, offering insights from work with school districts, utilities, manufacturers and others. The ESB Initiative monitors funding opportunities and helps educate school districts about the opportunities available to support school bus electrification. This education takes the form of written resources, webinars, one-on-one calls and other technical assistance.

WRI's Electric School Bus Initiative works with policymakers and stakeholders at the state level through education, research activities and advocacy. In a select number of states, this includes funded partnerships with in-state groups to push for the adoption of equitable school bus electrification policies. This may include executive, regulatory and legislative action on ESBs or medium- and heavy-duty vehicle electrification policies that impact school buses.

WRI's Electric School Bus Initiative provides technical assistance to school districts navigating the fleet transition process, including support with fleet assessments, facilitating conversations with utilities, understanding new legislation, applying for funding opportunities, and assisting with acquisition and deployment. This support comes in a number of forms, including one-on-one assistance, group office hours, webinars, two-pagers and comprehensive resource guides. Our knowledge products center equity in both in content to fill knowledge gaps for those new to the process and some are offered in other languages to help overcome language barriers. Our technical assistance also prioritizes their support by assisting districts that meet certain prioritized criteria based on air quality, income, race, and tribal status, identified internally as our Priority Outreach Districts [49]. This list enables us to prioritize the many asks we receive and ensure that the school districts that need it the most are receiving the most in-depth technical assistance. Our advocacy efforts, particularly at the state level, involve funding on the ground partners, with at least one environmental justice-oriented group in each of our priority states, to ensure that those who have been working on school buses are given the resources to continue their work. We seek to collaborate with our partners and support, not duplicate, their efforts. Moreover, our legislative advocacy and engagement with

decisionmakers always includes pushing for equitable incentive and program designs, to ensure equity in our asks. Above all, we ensure that we are listening to our in-state partners to keep our asks in alignment with what communities on the ground are voicing as their priorities.

9. Conclusion and Looking Ahead

Federal and state policies have played an important role in the transition to ESBs in the U.S. As incentive program amounts and geographic coverage have increased in the past two years, ESB adoption has increased and broadened, compared to the previous two years. State policies played an important role in launching the move to ESBs and providing continued support through to current day. Recent federal policy support has increased the reach and impact of ESBs in areas that otherwise lack state support. The continued disbursement of federal and state funding as well as the impact of state fleet electrification targets and other related requirements will support continued momentum. New state policies will play an increasingly important role in driving further adoption. This includes incentives, fleet transition targets and regulatory measures to the build out of charging infrastructure and the elimination of procurement barriers.

Looking ahead, policy measures will need to augment incentives with financing strategies, continued support for equity, and pursue additional measures around infrastructure development, workforce training, and battery recycling and reuse. Centering equity in the ESB process and creation and adoption of policy is critical to ensuring that historic inequities can be addressed and further burdens are not established.

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