

SMART COLUMBUS IMPACT REPORT

2019

AEP Ohio's Role in
Quadrupling EV Charging
Infrastructure in Columbus



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Introduction

Electric companies play a vital role in accelerating transportation electrification and ensuring that the transition to electric vehicles (EVs) has a positive environmental impact. AEP Ohio, the local electric company in Columbus, has been involved with Smart Columbus since its inception. Its commitment to grid modernization, and deploying EV charging, renewable energy and advanced energy efficient technologies are key factors in the city's success in achieving the goals of the Smart Columbus Electrification program.

AEP Ohio is investing in programs that modernize how energy is produced and used through decarbonization, making the electric grid smarter and stronger, and investing in EV charging. These investments support the mission of Smart Columbus and its implementation of the \$10 million grant by Paul G. Allen Family Foundation grant awarded to the City of Columbus as the winner of the U.S. Department of Transportation Smart City

Challenge. Realizing all of the benefits of transportation electrification relies on a resilient and efficient electrical grid. AEP Ohio is also committed to deploying energy efficiency programs, universal wind and solar, smart meters, and demonstration projects in smart lighting and microgrids.

Electric companies provide essential support to expanding the EV charging network and have a vested interest in EV market growth. More EVs lead to stronger demand for electricity that supports additional investment in the electric grid and new generation technologies. Through March 2019, investor-owned utilities across the country made more than 100 filings for EV-related programs [1]. Of those, 57 have been approved accounting for more than \$1 billion in investment and potential deployment of more than 1,900 DC Fast Charging (DCFC) and 41,000 Level 2 charging stations [1]. Nearly \$1.5 billion in additional EV-related investment is under

review by various regulatory agencies.

AEP Ohio is taking an active role by offering incentives for business customers and local governments to deploy EV charging infrastructure that will benefit electric vehicle drivers region-wide. Like other energy companies, AEP Ohio's plans are subject to public utility commission review before investments can be made (see Box 1).

Nationwide, electric utilities are emerging as important investors in transportation electrification at a critical time when public charging infrastructure is not sufficient to meet growing EV demand [3]. Beyond additional revenue for the utilities, EVs can help to stabilize the entire grid when charged at times when system-wide demand is low. This generates more predictability for utilities and could lead to cheaper electrical rates for all customers [4].

Box 1. Working Together for a Cleaner Electrical Grid

AEP Ohio's investment in Smart Columbus initiatives has been approved by the Public Utilities Commission of Ohio. The process provided customers, the Commission and other parties an opportunity to offer input on the company's plan. The alignment of goals and strategies between Smart Columbus, AEP Ohio and the Commission's PowerForward plan was essential for all to achieve success [2].

Advancing Decarbonization with Renewable Energy

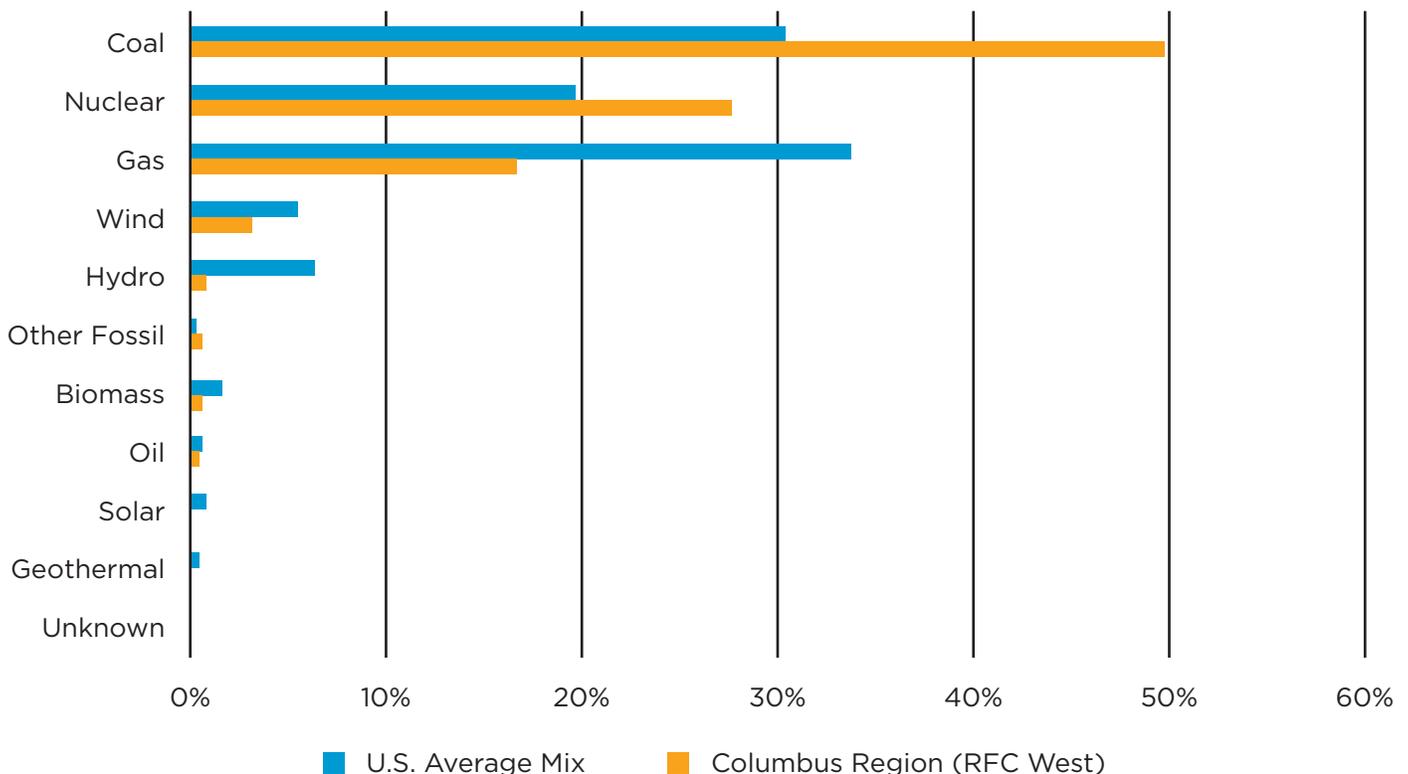
Decarbonization of the grid is a key initiative of the Smart Columbus Electrification Plan. The Smart Columbus program relies on regional estimates from the Environmental Protection Agency’s eGRID data to assess the current state of the grid [5]. The regional electrical grid for Columbus had a carbon emissions rate of 1,243 pounds per megawatt-hour in 2016, the latest available data [5]. The region experiences higher than average grid emissions. This is due to almost 20 percent higher than national average coal usage. Natural gas and nuclear power make up the majority of the remaining generation, with renewables accounting for only

a small percentage (see Figure 1). Notably, carbon emissions declined in the Columbus region by 10 percent between 2012 and 2016 versus 12 percent nationwide [5].

To advance decarbonization, AEP Ohio has committed to deploy 900 megawatts of universal wind and solar across the state. Given that the entire region has a capacity of more than 26,000 megawatts [6], this would be a small but meaningful step to reducing emissions from the electrified transportation sector. More information on Smart Columbus emissions calculations can be found in the Performance Measurement Plan [7].

Emissions reductions achieved through decarbonization are amplified when transportation is electrified. The Union of Concerned Scientists, using eGRID data, found that the emissions from an average EV in the United States is equal to a gasoline-powered vehicle with a fuel economy of 80 miles per gallon [8]. In the Columbus region, the equivalent is 50 miles per gallon, which is still twice the average fuel economy of gasoline-powered vehicles. With a cleaner grid, the environmental case for EVs is even stronger.

FIGURE 1: Grid Mix By Energy Source



Source: Environmental Protection Agency’s eGRID [5]

Smart Meters Lay the Groundwork for a More Intelligent Grid

Smart meters are an important component of grid modernization. AEP Ohio has been deploying smart meters since 2009, beginning with a demonstration project launched in 2009 that deployed 132,000 meters in Northeast Columbus through 2012. Since then, AEP Ohio has deployed more than 762,344 smart meters throughout its service territory, with more than 532,195 installed in the Smart Columbus seven-county region (Figure 2).

For customers, smart meters make meter reading less burdensome by eliminating the need to access the meter directly. Customers can

benefit from quicker outage restoration through investments in related grid modernization Distribution Automation Circuit Reconfiguration technologies. Customers with smart meters gain access to real-time data through online portals or smartphone apps. Smart meters may be particularly important to EV drivers who track the energy impacts of their charging decisions.

FIGURE 2: Phases Of Smart Meter Deployment

Phase I (gridSMART)	Phase II	Phase III
<p>Dec 2009 – Mar 2010 & 2012</p> <ul style="list-style-type: none"> • Northeast Columbus • 132,000 meters • Status: Complete 	<p>Aug 2017 – Dec 2019 (current)</p> <ul style="list-style-type: none"> • 89 cities across Ohio • 900,000 meters • Status: 762,344 (as of July 2019) 	<p>Start late 2020 or 2021</p> <ul style="list-style-type: none"> • Exurbs, small towns and rural areas • 474,000 meters • Status: Application filed with PUCO July 2019

Expanding the Charging Network for a Growing EV Market

FIGURE 3: Progress Against Program Goals



Progress made against Smart Columbus and AEP Ohio program goals as of the end of June 2019. Charging stations included in the count are in various phases including under review, design, installation and active. Source: AEP Ohio

The AEP Ohio charging station incentive program was approved by the Public Utilities Commission of Ohio in April 2018 and launched in August that year with the goal of deploying 300 Level 2 charging stations and 75 DC fast charging stations [9]. At the time of the program launch, the Smart Columbus program was also offering a charging station rebate for multi-unit dwellings in the Columbus seven-county region [10]. Smart Columbus and AEP Ohio worked together to make sure applicants were applying for the incentive that best met their needs.

The \$10 million investment in public, residential and workplace charging is providing a boost

to the charging market in the Columbus region and throughout AEP Ohio's service territory. In addition, AEP Ohio's program requires 10 percent of charging stations to be in low income areas. Details of the program are described in Table 1 and Figure 4.

The program requires that all charging stations be equipped with "smart" technology to capture usage data for four years and that all associated costs were covered for low-income areas. As of the end of June 2019, there are 140 applications in progress with 94 percent of them from the Smart Columbus program area. The program has already exceeded the requirement for 10 percent low-income area

installations for both charging station types. At the current rate of applications, AEP Ohio expects the program to be fully subscribed by the first quarter of 2020 with all projects installed on a rolling basis by the second quarter of 2020.

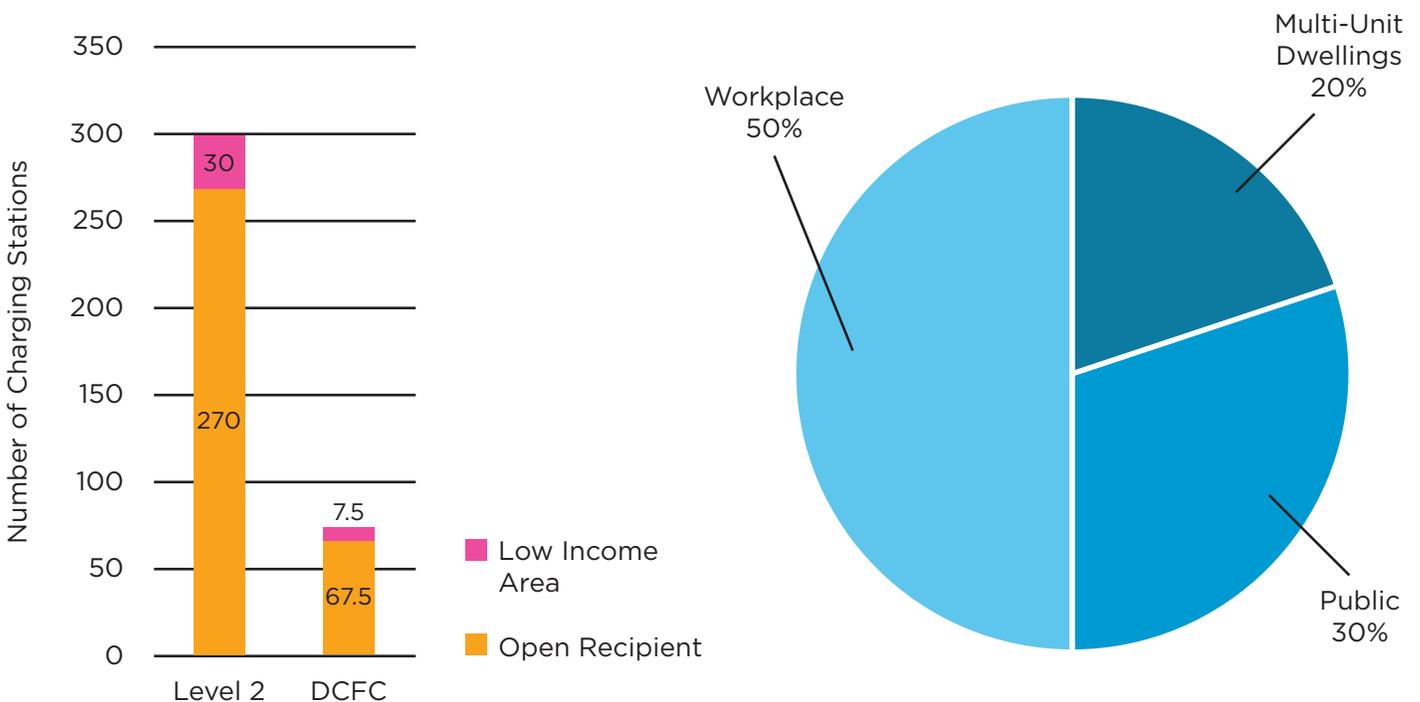
TABLE 1: Incentives For Charging Stations In AEP Ohio Program

	Level 2	DCFC
Local Government	Max 6 ports/sites Lesser of: • \$50,000 • 100% eligible project costs • \$10,000 per port	Max 2 stations/sites Lesser of: • \$100,000 • 100% eligible project costs • \$100,000 per station
Other Public	Max 6 ports/sites Lesser of: • \$50,000 • 80% eligible project costs • \$10,000 per port	Max 2 stations/sites Lesser of: • \$100,000 • 80% eligible project costs • \$50,000 per station
Workplace	Max 6 ports/sites Lesser of: • \$30,000 • 50% eligible project costs • \$5,000 per port	Not Eligible
Multifamily	Max 6 ports/sites Lesser of: • \$45,000 • 75% eligible project costs • \$7,500 per port	Not Eligible

Source: AEP Ohio [11]

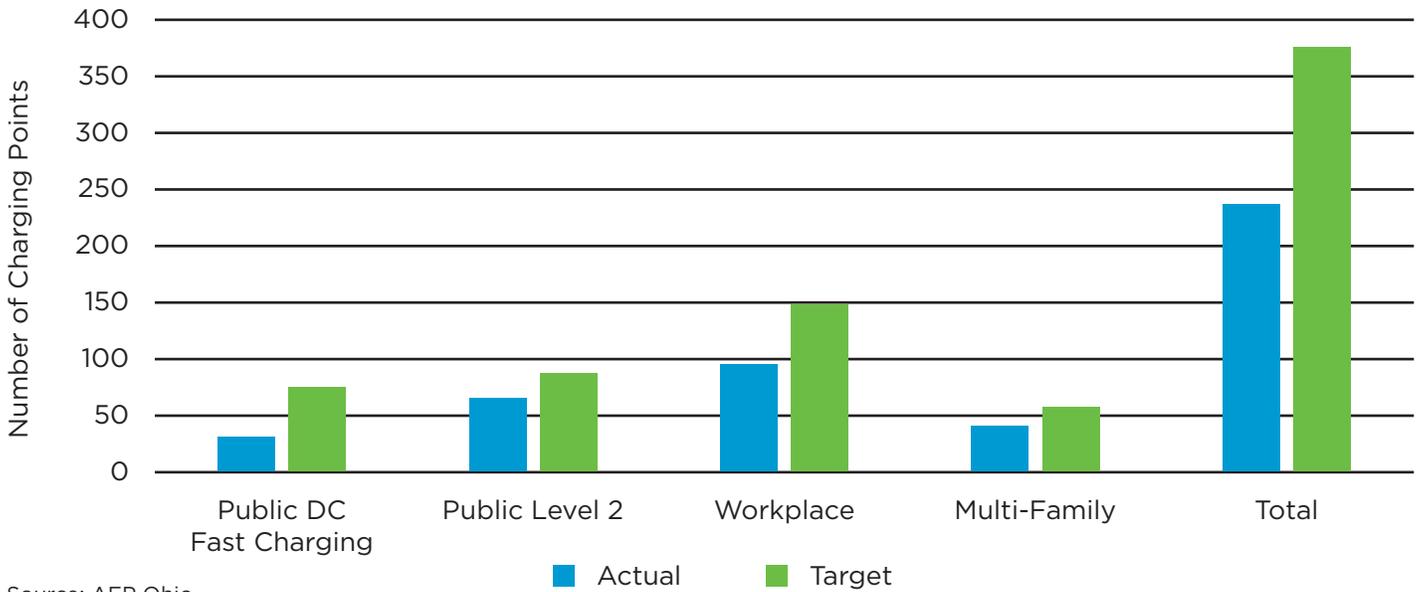
Low income areas are designated as locations where 50 percent or more of households have income less than two times the federal poverty threshold level as defined by the 2011-2015 American Community Survey.

FIGURE 4: Level 2 Charging Station Target Use & Low Income Requirements



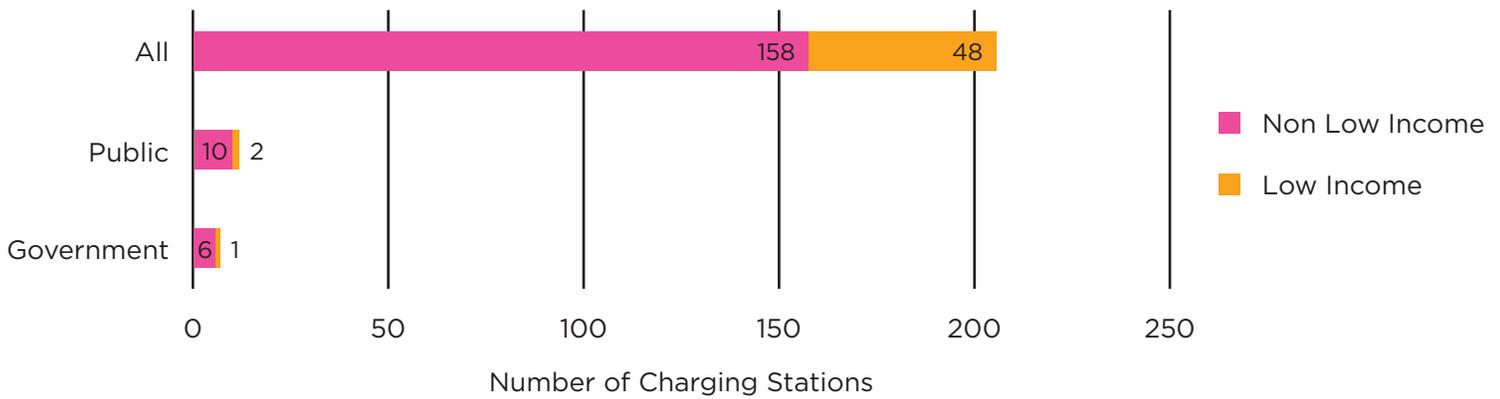
Level 2 charging station requirements for target use and low income area requirements for Level 2 and DC Fast Charging.

FIGURE 5: Actual & Target Number Of Charging Stations (Level 2 and DC Fast Charging)



Source: AEP Ohio

FIGURE 6: Number of Low Income/Non Low Income Charging Stations



Source: AEP Ohio

Working Together to Advance the EV Market in Columbus

AEP Ohio's decarbonization, smart meter and charging programs demonstrate the important role utilities play in ensuring a smooth transition toward a more electrified transportation system [12]. Their engagement since the start of Smart Columbus is critical to the program's overall success. Smart Columbus set realistic goals for decarbonization and charging infrastructure expansion that served as a foundation for AEP Ohio's EV charging incentive program. Alignment of priorities enabled a quick launch for the incentive program once it was approved. The Level 2 charging incentive for public charging was oversubscribed nine months into the program, and the DC fast charging continues to grow.

The success of AEP Ohio's decarbonization and charging infrastructure investment reflects upon the success of the Smart Columbus initiative as

a whole. Working together to help residents secure the best incentive for them has been a critical aspect of the program. Additionally, the goal of ensuring universal access to charging, by requiring some stations to be located in low income areas, can serve as an example for future utility programs in the region.

The collaboration between AEP Ohio and Smart Columbus shows that a city cannot achieve clean transportation goals alone. Both electric utilities and the cities they serve can achieve their individual goals while supporting each other's initiatives.

Box 2. Timeline for AEP Decarbonization and EV Charging Incentive Program

Pre-2015	132,000 smart meter devices deployed in Northeast Columbus as part of AEP Ohio's gridSMART Demonstration Project.
EARLY 2016	AEP Ohio works with Smart Columbus team to develop the U.S. Smart City Challenge grant proposal.
JUNE 2016	Smart City Challenge grant awarded to the City of Columbus, with goals of increasing EV adoption and lowering greenhouse gas emissions. EV charging goals were set to install over 1,000 residential Level 2, 250 public Level 2, 25 public DCFC, and 150 workplace Level 2 charging stations in the seven-county Columbus region.
NOV. 2016	AEP Ohio submits filing that includes incentives for the EV charging program, microgrids and smart lighting. The program was developed in parallel with the Smart Columbus proposal and reflected the commitment made in the initial grant proposal.
AUG. 2017	AEP Ohio begins second phase of smart meter deployment.
APRIL 2018	A modified AEP Ohio EV charging incentive program is approved providing \$10 million for the installation of 300 Level 2 and 75 DC fast charging stations.
AUG. 2018	AEP Ohio releases EV charging infrastructure incentives programs to the public.
JUNE 2019	762,344 smart meters installed across Ohio including 532,195 in the Columbus seven-county region. Deployment of smart meters will continue through the year with a goal of reaching 900,000 with 528,000 planned in the Columbus region.
JUNE 2019	AEP Ohio received 140 total applications for 206 Level 2 charging stations and for 31 DCFC stations to date.

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