

SMART COLUMBUS CASE STUDY

2018

2018

SMART COLUMBUS KICKSTARTS EV CHARGING DEPLOYMENTS AT MULTI-UNIT DWELLINGS

Case Study on Multi-Unit
Dwelling Charging Infrastructure

SMART



Executive Summary

Smart Columbus, the smart city initiative of the Columbus region¹, is taking concrete steps to grow the electric vehicle (EV) market in the region by expanding access to home charging. In summer 2017, Smart Columbus launched a residential charging program to accelerate EV adoption through a rebate for charging stations at multi-unit dwellings (MUDs)². Columbus is committed to adding 90 Level 2 charging ports at MUDs as part of the Smart Columbus Electrification Program.

Studies have shown that as much as 85% of charging for personal electric vehicles occurs at home^[10]. Multi-family households, such as apartment complexes or condominium communities, normally do not have easy access to at-home charging. This is often because of a lack of readily available electrical sources or dedicated parking. Advice from the Smart Columbus Charging Working group led to the conclusion that offering targeted assistance to MUD developers would have a meaningful effect on EV purchases in the region. The rebate requirements were structured with four objectives in mind: leverage Paul G. Allen Philanthropies (PGAPh) Smart City grant funds, improve the charging installation/ EV ownership process, encourage widespread deployment, and learn about charging behavior.

The first round of the rebate program resulted in 11 approved

sites supporting 48 Level 2 charging ports for a total cost of \$167,998. Recipients of the rebate funds will contract with the non-profit Clean Fuels Ohio³ (CFO), which will conduct the inspections of the charging equipment, provide the rebate funds and collect reports and data submitted by the recipients over a three-year period. The contract and rebate requirements hold the recipients accountable for installing the charging equipment. All the applicants were apartment developers or owners, with the majority of sites falling within Columbus city limits.

The success of the first round of the program encouraged Columbus to continue its effort with at least two additional rounds of funding planned during the three-year grant period. Future funding efforts will be modified based on the lessons learned from the first round. For example, a rebate program is easier to administer than a grant, but ensuring an equitable distribution of the funds may require the program review to be more complex than “first come, first serve.” Additionally, the city found that outreach was critical to ensuring broad interest in the program. Future efforts to expand charging at MUDs may include extended outreach to a broader audience through targeted contact with different types of MUD owners, developers and managers across the Columbus region.

JUN 2016	U.S. Smart City Challenge grant awarded to the City of Columbus, with the goal of adding over 1,000 residential charging ports through AEP and 30 Level 1 charging stations in MUDs through the City of Columbus.
AUG 2017	Smart Columbus releases the application for a MUD EV charging infrastructure rebate program.
NOV 2017	16 applications received and reviewed by CFO and the City of Columbus.
DEC 2017	City of Columbus MUD charging stations goals increased from 30 Level 1 chargers in Year 1 to 30 Level 2 chargers in Year 1 and 60 Level 2 chargers in Year 2.
JAN 2018	Four developers were notified of their rebate awards and were asked to contract with CFO to receive rebate funds. <ul style="list-style-type: none"> • 11 sites funded • 48 new charging ports • \$167,998 distributed, leveraging nearly \$137,500 in private funds
JUN 2018	CFO executed contracts with four developers. They were given until the end of 2018 to install the chargers.
JUN 2018	Second half of Round 1 awards approved.
JUN 2018	Release application for Round 2 of MUD charging.
DEC 2018	Estimated that all Round 1 MUD charging stations will be installed.

¹ The Columbus region is defined as Franklin County and its six surrounding counties: Delaware, Fairfield, Licking, Madison, Pickaway, and Union.

² Multiple separate homes that are contained within in the same building or across buildings in a complex – like an apartment, condo building, cooperative, mobile home park, or townhouse.

³ A regional non-profit organization focused on providing resources for transforming vehicle fleets from fossil fuels to cleaner, more environmentally-friendly options.



Background

Smart Columbus aims to put Columbus at the forefront of mobility innovation to drive economic growth, improve quality of life, foster sustainability and improve safety throughout the region. As the winner of the U.S Department of Transportation's (USDOT) first-ever Smart City Challenge, Columbus was awarded \$40 million from the USDOT and \$10 million from PGAPh to transform mobility in the country's 14th-largest city. Along with the grant dollars awarded, Smart Columbus has rallied more than \$500 million in aligned investments from the region's public and private sectors to scale and sustain the initiative.

This case study focuses on Smart Columbus' effort to support charging in MUDs. The initial goal was set at 30 Level 1 charging stations at MUD residences, as Level 1 charging is cost-effective and initially thought to offer adequate charging speed for overnight

parking for residents^[2]. In planning for Year 2, the goal for residential charging was increased to 90 Level 2 charging ports at MUDs, 30 in Year 1 and 60 in Year 2, based on MUD-owner demand. Other residential charging development was spearheaded by American Electric Power (AEP), the region's electric utility, and non-residential charging programs were developed by the Smart Columbus team, the City of Columbus and other partners.

Currently, as much as 85% of EV charging occurs at home, primarily in single-family homes with dedicated parking^[10]. Expanding access to home charging at MUDs was critical for the Columbus region, as 40% of households in the city are multi-family. MUDs make up 30% of households in the suburbs^[3]. Charging behaviors at MUDs are not well understood since most EV owners in the region live in single-family homes.

Smart Columbus understood that as the number of EV drivers increased, development of charging for MUD households would be necessary^[3]. Focusing on MUDs was one way the Smart Columbus team worked to obtain adequate information to close the knowledge gaps around charging infrastructure. This helps to better prepare for future market development. Additionally, Smart Columbus found that providing financial support helped to overcome some of the barriers to installing EV charging equipment at MUDs.

FIGURE 2: SMART COLUMBUS ELECTRIFICATION PLAN CHARGING PRIORITY GOALS

	RESIDENTIAL		PUBLIC		WORKPLACE		FLEET	
	Initial	Adjusted	Initial	Adjusted	Initial	Adjusted	Initial	Adjusted
Level 1	30 CoC	-	-	-	50	-	-	-
Level 2	1000 AEP	90 CoC 60 AEP	30 CoC 250 AEP	60 CoC 90 AEP	-	150 AEP 100 Other	300	300
DC Fast Charger	-	-	25 AEP	75 AEP	-	-	-	-





Grant Priorities

Through the PGAPh grant, Smart Columbus and its partners are addressing five priorities to decrease greenhouse gas emissions: grid decarbonization, EV fleet adoption, deployment and expanded use of autonomous and multi-modal systems, consumer EV adoption and charging infrastructure deployment.

Expanding access to charging infrastructure is essential to increasing EV adoption^[1]. Smart Columbus is providing financial and educational resources to increase the number

of charging stations in four sectors: residential, workplace, public and fleet.

The cost of charging infrastructure varies with installation, and often accounts for more than half of the total installation costs. The equipment and installation per port can range from no cost if using a standard 120V power outlet at a home to \$90,000 or more for a high-powered fast charging station.

The Smart Columbus Electrification Plan outlines the program goals and target numbers for the 925 total charging stations and types listed in Figure 2. Charging stations will be installed by the Smart Columbus team, the City of Columbus, AEP and members of the Columbus Partnership.⁴ The charging port goal in each sector was based on the need for charging, funding availability and infrastructure that was necessary to charge EVs.

⁴ The Columbus Partnership is a non-profit, membership-based CEO organization of more than 65 CEOs from the Columbus, Ohio region.

FIGURE 3: CHARGING LEVELS

The figure below shows the different levels of charging for EVs. The charging capabilities (miles per hour rates) increase moving down the chart, along with the cost of equipment and installation.

		Primary Use	Power to Vehicle	Charge (Volts)	Power (kW)	Miles/hr of Charge	Time to Recharge
Level 1	L1	Residential	AC	120	≤ 1.8	4	6 – 20 hrs
Level 2	L2	Residential	AC	240	≤ 7.2	22	3 – 8 hrs
	L2	Public	AC	240	≤ 19.2	22	3 – 8 hrs
DC Fast Charging	DCFC	Public	DC	480	≥ 50	150	30 min
Supercharger (Tesla)		Public	DC	480	120	400+	20 min



Need for MUD Charging

In support of the Smart Columbus initiative, the National Renewable Energy Laboratory (NREL) completed a study in February 2017 that estimated the number of charging ports required to accommodate EVs in the Columbus region. The study projected that 3,200 new EVs would allow the Smart Columbus program to meet the target of 1.8% of light-duty vehicle sales from EVs by March 31, 2020 (the end of the program). This target of 3,200 vehicles was used to set the program's charging

infrastructure goals.^[3] The researchers assumed that 12%-- or 636 vehicles-- would be housed at MUDs and would require 404 Level 2 charging stations at those residences.⁵

As a result, Smart Columbus and its partners increased the target number of charging stations for Year 2 from 30 to 90 charging stations. This increased target would bring the Columbus region closer to meeting the NREL estimated need of 404 Level 2 MUD chargers.

⁵ The number of required charging ports was estimated with main assumptions about the types of EVs, types of charging, travel patterns, and current spatial distributions of hybrid electric vehicles. All EVs were assumed to have charging stations at home. The model assumes consumers prefer to charge enough to complete their travel while minimizing operating costs.

Overcoming Challenges to Deploying Charging at MUDs in Columbus

Unique Barriers to MUD Charging Infrastructure

There are unique barriers to installing charging infrastructure at MUDs, compared to single-family homes including:

- the types of MUDs
- the installation process
- the cost of deploying/payment for providing charging services^[4] ^[5]

Types of MUDs

There are at least five types of MUDs, which can be owned or rented, including apartments, condos, cooperatives, mobile home parks and townhouses. Parking at MUDs can be shared, assigned or residents can rely on street parking. The parking can be in a structure or a lot and can be owned by individuals, the building owner or building associations/cooperatives. This allows for a sizeable number of environments to accommodate MUD charging. Because of this diversity, there is not a single charging solution for all MUDs.

Installation Process

Further complicating MUD charging installation is that the process is not as easy as just connecting an EV to an outlet. The charging infrastructure developer must work with tenants, owners, homeowner associations, boards, utilities, electricians/contractors and city permitting officials to complete an installation. The property owner or manager is responsible for most of the steps in the process, and while some of these steps are common to all charging equipment installation, the variety in property ownership and parking structures complicate the process.^[6] For example, the building owners or property managers would need to establish a policy for charging use: who can use the charging stations, how much it costs to use the stations and who owns the equipment. For a condo building, the installation would likely need to be approved through a homeowners association and clarity on equipment ownership would be required.

Cost of Deploying/Payment for Providing Charging Services

The cost and payment for equipment and installation are also important considerations and raise barriers to deployment at MUDs. Level 2 charging stations at MUDs could cost under \$2,000 per charging port or more than \$10,000 in some cases. Installation cost variables include equipment costs, labor costs, permitting fees, upgrades to electrical systems to support the use of the equipment and grid upgrade costs (borne by either or both the electric utility and the charging host). For a MUD, costs can also be complicated by the ownership issues of MUDs. For example, an apartment building has an owner that would be responsible for the entire process of charging station installation and maintenance. In a condo building, parking spaces may be owned by individuals or be a part of common spaces managed by a homeowners association.

Options to Overcome Barriers

Levers exist at the city and state levels to address the barriers to charging deployment at MUDs, including financial incentives, education, building-related regulations and utility engagement. For Smart Columbus, the team initially focused on actions it could employ without additional actions by state agencies or the state legislature.

These actions are captured in Figure 4, which illustrates the Process for Developing and Implementing a MUD Rebate Program from the perspective of the City of Columbus. The left side of the diagram captures the overall process, starting with designing the program/application process and engaging MUD developers to participating in it. It finishes on the bottom of the flow chart with capturing and reporting data. The remainder of the flow chart (right side) defines the steps needed within each of these categories to deliver the MUD Rebate Program.

Financial Incentives

Incentives that cover or reduce the costs of equipment and installation can come in multiple forms: rebates, grants, tax credits and loans. Rebates and grants can provide the most direct, near-term incentive, as the funds are received closer to when the project is completed (see Figure 5 for a comparison of these two financial incentives). Importantly, a rebate requires less critical review than a grant, and therefore can be quicker to implement. Beyond enabling building owners and property managers to overcome financial barriers, a financial incentive can also benefit the funder. A city funder, for example, can require access to charging use data in order to receive a grant or rebate. These were the most applicable financial incentives to Smart Columbus. Other incentives, like tax credits or loans, were not as applicable. A loan program would have required a lot of infrastructure to be created, including the hiring of financial loan officers, the establishment

of loan terms, and an assessment of the suitability of a subsidized loan program. While the city could have explored property tax credits, equipment-based tax credits would have required state action and would have only been applicable to individuals and not building owners or homeowners associations (Ohio does not have a corporate tax).

Building Policies

Policies that address building codes or change regulations can also push development and make future installations easier to manage. However, changes in policy and motivating policymakers can take time. These are long-term efforts that can supplement the near-term efforts of financial incentives. Below are examples of building code and legislative efforts that could aid charging equipment installation at MUDs:

- **Building code requirements:** As an important initiative of the program, Smart Columbus intends to “develop and refine standards and codes to facilitate efficient City of Columbus EV infrastructure permitting” and “share information and lessons learned with other municipalities.” This will include efforts to help ensure sites are “charger-ready.” Most existing buildings cannot accommodate the power consumption of EV charging equipment and retrofitting existing electrical systems can be expensive.^[6] However, doing the work to provide access to adequate power at the parking locations at the time of construction is a lower-cost option, which is known as making a parking location “make-ready” for charging equipment.^[6] To ensure that new construction can easily accommodate EV charging equipment, there is a requirement in the California Green Building Standards Code for “make-ready” electrical systems and designated parking spaces for charging.^[7] The Code includes guidance for single-family and multi-family homes to ensure that all types of facilities are prepared to handle EV charging in the future.
- **Legislation:** EV owners may need to overcome the obstacle of convincing a building owner, manager, homeowner association, or board to install EV charging equipment. In some cases, the EV owners may have their requests denied. California dealt with this issue by stating, in law, that common-interest developments cannot prohibit charging equipment installation but can instead set conditions for their installation that must be met.^[5]

Education

Education and outreach can help to clarify the installation steps for MUDs. Some organizations have prepared educational material for both EV and MUD owners/managers on charging equipment installation at MUDs.^[5] The material may be location-specific, as states may have different policies. For example, in Columbus, MUD owners are not required to make at-home charging possible, as they are in California. In future rounds of MUD funding, a variation of the MUD process flow chart, Figure 4, can be used to educate stakeholders on how the process works. It will also be used as a tool in discussions with other municipalities and agencies considering implementing such a program.

Utility Company Engagement

Government entities are not the only ones who can encourage charging expansion at MUDs. Given the importance of EV charging to the grid through electrical upgrade requirements, many electric utilities are leveraging their resources to support charging programs in public, workplace and residential (MUD) settings. AEP’s filing with the Public Utilities Commission of Ohio (PUCO) has been approved and will allow the company to deploy a number of charging stations at MUDs through equipment rebates.^[8]

FIGURE 4: PROCESS FOR DEVELOPING AND IMPLEMENTING A MUD REBATE PROGRAM

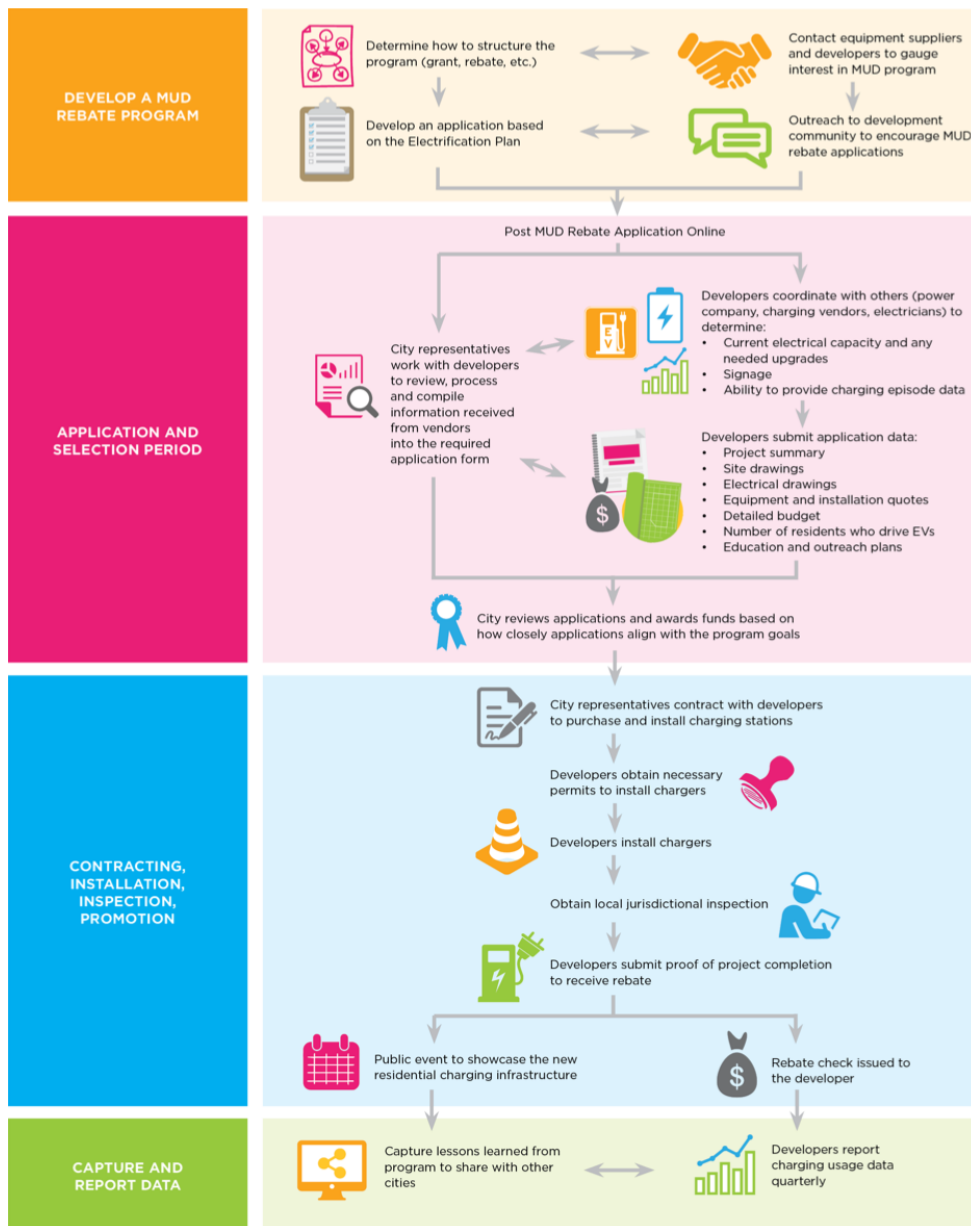


FIGURE 5: COMPARING REBATES AND GRANTS TO SUPPORT CHARGING INFRASTRUCTURE

	REBATE	GRANT
Cash given directly to recipient	Yes	Yes
Criteria established for eligibility through an application process	Yes	Yes
Application acceptance	First come, first serve	Deadline for application
Project approval	Approved when it meets criteria	Scored based on established criteria
Awarding	Can still be based on performance (require auditing)	Highest scores receive the award
Length of process	Generally quicker	Can take longer with review

Examples of financial incentives that can help owners/managers to overcome cost barriers to installing EV charging equipment. Financial incentives can provide near-term motivation.

Executing a Charging Station Rebate for MUDs

Considering the unique barriers facing MUD deployment and Smart Columbus' desire for near-term results, the team established a rebate program to support EV charging equipment installation at MUDs in the Columbus region. Smart Columbus stakeholders, including representatives from the City of Columbus and CFO, helped to develop the rebate program. Initial funding for the rebate was \$172,000 and aimed to deploy 30 Level 1 charging stations at MUDs.

The City contracted with CFO, a non-profit serving Ohio that focuses on clean transportation. CFO developed the rebate application and reviewed the applications submitted. They will coordinate installation inspections and transfer the rebate funds to the recipients. The City of Columbus and CFO also conducted outreach throughout the program. They contacted charging equipment suppliers and developers to gauge interest in a MUD program and to get

them thinking about how and where they could incorporate charging into their MUDs. The outreach helped to lay the groundwork for a successful rebate program application process. The outreach also served to educate the building owners and managers, as this can be a challenging task for EV owners to do on their own.

Charging Rebate Designs

Second, Smart Columbus used the rebate program to improve the installation and ownership process of charging at MUDs. Applicants had to provide detailed site and engineering plans to ensure the installation was well planned and would go as expected. Although the plug costs may have been less than \$25,000 for a two-space site, the rebate was also able to be used for installation costs, signage, parking stenciling, other equipment for data/network connection, and education or promotional material. The completed installations would also need to be inspected before funds were distributed to ensure the charging equipment met the project requirements. These inspections hold the developers accountable and keep them motivated to complete the projects.

Applicants also had to consult with their utility to ensure the equipment connection was feasible, thus expediting the process once a project was approved through the rebate program. Smart Columbus recommended in the application that the applicants consider preparing the site to be "make-ready," with wiring and panel

upgrades completed, for 10 to 50 percent of parking spaces (beyond the minimum number of spaces in the application). The goal of this was to have these MUDs ready to install more charging equipment if the demand from residents increased.

Smart Columbus anticipated confusion over charging use, fees and ownership and made sure the application outlined these items clearly:

- Charging stations must be dedicated for use by residents – although some applicants have negotiated to allow some public charging with priority still given to residents.
- Charging will be free for the first 30 days and the applicant must provide information on billing after that.
- Ownership was clearly specified to remain with the facilities.

Third, Smart Columbus wanted to spread the funding across the region and made the seven counties in-and-around Columbus eligible for funding. During the review process, the city considered the location

of the applicant when deciding whether or not to issue the rebate. In addition, applicants could only receive up to \$25,000 per site to ensure more properties received a rebate.

The fourth goal of the MUD rebate program was to learn more about charging behavior at MUDs. As this behavior at MUDs is still largely unknown, the new MUD charging stations will collect data that will help to develop a better understanding of charging use at these residences. The equipment must capture charging data that will be shared with Smart Columbus for up to three years. The charging stations must have the capability to be controlled by the utility for demand response adjustments through a separate meter. A diagram of the connected system is shown in Figure 6 to demonstrate the range of equipment that must work together to build a networked system. Finally, awardees must provide quarterly reports that include utilization data, marketing/education efforts, feedback from the residents for lessons learned and best practice development.

1st GOAL: LEVERAGE PGAPh GRANT FUNDS

- \$3,500 per plug/space
- 35% cash match requirement
- Two spaces for ≤ 20 units;
Three spaces for 21-40 units;
Four spaces for > 40 units
- Six months to complete project and collect the rebate

2nd GOAL: IMPROVE INSTALLATION / OWNERSHIP PROCESS

- Detailed site and engineering plans required
- Consult with utility to confirm site is suitable.
- Level 1/2 equipment, installation, signage, stenciling, other equipment, education/promotion
- Eligible users should be made clear through signage
- 30 days free and “reasonable” monthly fee afterwards
- Facilities will maintain ownership

3rd GOAL: ENCOURAGE WIDESPREAD DEPLOYMENT

- Franklin, Delaware, Union, Madison, Pickaway, Fairfield, and Licking Counties
- \$25,000 max per property

4th GOAL: LEARN CHARGING BEHAVIOR

- Equipment must be capable of recording user data
- Allow utility control for demand response.
- Quarterly reports and data sharing for three years

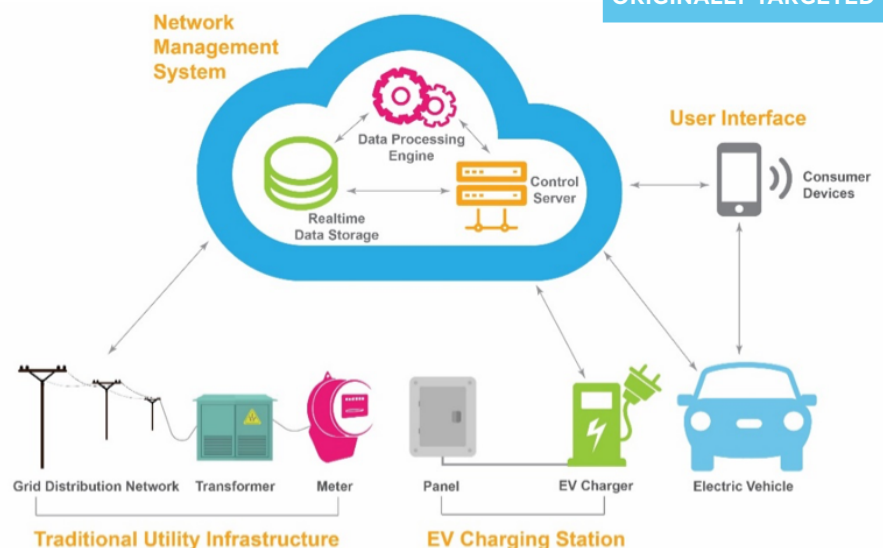
Application Review Process

The first round of the rebate program application process was a success. At the end of the application period, Smart Columbus had received 16 applications totaling \$265,990 in requested funds; 11 applications were accepted for a total of \$167,998 (leveraging \$137,500 in private match funding). The 11 applications will result in 48 new Level 2 charging ports, considerably more valuable than the 30 Level 1 charging ports originally targeted for the program.

Most applicants are located in the City of Columbus, with two located north of the city (see Figure 7). The applications received were from four rental property owners, and directly reflected the outreach conducted by the city and CFO. Accordingly, most of the applications proposed similar equipment and costs. This is partly attributed to only having four unique applicants, as the same owner/developer is likely to quote identical costs across the different sites. CFO also attributes some of the commonalities to the charging equipment providers' active pursuit of sites. Not only did CFO and the city approach the developers, but charging providers also worked with developers on their cost estimates and plans. One other notable result is that only a few of the sites are currently under development, and most plan to add the charging systems into their existing parking and electrical systems. The Smart Columbus team had expected that most applications would come from sites that are under development.

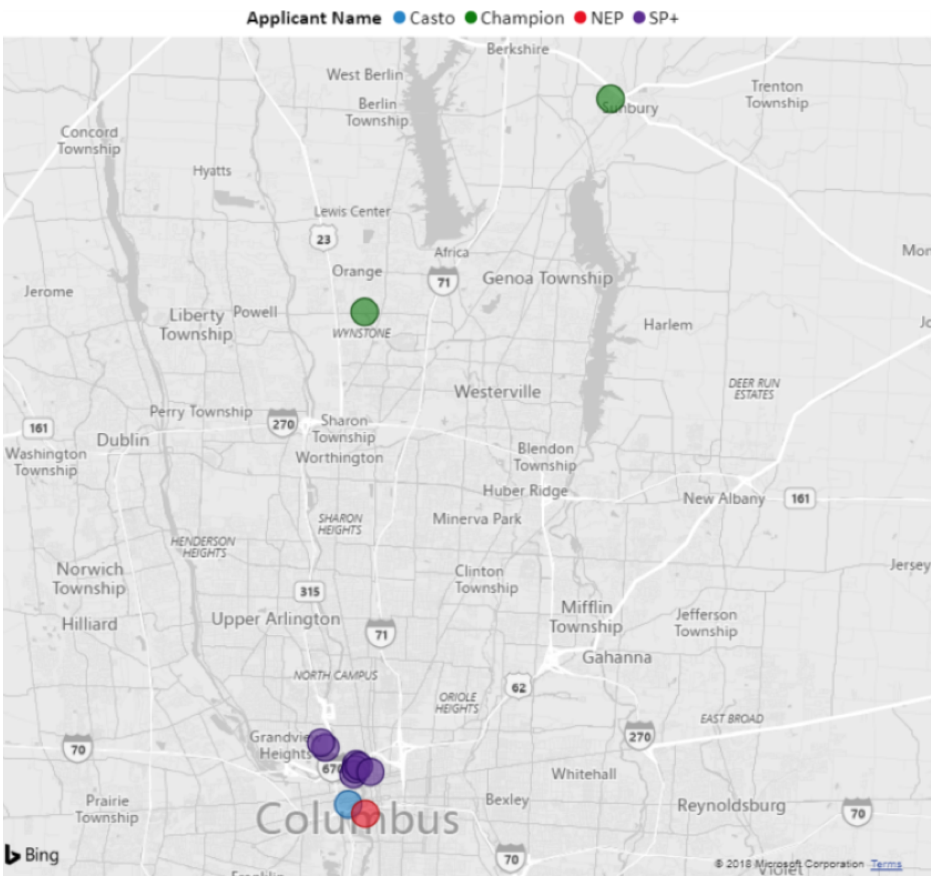
The applicants included four unique developers that applied for the rebate at one to seven different sites. The total number of potential new plugs is 48 located across 11 sites (see Figure 8). All sites had well above 40 residential units, which meant four spaces was the minimal requirement for all. Nine of the 11 sites applied for four plugs and two applied for six plugs. All sites requested the full rebate amount per plug (\$3,500). None of the approved applications applied for the \$25,000 maximum; see Figure 9 for a breakdown of costs per site.

FIGURE 6: GRID INTEGRATED CHARGING EQUIPMENT DIAGRAM



Components of a grid integrated and connected charging equipment with: 1) utility infrastructure; 2) EV charging; 3) Network system (connection of data to servers); 4) User interface.

FIGURE 7: MUD APPLICANT SITE BY OWNER/DEVELOPER



Locations for MUD charging ports supported through the Smart Columbus initiative.
Source: Smart Columbus

FIGURE 8: NUMBER OF CHARGING STATIONS/PARKING SPACES

	SP+	CHAMPION	CASTO	NEP	TOTAL
Number of Plugs	28	12	4	4	48
Number of Sites	7	2	1	1	11



What motivated the MUD rebate applicants?

Applicants expressed interest in the rebate program for a variety of reasons. The Smart Columbus team gathered that some of them were responding to the needs of current residents. In one case, an EV owner was dragging an extension cord across the garage to charge their EV. In other cases, the applicants were anticipating a growing demand from current or future tenants. The rebate program presented a great opportunity to install the equipment with financial support. If the developers were already considering incorporating charging equipment, it was an easy decision to apply for the rebate.

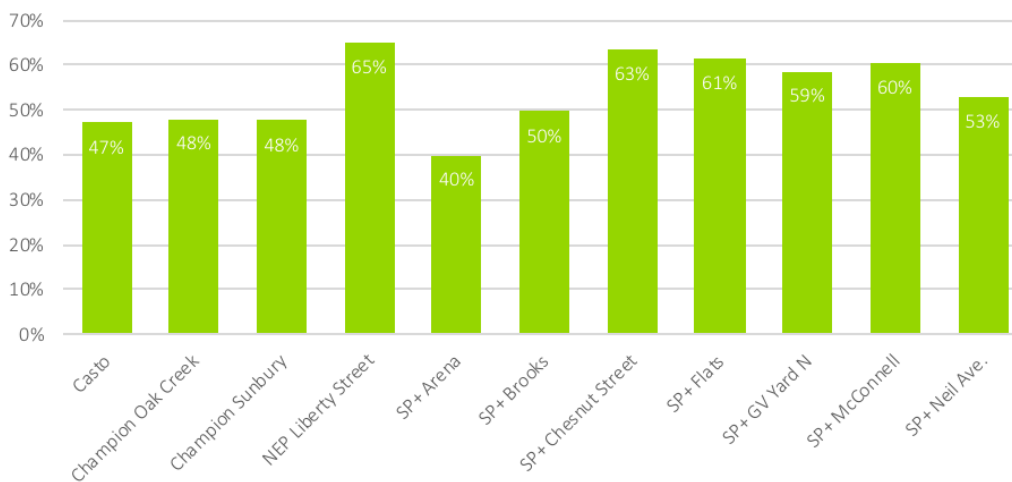
Round one applicants for the MUD rebate were primarily rental apartment developers from the Columbus region. The motivation for applying for the rebate varied among the developers, as mentioned above, but one applicant said in an interview that being able to offer charging as an amenity was a great motivator. John Riat, the Development Coordinator for Casto, said he built internal support for their participation due to his personal interest in electric vehicles and innovative technology. Riat saw installing charging infrastructure at a new Casto apartment development as a marketing tool to attract residents to the building, given growing popularity of EVs. The MUD rebate

was an effective way for Casto to jumpstart this effort. Riat expressed that the process for applying was easy. Though developers could make a profit from the charging services, Casto is not relying on that revenue. Their goal is to advance marketing efforts and improve the company's environmental impact. Casto has found the rebate experience to be worthwhile thus far and would consider applying for more funding to install infrastructure in some of their existing suburban Columbus apartment complexes.



FIGURE 9: PERCENTAGE OF TOTAL PROJECT COSTS SUPPORTED BY THE MUD REBATE AND SITES BY APPLICANT

DEVELOPER	SITE	REBATE REQUEST	NON-REBATE COSTS	% OF TOTAL PROJECT COST SUPPORTED BY REBATE
Casto	Franklinton	\$14,000	\$15,701	47%
Champion	Oak Creek	\$21,000	\$22,733	48%
Champion	Sunbury	\$21,000	\$23,173	48%
NEP	Liberty Street	\$13,998	\$7,538	65%
SP+	Arena	\$14,000	\$21,112	40%
SP+	Brooks	\$14,000	\$14,224	50%
SP+	Chesnut Street	\$14,000	\$8,112	63%
SP+	Flats	\$14,000	\$8,812	61%
SP+	GV Yard N	\$14,000	\$9,912	59%
SP+	McConnell	\$14,000	\$9,212	60%
SP+	Neil Ave.	\$14,000	\$12,512	53%
TOTAL		\$167,998	\$153,041	52%



Outreach and Education

Applicants included an outreach and education component with their responses to show how they would secure users for the charging equipment.

- SP+: Work with the garage owners of their properties (National Realty Investors) to educate residents on the equipment and release rules and guidance on their use and operation. They were also interested in having an EV expert on hand to help share reliable information and give a tutorial to other EV drivers.
- Champion: Prepare handouts for current and future tenants, make

email announcements and host an EV driving demo.

- Casto: Work with their equipment providers to prepare educational material on the EVs and equipment for building managers and host a Ride & Drive event when the building is completed.
- NEP: Provide printed flyers, run on-site education programs and make continued efforts to update information for residents.

The city is having CFO provide ongoing coordination with the developers that received rebates. Developers will provide data on a

quarterly basis and CFO will discuss how the program is going, garner any lessons learned and provide suggestions on ways to improve outreach and education. This activity will be included in the quarterly reports.



Installations

The applicants were informed of their approval and were given approximately six months to complete the installation of the equipment. CFO will conduct inspections at the sites upon completion, which will include bringing an EV to test the equipment. If a site does not pass inspection, CFO will work with the developer to make the changes needed to pass. Since CFO will be distributing the program

funds, each developer will contract with them. The contract language was approved by the city and will allow CFO to continue to collect quarterly reports and data from the sites for up to three years after the installations are complete. Requiring quarterly reports and data in the contract will keep the applicants accountable beyond the installation of the equipment.



Future Funding

Smart Columbus will advance charging at MUDs with additional funding. The city has already committed an additional \$100,000 in rebates for the remainder of the round one applicants, which will result in 24 additional charging ports. Smart Columbus also expects to allocate

up to \$175,000 for a second round of funding in the second year of the Paul G. Allen Philanthropies grant program. The second round will include a new outreach and application process that will enable the city and others to build upon the lessons learned from the first round of applications.

Guidance From Other Cities

The rebate program is still in its initial phases, but the Smart Columbus team already has a few lessons learned that can be applied to future funding and can be passed on to other cities.

- Grant program rather than a rebate: A rebate program is easier to administer but ensuring an equitable distribution of the funds requires funds be awarded through a more thoughtful process than “first come, first serve.” Only two of the six ZIP codes of winning applicants had household incomes below the median for the region. In addition, over half of adults in those ZIP codes have a bachelor’s degree or higher while less than one-third of all adults in the region have that educational attainment [3]. A grant program will provide the city more flexibility in matching community needs with applicants.
- Leverage local partnerships: CFO and the city found that outreach was critical to ensuring interest in the program from a broad group. Future programs may try to extend outreach to get a more diverse set of applicants. The City took

advantage of local partnerships, by contracting with CFO, to efficiently execute the program.

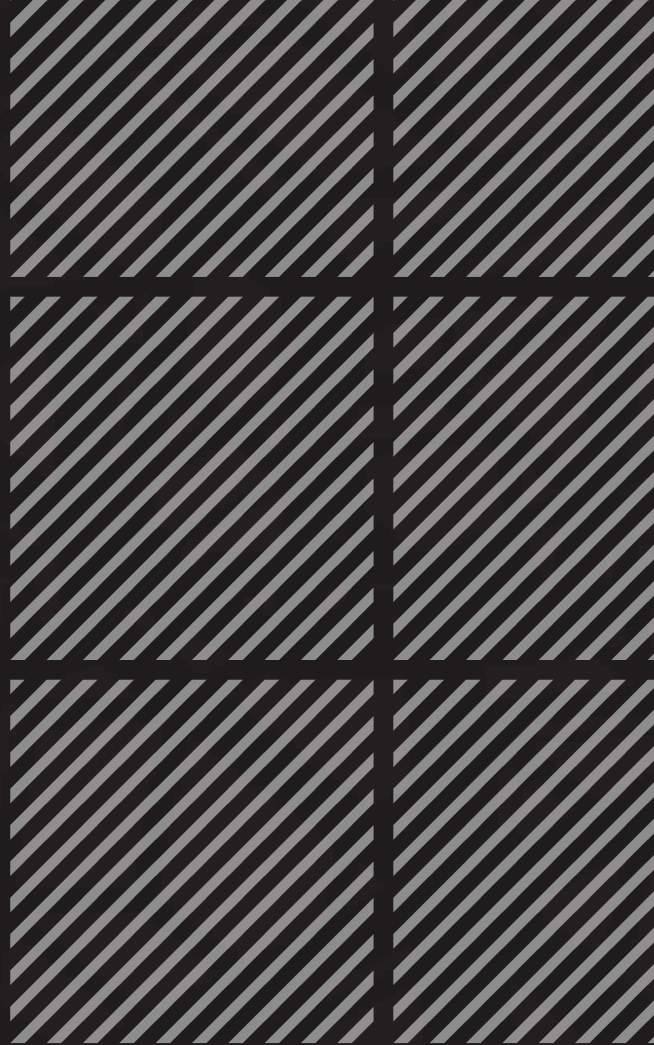
- Define reasonable charging costs: The original rebate program application required recipients to provide free charging for the first month and “provide free charging or require a reasonable monthly fee” for the 3-year reporting period. When the contracts with each developer were negotiated and signed, additional definition was provided regarding the fee: “Maximum hourly fee is determined to be no greater than three-quarters ($\frac{3}{4}$) of the cost per mile of mid-grade gasoline (89 octane) for a comparable vehicle.” In the future, this level of specificity of the user fee, provided in the contracts with developers, should be included in the application as a requirement to receive funding.
- Level 2 instead of Level 1 charging: The charging needs at MUDs may require Level 2 charging. Although Level 1 was eligible for rebates, no applicant preferred the use

of this charging level. This could be because of the influence of charging service providers that conducted outreach to developers, the availability of Level 1 charging equipment that met the other requirements of the rebate (e.g., data measurement and sharing) or the preference of EV drivers in the region.

So far, the program has shown that a city can successfully execute an incentive program for MUDs. The true success of the program will be determined after the equipment is installed and is actually put in to use. If the charging equipment is used regularly enough to produce data and allow the utility to test demand response, the information gathered could be used to inform the development of many more MUD residential charging programs. Additionally, the city will have succeeded at making EV ownership possible for a broader set of drivers.

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