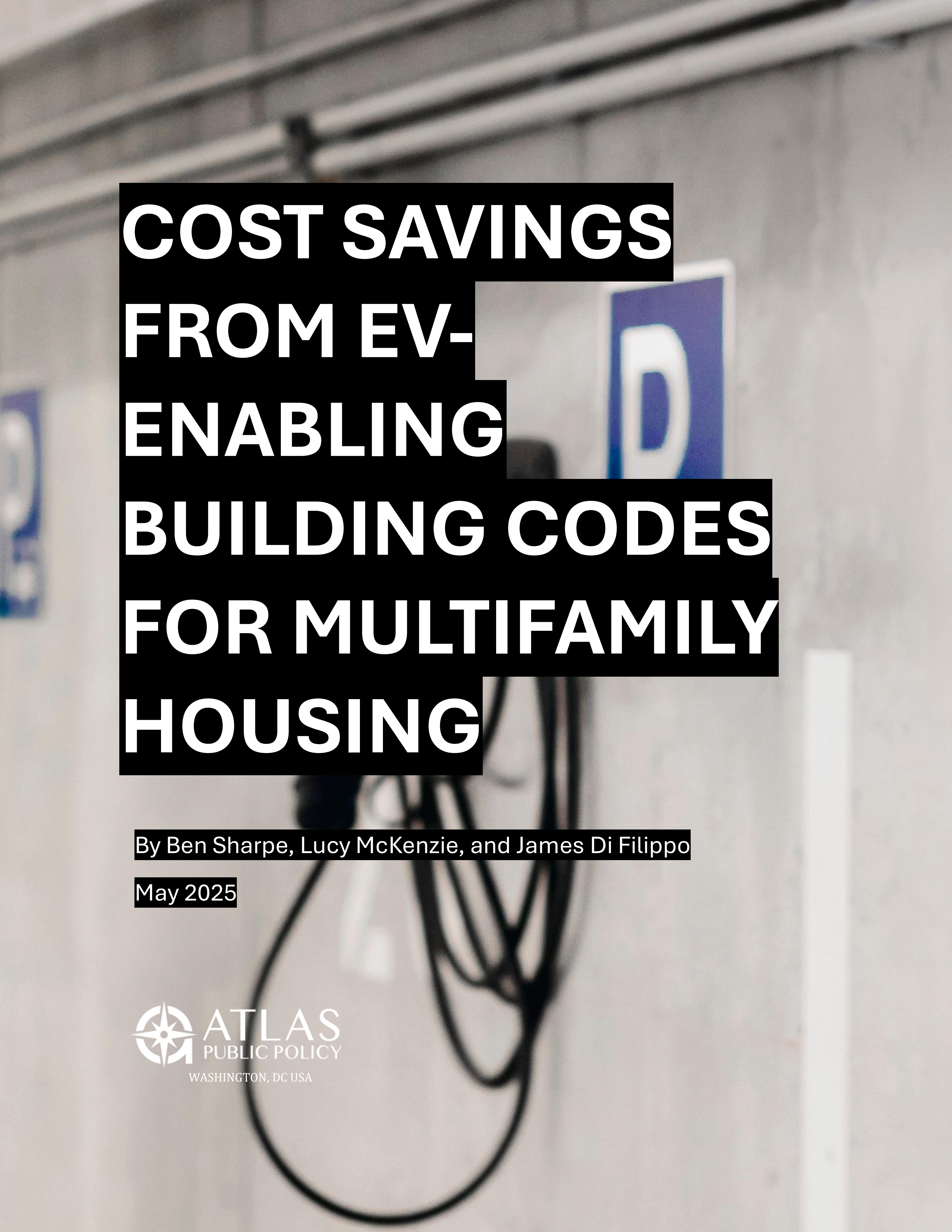

COST SAVINGS FROM EV-ENABLING BUILDING CODES FOR MULTIFAMILY HOUSING

By Ben Sharpe, Lucy McKenzie, and James Di Filippo

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Executive Summary

Modeling by Atlas Public Policy suggests that electric vehicle-enabling requirements in multifamily housing building codes could save the United States $8.6 billion over the coming decade. Our analysis shows that electric vehicle (EV) building codes already in place across various U.S. jurisdictions are expected to generate $2.1 billion in direct net present value cost savings by 2035. Expanding these building codes to more jurisdictions can create further savings: we use the EV-enabling requirements in the 2024 International Energy Conservation Code Appendix as an example, and find that enacting these requirements U.S-wide could result in an additional $6.5 billion savings by 2035.

The reason for the savings: requiring EV-enabling infrastructure during construction adds modest upfront costs, but avoids much costlier retrofits later. Retrofitting often requires breaking through finished surfaces like concrete or asphalt, upgrading existing electrical panels, and installing new conduits and wiring through completed buildings—whereas incorporating these elements during initial construction allows for efficient integration with other electrical work and avoids costly demolition and reconstruction.

Absent building code requirements, these cost savings often go unrealized due to split incentives between builders (who seek to minimize upfront costs) and future owners or residents (who would see the savings). Building codes bridge this gap by requiring upfront wiring that yields substantial cost savings over time, ensuring that short-term incentives don't prevent the most cost-effective long-term solution. As the U.S. continues its electric vehicle trajectory, forward-looking EV-enabling building codes will help ensure more convenient charging options and transportation choices for multi-family housing residents while significantly reducing costs. Given the 61-year average lifetime of residential buildings in the United States [1], inaction will mean locking additional costs into new buildings for decades.

Acknowledgments

We are grateful to Vanessa Warheit of the EV Charging for All Coalition for her input during the early stages of this study. The Coalition’s compendium of electric vehicle charging provisions in state and city-level building codes was an incredibly valuable input to this work.

Background

The transition to electric vehicles (EVs) continues to accelerate in the United States: EV sales represented approximately 10 percent of new light-duty vehicle sales in 2024 across the United States. That number is much higher in leading states – California topped 25 percent [2]. While most early EV adopters live in single-family homes with access to home charging, approximately 31% of U.S. households live in multifamily housing (MFH) such as apartments, condominiums, and townhouses [3]. This represents a significant barrier to consumer choice and convenience, as MFH residents face unique challenges in accessing convenient and affordable charging options.

Between roughly 85 percent and 95 percent of current EV drivers living in detached single-family homes have access to home charging, while less than half of those living in apartments have similar access [4]. This charging disparity disproportionately affects certain demographic groups. Renters make up more than a third of all U.S. households, with nearly two-thirds of renters living in MFH. These renters are more likely than homeowners to be single, households of color, or have lower incomes [3].

Without addressing these charging infrastructure challenges at MFH, the transition to EVs risks leaving behind a substantial portion of the population, causing inconvenience and curbing transportation choices.

The Case for EV-Enabling Building Codes

Building codes play a crucial role in establishing minimum standards for EV charging infrastructure in new MFH developments. Across the United States, these requirements vary significantly, from jurisdictions with no EV-specific provisions to those requiring 100% of parking spaces to have some level of EV charging support [5]. As EVs are projected to represent an increasingly significant portion of new vehicle sales in the coming decade—potentially reaching 67% of new light-duty sales by 2032 [6]—building codes will become an even more critical policy lever for enabling convenient charging access in MFH.

Installing EV-enabling infrastructure during new construction is substantially more cost-effective than retrofitting existing building structures or parking lots. Real-world assessments from several cities indicate that retrofitting costs for charging in MFH can be three to five times higher than installation undertaken during construction. This is because retrofitting often requires breaking through finished surfaces like concrete or asphalt, upgrading existing electrical panels, and installing new conduits and wiring through completed buildings—whereas incorporating these elements during initial construction allows for efficient integration with other electrical work and avoids costly demolition and reconstruction. These cost disparities create a strong economic case for anticipating and building for future EV charging needs during initial construction.

Building codes with EV charging requirements are essential to address a fundamental market failure in multifamily housing development. Without such codes, developers face limited incentives to invest in EV infrastructure during construction despite significantly lower installation costs compared to retrofitting. This split incentive problem occurs because developers bear the upfront costs while future residents receive the benefits, and EV-readiness may not immediately translate to higher property values that offset these investments. This can be especially true for long-life assets like housing and growing markets like electric vehicle adoption. As Pierce and Bui [6] demonstrate, building codes effectively bridge this gap by requiring infrastructure that yields substantial societal cost savings over time, ensuring that short-term economic barriers don't prevent the adoption of the most cost-effective long-term solution. By mandating EV-readiness in new construction, codes help avoid the substantially higher costs of retrofitting charging infrastructure in existing buildings.

Recognizing the need to overcome these split incentives to reduce costs and increase driver choice and convenience, over 200 cities, counties, and states have passed EV-friendly building codes of some kind [5].

Objectives & Methods

This study aims to quantify the direct economic benefits over the next 10 years of implementing additional EV-enabling charging provisions in building codes across the United States. We aim to provide policymakers with evidence-based insights to support decision making on code requirements.

To analyze the cost impacts of EV-enabling building codes, we developed:

a) A *Current Policies scenario* that compiles today's EV-enabling building code requirements across cities and states that have already passed them, and

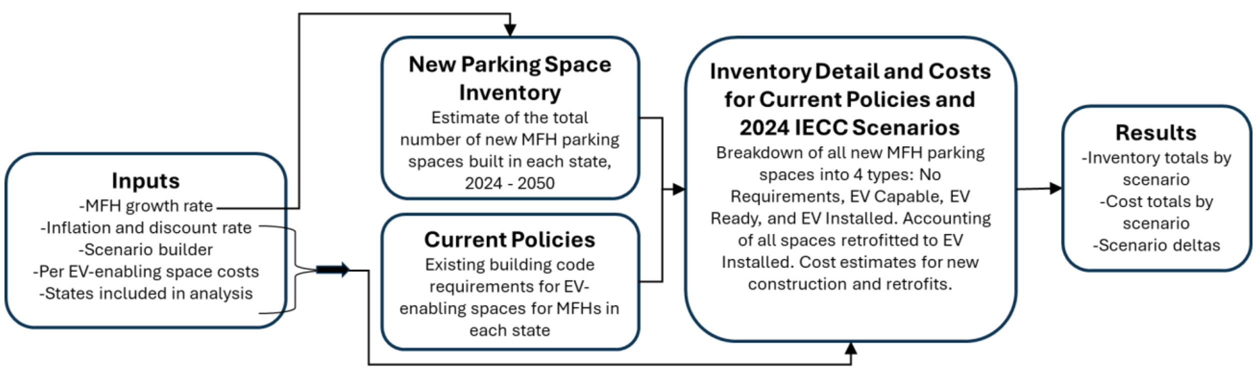
b) A *National EV Codes scenario* that represents a future where EV-enabling building codes are passed nationwide. For this analysis, we modeled this as nationwide passage of the 2024 International Energy Conservation Code (IECC) provisions for

MFH (which are found in that code's appendix). We note that the EV-enabling codes of several jurisdictions go further than IECC in an effort to further support coverage and simplicity for residents. We have chosen IECC as an illustrative case and do not intend in doing so to imply any negative assessment of other code language.

We then compared the costs that would accrue under each scenario as MFH retrofits charging over time to meet a defined 2035 level of charging demand from residents. The difference in costs between the two scenarios provides the net cost savings that can be attributed to the passage of additional EV-enabling building codes.

To implement this framework we built a model that consists of four interconnected modules. See Figure 1.

Figure 1: Overview of analytical model



Current Policies Scenario

The Current Policies scenario represents the current state of policy with respect to EV charging building code requirements for MFH across the United States. This scenario draws from a comprehensive August 2024 database developed by EV Charging for All of EV-enabling requirements in building codes across all states and major cities [5]. Parking spaces with EV charging support can generally be classified as being one of three types: EV Capable, EV Ready, or EV Installed. Table 1 summarizes the three types. State- and city-level EV-enabling building codes generally define a percentage of parking spaces that must meet at least some minimum level of EV Capable, EV Ready, and/or EV Installed.

Table 1: Three types of EV parking spaces differ in their level of charging readiness

Parking space type	Description
EV Capable	Parking spaces with electrical panel capacity, dedicated branch circuit, and raceway/conduit installed to support future EV charging. These spaces require additional wiring and charger installation before they can be used for charging.
EV Ready	Parking spaces with all EV Capable infrastructure plus completed circuit terminating in a junction box or 240-volt outlet. These spaces need only the charger itself to be added in order to be used for charging.
EV Installed	Parking spaces with fully installed Level 2[1] charging stations connected to the electrical panel, ready for immediate use.

The Current Policies scenario assumes that MFH built during the study period meet existing EV-enabling building code requirements in each state.

As of August 2024, 27 states had no EV-enabling building code requirements. For states that have statewide requirements but do not contain cities with more stringent rules (5 states), our Current Policies scenario uses the state-level requirements. For states with cities that exceed state requirements (18 states), we calculate population-weighted averages to estimate effective statewide requirements.[2]

National EV Code Scenario

The National EV Code scenario assumes that all states adopt the 2024 International Energy Conservation Code (IECC) provisions for MFH, which were placed in the appendix rather than the main body of that code.[3]

[1] Level 2 electric vehicle charging utilizes 240-volt electrical service to deliver between 3 and 19 kilowatts (kW) of power. This charging level typically requires dedicated electrical circuits and can fully charge light-duty electric vehicles overnight.

[2] For example, if a state has a 20% EV Capable requirement but contains cities representing 10% of the population with 50% requirements, the weighted average would be 23% ([20% × 90%] + [50% × 10%]).

[3] When requirements are placed in an IECC appendix rather than the main code, they typically become optional unless jurisdictions specifically adopt them.

The IECC requirements vary by building height, with different specifications for MFH of 3 stories or fewer versus 4 stories or more. Using U.S. Census data on historical MFH construction, we estimate that 20% of new MFH units built during the study period will be 3 stories or fewer and 80% will be 4 stories or more [7]. Table 2summarizes these requirements and our calculated weighted average for the National EV Code scenario.

Table 2: Requirements for EV parking spaces Codified in the 2024 International Energy Conservation Code

Space type	MFH 3 stories or less (2024 IECC R404.7.1)	MFH 4 stories or more (2024 IECC C405.14.1)	Estimated weighted average
EV Capable	40%	75%	68%
EV Ready	-	5%	4%
EV Installed	-	20%	12%

Modeling Parameters for Both Scenarios

We use cost estimates for both new construction and retrofit installations, as shown in Table 3. Note that retrofits costs shown here are to bring the parking space up to the level of EV Installed. For example, we estimate that an EV Capable parking space costs $400 more than building a parking space with no EV-enabling infrastructure. For EV Ready and EV Installed, we estimate $1,150 and $3,650 more, respectively, than a space with no requirements.

Table 3: Cost Estimates for EV Infrastructure in New Construction and Retrofits

Space type	New Construction*	Retrofit to EV Installed
No Building Code Requirements	-	$13,800
EV Capable	$400	$3,500
EV Ready	$1,150	$2,500
EV Installed	$3,650	-

* Values here represent the cost of each level of EV-enabling infrastructure beyond 'No Requirements.'

Sources: [8] [9] [10] [11] [12] [13]

Another input to our modeling is the total percentage of EV installed parking spaces that will be demanded by residents by 2035. When existing building code provisions fall short of the target percentage of EV Installed spaces, additional spaces must be retrofitted to meet this requirement, incurring substantially higher costs.

To determine this target demand level, we divided states into two groups according to their expected zero-emission vehicle (ZEV) trajectories:

1) Fourteen "ZEV-leading states" (including Washington, DC) that have adopted California's Advanced Clean Cars II regulation or comparable targets,[4] and
2) The remaining 37 states.

The ZEV-leading states are projected to reach 100% zero-emission vehicle sales by 2035. We assume 100% of these ZEVs are battery electric vehicles (EVs), resulting in approximately 40% of these states' total vehicle fleet being EVs by 2035. For the remaining states, we assume slower adoption rates, with ZEVs comprising 20% of their fleet by 2035.

Our model assumes charging access parity between new single-family homes and new MFH units, enabling drivers to conveniently 'refuel' their electric vehicle(s) just as easily in a single-family home or a MFH unit built between 2025 and 2035.

To model this future, we make the following assumptions:

- *Charging access among EV drivers living in single-family homes:* Research indicates that between 84% and 94% of EV drivers in detached single-family homes have home charging access [4], so we assume 90% as our benchmark.
- *Proportional distribution of EV drivers among housing types:* Unlike the current reality in which EV drivers are much more likely to live in single-family homes vs. MFH (in significant part due to home charging access [15]), we assume in 2035 EV ownership is proportionally distributed across housing types.
- *Parking availability:* We assume one off-street parking space per MFH unit [14].

Using these assumptions, we estimate the percentage of MFH parking spaces that need EV chargers by 2035:

[4] California, Colorado, Delaware, District of Columbia, Hawaii, Maryland, Massachusetts, New Jersey, New Mexico, New York, Oregon, Rhode Island, Vermont, Washington

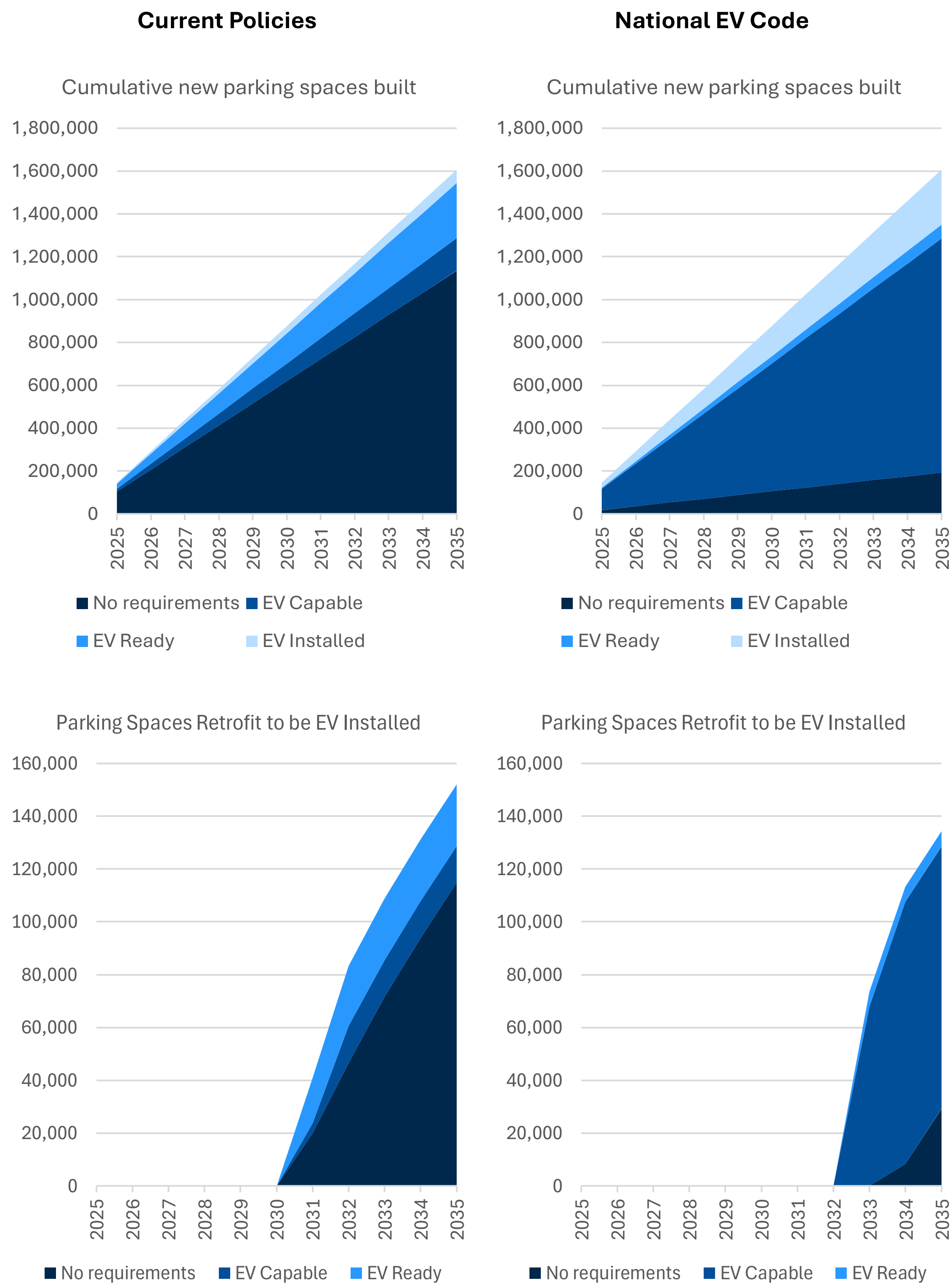
- *ZEV-leading states:* 36% of MFH parking spaces need charging (40% MFH EV adoption × 1 space/unit × 90% charging access)
- *Other states:* 18% of MFH parking spaces need charging (20% MFH EV adoption × 1 space/unit × 90% charging access)

Results

Our analysis reveals significant economic benefits from adopting additional charging infrastructure requirements in building codes for multifamily housing.

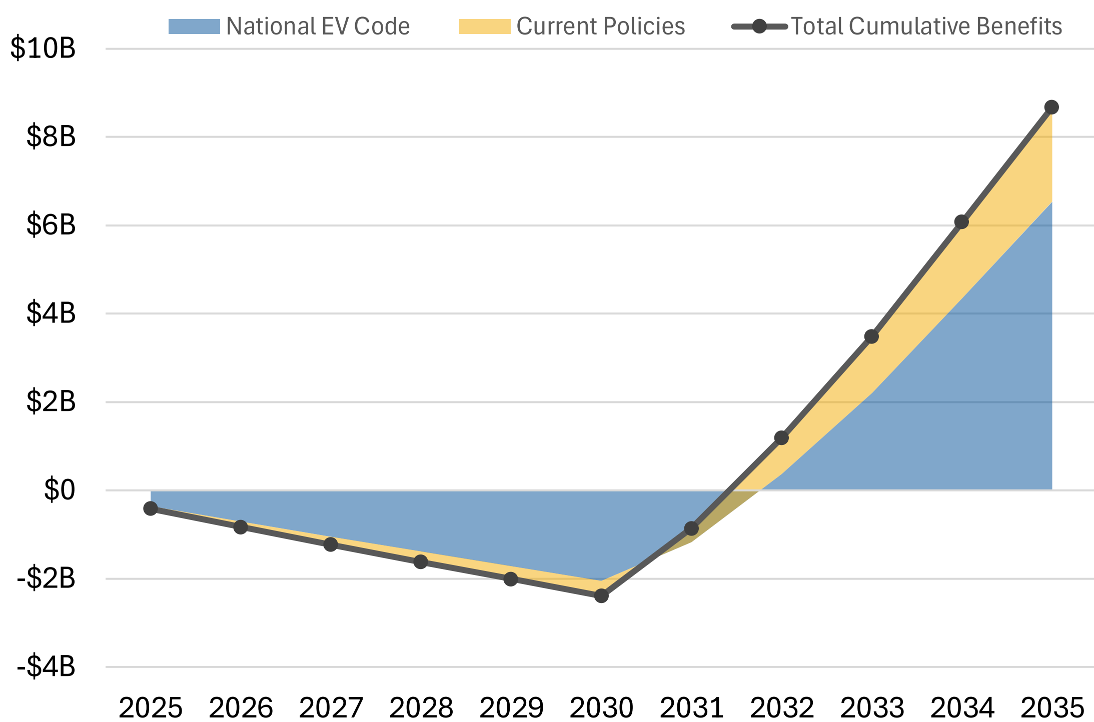
As shown in Figure 2Figure 2, the distribution of EV infrastructure types differs significantly between scenarios. Under the Current Policies scenario, approximately 75% of new parking spaces have no EV infrastructure requirements, while the National EV Code scenario reduces this to under 15%, with over 85% of spaces having some form of EV-enabling infrastructure. This difference in initial construction standards has major implications for retrofit needs. The Current Policies scenario requires substantially more retrofits of spaces with no EV infrastructure, which at $13,800 per space represents the most expensive retrofit pathway. In contrast, the National EV Code scenario's emphasis on EV Capable spaces ($400 during construction vs. $3,500 for retrofit) significantly reduces total retrofitting costs.

Figure 2. Comparison of parking spaces built and retrofitted in new MFH units under Current Policies and National EV Code scenarios



Our analysis reveals significant economic benefits from adopting EV-enabling requirements in building codes for multifamily housing. We find that the initially higher costs of implementing EV-enabling infrastructure during construction are expected to be more than offset by avoided retrofit expenses in later years, resulting in a total $8.6 billion NPV cost savings between 2025 and 2035: $2.1 billion attributable to EV-enabling building codes that have already been adopted, plus an additional $6.5 billion if the 2024 International Energy Conservation Code Appendix was adopted U.S.-wide. See Figure 3.

Figure 3. Cumulative U.S.-Wide Net Benefits ($billion) of National EV Code Scenario, Net Present Value (5% Discount Rate)



Even with a higher discount rate of 10%, which places greater emphasis on near-term costs versus future benefits, the National EV Code scenario remains economically advantageous, showing approximately $5.4 billion in cumulative savings by 2035.

Recall that our analysis assumes retrofits will occur to achieve parity in 2035 home charging access between single-family homes and MFH. Additionally, our results assume that developers will build strictly to code. In the absence of code, developers might instead provide some charging in our study timeframe based on growing market demand. While any EV charging built under those circumstances would still generate cost savings, those savings could not be attributed to the building codes themselves.

Conclusions

This analysis demonstrates that forward-looking building codes requiring EV-enabling infrastructure in multifamily housing developments offer significant economic advantages. Implementing 2024 IECC EV-enabling requirements could produce net present value savings of $6.5 billion nationwide by 2035. These savings are above and beyond the $2.1 billion in savings already expected in jurisdictions that have EV-enabling building codes provisions in place today. Combined, existing and additional EV-enabling building codes could save the United States $8.6 billion over the coming decade.

States pursuing zero-emission vehicle targets, particularly those adopting the Advanced Clean Cars II regulation, have the strongest economic incentive to implement comprehensive EV provisions in their building codes. While such provisions require modest upfront investments, they substantially reduce future retrofit costs and help to overcome split incentives that can stand in the way of achieving long-term savings.

As EV adoption accelerates, ensuring that residents of multifamily housing have comparable home charging access to single-family housing residents will become increasingly important. Without proactive building code policies, the charging access gap between housing types risks widening, potentially limiting transportation choices and further impeding convenient ‘refueling’ for multifamily residents.

References

[1] C. B. M. Aktas, "Impact of lifetime on US residential building LCA results.," *Int J Life Cycle Assess,* vol. 17, pp. 337 - 349, 2012.

[2] Atlas Public Policy, "EV Hub - EV Market: National and States Sales Data," 20 March 2025. [Online]. Available: https://www.atlasevhub.com/market-data/ev-market-dashboard/. [Accessed 21 March 2025].

[3] United States Census Bureau, "American Community Survey - 2023: ACS 5-Year Estimates Subject Tables (Table S1101: Households and Families)," 20 February 2025. [Online]. Available: https://data.census.gov/table/ACSST5Y2023.S1101?q=S1101. [Accessed 8 April 2025].

[4] G. Tal, J. H. Lee and M. Nicholas, "Observed Charging Rates in California," Institute of Transportation Studies, Davis, CA, 2018.

[5] EV Charging for All Coalition, "State by state EV codes compendium," 2024. [Online]. Available: https://docs.google.com/spreadsheets/d/1y5FGDZcOfgWj8GLhjcH0J4hGce90FdlMMaQLC7SRHio/edit?gid=1113770683#gid=1113770683. [Accessed 12 March 2024].

[6] United States Environmental Protection Agency, "Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles," 18 April 2024. [Online]. Available: https://www.govinfo.gov/content/pkg/FR-2024-04-18/pdf/2024-06214.pdf. [Accessed 18 April 2024].

[7] L. Pierce and A. Bui, "Electric vehicle charging at multifamily homes: barriers, solutions, and selected equity considerations," International Council on Clean Transportation, Washington, DC, 2024.

[8] United States Census Bureau, "Number of Multifamily Buildings Completed by Number of Floors in Building," 2024. [Online]. Available: https://www.census.gov/construction/chars/xls/mfb_floors_cust.xls. [Accessed 9 April 2025].

[9] City and County of Denver, "EV Ready Building Codes in the City and County of Denver," 24 March 2021. [Online]. Available: https://www.epa.gov/sites/production/files/2021-04/documents/webinar-ev-ready-buildings-2021-03-24.pdf. [Accessed 28 March 2024].

[10] City of Columbus, "Equitable Electric Vehicle Ready Parking in Columbus: Roundtable #6," 20 April 2022. [Online]. Available: https://www.columbus.gov/files/sharedassets/city/v/1/utilities/sustainability/ev/equitable-ev-ready-roundtable-mtg6-presentation.pdf. [Accessed 28 March 2024].

[11] City of Orlando, "EV Ready Code," 17 March 2021. [Online]. Available: https://www.orlando.gov/files/sharedassets/public/v/1/departments/edv/accc-ev-ready-commissioner-briefings_updated.pdf. [Accessed 28 March 2024].

[12] Clark County Nevada, "Clark County Transportation Electrification Working Group," 6 October 2022. [Online]. Available: https://webfiles.clarkcountynv.gov/Environmental%20Sustainability/TEWG/Oct_6_Clark_County_TEWG.pdf. [Accessed 28 March 2024].

[13] T. Minezaki, C. Kido and E. Pike, "Electric Vehicle Infrastructure Cost Analysis Report for Peninsula Clean Energy (PCE) & Silicon Valley Clean Energy (SVCE)," Energy Solutions, Oakland, CA, 2019.

[14] S. Thesen, "A Comparison of Two Multi-Family Dwelling EV Charging Codes: An Economic and Environmental Analysis of the CALGreen 2022 Mandatory Residential Electric Vehicle (EV) Infrastructure Code," Sven Thesen and Associates, Palo Alto, CA, 2021.

[15] M. a. C.-C. A. a. P. N. C. a. K. D. A. Kuby, "Electric Vehicle Charging for Multifamily Housing: Review of Evidence, Methods, Barriers, and Opportunities," Available at SSRN: https://ssrn.com/abstrac, 2024.

[16] United States Census Bureau, "Rental Housing Finance Survey (RHFS)," 2021. [Online]. Available: https://www.census.gov/data-tools/demo/rhfs/#/?s_type=2&s_byGroup1=3. [Accessed 9 April 2024].

[17] Coinnews Media Group LLC, "Consumer Price Index Data from 1913 to 2025," 10 March 2025. [Online]. Available: https://www.usinflationcalculator.com/inflation/consumer-price-index-and-annual-percent-changes-from-1913-to-2008/. [Accessed 9 April 2025].

[18] United States Office of Management and Budget, "OMB Circular A-4," 9 November 2023. [Online]. Available: https://whitehouse.gov/wp-content/uploads/2023/11/CircularA-4.pdf. [Accessed 9 April 2025].

Appendix: State-Specific Results

State	Net Present Value of Expected Savings, 2025 – 2035 (5% discount rate)		
	Savings from Current EV-Enabling Building Codes	**Additional Savings from 2024 IECC EV Charging Provisions**	**Total Savings**
Alabama	$215,000	$44,560,000	$44,775,000
Alaska	$0	$4,529,000	$4,529,000
Arizona	$12,789,000	$141,382,000	$154,171,000
Arkansas	$0	$46,452,000	$46,452,000
California	$791,463,000	$582,640,000	$1,374,103,000
Colorado	$316,654,000	$107,986,000	$424,639,000
Connecticut	$15,989,000	$11,285,000	$27,274,000
Delaware	$0	$32,388,000	$32,388,000
District of Columbia	$38,546,000	$114,106,000	$152,651,000
Florida	$38,929,000	$615,422,000	$654,351,000
Georgia	$12,687,000	$184,546,000	$197,234,000
Hawaii	$3,027,000	$40,809,000	$43,836,000
Idaho	$0	$44,043,000	$44,043,000
Illinois	$127,702,000	$6,931,000	$134,634,000
Indiana	$0	$79,405,000	$79,405,000
Iowa	$0	$58,135,000	$58,135,000
Kansas	$0	$43,178,000	$43,178,000
Kentucky	$0	$62,962,000	$62,962,000
Louisiana	$0	$28,249,000	$28,249,000
Maine	$0	$10,393,000	$10,393,000
Maryland	$0	$186,302,000	$186,302,000
Massachusetts	$27,358,000	$187,130,000	$214,488,000
Michigan	$2,493,000	$61,853,000	$64,346,000
Minnesota	$0	$143,309,000	$143,309,000
Mississippi	$0	$14,175,000	$14,175,000
Missouri	$1,519,000	$87,343,000	$88,862,000
Montana	$0	$28,378,000	$28,378,000
Nebraska	$0	$44,306,000	$44,306,000
Nevada	$0	$67,672,000	$67,672,000
New Hampshire	$0	$13,453,000	$13,453,000
New Jersey	$119,651,000	$310,662,000	$430,313,000
New Mexico	$0	$27,622,000	$27,622,000
New York	$78,407,000	$586,793,000	$665,200,000
North Carolina	$21,571,000	$252,660,000	$274,231,000
North Dakota	$0	$37,425,000	$37,425,000
Ohio	$6,112,000	$103,582,000	$109,694,000
Oklahoma	$0	$32,609,000	$32,609,000
Oregon	$132,750,000	$93,438,000	$226,187,000
Pennsylvania	$0	$99,216,000	$99,216,000
Rhode Island	$458,000	$5,585,000	$6,043,000
South Carolina	$0	$87,501,000	$87,501,000
South Dakota	$0	$32,003,000	$32,003,000
Tennessee	$0	$176,588,000	$176,588,000

State	Net Present Value of Expected Savings, 2025 – 2035 (5% discount rate)		
	Savings from Current EV-Enabling Building Codes	Additional Savings from 2024 IECC EV Charging Provisions	Total Savings
Texas	$40,867,000	$983,131,000	$1,023,998,000
Utah	$5,056,000	$97,259,000	$102,315,000
Vermont	$1,083,000	$16,822,000	$17,905,000
Virginia	$0	$161,652,000	$161,652,000
Washington	$360,803,000	$227,008,000	$587,812,000
West Virginia	$0	$8,286,000	$8,286,000
Wisconsin	$3,789,000	$95,592,000	$99,381,000
Wyoming	$0	$5,143,000	$5,143,000
TOTAL	**$2,159,917,000**	**$6,533,901,000**	**$8,693,818,000**

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