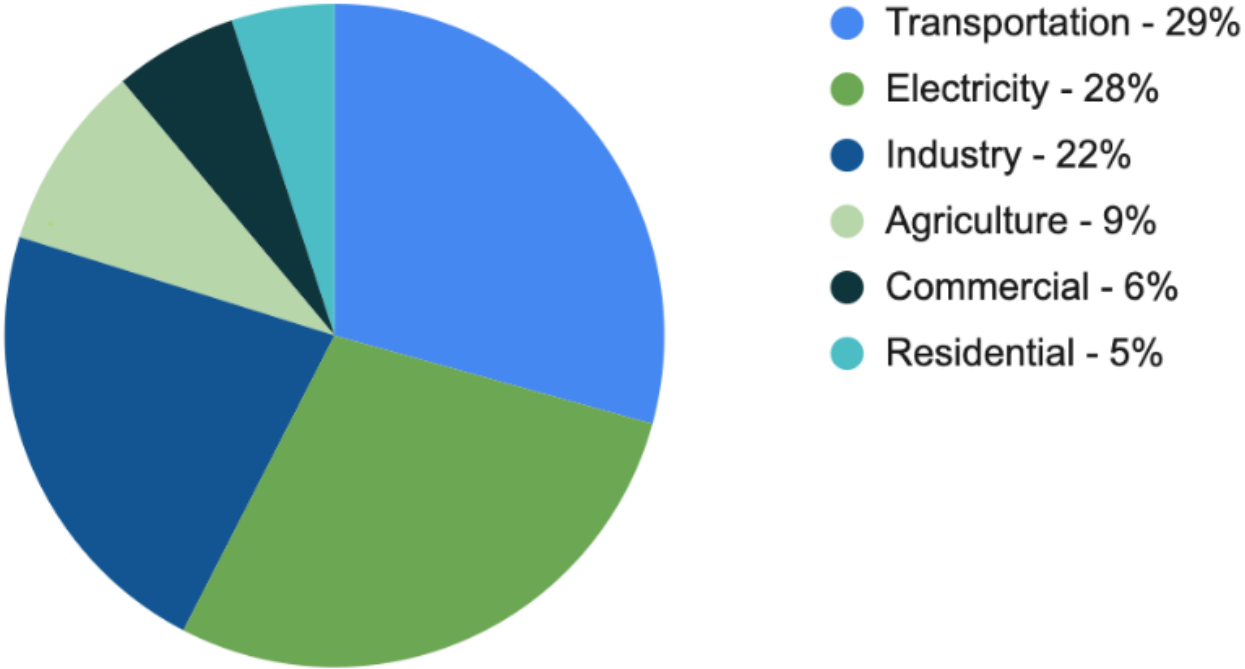
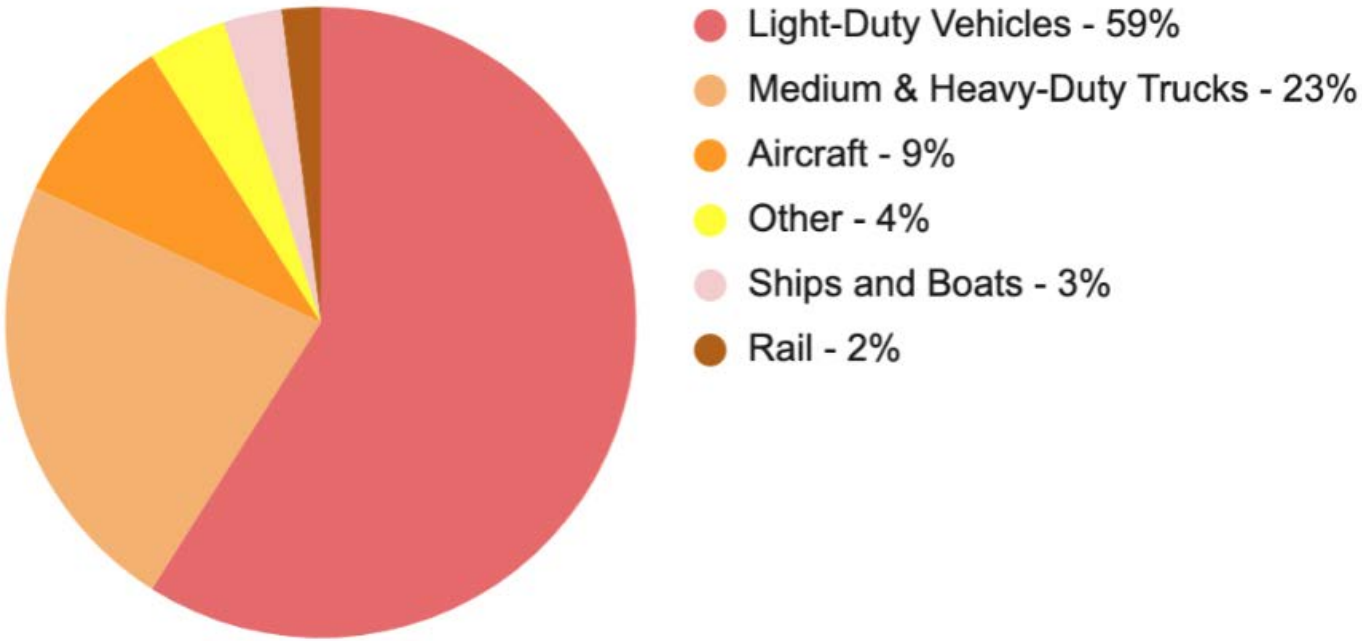
Ann Arbor's Draft Electric Vehicle Readiness Ordinance

2017 U.S. Greenhouse Gas (GHG) Emissions by Sector



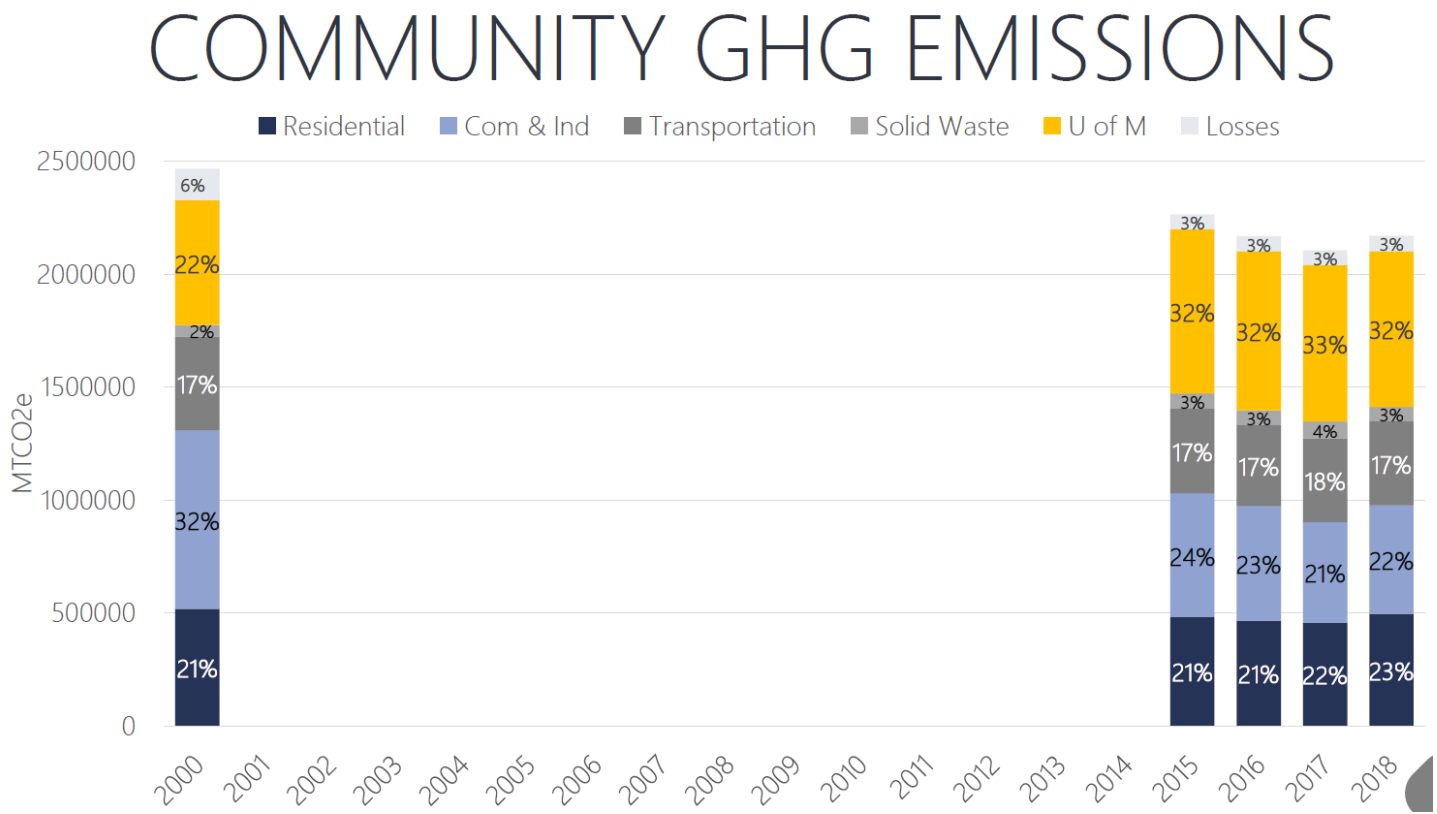
www.epa.gov/greenvehicles/fast-facts-transportation-greenhouse-gas-emissions

2017 U.S. Transportation GHG Emissions by Source

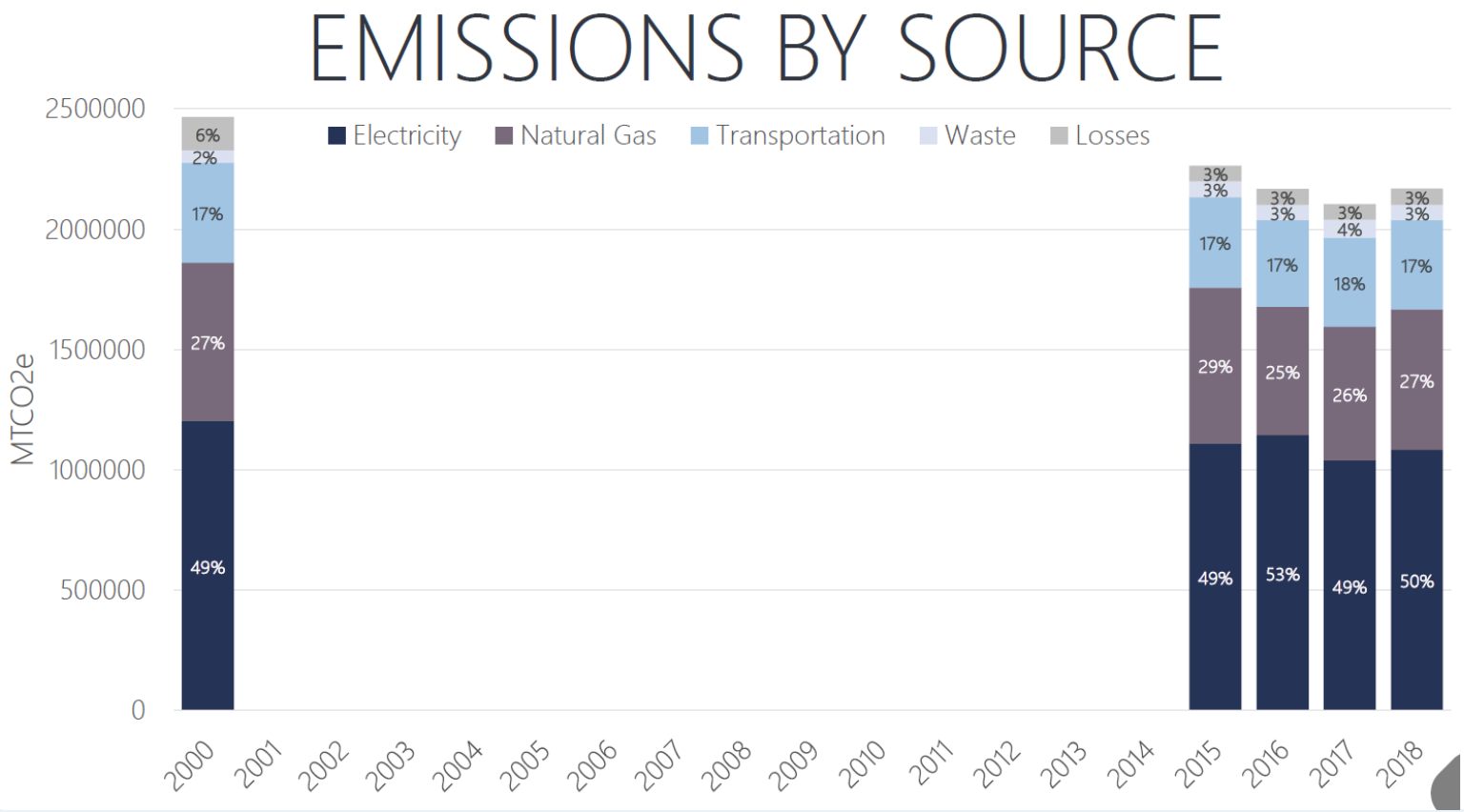


www.epa.gov/greenvehicles/fast-facts-transportation-greenhouse-gas-emissions

Ann Arbor GHG Emissions by Sector



Ann Arbor GHG Emissions by Source



Ann Arbor GHG Goals

GHG Targets Adopted in the Ann Arbor Climate Action Plan (2012)

COMMUNITY REDUCTION TARGETS

2015 – 8% 2025 – 25% 2050 – 90%

New target adopted Goal for Community-wide Carbon Neutrality by 2030

OFFICE OF SUSTAINABILITY AND INNOVATIONS
5-YEAR WORK PLAN
FISCAL YEAR 2020 – FISCAL YEAR 2025 APRIL 2019 | PREPARED BY THE OFFICE OF SUSTAINABILITY AND INNOVATIONS

5-YEAR WORK PLAN

RESIDENTIAL

138,168 MTCO2e
Predicted Reductions

- Time of Marketing
- Net 0 Affordable Housing
- Green Rental Program
- Aging in Place Efficiently
- Efficiency and Solar in the Community
- Weatherization Expansion
- Resilience Hubs
- Ann Arbor Storm Smart
- Local Carbon Offset Program
- Sustaining Together Neighborhood Grant

COMMERCIAL

101,120 MTCO2e
Predicted Reductions

- Grand Challenge
- Innovation Hubs
- Green Business Program

ELECTRIC VEHICLES

18,294 MTCO2e
Predicted Reductions

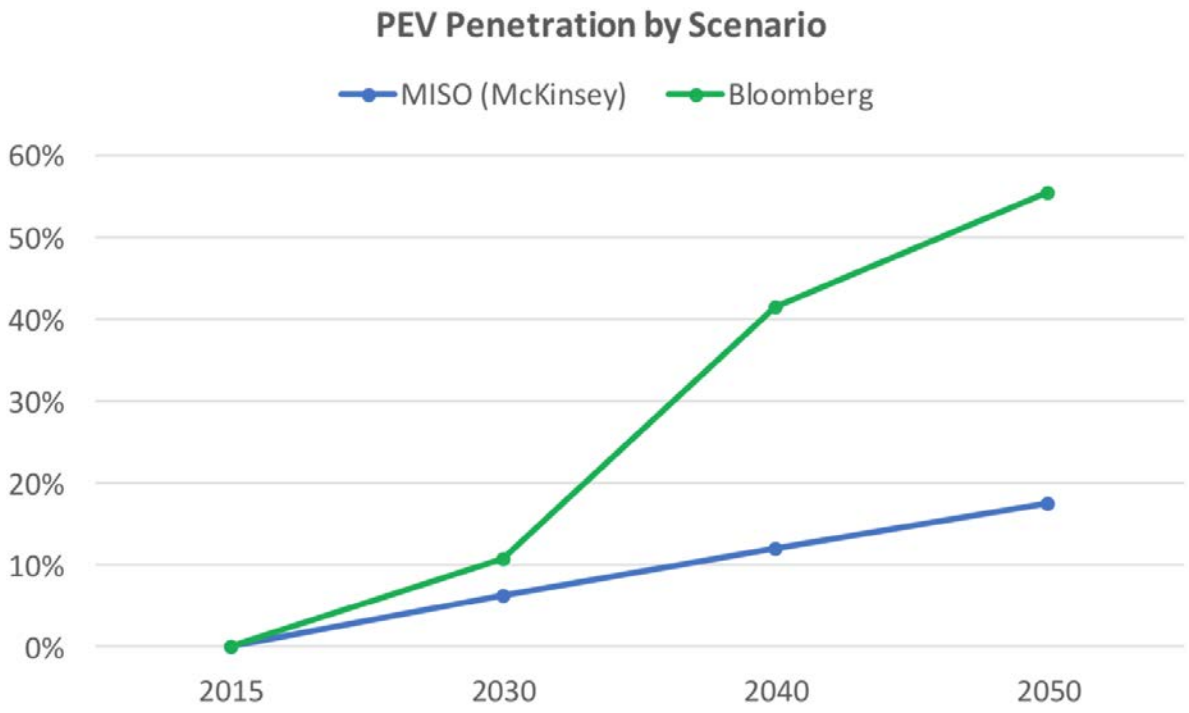
- EV Readiness

Carbon Neutrality-2030

A2ZERO

EQUITABLE • SUSTAINABLE • TRANSFORMATIVE

Projected EV Growth in Michigan



Electric Vehicle Market Projections

Two sources for MI EV projections:[2]

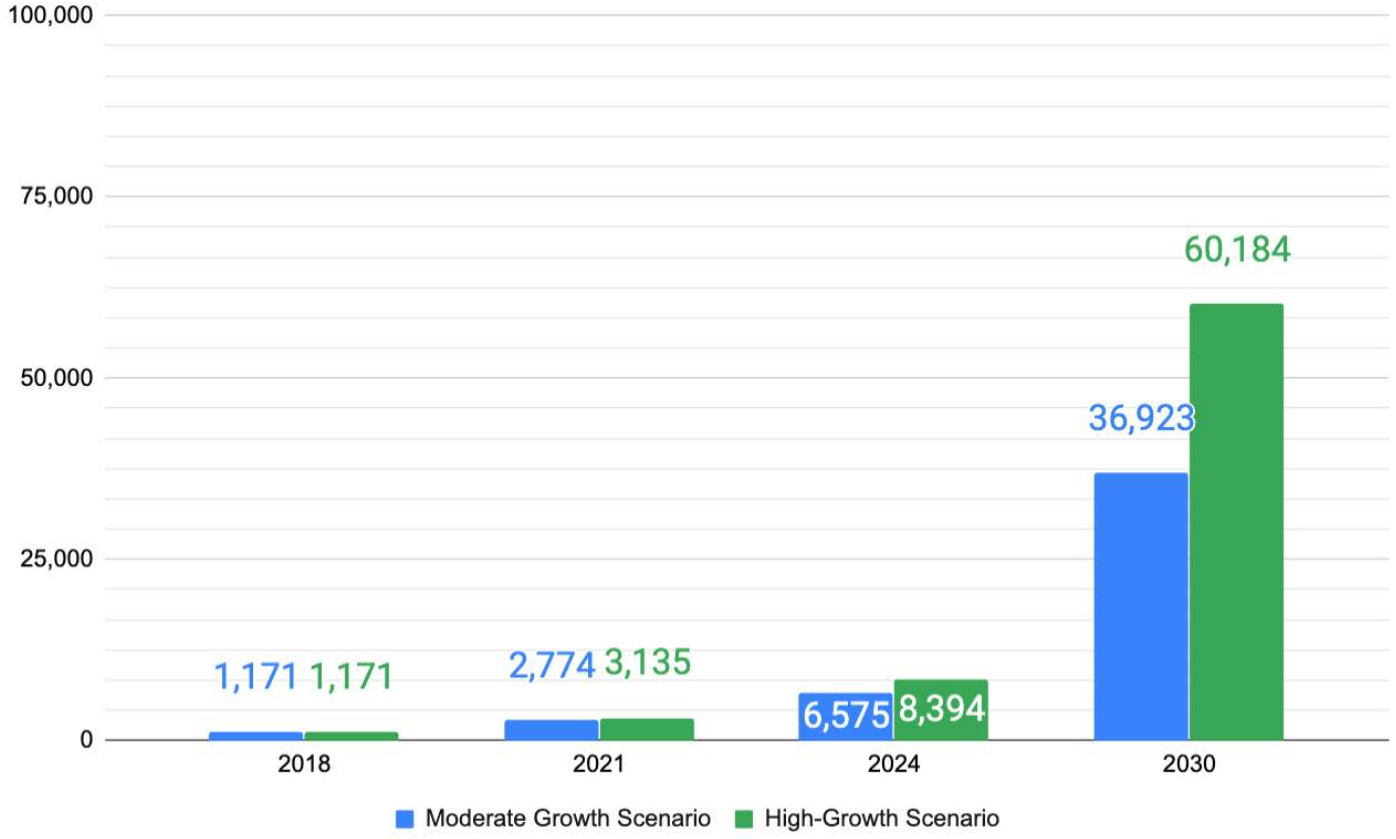
- MISO scenario:
  - 2020: 1.49% → 591,828
  - 2025: 3.74% → 1.13M
  - 2030: 6% → 1.7M
- Bloomberg scenario:
  - 2020: 2.46% → 999,450
  - 2025: 6.56% → 3.9M
  - 2030: 10.8% → 5.4M

where EV market share is the proportion of EVs to all vehicles on the road.

Projected EV Growth in the Ann Arbor area

Current Total Registered Vehicles:
~250k

2018 Ann Arbor EV's:
1,171→ ~0.45%



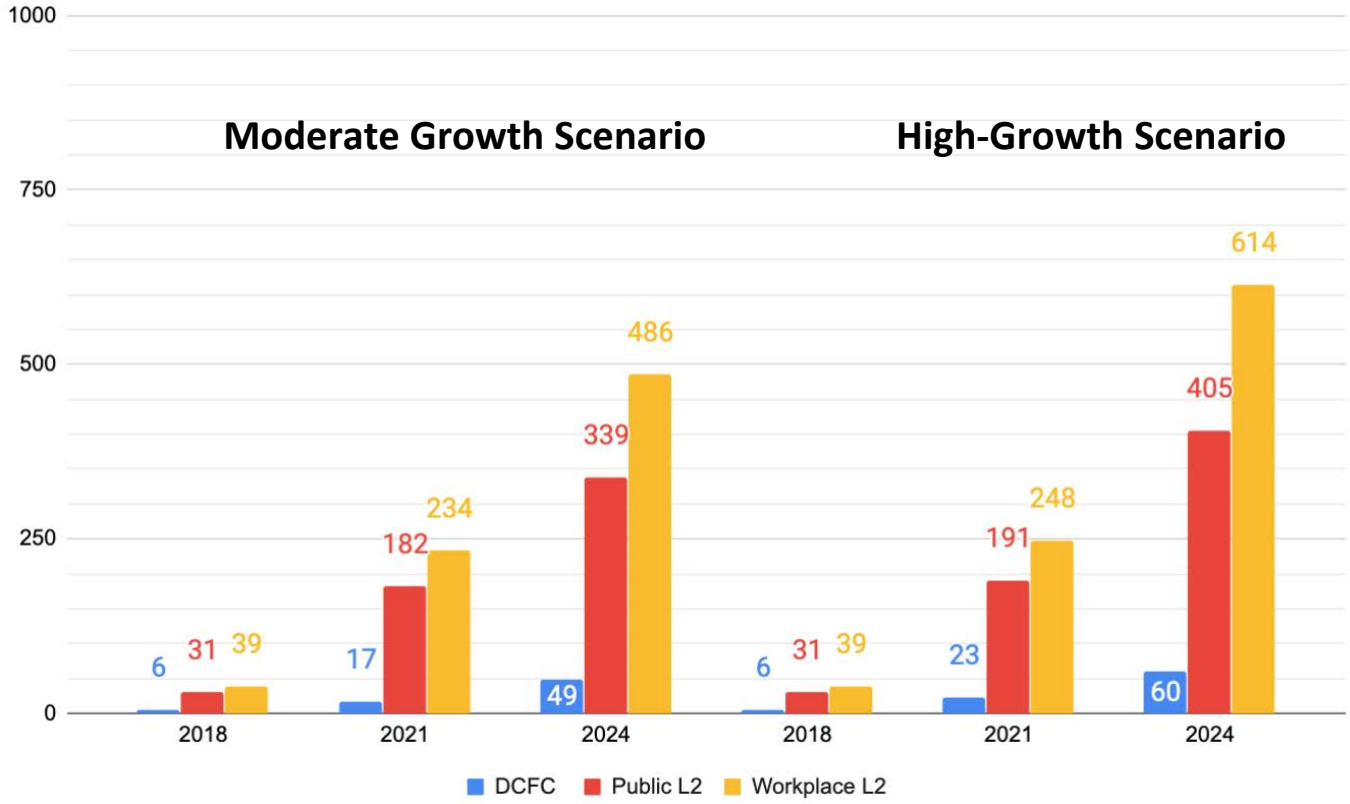
Source" Aug. 2018.

Projected need for EV Charging stations in the Ann Arbor area

Current Infrastructure

DCFC: 14

L2: 60



Tim Arvan, Charles Griffith. "Forecasting Demand for EV Charging Infrastructure in Ann Arbor," Aug. 2018.

Electric Vehicle Readiness Ordinance Basics

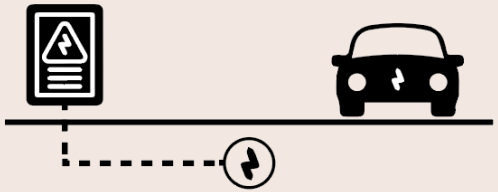
- Amends the Ann Arbor Uniform Development Code
- Installed conduit and/or wires in new construction cuts cost
- Applies to all projects requiring site plans
- Similar policy adopted by other cities throughout the US
- Mandates a percentage of new parking spaces be either:
  - EV Capable (EV_C); EV Ready (EV_R); EV Installed (EV_I)
- Is intended to prepare the City for expected EV growth

1. EV-Capable

Install electrical panel capacity with a dedicated branch circuit and a continuous raceway from the panel to the future EV parking spot.

Aspen, CO: 3% of parking is EV-Capable (IBC)

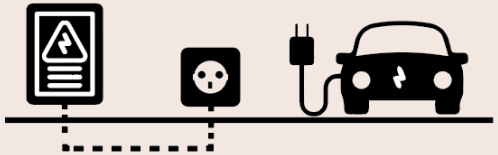
Atlanta, GA: 20% is EV-Capable (Ordinance)



2. EVSE-Ready Outlet

Install electrical panel capacity and raceway with conduit to terminate in a junction box or 240-volt charging outlet (typical clothing dryer outlet).

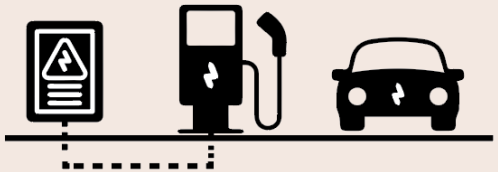
Boulder, CO: 10% of parking is EV-Ready Outlet



3. EVSE-Installed

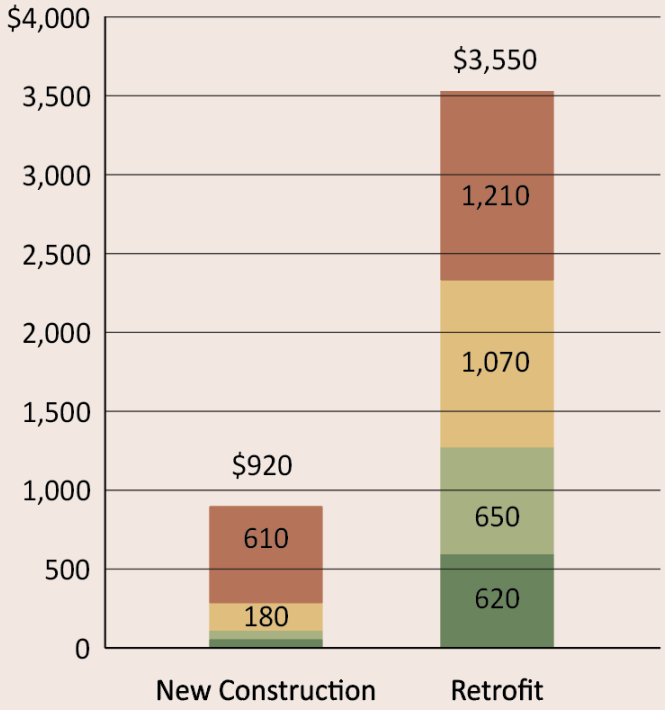
Install a minimum number of Level 2 EV charging stations.

Palo Alto, CA: 5-10% of parking is EV-Installed



Cost per EV Parking Space: New Construction vs Retrofit

Case Study prepared for the City and County of San Francisco (2016)



The case study considers a parking lot with ten total spaces and two EV parking spaces, and compares the EV infrastructure installation costs at the time of new construction versus building retrofit. "EV parking spaces" define spaces that have an EV-ready outlet, and include the electrical panel capacity, raceways, breakers, outlet boxes, and wiring to install an EV charger at any given time in the future.

- Balance of Circuit
- Raceway
- Permitting & Inspection
- Construction Management

www.swenergy.org/cracking-the-code-on-ev-ready-building-codes

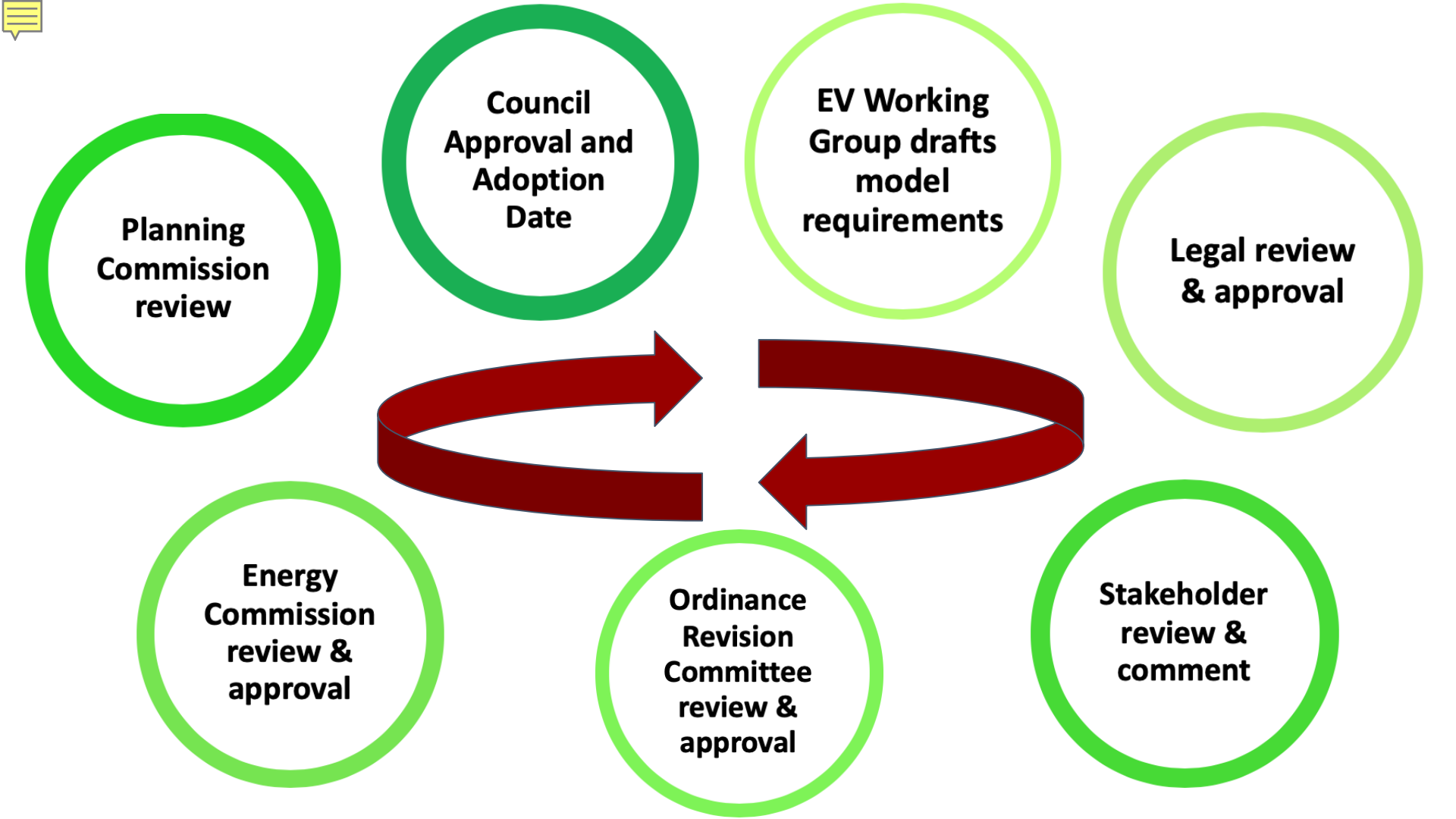
Cities Leading the Charge

	Residential	Multifamily		Commercial	
	Spots (EV-Capable or EVSE-Ready)	Spots (EV-Capable or EVSE-Ready)	Chargers Installed (EV_I)	Spots (EV-Capable or EVSE-Ready)	Chargers Installed (EV_I)
Boulder, CO	100%	10% for buildings with 25+ spaces	2 for parking lots with 25+ spaces	10% for buildings with more than 25 spaces	2 for parking lots with 25+ spaces
Denver, CO	100%				1 for city parking lots with 100+ spaces
Lansing, MI	*mixed-use applications require 1 per 50 spaces		1 for each 50 spaces		1 for each parking lot, 1 additional per 50 spaces
Los Angeles, CA	1 per dwelling unit	5% for residences with 17+ dwellings		0-10+, depending on available spaces	0-4+, depending on available space
Palo Alto, CA	1 per dwelling unit	25% of visitor spaces	1 outlet per housing unit	25%	5%
San Francisco, CA	100%	10%		90% EV-Capable, 10% EV-Ready	
Atlanta, GA	1 per dwelling unit	20%		20%	

Proposed EV Readiness Requirements

Table 2: Examples of Proposed Ann Arbor EV Readiness Code Requirements

Building Type	EV-Capable (EV_C)	EV-Ready (EV_R)	EV-Installed (EV_I)
A - Residential: Single Family and Townhouses		100%	
B - Residential: Multi-family and Student Cooperatives	65%	25%	10%
C - Offices, Parking Structures, Healthcare and Schools	25%	15%	10%
D - Hotels, B&Bs and Other Lodging	25%	50%	25%
E - Recreational, Public, Institutional and Food Service	25%	10%	10%
F - Retail	10%	10%	10%


Council Approval and Adoption Date
EV Working Group drafts model requirements
Legal review & approval
Planning Commission review
Energy Commission review & approval
Ordinance Revision Committee review & approval
Stakeholder review & comment

- EVSE INSTALLATION COST AS A % OF PROJECT COST
  - Ann Arbor Infrastructure Cost Analysis: Cost estimates are for EV-R and EV-R, in ENCLOSED Garages
    - NEW Installation: 0.03% -> 0.4%
    - RETROFIT Installation: 0.07% -> 0.19%

- Total EV charging capacity that Ann Arbor could build from the twenty-two 2019 site plans in this study, based on the proposed UDC Parking Table's EV Charging Equipment Requirements:
  - EV-C spaces: 1,309
  - EV-R spaces: 1,192
  - EV-I spaces: 175

Questions ?

Proposed Amendment to the Ann Arbor Unified Development Code Requiring Installation of EV Charging Infrastructure

To **Article VIII: Definition**, add the following terms:

Electric Vehicle (EV)
Electric Vehicle Supply Equipment (EVSE)
EV-Capable (EV-C)
EV-Ready (EV-R)
EV-Installed (EV-I)

To **Article IV: Development Standards 5.19, 5.19.1 Applicability**, add:
A, No New Building or modifications that will trigger a site plan for an existing building shall be erected unless the parking for bicycles, motor vehicles and ***electric vehicles*** required by this section 5.19 is provided.

To **Article IV: Development Standards 5.19, Table 5:19-1**, add a new column: ***Required Electric Vehicle Charging Spaces***

To **Table 5:19-2 Stall and Aisle Standards** add to footnote 3: ***Barrier Free Spaces shall have electric vehicle charging access according to Table 5:19-3***

Electric Vehicle (EV): An automotive-type vehicle for on-road use, such as passenger automobiles, buses, trucks, vans, neighborhood electric vehicles, electric motorcycles, and the like, powered by an electric motor that draws current from a rechargeable storage battery, fuel cell, photovoltaic array, or other source of electric current which is charged by being plugged into an electrical source. For the purpose of this ordinance, off-road, self-propelled electric vehicles, such as industrial trucks, hoists, lifts, transports, golf carts, airline ground support equipment, tractors, boats, and the like, are not included.

Electric Vehicle Supply Equipment (EVSE): Conductors, including the ungrounded, grounded, and equipment grounding conductors, and the electric vehicle connectors, attachment plugs, and all other fittings, devices, power outlets, or apparatus installed specifically for the purpose of transferring energy between the premises and the electric vehicle.

EV-Capable(EV_C): Refers to installed electrical panel capacity with a dedicated branch circuit and a continuous raceway from the panel to future EV parking spaces.

EV-Ready(EV_R): Refers to the following components: The entirety of the elements contained in the EV-Capable definition, in addition to the installation of a minimum 40-amp circuit breaker and suitable wiring that is continuous from the installed circuit breaker to an appropriate termination point such as a junction box or charging outlet.

EV-Installed(EV_I): Refers to a parking space that is completely ready to provide charging to an EV. This parking space must contain the entirety of the elements contained in the EV-Capable and EV-Ready definitions, in addition to a charging station.

Proposed Amendment to the Ann Arbor Unified Development Code Requiring Installation of EV Charging Infrastructure, cont'd

To **Section 5.19.8 Design of Vehicle Parking Facilities**, add:

G. All Parking shall have at least the percent of EV charging infrastructure noted in Table 5.19.2. If the percentage results in a fraction, the number of EV charging sites shall be rounded up to the next whole number. The following provisions must be met in accordance with the apportioned EV-designated parking spaces contained in Table 5.19.2.

1. ***EV Capable infrastructure(EV-C) shall include….***
2. ***EV-Ready infrastructure(EV-R) shall include…***
3. ***EV-Installed infrastructure(EV-I) shall include…***
4. ***The proposed placement and installation of EV infrastructure or equipment shall not allow for any violation of the Americans with Disabilities Act of 1990 (42 U.S.C. § 12101).***
5. ***The placement of EV charging infrastructure shall not create a trip hazard or violation of the accessible path of travel when the cord is connected to an EV or PHEV.***

Proposed Amendment to the Ann Arbor Unified Development Code Requiring Installation of EV Charging Infrastructure, cont'd

H. ***Where parking spaces are separated into distinct areas, separate garages or lots, EV charging infrastructure(EV-C, EV-R, EV-I) shall be evenly distributed among all separate areas by their required percentages….***

I. The proposed placement and installation of EV infrastructure or equipment shall not allow for any violation of the Americans with Disabilities Act of 1990 (42 U.S.C. § 12101). The minimum number of electric vehicle charging stations (EVCS) as dictated by Table 5:19-3 shall meet the accessibility requirements as shown in Graphic 5:19-1 (graphic)

Table 5:19-3 Accessible EV Charging Stations Required (table)

J. Requirements for the City of Ann Arbor
Requirements for the City of Ann Arbor Construction and Building Department
Requirements for the Office of Sustainability and Innovation

EV Ordinance Site Plan Study:
An Exercise in Using the Parking Table to Calculate Required EV-C / R / I Parking Spaces

Natural Features Setback		ft	43	and edge of wetland	NA	NA	NA
Vehicular Parking							
					PUD	Avalon	Thrive
Required Parking							
Multi-family residential		1.5 /DU		133 dwelling units= 195	204	73(1 EV)	133(58 EV)(2 BF)
Single Family		2 /DU		16 dwelling units = 32	32	-	32(16 EV)
Retail sales, general merchandise less than 300,000sf		1 /310sf		4745/310sf min. = 15 spaces	15	-	15(6 EV) (2BF)
School, Private (Elementary/Day Care)	3 classrooms, max 54 students	1/classroom		3 classrooms x 3 = 9 spaces	0		church agreement
				Total Spaces Required = 251	251	71	180
Bicycle Parking							
					PUD	Avalon	Thrive

Parking			
Parking – Automobiles - total	705	719	1.5 per unit required
Garage Parking (see architectural plans)		578	
Garage Parking (see architectural plans)		14	EV charging stations
Townhouse garage parking		49	
Street Parking		92	Includes 2 car share spaces
Barrier Free Parking		16	Included in total (4 site, 12 garage)
Parking – Bicycles (see architectural plans)	94		1 per 5 D.U.
Parking – in garages	47	128	Class A & A1 (50%)
Parking – in garages	47	40	Class B (50%)
Parking – in garages	47	38	Class C
Parking – surface		9	Class C

PARKING REQUIREMENTS

PARKING SPACE TYPES		REQUIRED	PREVIOUS PLAN	PROPOSED	LOCATION
VEHICULAR SPACES					
1 CAR GARAGES			58	203*	INTERIOR
2 CAR GARAGES			152/304 SPACES	51/102 SPACES	INTERIOR
EXTERIOR PARKING	9' SPACES	264	60	60	EXTERIOR
	8' SPACES	115 MAX.	74	74	
	BF SPACES	4	5	5	
	BF VAN SPACES	1	1	1	
TOTAL VEHICULAR SPACES		380 1.5 SP/UNIT	600 SPACES 1.95 SP/UNIT	445 SPACES 1.76 SP/UNIT	
BICYCLE SPACES					
	CLASS A	26/50%	208	154	IN GARAGES
	CLASS B	25/50%	60	60	EXTERIOR
TOTAL BICYCLE SPACES		51 SPACES 1 SP/5 DU	268 SPACES 1 SP/0.96 DU	214 SPACES 1 SP/1.18 DU	

* 4 apartment units have 1 stall barrier free garages

Height			Non-residential: 105	Non-res.: 105
Stories	n/a	n/a	n/a	n/a
PARKING - Vehicular	Per Off Street Parking Table 5-19 (City of Ann Arbor Unified Development Code)	0	Per July 1, 2019 Council Amended Supplemental Regulations	490 (Incl. 7 standard and 2 van BF Spaces)
PARKING - Bicycle	Per Off Street Parking Table 5-19 (City of Ann Arbor Unified Development Code)	0	Per July 1, 2019 Council Amended Supplemental Regulations	82 Required, 83 Provided, as shown on C5100

Ann Arbor UDC Parking Table 5:19-1 Off-Street Parking Spaces Required
(draft) EV CHARGING EQUIPMENT REQUIREMENTS

Residential Uses				
Property Use **[See Sec. 5.19.3 for Uses in D1 and D2 Downtown Districts:]**	**Required Parking Spaces**	**Required Bicycle Spaces**	**Required Bicycle Class**	**Required EV Charging Spaces (round up to next integer)**
Dwelling, Assisted Living	For R4A: 2 spaces per Dwelling Unit For R4B, R4C, R4D and R4E: 1 ½ spaces per Dwelling Unit For any Nonresidential District: 1 space per Dwelling Unit	1 space per 5 Dwelling Units	A 50% C 50%	65% EV-C plus 25% EV-R 10% EV-I
Dwelling, Multi-Family	For R4A: 2 spaces per Dwelling Unit For R4B, R4C, R4D, and R4E: 1 ½ spaces per Dwelling Unit In any Nonresidential District: 1 space per Dwelling Unit	1 space for 5 Dwelling Units	A 50%, C50%	65% EV-C plus 25% EV-R 10% EV-I
Dwelling, Single-Family	1 space per Dwelling Unit	None	None	100% EV-R
Dwelling, Townhouse	2 spaces per Dwelling Unit	1 space per 5 Dwelling Units	A 50%, C 50%	100% EV-R
Dwelling, Two Family	1 ½ spaces per Dwelling Unit	None	None	100% EV-R
House Trailer Park	1 space per Dwelling Unit	None	None	100% EV-C
Emergency Shelter	None	None		25% EV-C
Fraternities, sororities, student cooperatives	1 space for each 5 beds	1 space per 2 beds	A 50% B 50%	65% EV-C plus 25% EV-R 10% EV-I
Group Housing	1 space for each 3 beds	1 space per 5 beds	A 50%	65% EV-C plus 25% EV-R

EXAMPLE: Midtown Condominium, 1400 S. Maple, just south of Pauline Blvd

EXERPT FROM UDC PARKING TABLE:

Property Uses	Off-Street Parking Spaces Required	EV Charging Spaces Required
Dwelling, Single-Family	1 space per Dwelling Unit	100% EV-R
Dwelling, Townhouse	2 spaces per Dwelling Unit	100% EV-R

Calculating Number of EV-C / R / I Parking Spaces:

PROJECT ID: SP19-011 Midtown Condos, 1400 S. Maple St. ZONE: R4B Multiple family dwelling								
79 townhomes; 174 apartments	Units	parking spaces	EV-C		EV-R		EV-I	
TOTAL RESIDENTIAL UNITS:	253							
TOTAL PROPOSED SPACES:		445						
one-car garages	203	203	0%	0	100%	203	0%	0
two-car garages	51	102	0%	0	100%	51	0%	0
exterior parking spaces		140	0%	0	0%	-	0%	0
		445		0		254		0

Midtown Condominium parking table:

PARKING SPACE TYPES		REQUIRED	PREVIOUS PLAN	PROPPOSED	LOCATION
VEHICULAR SPACES					
1 CAR GARAGES			56	203*	INTERIOR
2 CAR GARAGES			152/304 SPACES	51/102 SPACES	INTERIOR
EXTERIOR PARKING	9' SPACES	264	60	60	EXTERIOR
	8' SPACES	115	74	74	
	BF SPACES	4	5	5	
	BF VAN SPACES	1	1	1	
TOTAL VEHICULAR SPACES		380 1.5 SP/UNIT	600 SPACES 1.95 SP/UNIT	445 SPACES 1.76 SP/UNIT	

NEW TABLE:

PARKING SPACE TYPES		REQUIRED	PREVIOUS PLAN	PROPPOSED	# EV-C/I/R SPACES	LOCATION
VEHICULAR SPACES						
1 CAR GARAGES			56	203*	203 EV-R	INTERIOR
2 CAR GARAGES			152/304 SPACES	51/102 SPACES	51 EV-R	INTERIOR
EXTERIOR PARKING	9' SPACES	264	60	60		EXTERIOR
	8' SPACES	115	74	74		
	BF SPACES	4	5	5		
	BF VAN SPACES	1	1	1		
TOTAL VEHICULAR SPACES		380 1.5 SP/UNIT	600 SPACES 1.95 SP/UNIT	445 SPACES 1.76 SP/UNIT		

EXAMPLE: The Glen PUD, between E. Ann & Catherine

EXERPT FROM UDC PARKING TABLE:

Property Uses	Off-Street Parking Spaces Required	EV Charging Spaces Required
Dwelling, Multi-Family	For R4A: 2 spaces per Dwelling Unit For R4B, R4C, R4D, and R4E: 1 ½ spaces per Dwelling Unit In any Nonresidential District: 1 space per Dwelling Unit	65% EV-C plus 25% EV-R plus 10% EV-I
Hotel	1 space per room	25% EV-C plus 50% EV-R plus 25% EV-I
Retail Sales, General Merchandise	Retail stores and Retail Centers less than 300,000 sq. ft. of Floor Area = Minimum of 1 space per 310 sq. ft. of Floor Area; maximum of 1 space per 265 sq. ft. of Floor Area [1]	10% EV-R plus 10% EV-I
Restaurant, Bar, Food Service	1 space for each 100 sq. ft. of Floor Area	15% EV-C plus 10% EV-R plus 10% EV-I

Calculating Number of EV-C / R / I Parking Spaces:

PROJECT ID:	SP19-012								
ZONE:	T2S, R6EMixed use								
Hotel + Retail + Apartments + Restaurant 24 apts, 162 hotel rooms	Units	area (sf)	parking spaces	EV-C		EV-R		EV-I	
TOTAL REQUIRED SPACES:			238						
TOTAL PROPOSED SPACES:			241						
apartment units	24		24	65%	16	25%	6	10%	2
hotel rooms	162		162	25%	40.5	50%	121.5	25%	40.5
retail		1173 sf	4	0%	0	10%	0.4	10%	0.4
restaurant (new)		4000 sf	40	15%	6	10%	4	10%	4
restaurant (Angelos)			8	15%	1	10%	1	10%	1
			238		63		92		48

The Glen PUD parking table:

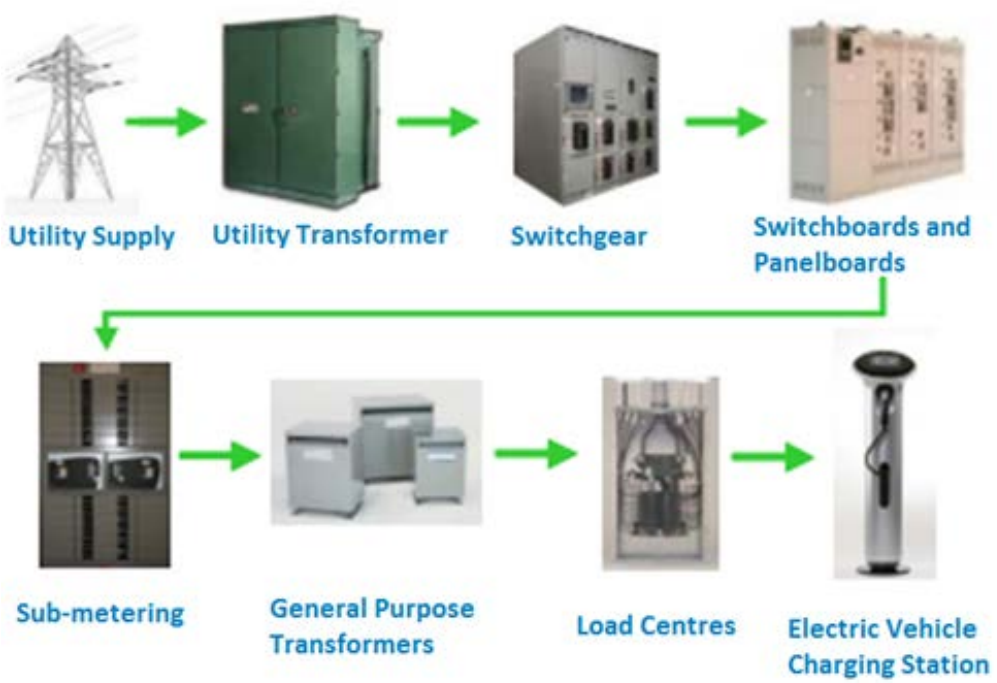
	Glenn Ann Place Previously Approved PUD Zoning 11/01/7	The Glenn Mixed Use Development Previously Approved PUD Zoning - December 2017	The Glenn Mixed Use Development Required/Permitted	The Glenn Mixed Use Development Revised PUD Zoning - Current Provided
CAR PARKING				
Retail Parking Reqd	16,800 SF/310 = 54 spaces		1,173 SF/310 = 4 spaces	
Office Parking Reqd	21,051 SF/333 = 63 spaces			
Apartment Parking Reqd	112 Units/1 = 112 spaces		24 Units/1 = 24 spaces	
Hotel Parking Reqd			162 Hotel Rooms/1 = 162 spaces	
Restaurant Parking Reqd			4,000 SF/100 = 40 spaces	
			Angelo's restaurant parking = 8 spaces	
Total Parking Reqd	237 spaces required		238 total spaces required	
Total Parking Provided	136 + 8 = 144 spaces provided	252 spaces provided		241 spaces provided per parking summary on A6

Retail: 1,173 SF/310 = 4 spaces (0.4 EV-R spaces; 0.4 EV-I spaces)
Apartments: 24 Units/1 = 24 spaces (16 EV-C spaces; 6 EV-R spaces; 2 EV-I spaces)
162 Hotel Rooms/1 = 162 spaces (40 EV-C spaces; 81 EV-R spaces; 41 EV-I spaces)
Restaurant: 4,000 SF/100 = 40 spaces (6 EV-C spaces; 4 EV-R spaces; 4 EV-I spaces)
Angelo's restaurant parking = 8 spaces (2 EV-C)
238 total spaces required

WALL- AND POLE-MOUNTED L2 CHARGING STATIONS

PLUG-IN AND PORTABLE L2 CHARGERS

EV CHARGING STATION FLOW CHART



- http://www.eai.in/wp-content/uploads/2018/12/EVSE.png