CALGreen EV Charging Training

Prepared for: *ICC LA Basin*

Presented by: Grant Alpert
on Behalf of 2050 Partners

Date Presented: November 2025

CALIFORNIA ENERGY CODES & STANDARDS
A STATEWIDE UTILITY PROGRAM

Agenda / Key Objectives / Next Steps

- Provide overview of CALGreen process
- Highlights of Changes
- Examples
- Introduce Automatic Load Management Systems
- Next Steps

California Building Standards Code ("Title 24")

- PART 1 - ADMINISTRATIVE
- PART 2 - BUILDING
- PART 2.5 - RESIDENTIAL
- PART 3 - ELECTRICAL
- PART 4 - MECHANICAL
- PART 5 - PLUMBING
- PART 6 - ENERGY
- PART 7 - VACANT
- PART 8 - HISTORICAL BUILDING
- PART 9 - FIRE
- PART 10 - EXISTING BUILDING
- PART 11 - GREEN BUILDING STANDARDS (CALGREEN)
- PART 12 - REFERENCE STANDARD

CALGreen

Key Adopting Agencies

CHAPTER 1 - ADMINISTRATION	CA Building Standards Commission (**BSC**) oversees entire process
CHAPTER 2 - DEFINITIONS	
CHAPTER 3 - GREEN BUILDING	
CHAPTER 4 - RESIDENTIAL MANDATORY MEASURES	Department of Housing and Community Development (**HCD**)
CHAPTER 5 - NONRESIDENTIAL MANDATORY MEASURES	**BSC** is primary lead. **DSA** is lead for public k-12 and CCs.
CHAPTER 6 - REFERENCED ORGANIZATIONS AND STANDARDS	
CHAPTER 7 - INSTALLER AND SPECIAL INSPECTOR QUALIFICATOINS	
CHAPTER 8 - COMPLIANCE FORMS, WORKSHEETS AND REFERENCE MATERIALS	
APPENDIX A4 - RESIDENTIAL VOLUNTARY MEASURES	Same as Chapter 4
APPENDIX A5 - NONRESIDENTIAL VOLUNTARY MEASURES	Same as Chapter 5
APPENDIX A6.1 VOLUTARY STANDARDS FOR HEALTH FACILITIES	

DSA = Division of State Architect

Key Agency for EV Infrastructure Proposals

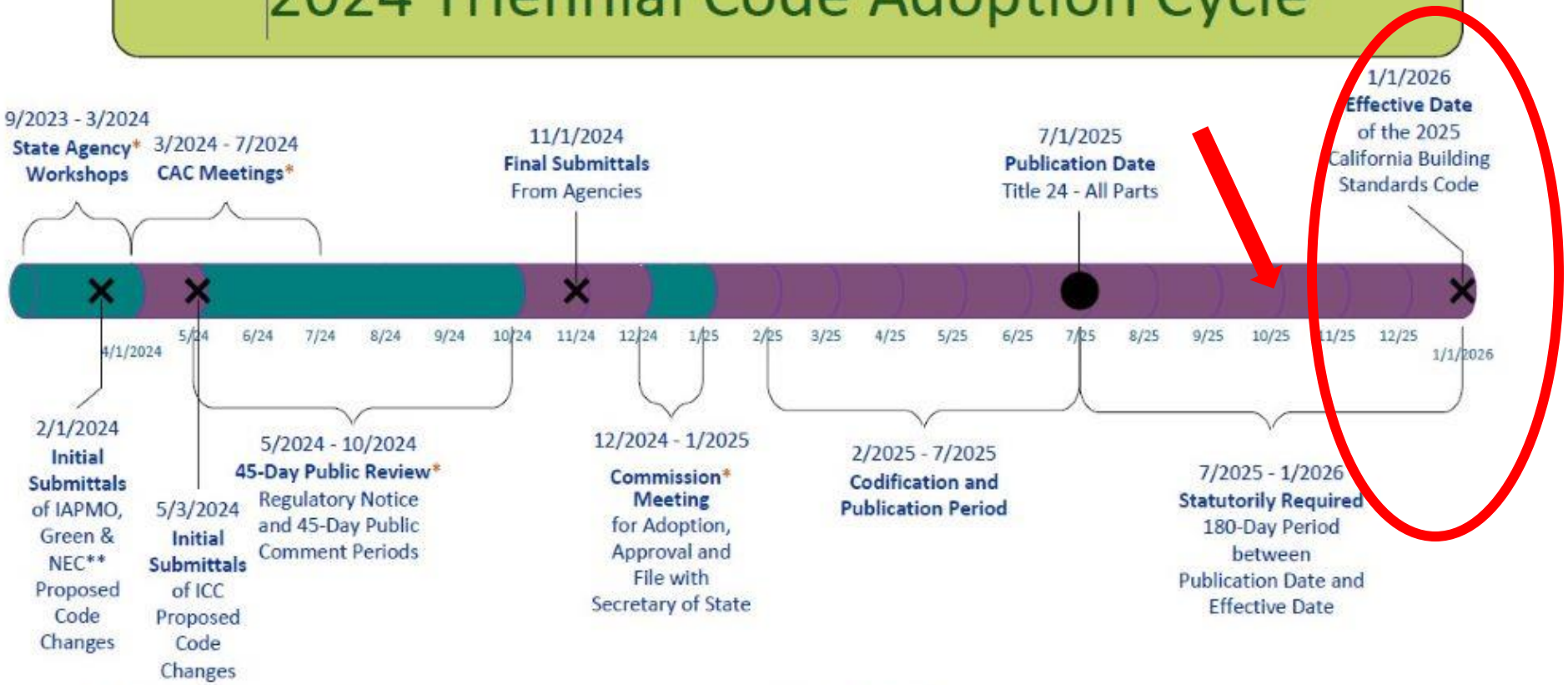
CALIFORNIA AIR RESOURCES BOARD

CARB is authorized by statue to provide proposals for CALGreen. Have been involved in submitting EV infrastructure proposals since 2013 code cycle.

California Building Standards Commission

2025 California Building Standards Code, Title 24
Effective January 1, 2026

2024 Triennial Code Adoption Cycle



Code Advisory Committees (CAC):
ACCESS – Accessibility
BFO – Building, Fire & Other
GREEN – Green Building
HF – Health Facilities
PEME – Plumbing, Electrical, Mechanical & Energy
SDLF – Structural Design/Lateral Forces

Model Code Publishers:
ICC – International Code Council
IAPMO – International Association of Plumbing and Mechanical Officials
NFPA – National Fire Protection Association
**NEC resubmittal if necessary

* Public Participation Opportunity

dgs.ca.gov/BSC
(916) 263-0916

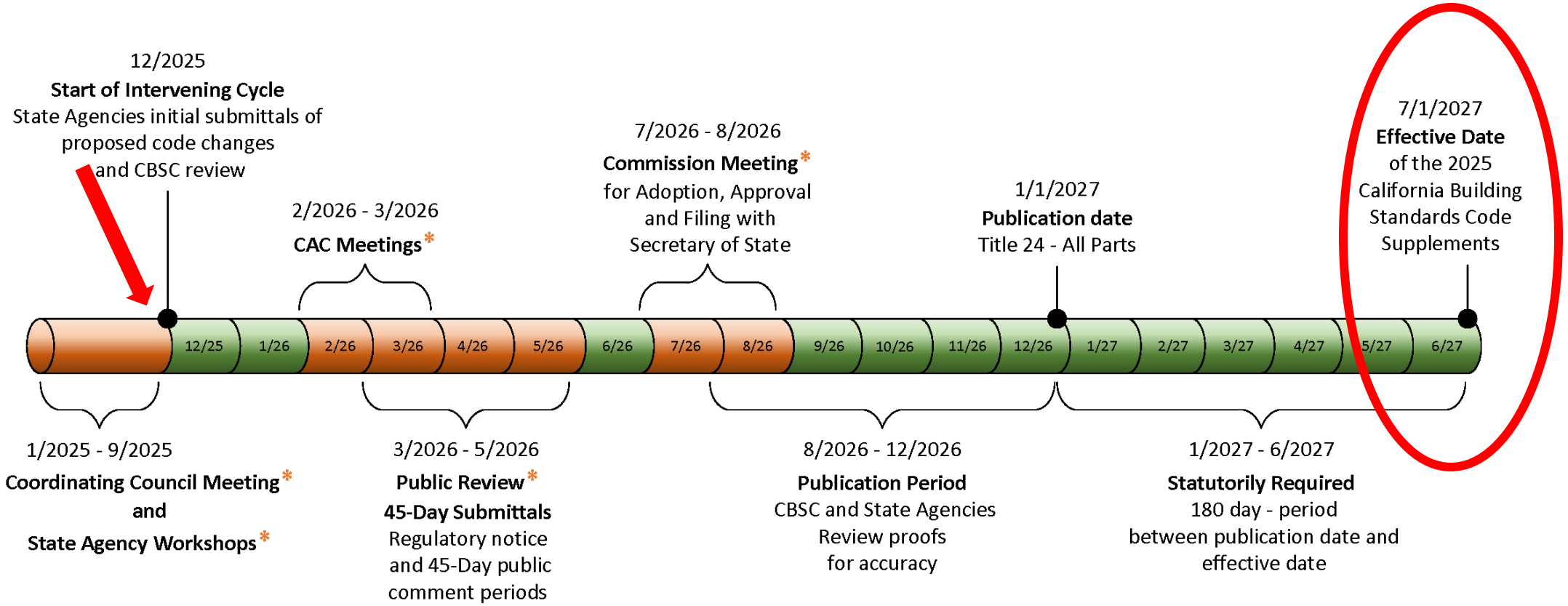
https://www.dgs.ca.gov/BSC/Rulemaking/2024-Triennial-Cycle

2025 Intervening Code Adoption Cycle

California Building Standards Commission

Amendments to the 2025 California Building Standards Code, Title 24 Supplement July 1, 2027 Effective Date

* **Public Participation Opportunity**



https://www.dgs.ca.gov/BSC/Rulemaking/2025-Intervening-Cycle

CALGreen EV 2024 Highlights for: New Construction

Non-Residential

1. No increase in overall EV Spaces
2. Increasing the mix of EVSE-Installed spaces (2x, 3x for Office & Retail)
3. EVSE-Installed spaces can support new J3400 connector and allowing 277V for some spaces.
4. Increasing raceway size for future 40A branch-circuit conductors

Multifamily

1. Increasing from 40% coverage to one low-power Level 2 EV Space per unit
2. Assigned-space parking lots must connect EV Space to dwelling unit's panel, unless infeasible
3. EVSE-Installed spaces increase from 10% to 25%, and support J3400 connector
4. Automated Load Management Systems allowed

Hotels

1. Continuing with 40% low-power level 2 EV Spaces
2. EVSE-Installed spaces increase from 10% to 25%, and support J3400 connector

References
- Final Dec 2024 Meeting page: https://www.dgs.ca.gov/BSC/Rulemaking/2024-Triennial-Cycle/Commission-Mtgs
- BSC's Final Express Terms (Non-Residential) (link)
- HCD's Final Express Terms (Multifamily) (link)

CALGreen EV 2024 Highlights for: Altered or added Parking Spaces

Non-Residential

When EV capable infrastructure is available at an existing parking facility or building, and the parking facility or building is undergoing an addition or alteration…Install EVCS at all existing EV capable spaces, utilizing the existing ~~EV capable~~ allocated power and infrastructure for the total number of actual parking spaces being added or altered, prior to adding any new EV capable spaces.

Multifamily & Hotels/Motels

When existing parking facilities are altered or new parking spaces are added to existing parking facilities, and the work requires a building permit, each parking space added or altered shall have access to either a low power Level 2 EV charging receptacle or Level 2 EV charger, unless determined as infeasible by the project builder or designer and subject to concurrence of the local enforcing agency.

Exception: Where work requiring a permit is being performed for the installation of 120-volt electrical receptacle(s) for level 1 EV charging.

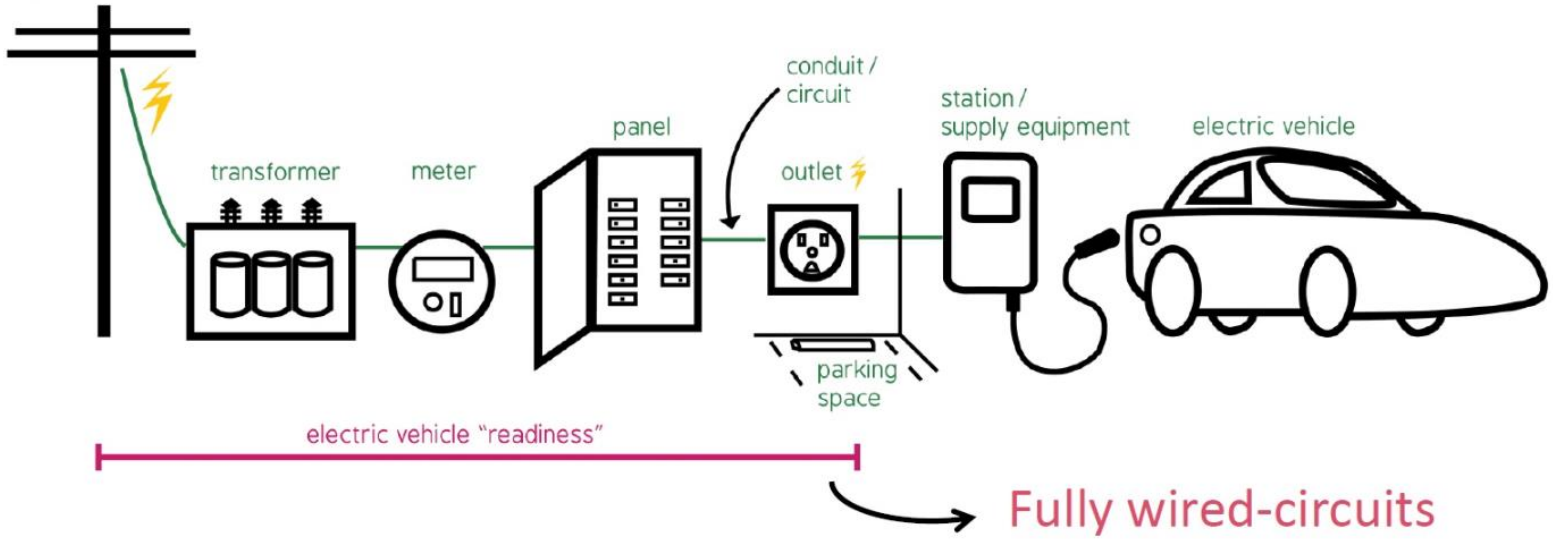
CALGreen EV 2024 Proposed Change Highlights for: Altered or added Parking Spaces

Update: In 2025 Intervening Code Adoption Cycle, clarifications are being made to the covered parking requirements. Only newly covered or newly created spaces shall count toward the EV charging requirements.

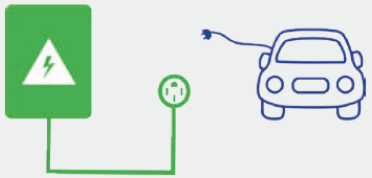
2. When a new photovoltaic system is installed covering existing parking spaces. All newly covered parking spaces shall count toward the EV charging requirements as applicable.
3. When additions or alterations to existing buildings are triggered pursuant to code Section 301.3 and the scope of work ~~includes an increase in power supply to an electric service panel~~ results in a required increase in the number of parking spaces. All newly added parking spaces shall count toward the EV charging requirements as applicable.

Source: https://www.dgs.ca.gov/BSC/Rulemaking/2025-Intervening-Cycle/PreCycle, CALGreen Electric Vehicle Workgroup, Draft Item 2c

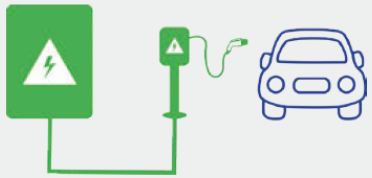
Example layout for EV charging infrastructure and the Three levels of “Readiness”



EV Capable
EV space that has the electrical panel capacity and conduit, called raceway, installed to implement EV charging in the future.



EV Ready
EV space that has circuit installations and panel capacity, raceway with wiring, receptacle, and circuit overprotection devices.



EV Installed
EVSE fully installed from the electrical panel to the EV space.

https://sccinsight.com/wp-content/uploads/2019/04/ev-ready.jpg

EV Charging Infrastructure Examples

EV Capable Space	EV Ready - Low Power Level 2 Receptacle	EVSE - Level 2 EV Supply Equipment (aka EV Charger)	DC Fast Charger
208/240 Volts, 40 Amp capacity, with empty conduit ready for wire	208/240 Volts, 20 Amp circuit (minimum), 16 A charging capacity, terminating in a receptacle	208/240 Volts, 40 Amp circuit (minimum), 32 A max charging capacity, terminating in an EVSE	277/480 Volts, 50-350 kVA charging capacity
	 		

2022 CALGreen Nonresidential buildings (Ch. 5) required EV spaces, and changes from the Intervening Cycle

2022 CALGreen eff. 1/1/23

- The number of requires EV spaces is reported in TABLE 5.106.5.3.1 below:

TOTAL NUMBER OF ACTUAL PARKING SPACES	NUMBER OF REQUIRED EV CAPABLE SPACES	NUMBER OF EVCS (EV CAPABLE SPACES PROVIDED WITH EVSE) [2]
0-9	0	0
10-25	4	0
26-50	8	2
51-75	13	3
76-100	17	4
101-150	25	6
151-200	35	9
201 and over	20 percent of total[1]	25 percent of EV capable spaces [1]

1. Calculation for spaces shall be rounded up to the nearest whole number.
2. The number of required EVCS (EV capable spaces provided with EVSE) in column 3 count toward the total number of required EV capable spaces shown in column 2.

2025 CALGreen eff. 1/1/2

- No changes on the number of required EV Spaces in TABLE 5.106.5.3.1 (left) except that in column 3 the EV spaces required shall be provided with Level 2 EVSE or DCFC[1], and at least one Level 2 EVSE shall be provided.
- The IET proposed in new section 5.106.5.3.2.2 that **"t**he installation of two Low Power Level 2 EV charging receptacles shall be permitted to reduce the minimum number of required EV capable spaces without EVSE in Table 5.106.5.3.1 by one."
- There are new requirements on "Electric vehicle charging stations (EVCS)-Power allocation method"[2]

Legend: ~~Strikeout~~ = suggested deletions to 45-Day Language.
Underlined text = proposed additions to 45-Day Language.

[1] Section "5.106.5.3.2.1 DCFC EVSE shall be permitted to reduce the minimum number of required EV capable spaces without EVSE or EVCS with Level 2 EVSE by five and reduce proportionally the required electrical load capacity to the service panel or subpanel"
[2] in Section 5.106.5.3.6 and TABLE 5.106.5.3.6 in the code.

Key Intervening Cycle Nonresidential Updates

1. **Space Quantity method (unchanged)**
   - One DC Fast Charger can replace five EV Capable or five L2 EVSE.
   - Two Low Power Level 2 EV Charging Receptacles can replace one EV Capable space.
2. **Power Allocation method (new!)**
3. **New construction requirements apply for existing buildings or parking facilities being modified by one of the following:**
   - Increase in power supply to an electric service panel as part of a parking facility addition or alteration.
   - New photovoltaic system is installed covering existing parking spaces.
   - Must utilize any preexisting EV Capable power and infrastructure
   - Exceptions available

2025 CALGreen Nonresidential buildings (Ch. 5) required EV spaces

TABLE 5.106.5.3.1— EV CAPABLE SPACES AND EVCS

TOTAL NUMBER OF ACTUAL PARKING SPACES	NUMBER OF REQUIRED EV CAPABLE SPACES	OTHER THAN OFFICE AND RETAIL NUMBER OF REQUIRED EVCS [2, 3]	OFFICE AND RETAIL NUMBER OF REQUIRED EVCS [2, 3]
1–9	0	0	0
10–25	4	2	3
26–50	8	4	6
51–75	13	6	8
76–100	17	8	13
101–150	25	12	19
151–200	35	18	26
201 and over	20 percent of actual parking spaces [1]	50 percent of EV capable spaces [1]	75 percent of EV capable spaces [1]

1. Calculation for spaces shall be rounded up to the nearest whole number.
2. Each EVCS shall reduce the number of required EV capable spaces by the same number.
3. At least one Level 2 EVSE shall be provided.

Power Allocation Method

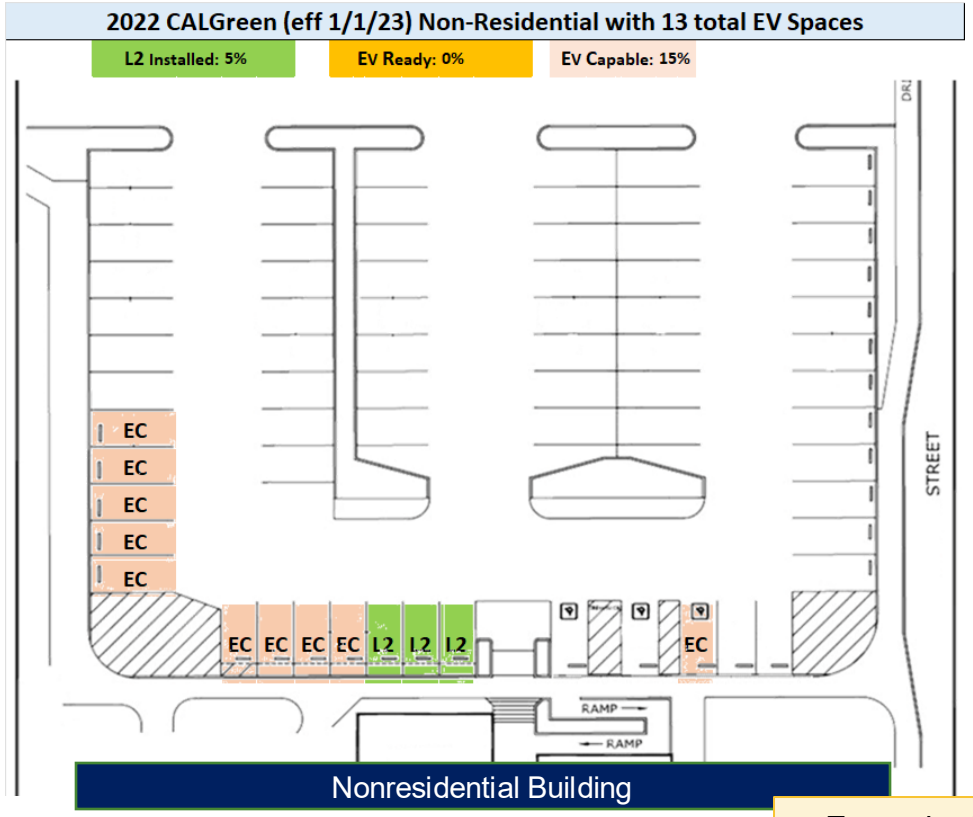
TABLE 5.106.5.3.6-EVCS—POWER ALLOCATION METHOD

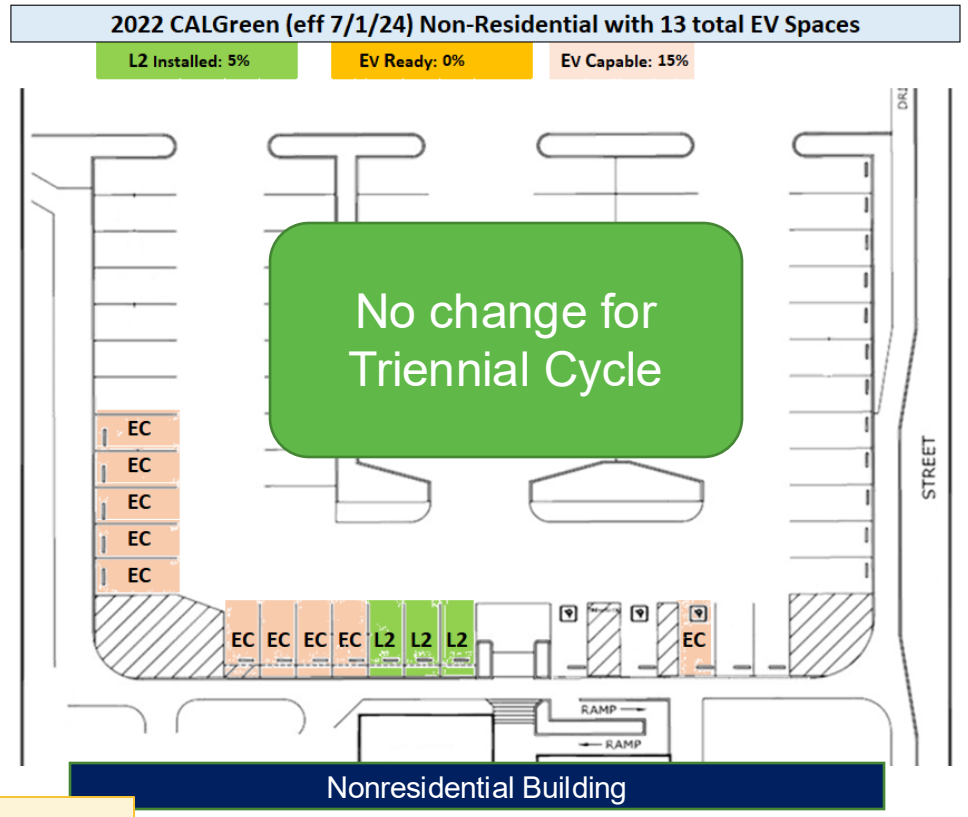
TOTAL NUMBER OF ACTUAL PARKING SPACES	MINIMUM TOTAL kVA @ 6.6 kVA	OTHER THAN OFFICE AND RETAIL TOTAL kVA REQUIRED IN ANY COMBINATION OF EV CAPABLE [3,4], LOW POWER LEVEL 2, LEVEL 2 [1, 2], OR DCFC	OFFICE AND RETAIL TOTAL kVA REQUIRED IN ANY COMBINATION OF EV CAPABLE [4, 5], LOW POWER LEVEL 2, LEVEL 2 [1, 2], OR DCFC
1–9	0	0	0
10–25	26.4	26.4	26.4
26–50	52.8	52.8	52.8
51–75	85.8	85.8	85.8
76–100	112.2	112.2	112.2
101–150	165	165	165
151–200	231	231	231
201 and over	20 percent of actual parking spaces × 6.6	Total required kVA = P × .20 × 6.6 Where P = Parking spaces in facility	Total required kVA = P × .20 × 6.6 Where P = Parking spaces in facility

1. Level 2 EVSE @ 6.6 kVA minimum.
2. At least one Level 2 EVSE shall be provided.
3. Maximum allowed kVA to be utilized for EV capable spaces is 75 percent.
4. If EV capable spaces are utilized, they shall meet the requirements of Section 5.106.5.3.1 EV capable spaces.
5. For office and retail buildings the maximum allowed kVA to be utilized for EV capable spaces is 25 percent.

- 20% of the spaces each contribute 6.6kW to the budget. (40A circuit x 80% continuous duty x 208V)
- Must have one or more Level 2 EVSE
- EV Capable spaces are limited to 75% of the required capacity
- Low Power Level 2 EV Charging Receptacles are now an option.

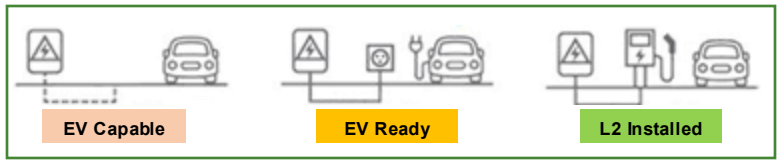
Mandatory Nonresidential New Construction
2022 CALGreen (eff. 1/1/23) vs.
2025 CALGreen Intervening cycle (eff. 1/1/26)





Example: 69 parking spaces

L2 = L2 EVSE Installed (Level 2 208/240V 40A)
ER = EV Ready (receptacle) (low power Level 2 208/240V 20A)
EC = EV Capable (panel space and electrical load capacity for a future EVSE Space 208/240V 40A)

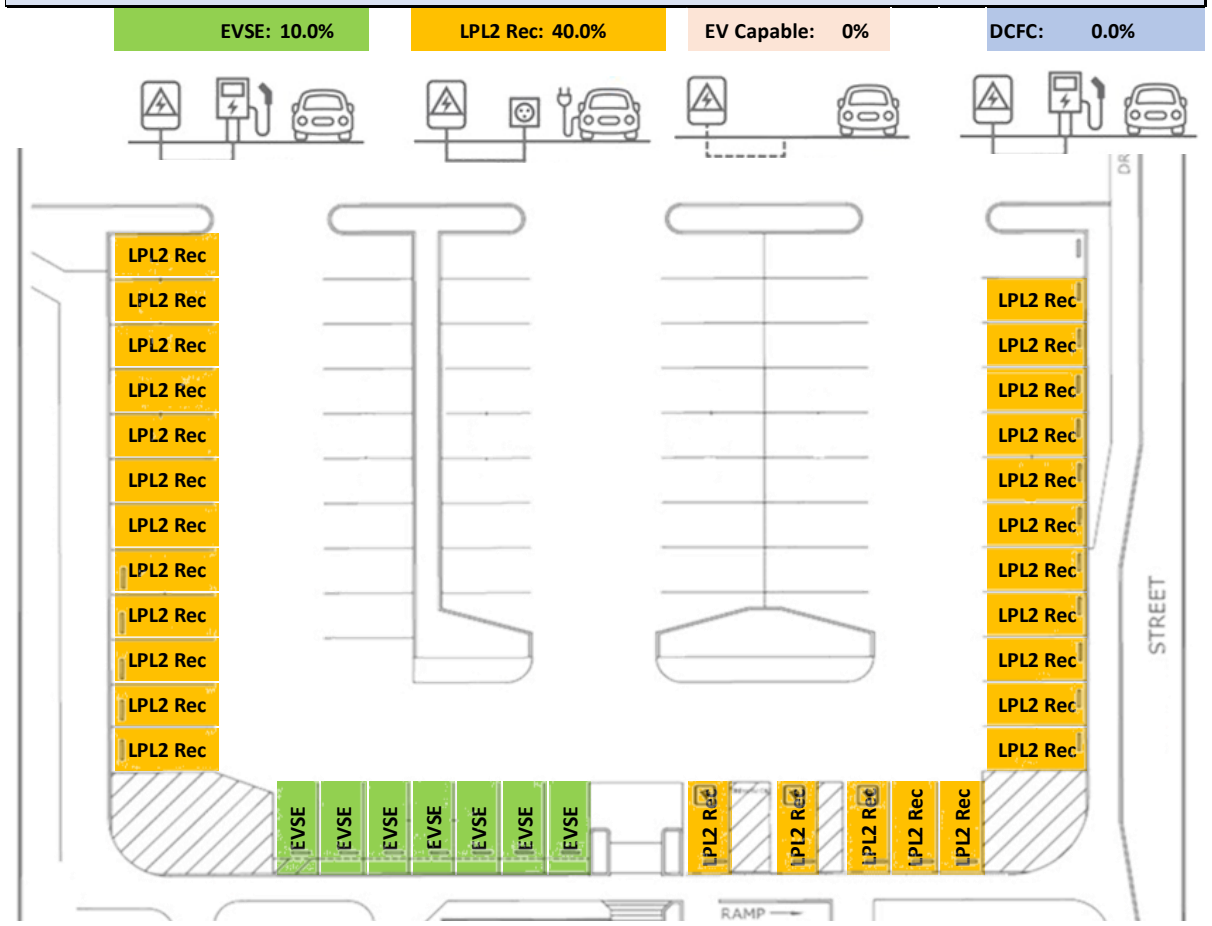


Note: this slide is intended to illustrate a general code requirement scenario and does not reflect the full nuance of code language.

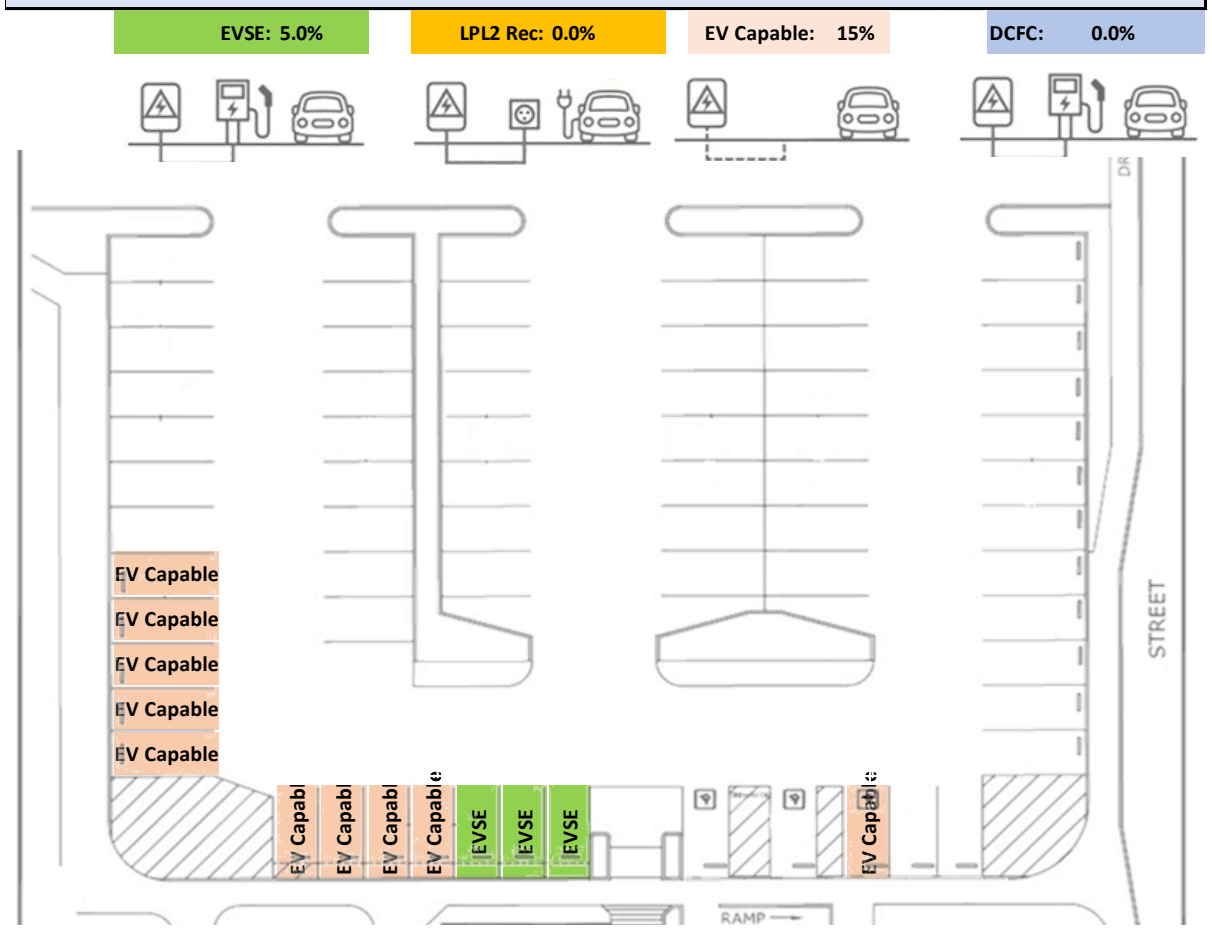
https://codes.iccsafe.org/content/CAGBC2022P2/chapter-5-nonresidential-mandatory-measures

New Power Allocation Method – more spaces, more power…

Total Power: 69 Spaces x 20% x 6.6 kW = 91.1 kW (use 85.8 kW per table 5.106.5.3.6)
Scenario: 2022 CALGreen (eff 7/1/24) Multifamily with 35 total EV Spaces



Total Power: 69 Spaces x 20% x 6.6 kW = 91.1 kW (use 85.8 kW per table 5.106.5.3.6)
Scenario: 2022 CALGreen (eff 7/1/24) Non-Residential with 13 total EV Spaces



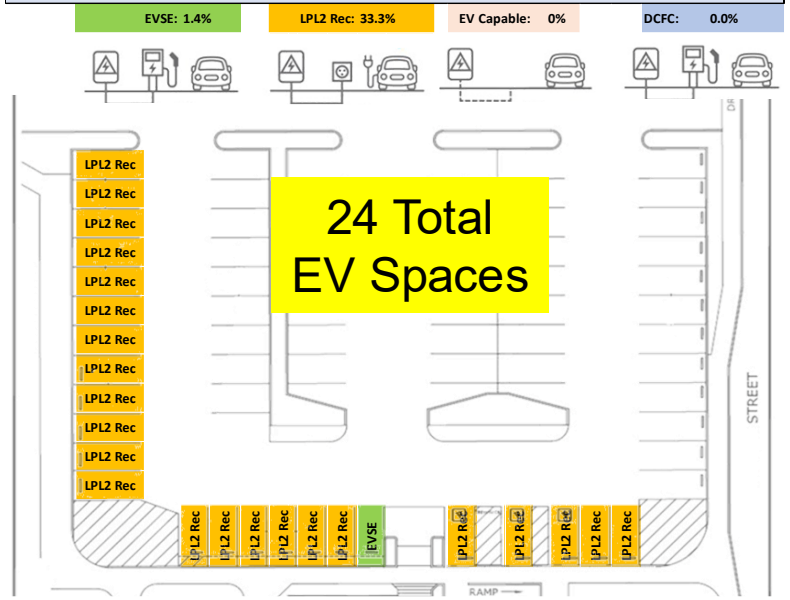
EV Charging Parking Lot Visualization - for Power Allocation July 2024.xlsx

Owner's Choice! Power Allocation Method Examples for Nonresidential – From 24 EV Spaces to 2 EV Spaces

Total Power: 69 Spaces x 20% x 6.6 kW = 91.1 kW (use 85.8 kW per table 5.106.5.3.6)

Scenario: All LPL2 Receptacles + 1 Min EVSE with 24 total EV Spaces

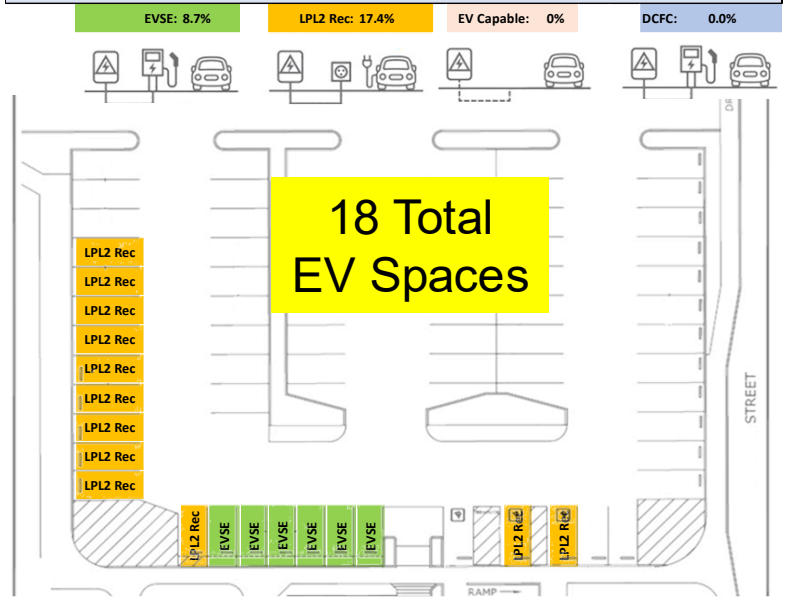
EVSE: 1.4% | LPL2 Rec: 33.3% | EV Capable: 0% | DCFC: 0.0%



Total Power: 69 Spaces x 20% x 6.6 kW = 91.1 kW (use 85.8 kW per table 5.106.5.3.6)

Scenario: 50% EVSE, 50% LPL2 Rec with 18 total EV Spaces

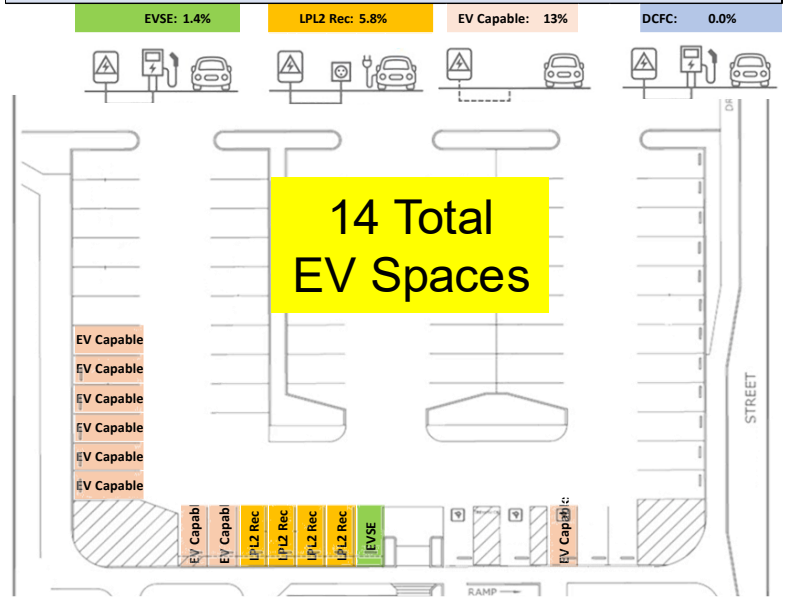
EVSE: 8.7% | LPL2 Rec: 17.4% | EV Capable: 0% | DCFC: 0.0%



Total Power: 69 Spaces x 20% x 6.6 kW = 91.1 kW (use 85.8 kW per table 5.106.5.3.6)

Scenario: Max EV Capable + 1 Min EVSE + Min LPL2 Rec with 14 total EV Spaces

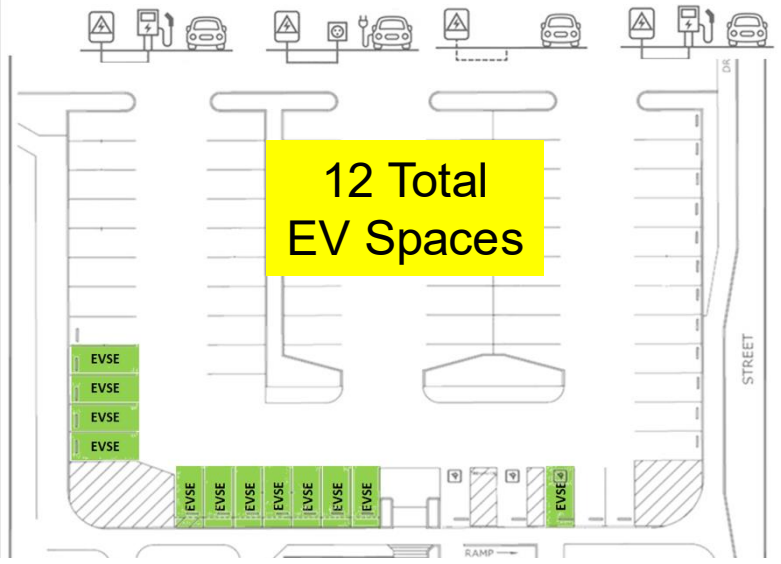
EVSE: 1.4% | LPL2 Rec: 5.8% | EV Capable: 13% | DCFC: 0.0%



Total Power: 69 Spaces x 20% x 6.6 kW = 91.1 kW (use 85.8 kW per table 5.106.5.3.6)

Scenario: 100% EVSE with 12 total EV Spaces

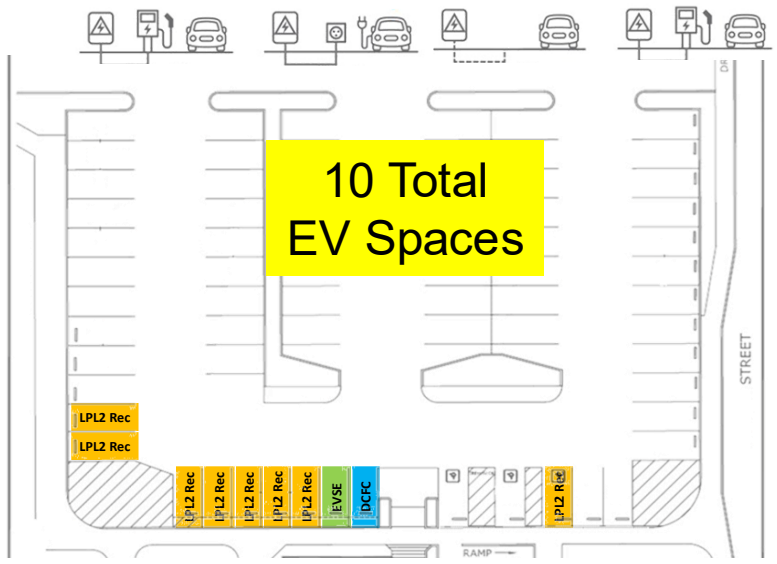
EVSE: 17.4% | LPL2 Rec: 0.0% | EV Capable: 0% | DCFC: 0.0%



Total Power: 69 Spaces x 20% x 6.6 kW = 91.1 kW (use 85.8 kW per table 5.106.5.3.6)

Scenario: One DCFC (50kW), LPL2 Recept, + 1 Min EVSE with 10 total EV Spaces

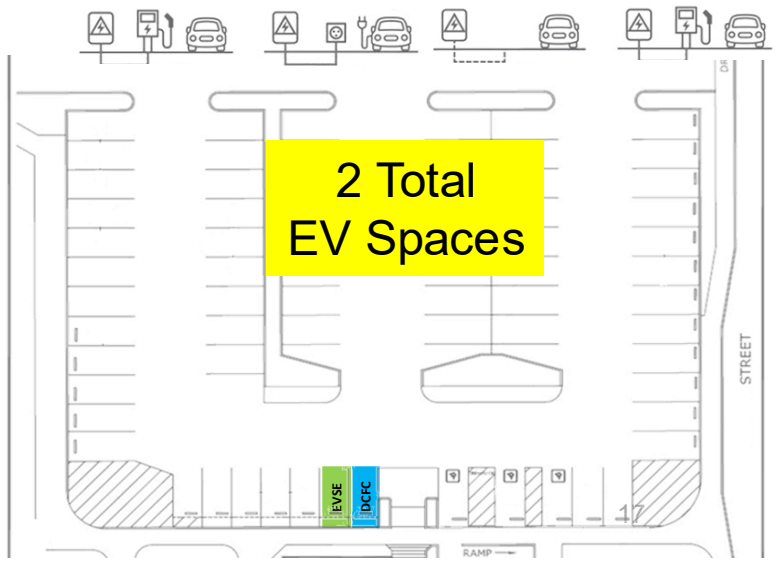
EVSE: 1.4% | LPL2 Rec: 11.6% | EV Capable: 0% | DCFC: 1.4%



Total Power: 69 Spaces x 20% x 6.6 kW = 91.1 kW (use 85.8 kW per table 5.106.5.3.6)

Scenario: One Larger DCFC (100kW) + 1 Min EVSE with 2 total EV Spaces

EVSE: 1.4% | LPL2 Rec: 0.0% | EV Capable: 0% | DCFC: 1.4%



2022 CALGreen for Medium-/Heavy-Duty EV-Ready requirements for buildings with off-street loading spaces

- 2022 CALGreen effective 1/1/23 requires that spare raceway(s) or busway(s) and adequate capacity for transformer(s), service panel(s) or subpanel(s) shall be installed at the time of construction to facilitate future installation of EVSE, and avoid costly demolitions
- In the figure below, green items included during new construction are sized to cost-effectively enable future installation of MHD EV charging equipment for retail, warehouse and grocery building types.

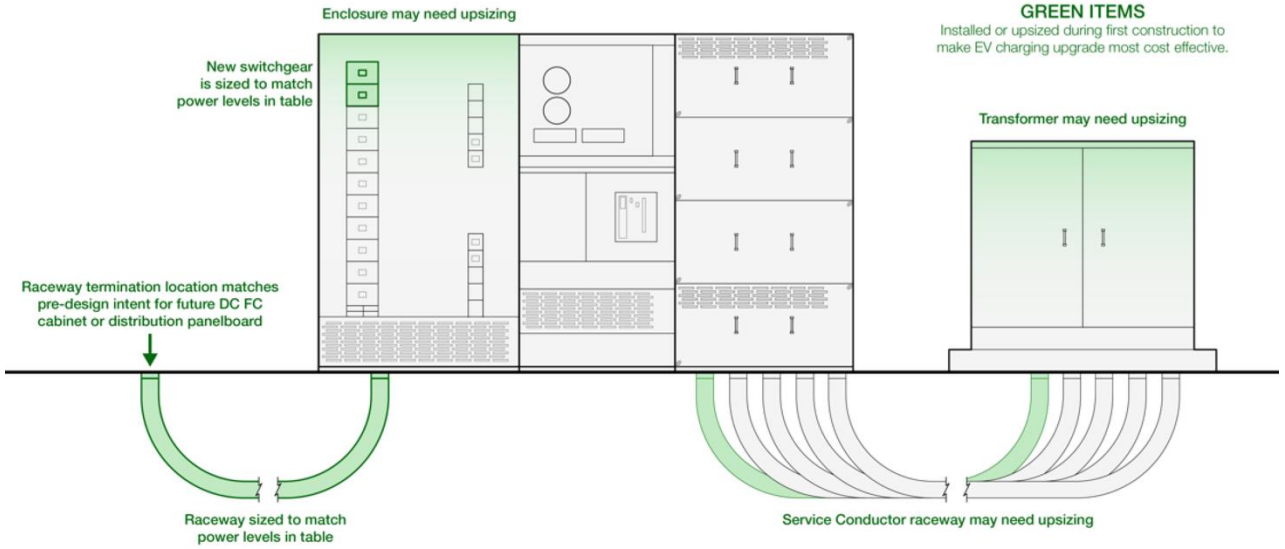


TABLE 5.106.5.~~4~~ 5.1, RACEWAY CONDUIT AND PANEL POWER REQUIREMENTS FOR MEDIUM-AND-HEAVY-DUTY EVSE [N]

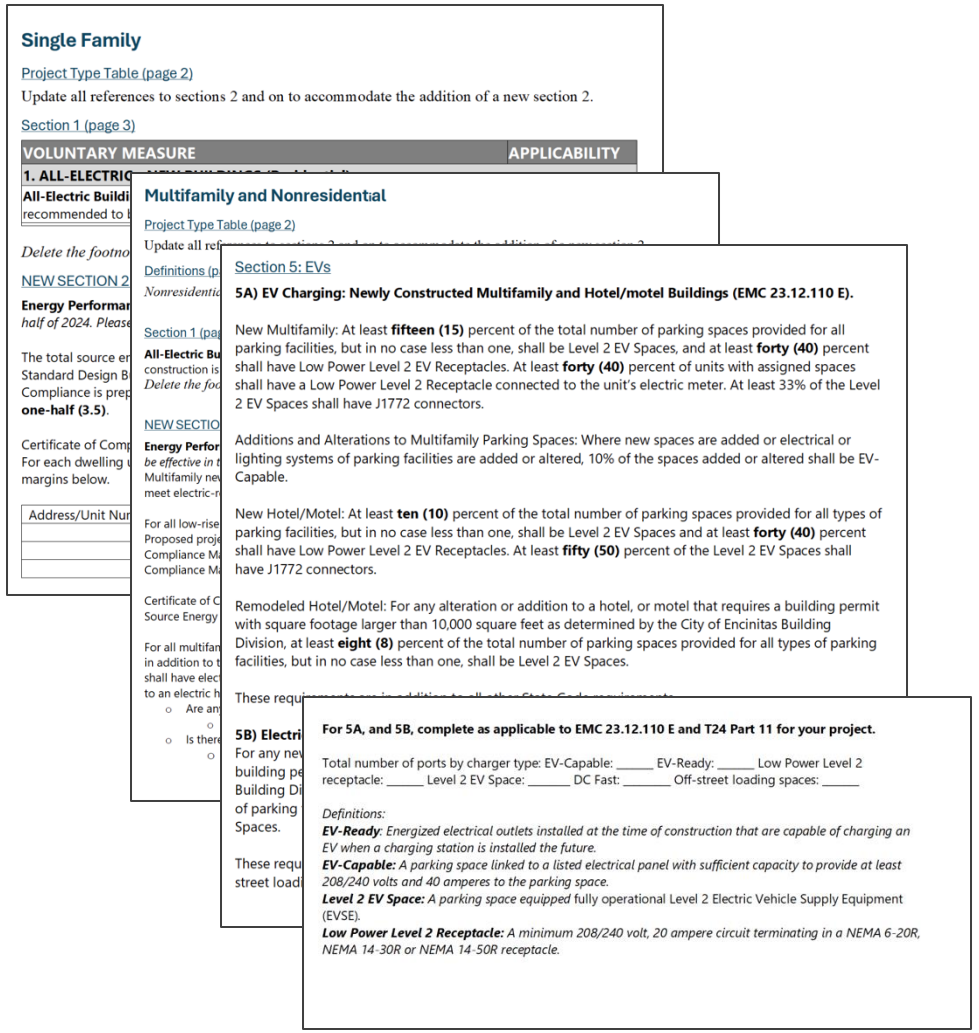
Building type	Building Size (sq. ft.)	Number of Off-street loading spaces	Additional capacity Required (kVa) for Raceway & Busway and Transformer & Panel
Grocery	10,000 to 90,000	1 or 2	200
		3 or Greter	400
	Greater than 90,000	1 or Greter	400
Retail	10,000 to 135,000	1 or 2	200
		3 or Greater	400
	Greater than 135,000	1 or Greater	400
Warehouse	20,000 to 256,000	1 or 2	200
		3 or Greater	400
	Greater than ~~250,000~~	1 or Greater	400
Manufacturing Facilities	10,000 to 50,000	1 or 2	200
	10,000 to 50,000	3 or Greater	400
	Greater than 50,000	1 or Greater	400
Office Buildings	10,000 to 135,000	1 or 2	200
	10,000 to 135,000	3 or Greater	400
	Greater than 135,000	1 or Greater	400

New Building Types Added for 7/1/2024

Links

January 2026 Language

https://codes.iccsafe.org/content/CAGBC2025P2

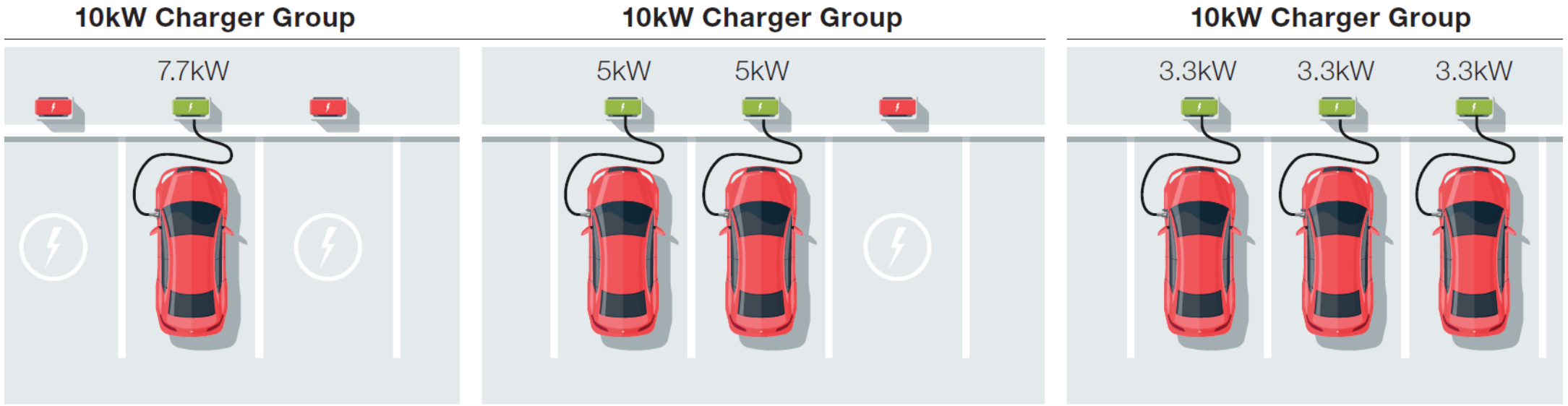


Automatic Load Management System (ALMS)

As more vehicles and fleets transition to electric, buildings often do not have the capacity to simultaneously charge large numbers of electric vehicles (EV).

Upgrading a building's electrical systems can be impractical and expensive. An automatic load management system (ALMS) manages EV charging to reduce the combined electrical load, allowing capacity to be shared among several vehicles.

In this example, 10kW of charging power is shared among three chargers.



What are the benefits of ALMS?

- **Capacity Management**
  - Maximizes the number of EV chargers when faced with limited building capacity. More chargers mean users don't have to move their car to share a charger.
  - Reduces upstream capacity requirements of existing buildings (and possibly utility service). Rightsizing capacity may avoid stranded assets.
- **Energy Management**
  - Decreases or increases the capacity allocated to EV charging based on strategies to:
    - Control demand charges
    - Avoid higher time-of-use electricity costs
    - Participate in utility's demand response programs
    - Shift charging loads to green generation periods

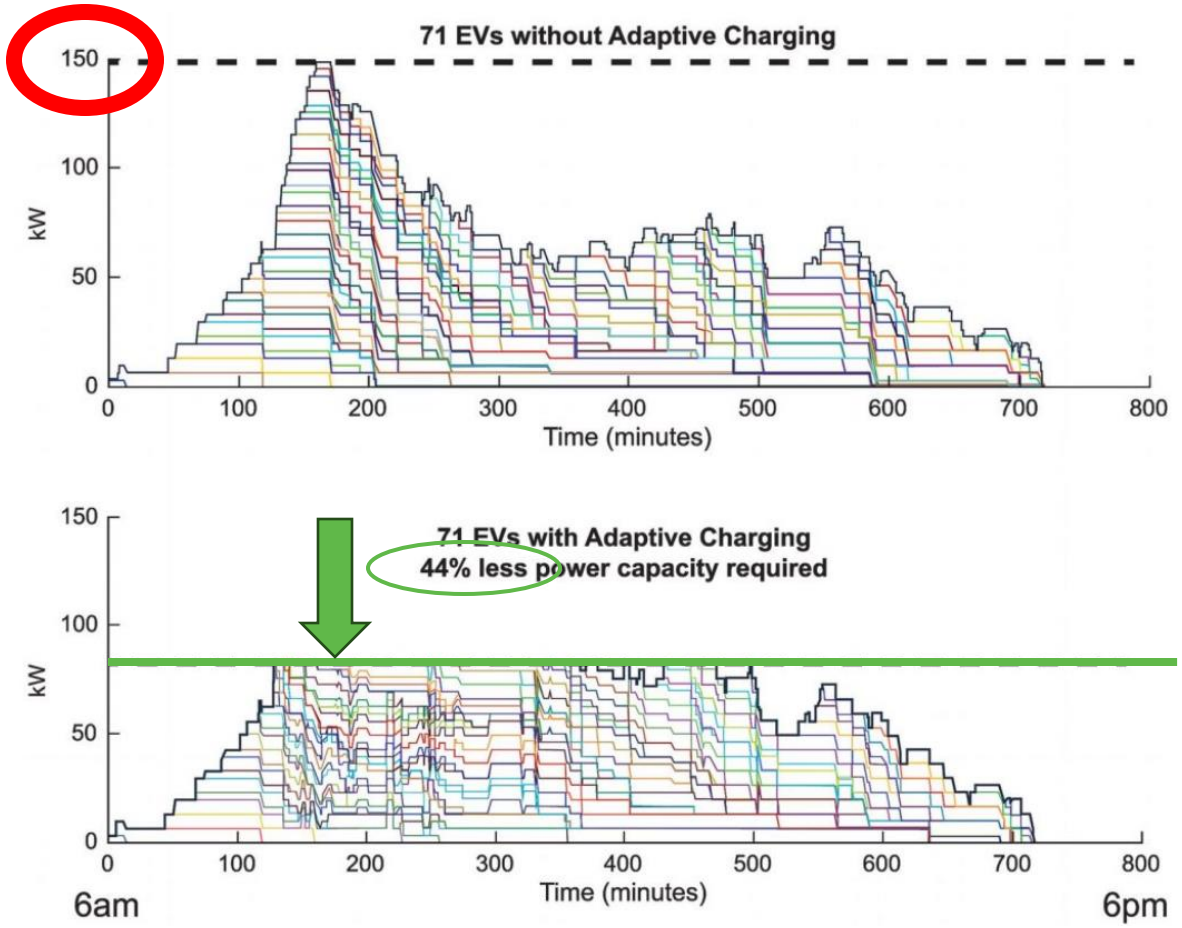
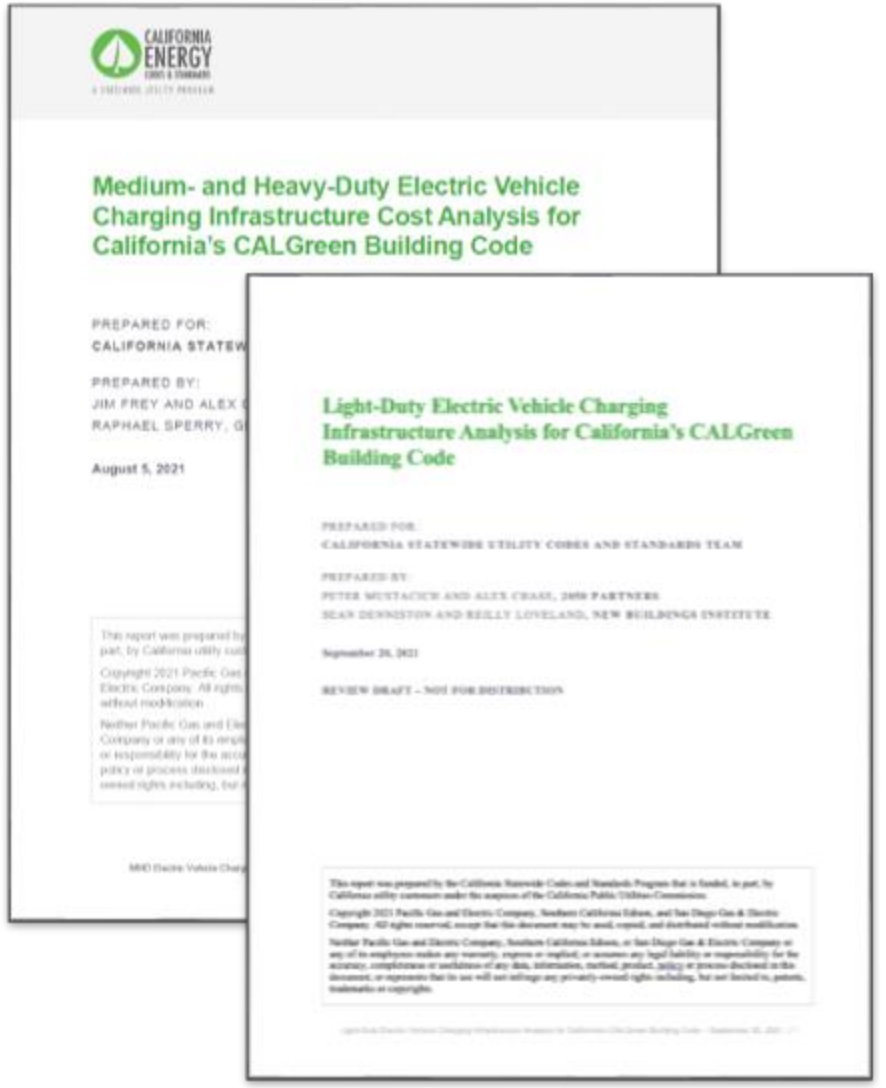


Image: PowerFlex

Light-duty & Medium/Heavy-duty EV Reports

- Summarizes supporting analysis provided to California Air Resources Board (CARB) in support of 2022 CALGreen development
- Provides recommendations for future EV infrastructure code updates (beyond current cycle)
- Link to the Light Duty Report
- Link to the Medium-Heavy Duty Report



120 Space Example

w/208V Transformer

Spaces Table 5.106.5.3.1:

25 EV Spaces

EVSE-Installed: 6

EV-Capable: 25-6 =19

Power Allocation Table 5.106.5.3.6:

165 kW power budget (~20% x spaces x 6.6kW)

TABLE 5.106.5.3.1

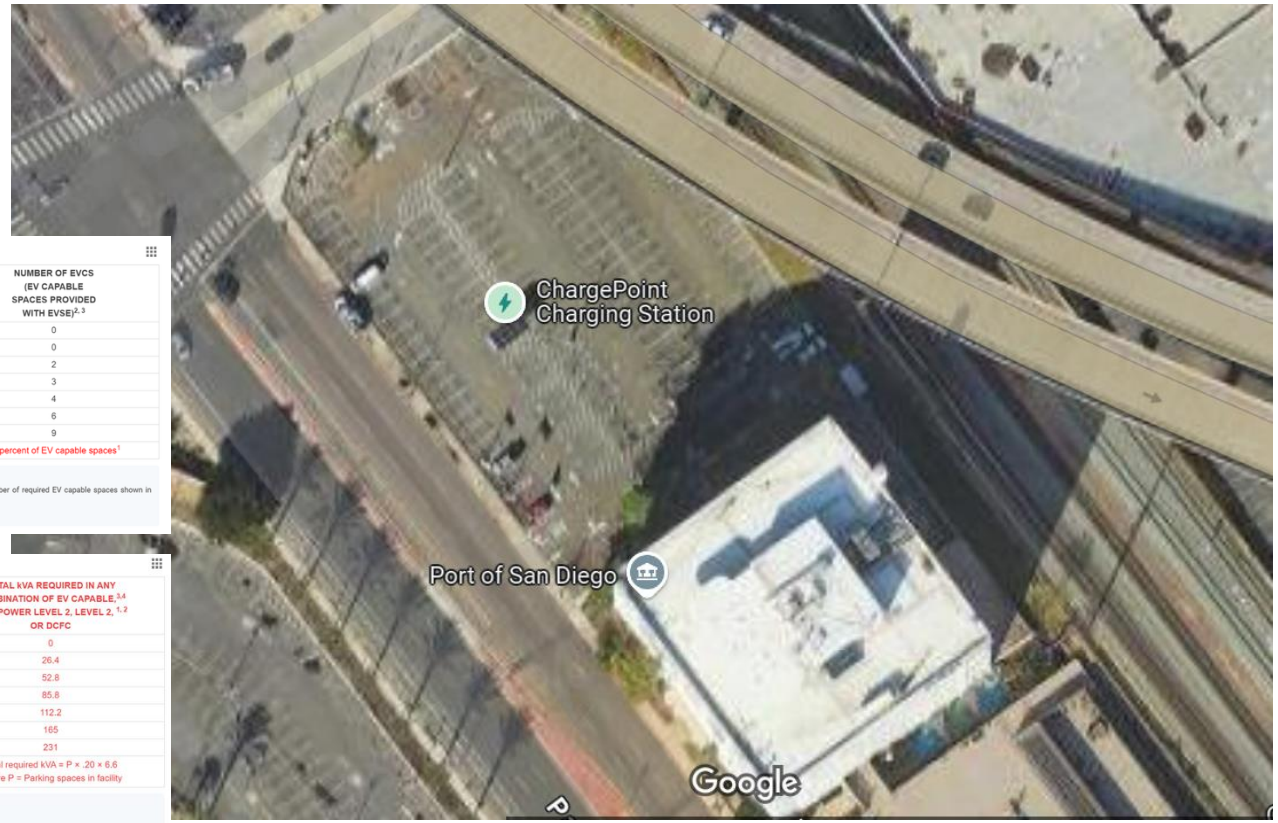
TOTAL NUMBER OF ACTUAL PARKING SPACES	NUMBER OF REQUIRED EV CAPABLE SPACES	NUMBER OF EVCS (EV CAPABLE SPACES PROVIDED WITH EVSE)[2, 3]
0–9	0	0
10–25	4	0
26–50	8	2
51–75	13	3
76–100	17	4
101–150	25	6
151–200	35	9
201 and over	20 percent of actual parking spaces[1]	25 percent of EV capable spaces[1]

1. Calculation for spaces shall be rounded up to the nearest whole number.
2. The number of required EVCS (EV capable spaces provided with EVSE) in column 3 count toward the total number of required EV capable spaces shown in column 2.
3. At least one Level 2 EVSE shall be provided.

TABLE 5.106.5.3.6

TOTAL NUMBER OF ACTUAL PARKING SPACES	MINIMUM TOTAL kVA @ 6.6 kVA	TOTAL kVA REQUIRED IN ANY COMBINATION OF EV CAPABLE,[3,4] LOW POWER LEVEL 2, LEVEL 2, [1, 2] OR DCFC
0–9	0	0
10–25	26.4	26.4
26–50	52.8	52.8
51–75	85.8	85.8
76–100	112.2	112.2
101–150	165	165
151–200	231	231
201 and over	20 percent of actual parking spaces × 6.6	Total required kVA = P × .20 × 6.6 Where P = Parking spaces in facility

1. Level 2 EVSE @ 6.6 kVA minimum.
2. At least one Level 2 EVSE shall be provided.
3. Maximum allowed kVA to be utilized for EV capable spaces is 75 percent.
4. If EV capable spaces are utilized, they shall meet the requirements of Section 5.106.5.3.1 EV capable spaces.



EV-Capable Spaces: Use no more than 75% of the power (165kW x 75% = 124 kW), each space needs 30A x 208V = 6.24kW/space, 124/6.24 = 20 EV Capable Spaces max

Other EV Spaces: No less than 25% of the power (165kW x 25% = 41kW)

1. Low Power Level 2 Receptacles – 20A x 80% x 208V = 3.3kW per space = 13 spaces
2. AC EVSEs – 30A equipment x 208V = 6.3kW per space = 7 spaces (Must always include at least one)
3. DC EVSE – 50kW (very small one!) = 1 space

http://codes.iccsafe.org/content/CAGBC2022P3/chapter-5-nonresidential-mandatory-measures#CAGBC2022P3_Ch05_SubCh5.1_Sec5.106.5.3

Thank You !

Questions?

Grant Alpert
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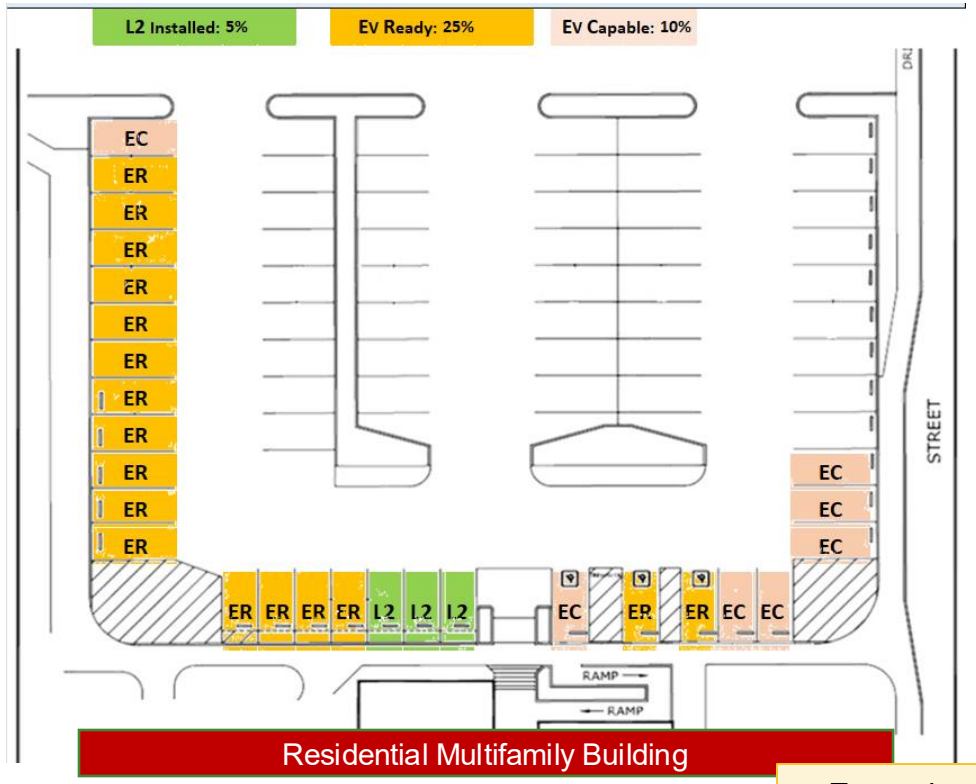
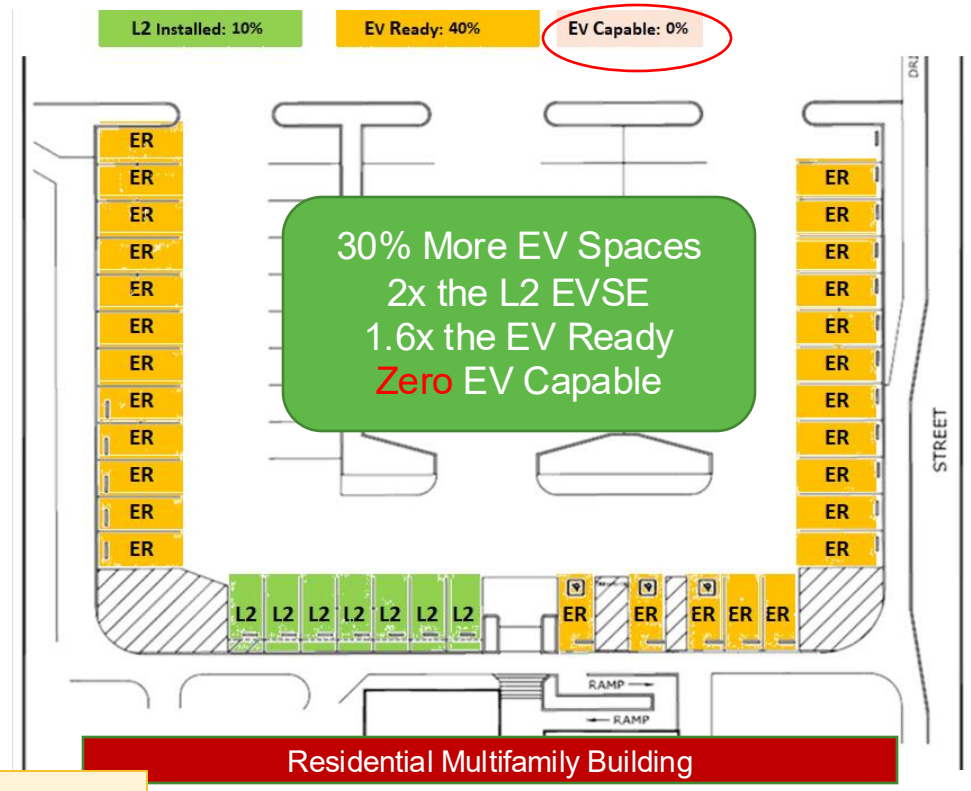
CALIFORNIA ENERGY CODES & STANDARDS
A STATEWIDE UTILITY PROGRAM

APPENDIX

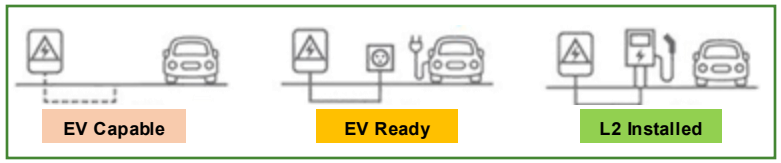
Mandatory MF Residential New Construction (includes Hotels/Motels)
2022 CALGreen (eff. 1/1/23) vs.
2025 CALGreen Intervening cycle (eff. 1/1/26)





Example: 69 parking spaces

L2 = L2 EVSE Installed (Level 2 208/240V 40A)
ER = EV Ready (receptacle) (low power Level 2 208/240V 20A)
EC = EV Capable (panel space and electrical load capacity for a future EVSE Space 208/240V 40A)



Note: this slide is intended to illustrate a general code requirement scenario and does not reflect the full nuance of code language.

https://codes.iccsafe.org/content/CAGBC2025P2

2022 CALGreen multifamily residential buildings (Ch. 4) required EV spaces, and changes from the Intervening Cycle

2022 CALGreen eff. 1/1/23

- Section 4.106.4.2 “New multifamily dwellings, hotels and motels and new residential parking facilities” is split into two subsections
    - 4.106.4.2.1, for multifamily and hotels/motels with less than 20 units/guest rooms. Where the required EV Spaces are EV Capable= 10% and EV Ready=25% of actual parking spaces
    - 4.106.4.2.2, for multifamily and hotels/motels with more than 20 units/guest rooms. Where the required EV Spaces are EV Capable= 10% and EV Ready=25%, and EV Chargers=5% of actual parking spaces

2025 CALGreen eff. 1/1/26

- In Section 4.106.4.2 there is no longer distinction between more or less than 20 units/guest rooms
    - Hotel/Motel were separated from multifamily buildings
    - EV Capable spaces are removed
    - 40% of actual parking spaces are required to be low power Level 2 charging receptacles
    - 40% of actual parking spaces are required to be Level 2 EV Chargers.
    - EV charging receptacles in multifamily parking facilities shall be provided with a dedicated branch circuit connected to the dwelling unit’s electrical service panel, where feasible as determined by the local enforcing agency.

Key Intervening Cycle Multifamily Residential Updates

1. **EV Capable spaces are gone, EV Ready Receptacles and L2 EVSE are increased.**
2. **The separate language for buildings <20 units is removed**
3. **Hotels & Motels have their own section**
4. **Receptacle Power Source**. EV charging receptacles in multifamily parking facilities shall be provided with a dedicated branch circuit connected to the dwelling unit's electrical panel, unless determined as infeasible by the project builder or designer and subject to concurrence of the local enforcing agency.
5. **Receptacle Configurations**. 208/240V EV charging receptacles shall comply with one of the following configurations:
   - For 20- ampere receptacles, NEMA 6-20R (16A of charging)
   - For 30- ampere receptacles, NEMA 14-30R (24A of charging)
   - For 50- ampere receptacles, NEMA 14-50R (40A of charging)

https://digitalassets-shop.tesla.com/image/upload/f_auto,q_auto/v1/content/dam/tesla/studio/CAR_ACCESSORIES/MODEL_S/CHARGING_ADAPTERS/1099345_0_2000.jpg
Downloaded 2023-09-25

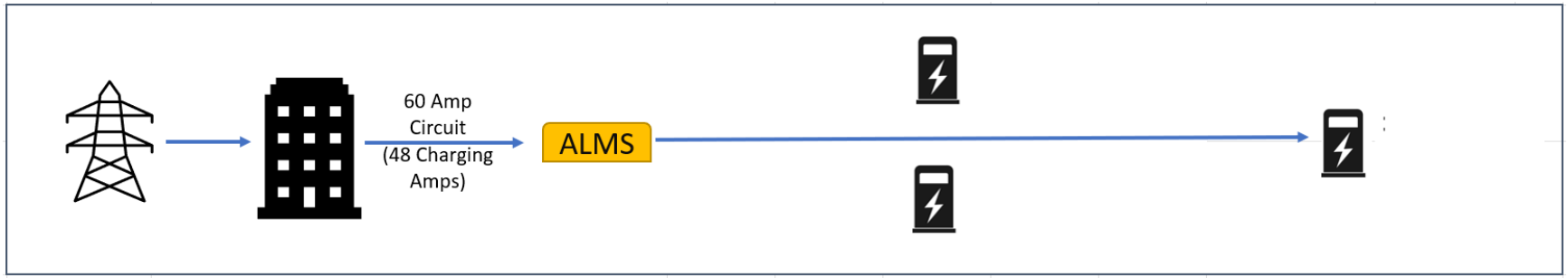
“Day in the Life” of Automatic Load Management Systems

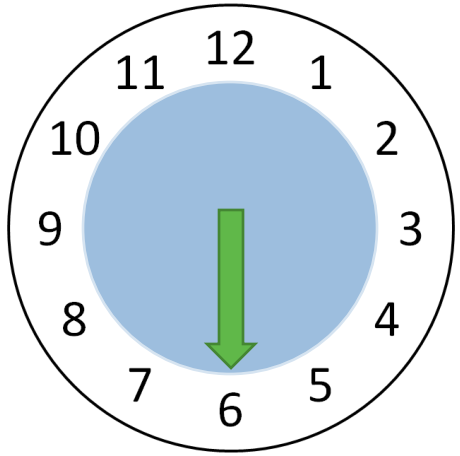
ALMS orchestrates charging sessions to protect building power distribution infrastructure and allocate charging rates based on other business rules.

ALMS can be smart EVSEs working together while other systems use a shared controller that also monitors power levels within the building power distribution infrastructure.

The following "for illustration only" example shows how a system could share a single circuit's current capacity (48 Amps continuous) across five charging spaces.

The example starts with an empty parking lot at 6am and finishes with fleet charging at 9pm.





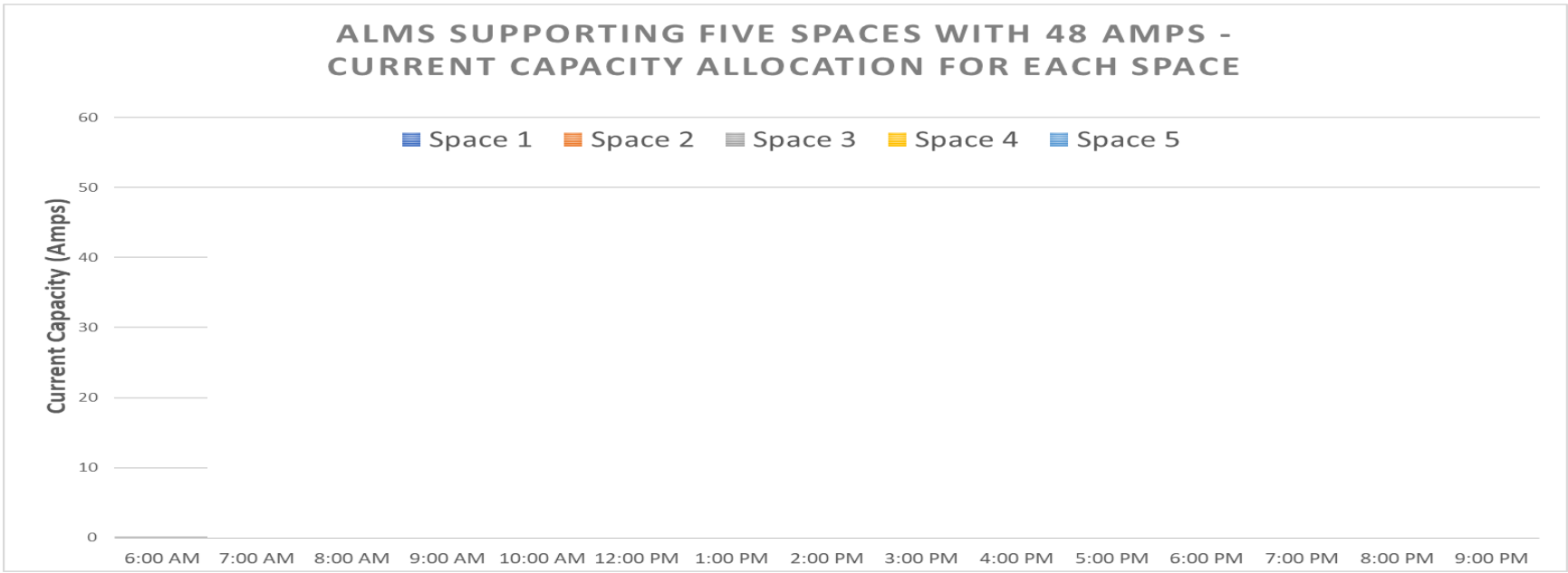
A Day in the Life of Five EV Charging Spaces Controlled by ALMS

(Charging sessions shortened for impact)

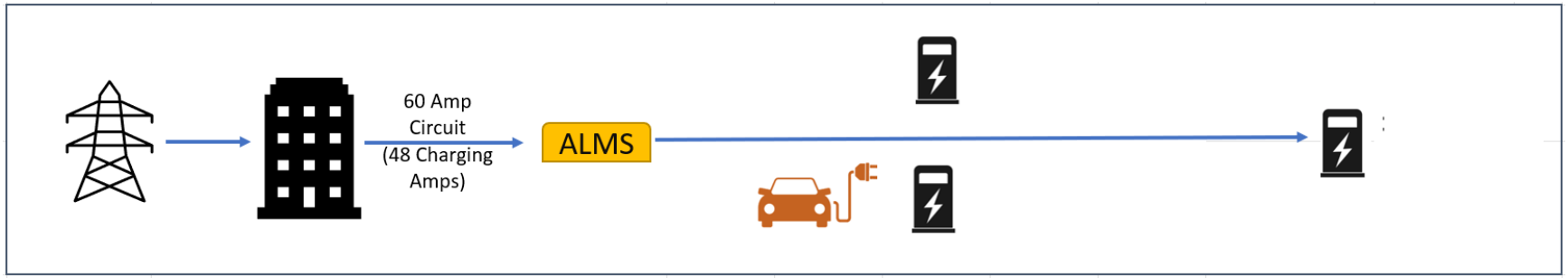
Current Capacity Allocated to Each Space
* EVSE advertises max current capacity to vehicle, vehicle takes the current it needs below that maximum *

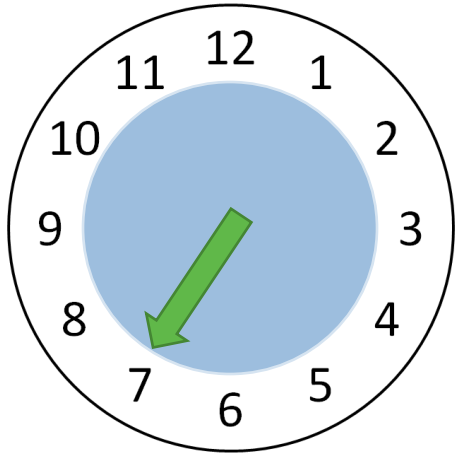
Continuous Load Factor 125%

							Total Available Panel Capacity (A)	Required Circuit Capacity
							48	60
Time of Day	**Activity**	**Space 1**	**Space 2**	**Space 3**	**Space 4**	**Space 5**	**Allocated Current Capacity**	**Unallocated Capacity**
06:00 AM	Parking lot empty	Empty	Empty	Empty	Empty	Empty	0	48



What is happening during the start of each hour appears here.





A Day in the Life of Five EV Charging Spaces Controlled by ALMS

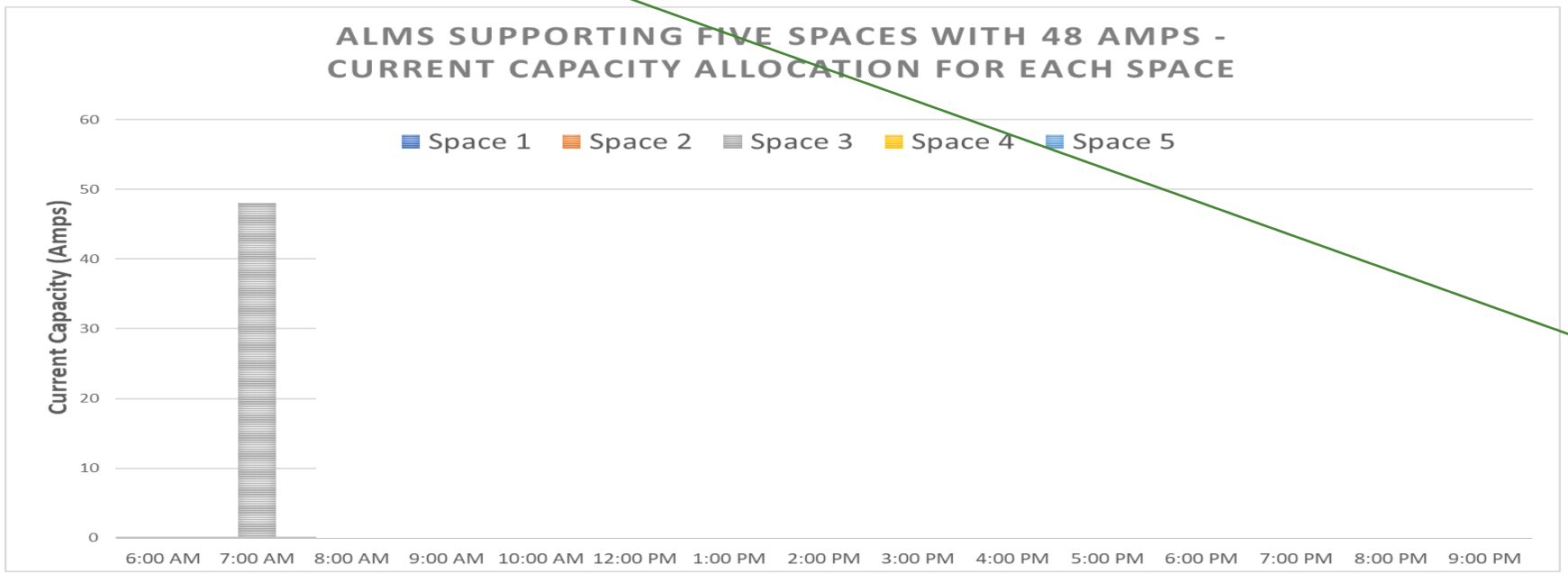
(Charging sessions shortened for impact)

Current Capacity Allocated to Each Space
* EVSE advertises max current capacity to vehicle, vehicle takes the current it needs below that maximum *

Continuous Load Factor 125%

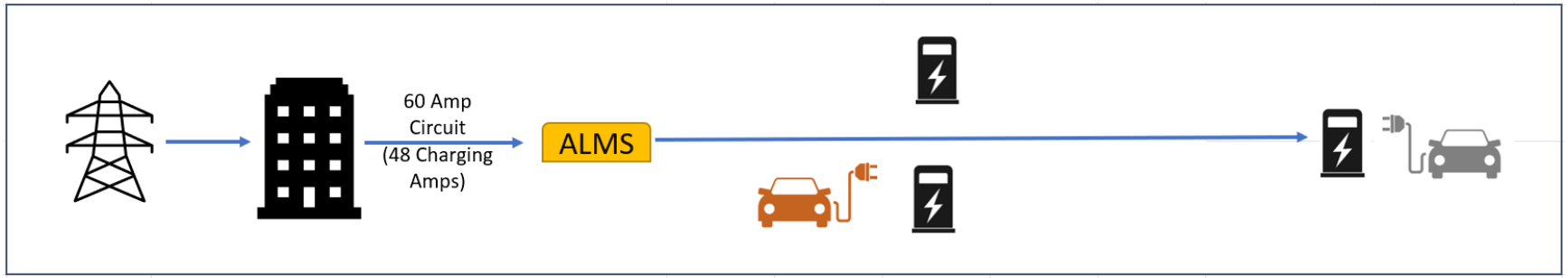
Total Available Panel Capacity (A)	Required Circuit Capacity
48	60

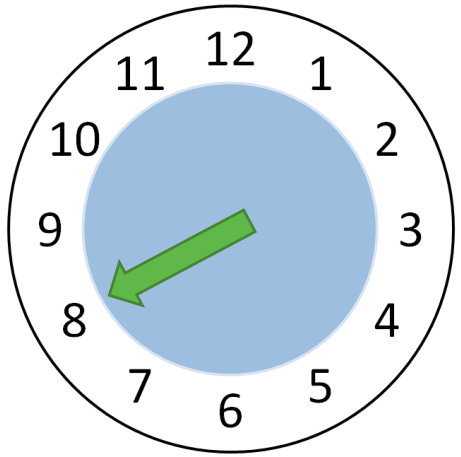
Time of Day	Activity	Space 1	Space 2	Space 3	Space 4	Space 5	Allocated Current Capacity	Unallocated Capacity
07:00 AM	Julie arrives in Space 3 and ALMS offers full current capacity	Empty	Empty	48	Empty	Empty	48	0



The charging current allocated to each space appear in this row

The first car arrives for the day





A Day in the Life of Five EV Charging Spaces Controlled by ALMS

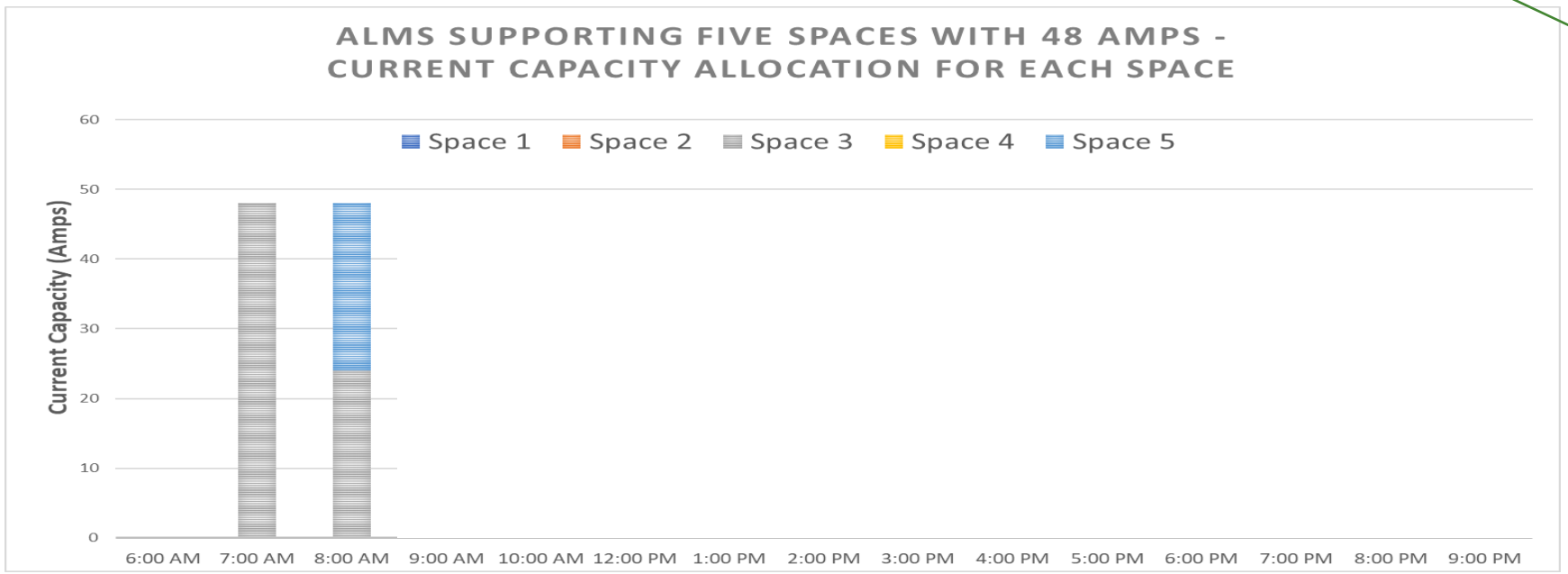
(Charging sessions shortened for impact)

Current Capacity Allocated to Each Space
* EVSE advertises max current capacity to vehicle, vehicle takes the current it needs below that maximum *

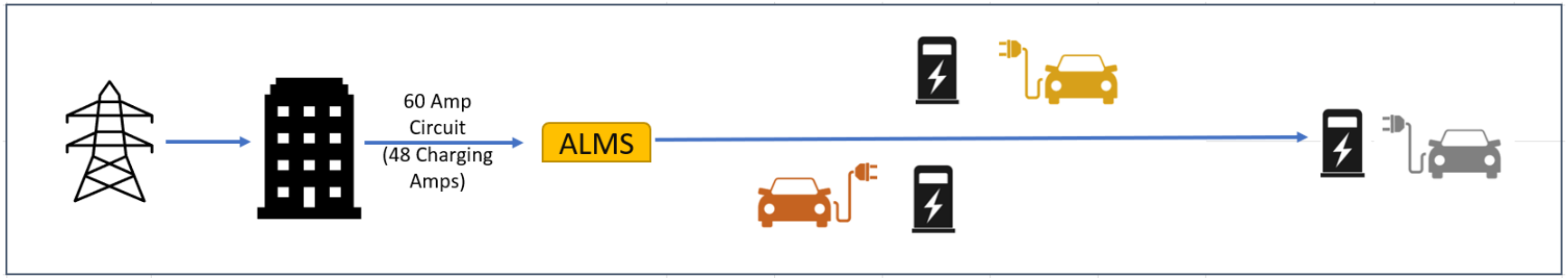
Continuous Load Factor 125%

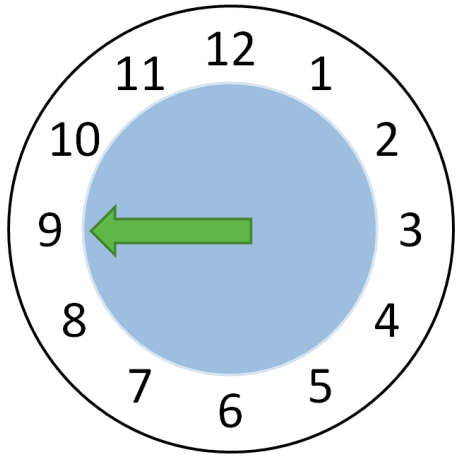
Total Available Panel Capacity (A)	Required Circuit Capacity
48	60

Time of Day	Activity	Space 1	Space 2	Space 3	Space 4	Space 5	Allocated Current Capacity	Unallocated Capacity
08:00 AM	Fred arrives in Space 5, ALMS splts the current capacity equally	Empty	Empty	24	Empty	24	48	0



Since the shared circuit can only provide 48 Amps, ALMS instructs each EVSE to advertise a maximum current based on the rules, never exceeding 48 Amps combined.





A Day in the Life of Five EV Charging Spaces Controlled by ALMS

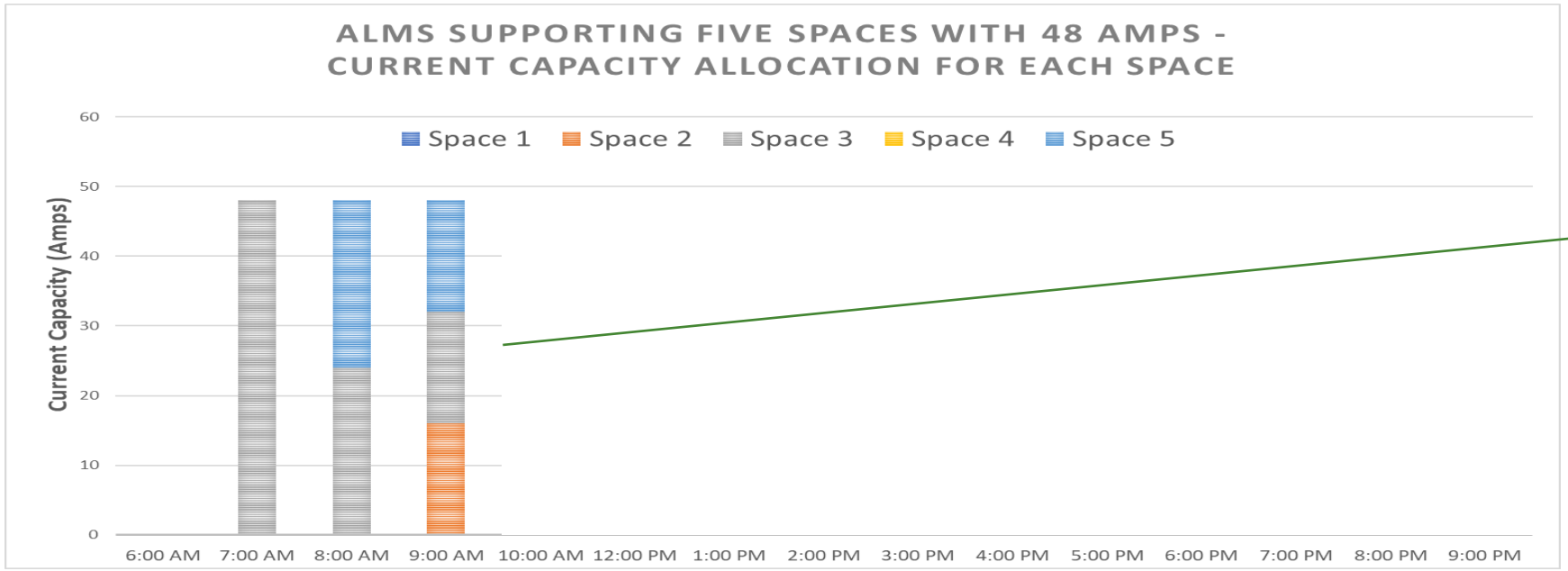
(Charging sessions shortened for impact)

Current Capacity Allocated to Each Space
* EVSE advertises max current capacity to vehicle, vehicle takes the current it needs below that maximum *

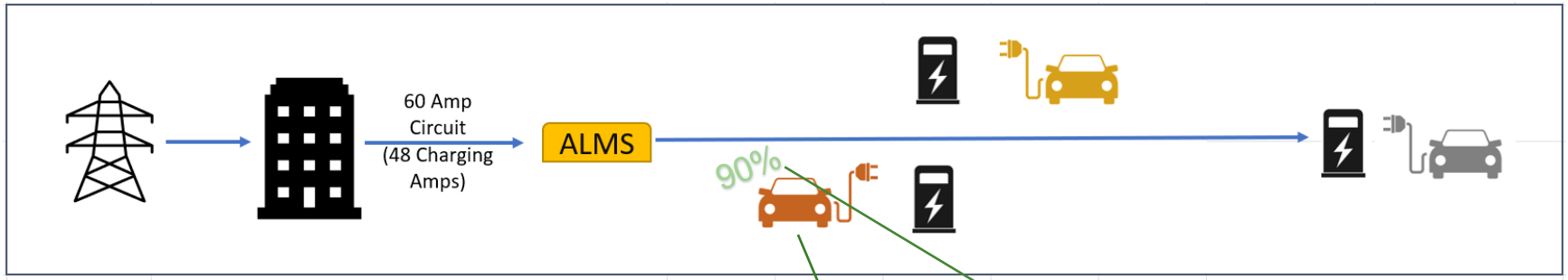
Continuous Load Factor 125%

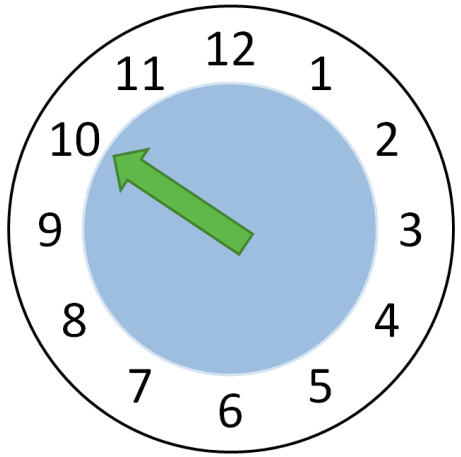
Total Available Panel Capacity (A)	Required Circuit Capacity
48	60

Time of Day	Activity	Space 1	Space 2	Space 3	Space 4	Space 5	Allocated Current Capacity	Unallocated Capacity
09:00 AM	Jose arrives in Space 2, ALMS splits the current capacity equally	Empty	16	16	Empty	16	48	0



How the current is split over the day appears in this bar graph. Each space contributes to the total current.





A Day in the Life of Five EV Charging Spaces Controlled by ALMS

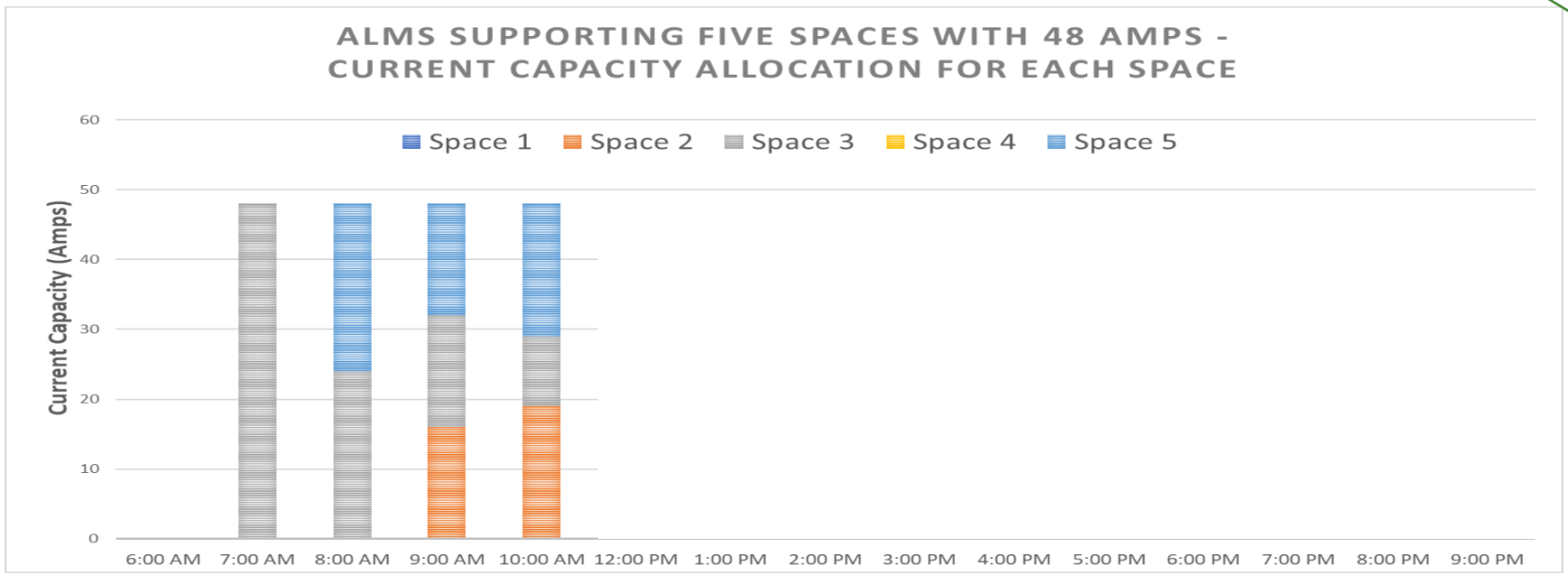
(Charging sessions shortened for impact)

Current Capacity Allocated to Each Space
* EVSE advertises max current capacity to vehicle, vehicle takes the current it needs below that maximum *

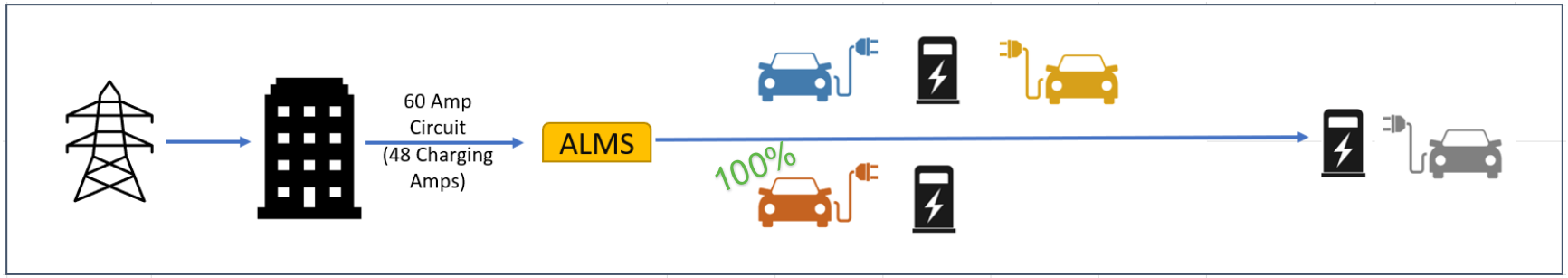
Continuous Load Factor 125%

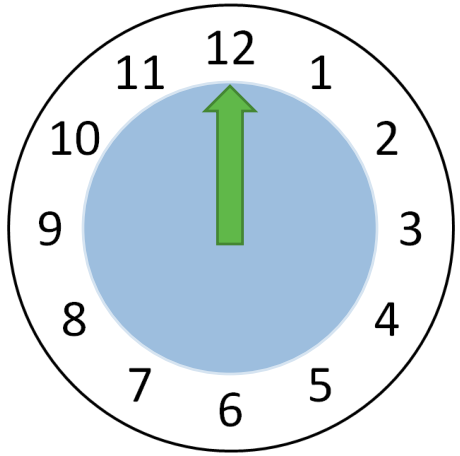
Total Available Panel Capacity (A)	Required Circuit Capacity
48	60

Time of Day	Activity	Space 1	Space 2	Space 3	Space 4	Space 5	Allocated Current Capacity	Unallocated Capacity
10:00 AM	Julie's car getting full in Space 3 and needs less current. ALMS "frees up" some current capacity and splits between the remaining two spaces.	Empty	19	10	Empty	19	48	0



EVSEs advertise the maximum current available and the EV sets its own value below that. Once an EV gets close to full, it may reduce the charging current. The ALMS can then reallocate some current to other sessions.





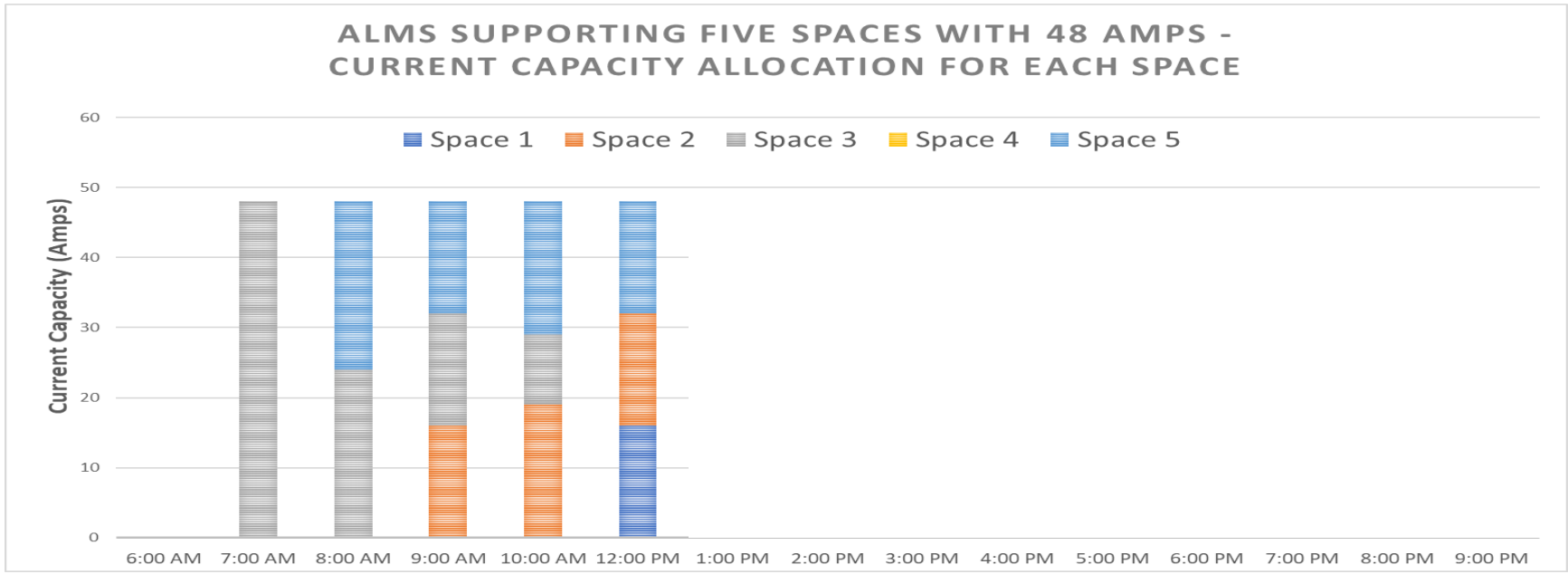
A Day in the Life of Five EV Charging Spaces Controlled by ALMS

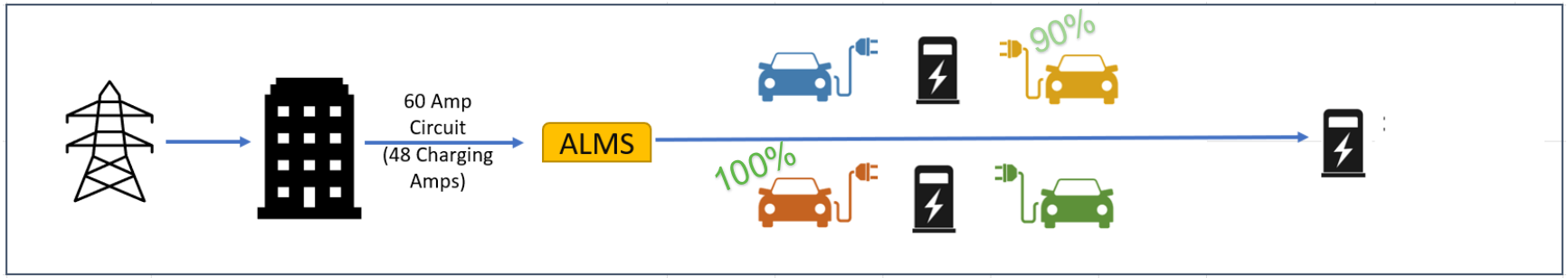
(Charging sessions shortened for impact)

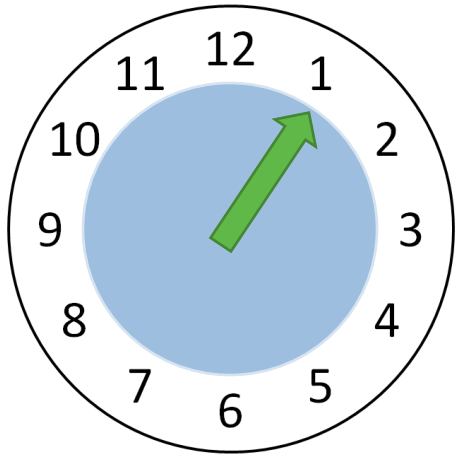
Current Capacity Allocated to Each Space
* EVSE advertises max current capacity to vehicle, vehicle takes the current it needs below that maximum *

Continuous Load Factor: 125%

Time of Day	Activity	Space 1	Space 2	Space 3	Space 4	Space 5	Total Available Panel Capacity (A)	Required Circuit Capacity
							48	60
12:00 PM	Tom parks in Space 1, Julie's car full in Space 3, ALMS splits current capacity equally	16	16	Full ☺	Empty	16	Allocated Current Capacity: 48	Unallocated Capacity: 0







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(Charging sessions shortened for impact)

Current Capacity Allocated to Each Space
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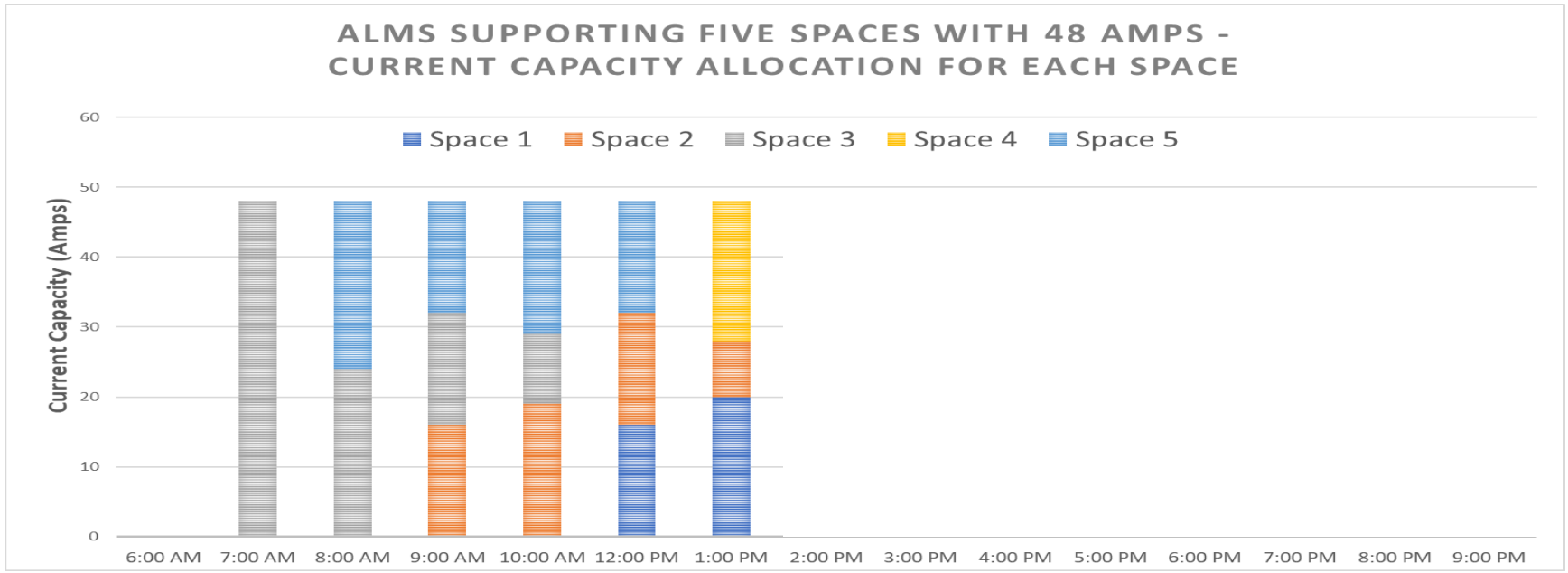
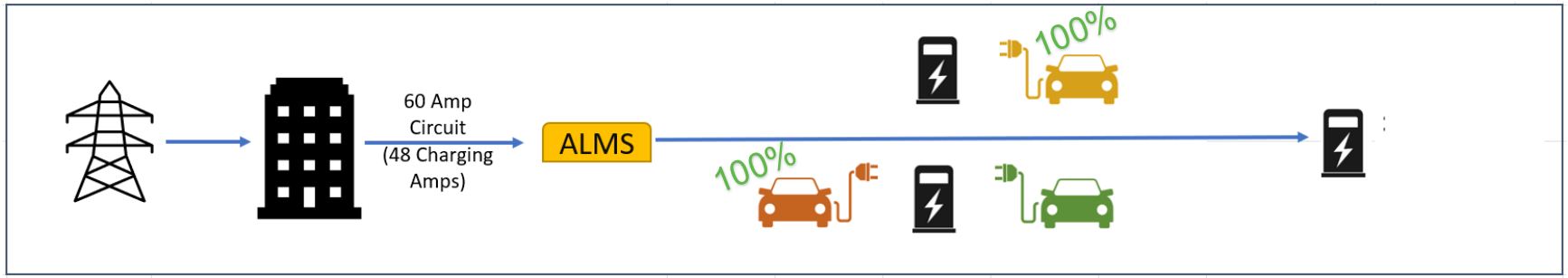
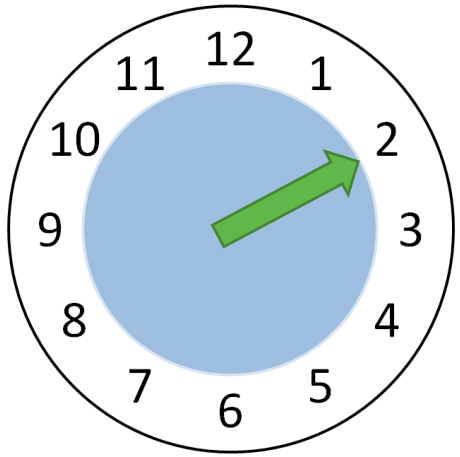
Continuous Load Factor 125%

Total Available Panel Capacity (A)	Required Circuit Capacity
48	60

Time of Day	Activity	Space 1	Space 2	Space 3	Space 4	Space 5	Allocated Current Capacity	Unallocated Capacity
01:00 PM	Sally parks in Space 4, Fred leaves Space 5, Jose car getting full in Space 2	20	8	Full ☺	20	Empty	48	0







A Day in the Life of Five EV Charging Spaces Controlled by ALMS

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Current Capacity Allocated to Each Space
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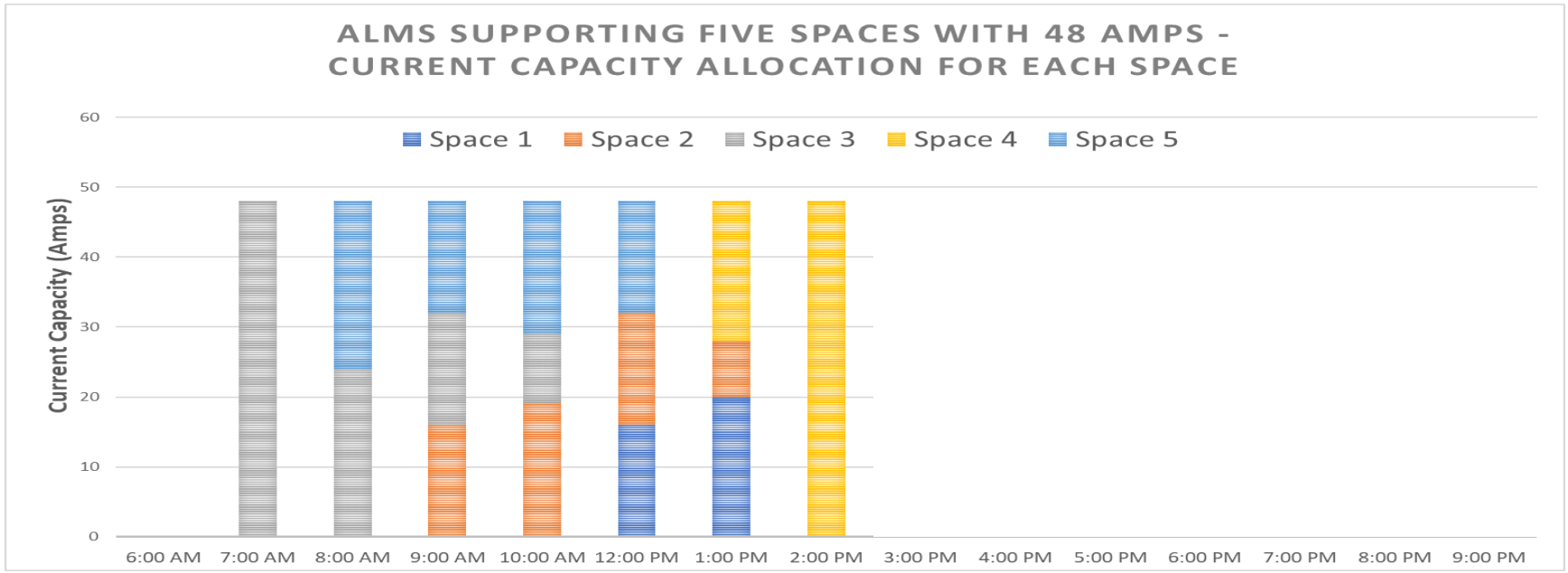
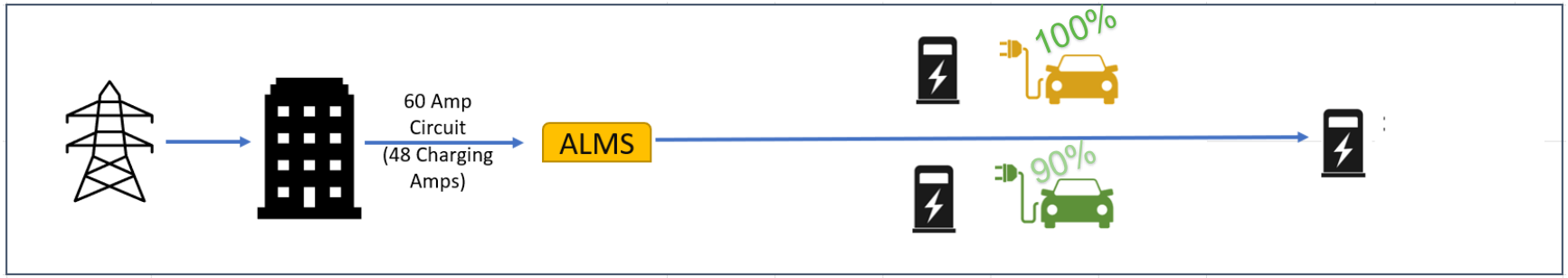
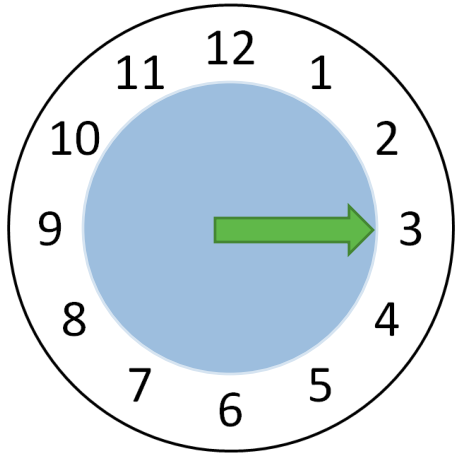
Continuous Load Factor 125%

Total Available Panel Capacity (A)	Required Circuit Capacity
48	60

Time of Day	Activity	Space 1	Space 2	Space 3	Space 4	Space 5	Allocated Current Capacity	Unallocated Capacity
02:00 PM	Jose's car in Space 2 now full, Tom leaves Space 1, ALMS offers Sally full current capacity in Space 4	Empty	Full ☺	Full ☺	48	Empty	48	0







A Day in the Life of Five EV Charging Spaces Controlled by ALMS

(Charging sessions shortened for impact)

Current Capacity Allocated to Each Space
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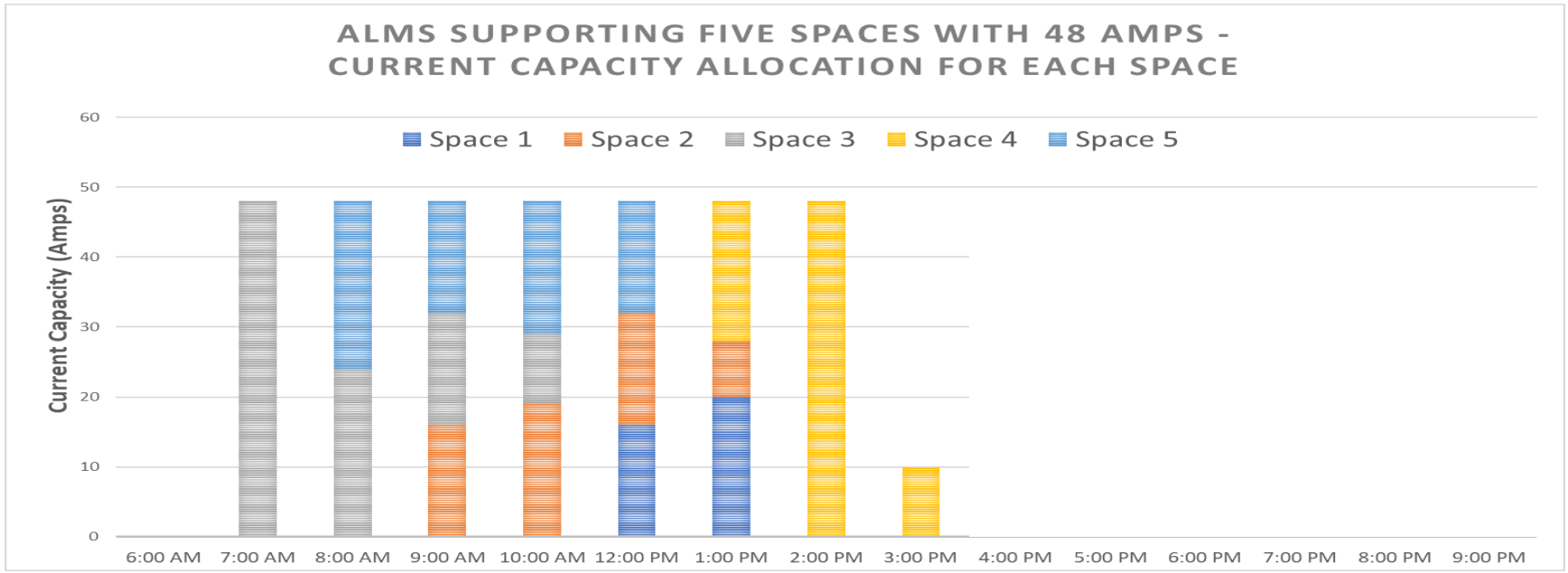
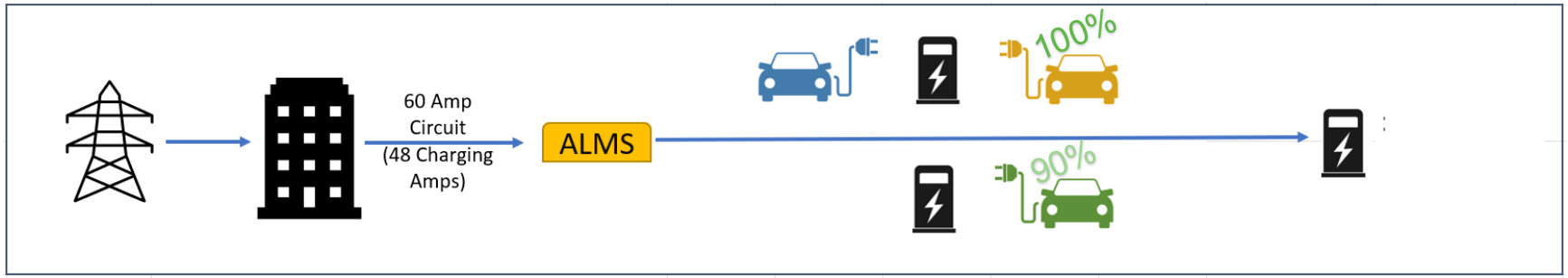
Continuous Load Factor 125%

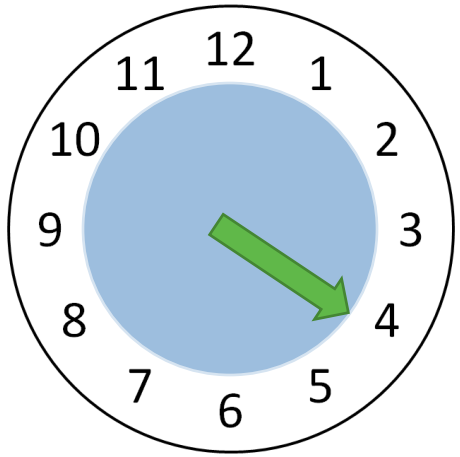
Total Available Panel Capacity (A)	Required Circuit Capacity
48	60

Time of Day	Activity	Space 1	Space 2	Space 3	Space 4	Space 5	Allocated Current Capacity	Unallocated Capacity
03:00 PM	Julie leaves Space 3, Sally's car getting full in Space 4, ALMS "frees up" current capacity	Empty	Full ☺	Empty	10	Empty	**10**	38

There may be times when the spaces don't need full capacity







A Day in the Life of Five EV Charging Spaces Controlled by ALMS

(Charging sessions shortened for impact)

Current Capacity Allocated to Each Space
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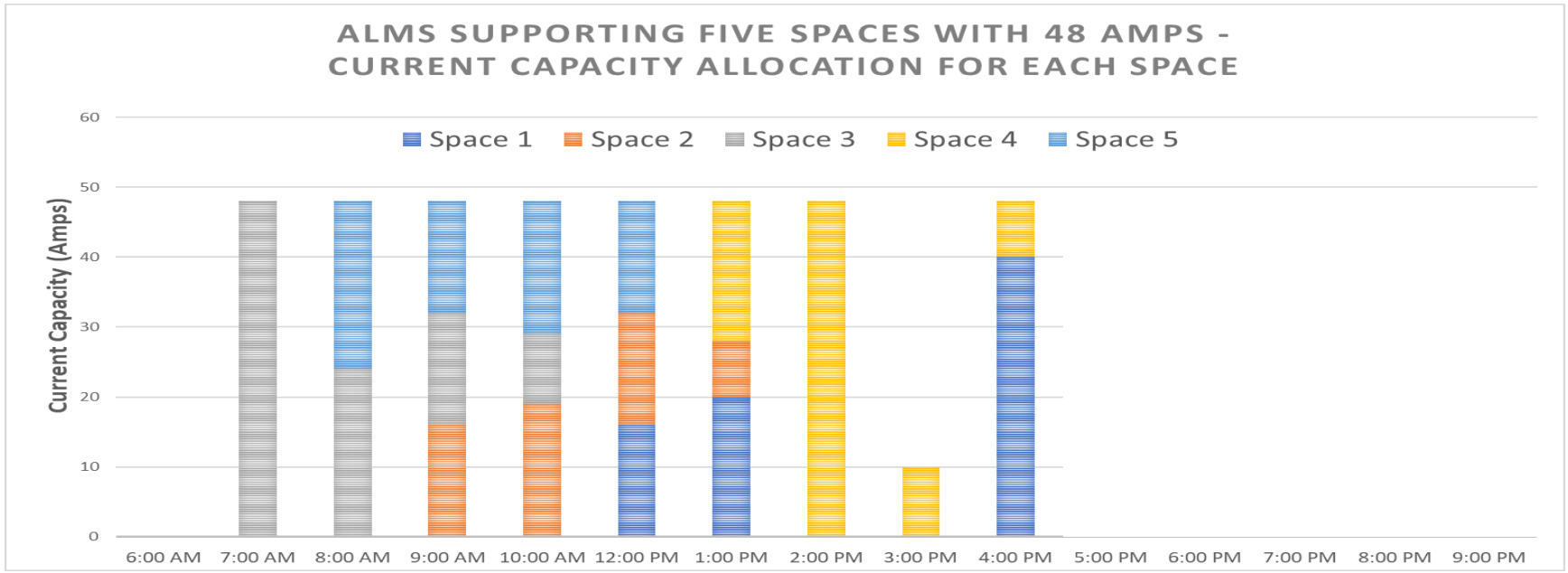
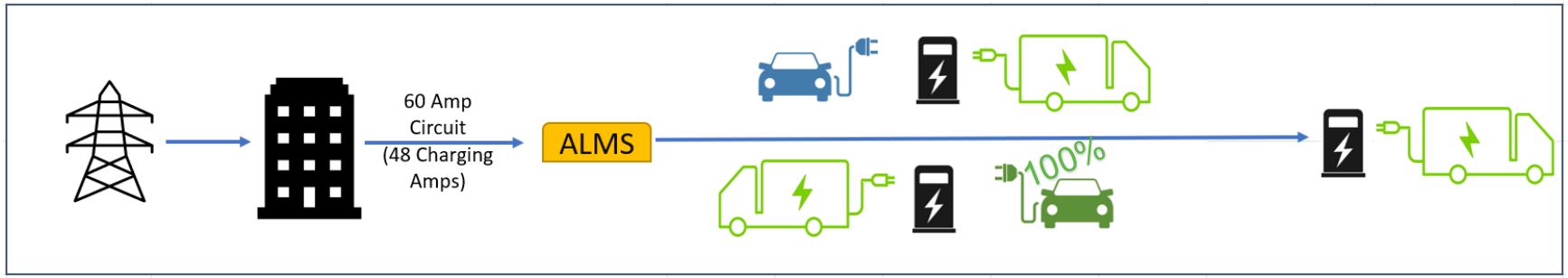
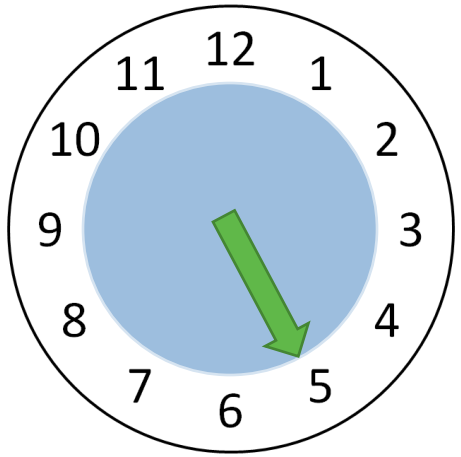
Continuous Load Factor 125%

Total Available Panel Capacity (A)	Required Circuit Capacity
48	60

Time of Day	Activity	Space 1	Space 2	Space 3	Space 4	Space 5	Allocated Current Capacity	Unallocated Capacity
04:00 PM	Sally's car nearly finished in Space 4, Lucy parks in Space 1, and ALMS offers Lucy remaining current capacity	40	Full ☺	Empty	8	Empty	48	0







A Day in the Life of Five EV Charging Spaces Controlled by ALMS

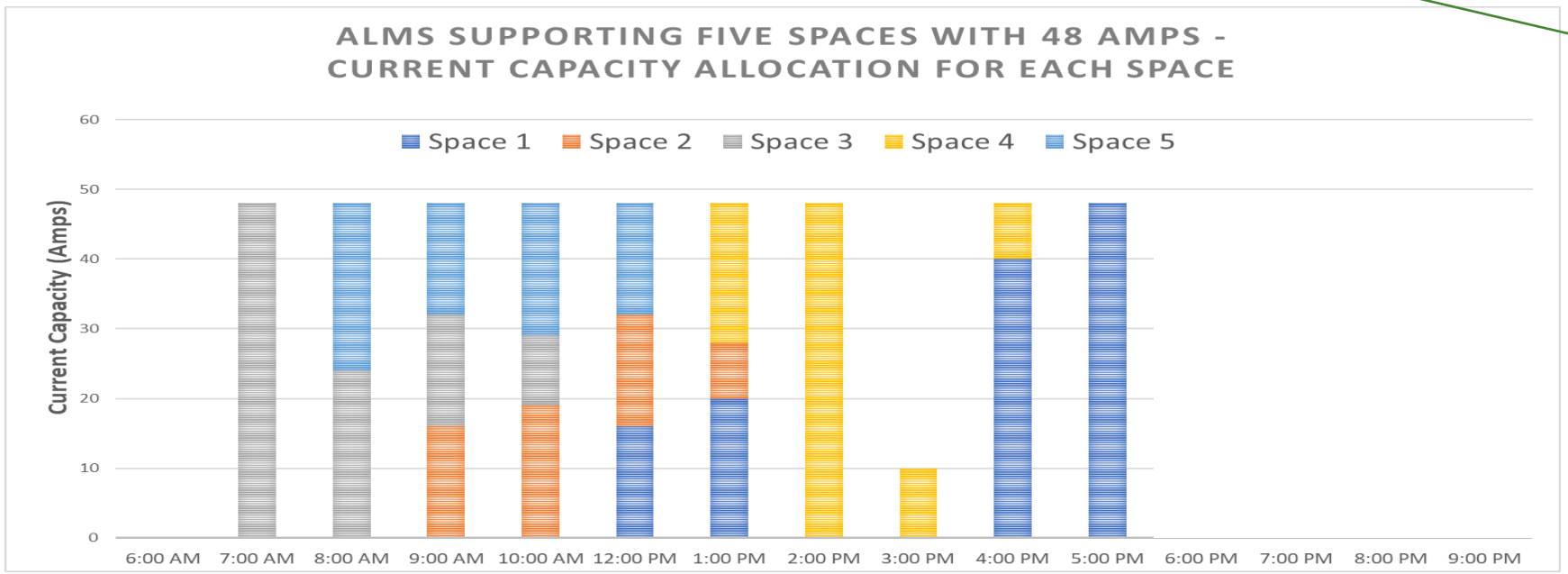
(Charging sessions shortened for impact)

Current Capacity Allocated to Each Space
* EVSE advertises max current capacity to vehicle, vehicle takes the current it needs below that maximum *

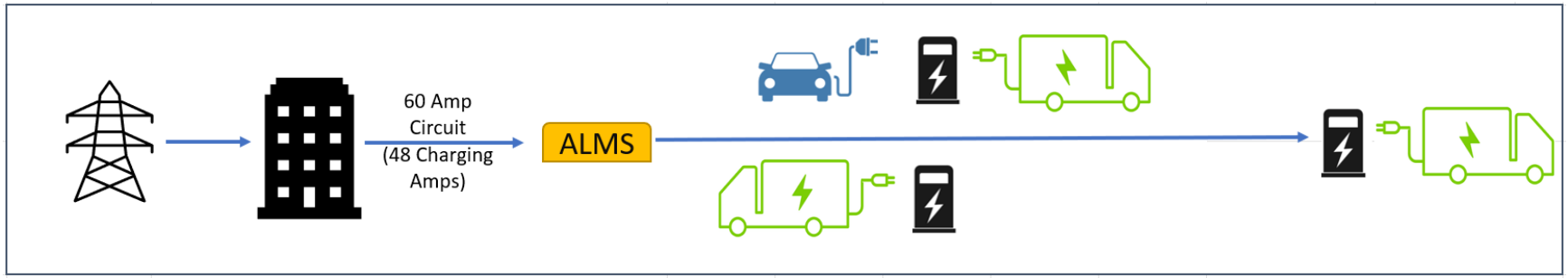
Continuous Load Factor: 125%

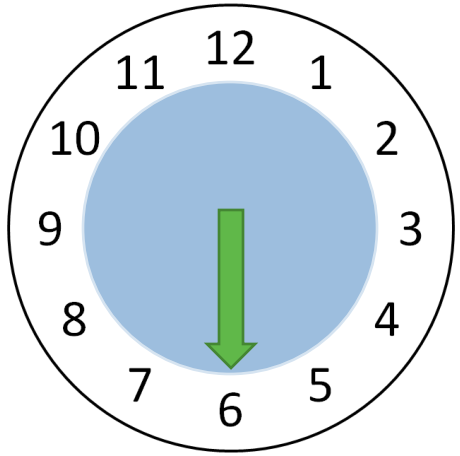
Total Available Panel Capacity (A)	Required Circuit Capacity
48	60

Time of Day	Activity	Space 1	Space 2	Space 3	Space 4	Space 5	Allocated Current Capacity	Unallocated Capacity
05:00 PM	Sally finished charging in Space 4. Fleet returns filling Space 2,3,5. ALMS delays charging until Lucy's prioritized session is complete or 8pm whichever comes first.	48	Delayed per ALMS rule	Delayed per ALMS rules	Full ☺	Delayed per ALMS rule	48	0



ALMS can control charging rates for business rules as well as infrastructure protection. In this case, the visitor car is prioritized over the fleet.





A Day in the Life of Five EV Charging Spaces Controlled by ALMS

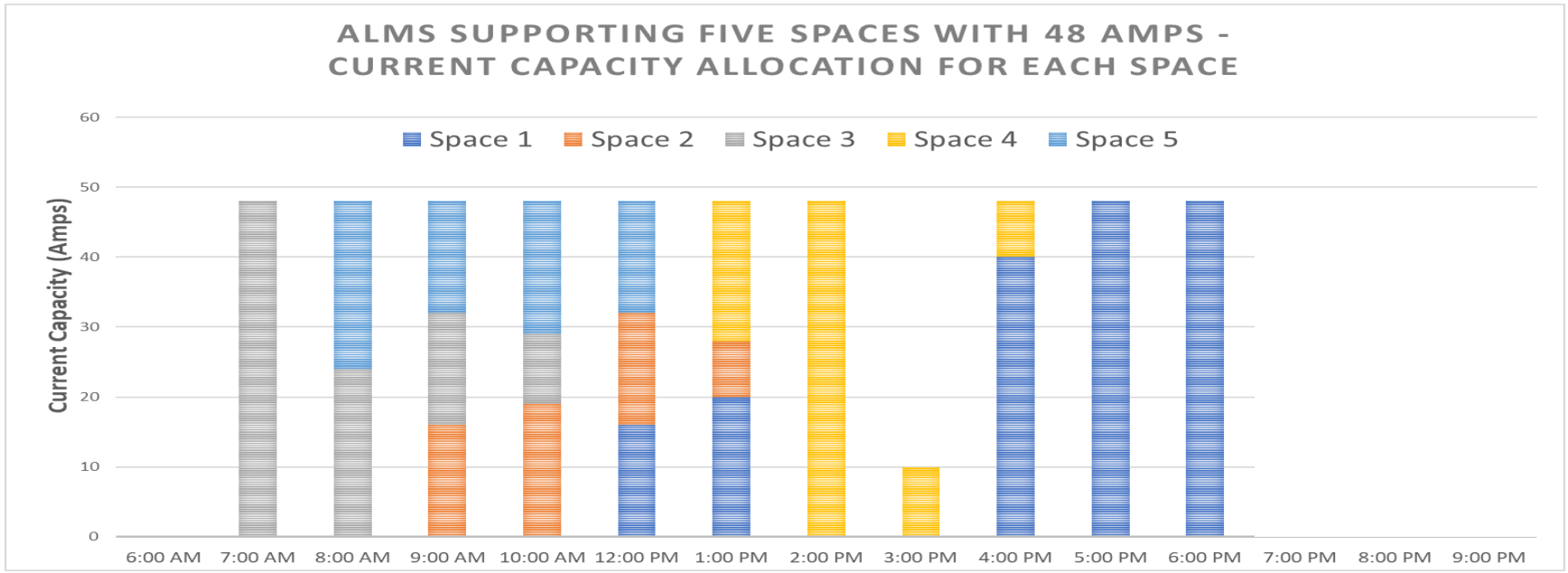
(Charging sessions shortened for impact)

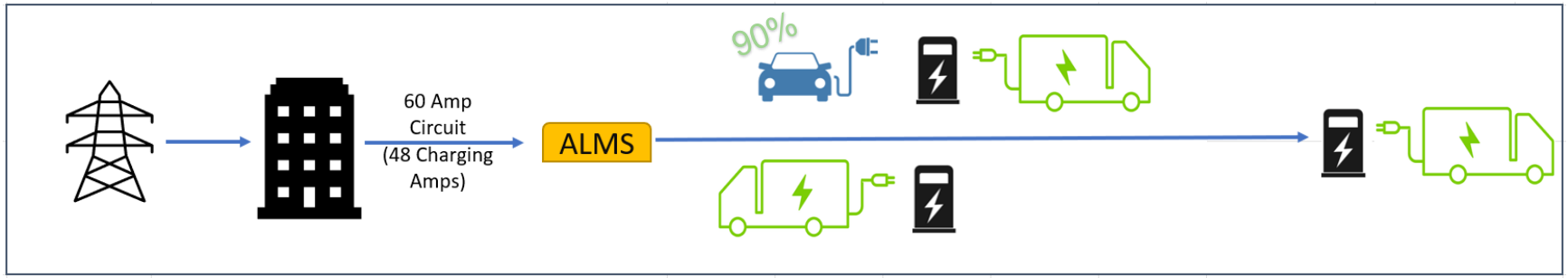
Current Capacity Allocated to Each Space
* EVSE advertises max current capacity to vehicle, vehicle takes the current it needs below that maximum *

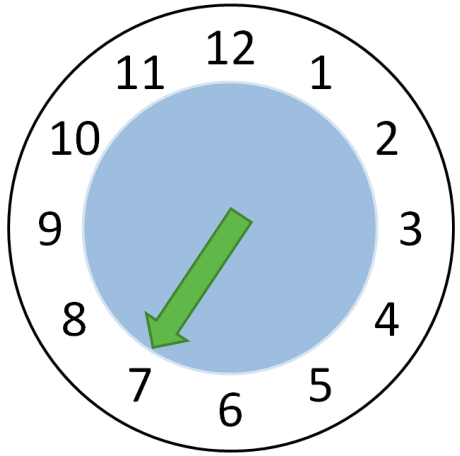
Continuous Load Factor: 125%

Total Available Panel Capacity (A)	Required Circuit Capacity
48	60

Time of Day	Activity	Space 1	Space 2	Space 3	Space 4	Space 5	Allocated Current Capacity	Unallocated Capacity
06:00 PM	Sally leaves Space 4, Lucy still allocated full capacity for Space 1 per ALMS rule	48	Delayed per ALMS rule	Delayed per ALMS rules	Empty	Delayed per ALMS rule	48	0







A Day in the Life of Five EV Charging Spaces Controlled by ALMS

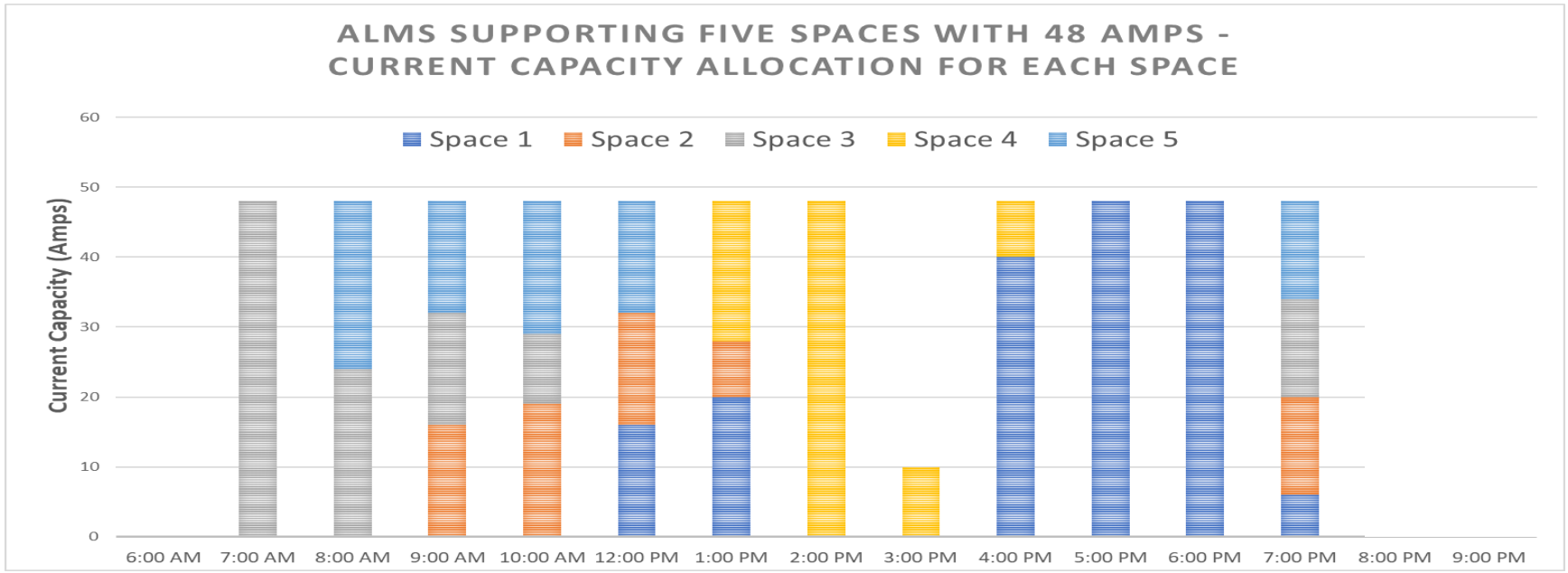
(Charging sessions shortened for impact)

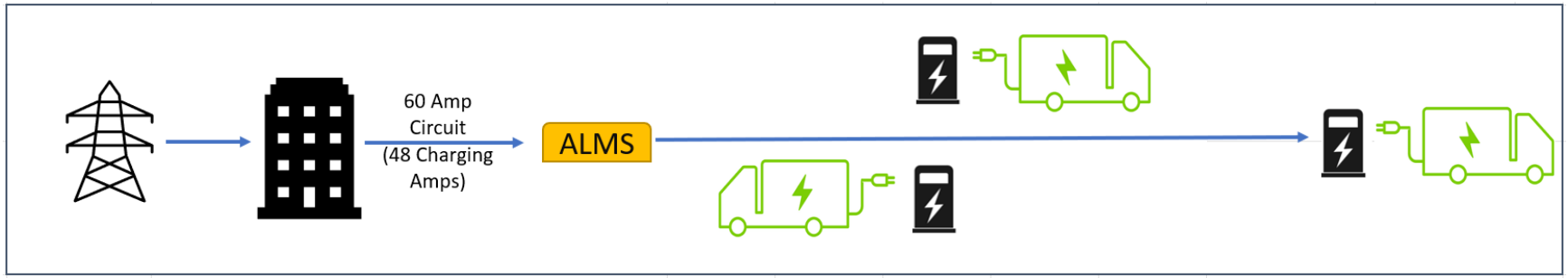
Current Capacity Allocated to Each Space
* EVSE advertises max current capacity to vehicle, vehicle takes the current it needs below that maximum *

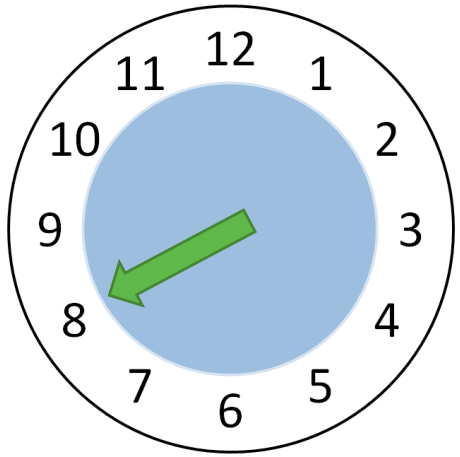
Continuous Load Factor 125%

Total Available Panel Capacity (A)	Required Circuit Capacity
48	60

Time of Day	Activity	Space 1	Space 2	Space 3	Space 4	Space 5	Allocated Current Capacity	Unallocated Capacity
07:00 PM	Lucy's car getting full and needs less capacity for Space 1. Rules allocate balance to fleet or until 8pm whichever comes first	6	14	14	Empty	14	48	0







A Day in the Life of Five EV Charging Spaces Controlled by ALMS

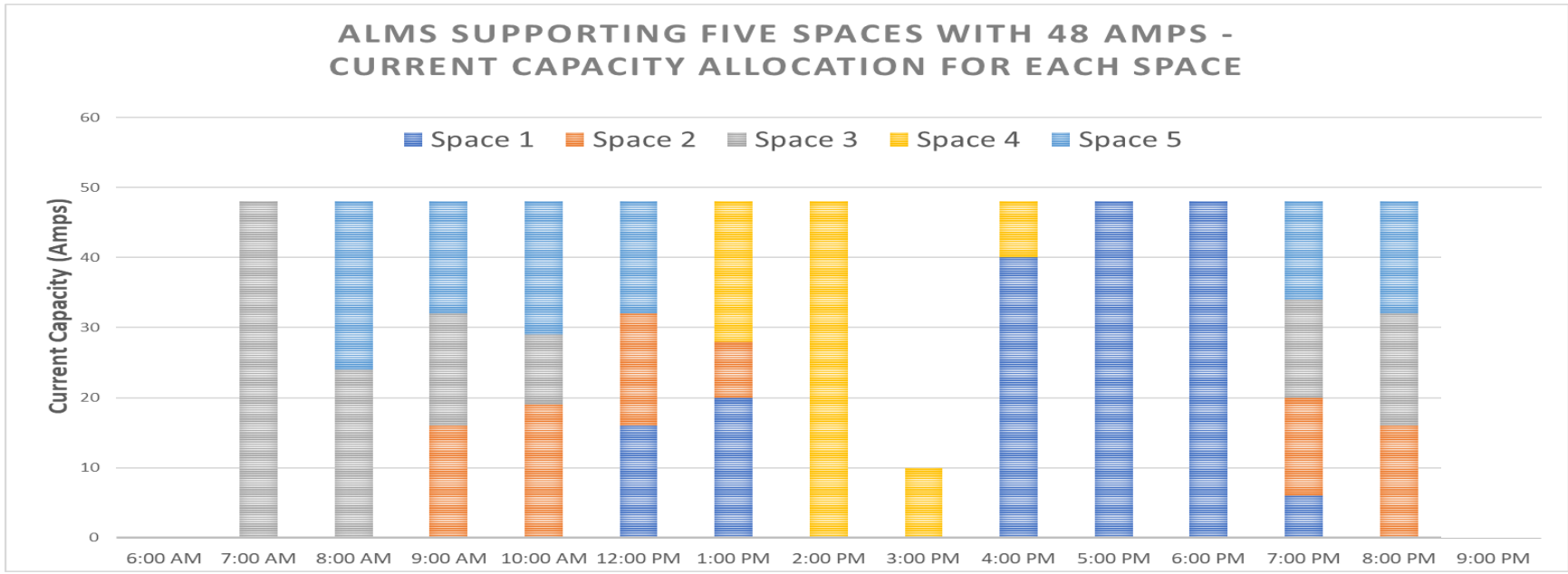
(Charging sessions shortened for impact)

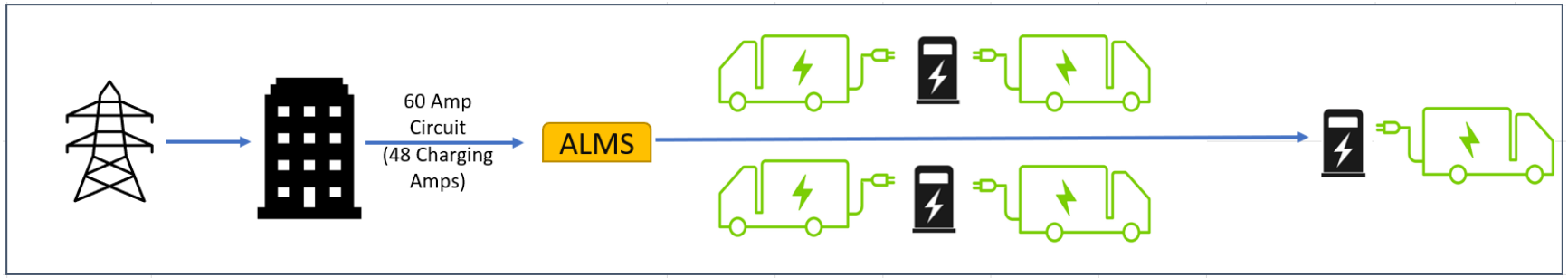
Current Capacity Allocated to Each Space
* EVSE advertises max current capacity to vehicle, vehicle takes the current it needs below that maximum *

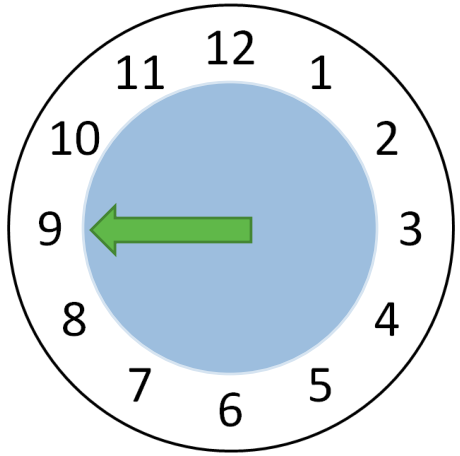
Continuous Load Factor 125%

Total Available Panel Capacity (A)	Required Circuit Capacity
48	60

Time of Day	Activity	Space 1	Space 2	Space 3	Space 4	Space 5	Allocated Current Capacity	Unallocated Capacity
08:00 PM	Lucy leaves Space 1. ALMS splits current capacity evenly after 8pm based on rules.	Empty	16	16	Empty	16	48	0







A Day in the Life of Five EV Charging Spaces Controlled by ALMS

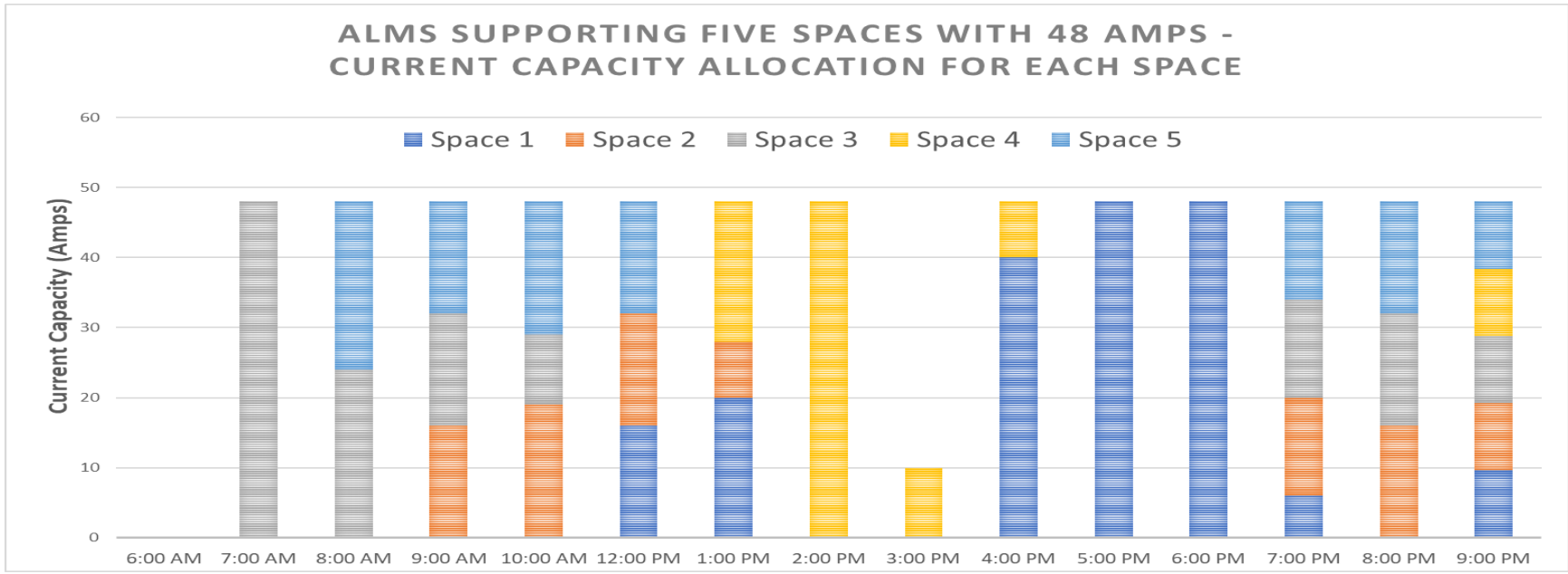
(Charging sessions shortened for impact)

Current Capacity Allocated to Each Space
* EVSE advertises max current capacity to vehicle, vehicle takes the current it needs below that maximum *

Continuous Load Factor 125%

Total Available Panel Capacity (A)	Required Circuit Capacity
48	60

Time of Day	Activity	Space 1	Space 2	Space 3	Space 4	Space 5	Allocated Current Capacity	Unallocated Capacity
09:00 PM	Fleet fills Spaces 1 and 4. ALMS continues "long dwell" charging overnight for all Spaces.	9.6	9.6	9.6	9.6	9.6	48	0



References

Live parking lot with 50 spaces controlled by ALMS

- https://jpl.powerflex.com/d/000000001/arroyo-parking-garage?viewPanel=820&orgId=1&refresh=1m&from=now-7d&to=now

EV Energy Management Systems white paper (CSA Group)

- https://www.csagroup.org/wp-content/uploads/CSA-RR_ElectricVehicle_WebRes.pdf

Electric Vehicle Vectors by Vecteezy

- https://www.vecteezy.com/free-vector/electric-vehicle
- https://www.vecteezy.com/free-vector/car
- https://www.vecteezy.com/vector-art/3373807-electric-vehicle-charging-station-flat-style
- https://www.vecteezy.com/vector-art/7629947-electric-truck-outline-vector-icon-isolated-on-white-background

Executive Order N-79-20

San Francisco Chronicle

California to ban sale of new gas-only cars in 2035 under Newsom order

EXECUTIVE ORDER N-79-20

IT IS HEREBY ORDERED THAT:

1. It shall be a goal of the State that 100 percent of in-state sales of new passenger cars and trucks will be zero-emission by 2035. It shall be a further goal of the State that 100 percent of medium- and heavy-duty vehicles in the State be zero-emission by 2045 for all operations where feasible and by 2035 for drayage trucks. It shall be further a goal of the State to transition to 100 percent zero-emission off-road vehicles and equipment by 2035 where feasible.

…

5. The Energy Commission, in consultation with the State Air Resources Board and the Public Utilities Commission, shall update the biennial statewide assessment of zero-emission vehicle infrastructure required by Assembly Bill 2127 (Chapter 365, Statues of 2018) to support the levels of electric vehicle adoption required by this Order.

Source: Executive Order N-79-20

National Electrical Code (NEC) ALMS Provision

2017 National Electrical Code (NEC) 625.42[1]:

***625.42 Rating**. The equipment shall have sufficient rating to supply the load served. Electric vehicle charging loads shall be considered to be continuous loads for the purposes of this article. Where an automatic load management system is used, the maximum equipment load on a service and feeder shall be the maximum load permitted by the automatic load management system.*

[1]First introduced into the 2014 NEC as 625.41 (adopted in 2016 California Electrical Code)

EV Ready Level 2 Receptacle Configurations

CALGreen EV Residential - **4.106.4.2.2** has specific configurations for Level 2 (208/240V) Receptacles.

NEMA 6-20 (20A circuit, 16A charging)

NEMA 14-30 (30A circuit, 24A charging)

NEMA 14-50 (50A circuit, 40A charging)

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