TRB Webinar: Planning for Growth in Electric Vehicle Charging at Airports

September 11, 2025
1-2:30 PM ET

NATIONAL ACADEMIES Sciences Engineering Medicine

TRB TRANSPORTATION RESEARCH BOARD

ACRP AIRPORT COOPERATIVE RESEARCH PROGRAM

Today's Learning Objectives

1. **Establish a framework for determining needs and gaps in EV charging infrastructure at public parking facilities**

2. **Understand the different use cases for airport vehicle charging and the unique characteristics of each case**

3. **Access tools and resources to assist airports in planning for EV charging**

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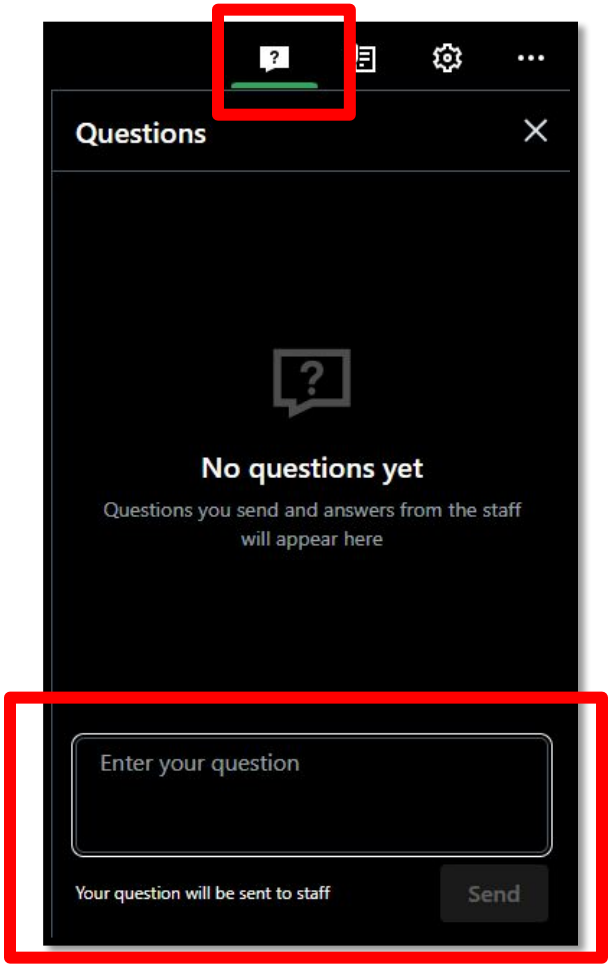
Questions and Answers

Please type your questions into your webinar control panel

We will read your questions out loud, and answer as many as time allows

#TRBwebinar



Kingsley Coppinger
City of Austin – Aviation

- Environmental Conservation Program Manager
- Advances the airport's sustainability and energy efficiency goals

Today's Speakers

Jacqueline Kuzio
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Texas A&M Transportation Institute

Geoff Morrison
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ACRP Synthesis 138

Texas A&M Transportation Institute

Electric Vehicle Charging Stations at Airport Passenger Parking Facilities

Jacqueline Kuzio, Ph.D.
Texas A&M Transportation Institute

Jacqueline Kuzio, Ph.D.
Principal Investigator

- Associate Research Scientist, Texas A&M Transportation Institute
- Program Manager, Investment Analysis

ACRP Synthesis 138 Panel

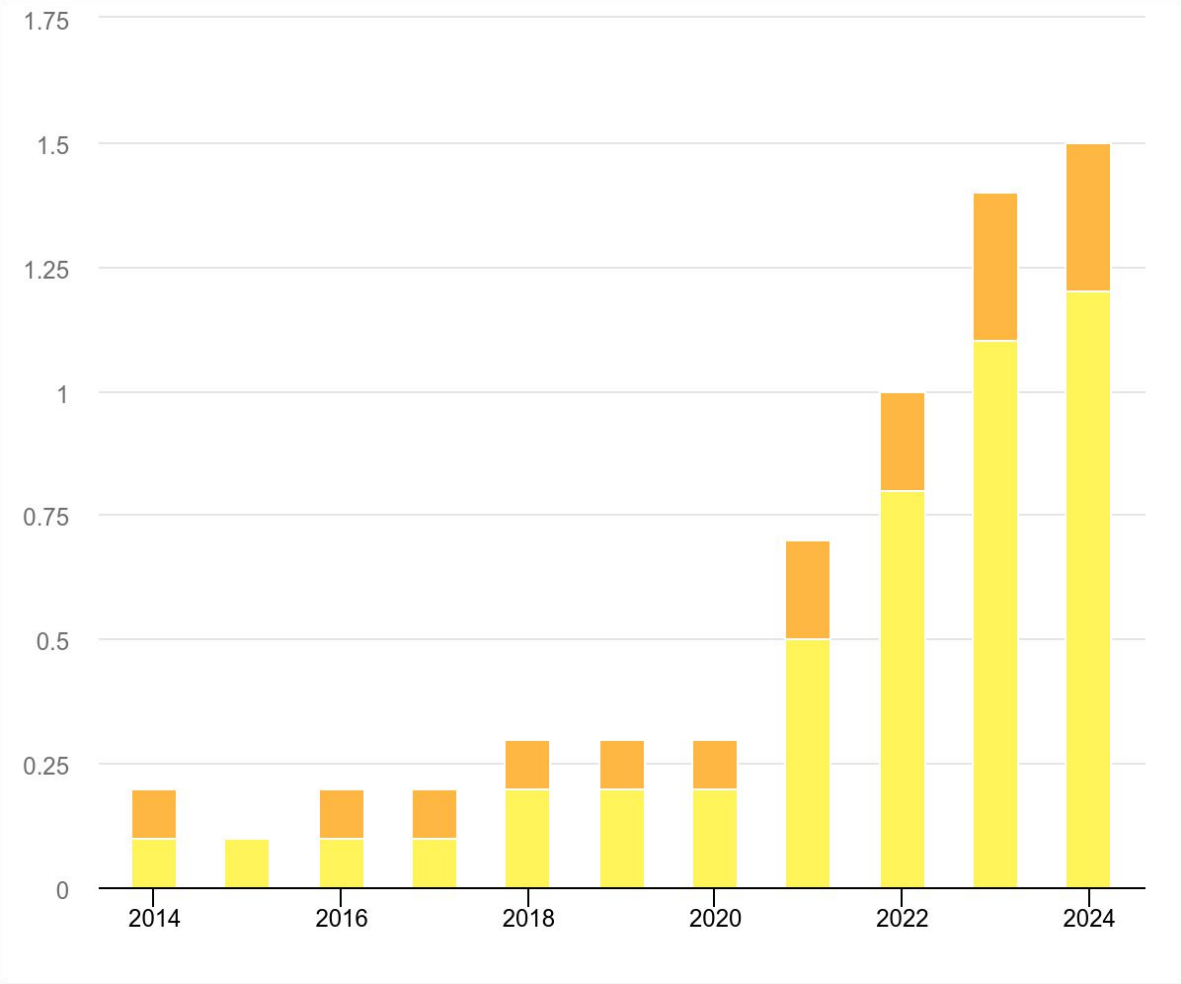
Kingsley Coppinger, City of Austin, TX, Department of Aviation
Brenda L. Enos, TRC
Shailesh Gongal, Massachusetts Port Authority
Casey Lamont, City of Burlington Electric Department,
Heather McKee, Denver International Airport
Sandy Webb, Environmental Consulting Group
Scott Tener, FAA Liaison

Motivation for the Research

- Increasing EV sales in the U.S; growing from 100,000 in 2013 to over 1 million in 2023.
- Limited guidance on the unique passenger use case at airports.
- Updating ACRP Synthesis 54 released in 2014.

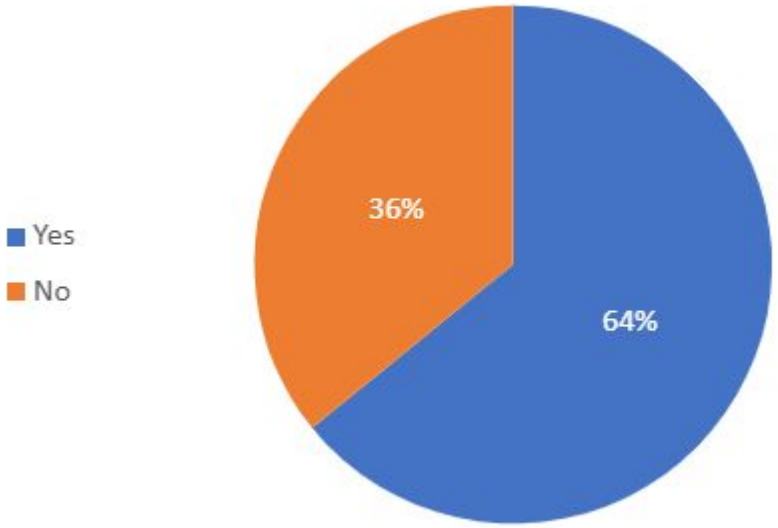
The Changing EV Landscape

U.S. EV Sales 2014-2024 (millions)

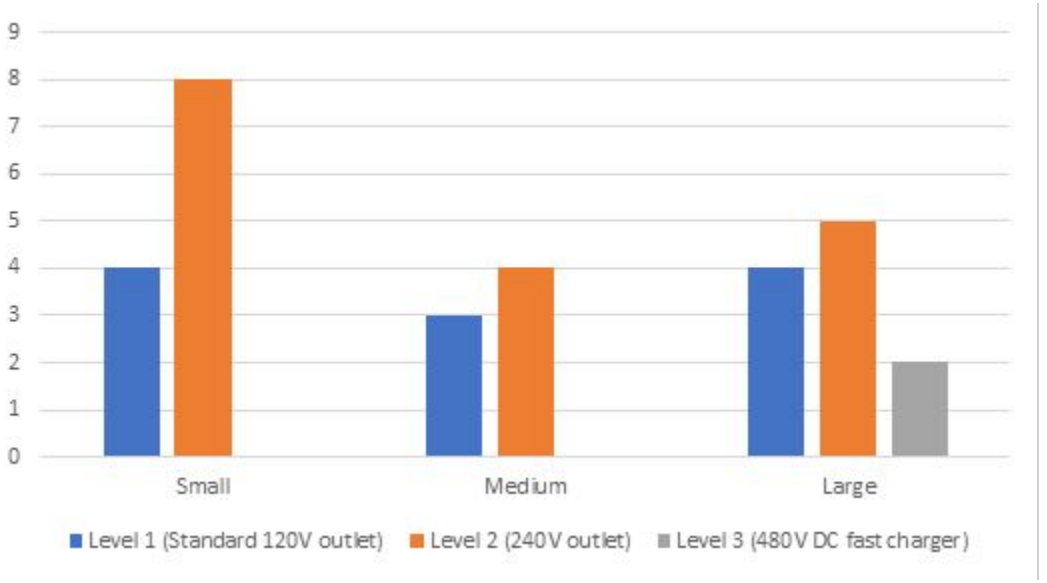


Source: https://www.iea.org/reports/global-ev-outlook-2025/trends-in-electric-car-markets-2

The Changing EV Landscape



Hub Airports with EV Charging



Charging Station Types at Airports by Hub Size

State of the Practice

- Existing Electric Vehicle Infrastructure at Airports
- Parking Use Cases for Different EV Chargers
- Challenges & Opportunities Associated with Charging at Airport Parking Facilities

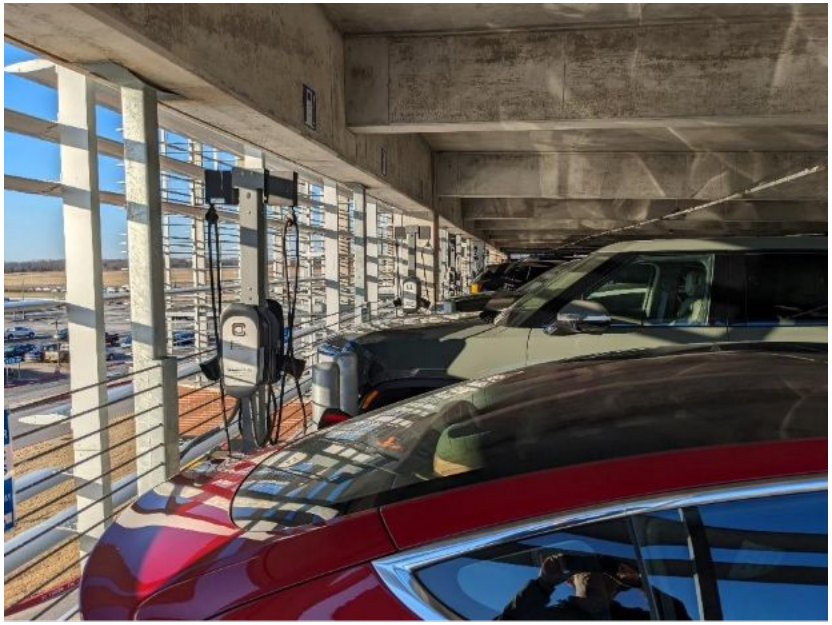
Passenger Parking Use Cases

Short-Term Parking

- Level 2
- Level 3 for pick-up/drop-off*

Long-Term Parking

- Level 1 or 2



Challenges and Opportunities

Challenges

- Location and Demand Management
- Data Collection and Utilization Policies
- Utility Coordination and Load Management
- Investment Costs
- Safety
- Cybersecurity

Opportunities

- Funding
- Revenue Recovery
- Innovative Solutions

The Airport Experience

The Passenger Parking Use Case

Charging Stations and Associated Infrastructure

Funding and Revenue

Safety & Security Considerations

Workforce Needs

Key Decision Points

- Charger Level
- Charger Location
- Networked vs. Non-Networked
- Data Collection
- Energy Management
- Staff Impacts

What type of charger?

	Level 1	Level 2	DC Fast Charging
Connector Type	J1772 Connector 	J1772 Connector 	CCS Connector  CHAdeMO  Tesla Connector 
Voltage	120 V AC	208 – 240 V AC	400 V – 1000 V DC
Typical Power Output	1kW	7kW – 19kW	50 – 350 kW
Estimated PHEV Charging Time from Empty	5 – 6 hours	1 – 2 hours	N/A
Estimated BEV Charge Time from Empty	40 – 50 hours	4 – 10 hours	20 minutes – 1 hour
Estimated Electric Range per Hour of Charging	2 – 5 miles	10 – 20 miles	180 – 240 miles
Typical Locations	Home	Home, Workplace, and Public	Public

Where to locate chargers?

- Facility:
  - New construction vs. retrofit
  - Centralized vs. across all parking facilities.

- Within the facility:
  - Visibility
  - Accessibility

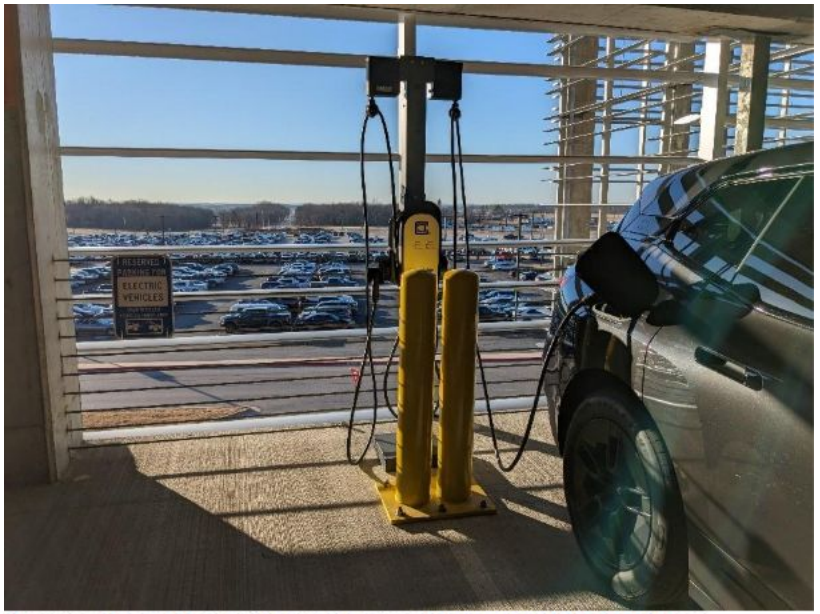


Figure 2. EV Parking Signage at Northwest Arkansas National Airport
Source: Northwest Arkansas National Airport

Whether to use network or non-network chargers?

Factors to Consider

- Parking Facility/Use Case
- Number of Assets
- Cost
- Cybersecurity

Benefits of Network Chargers

- Ease of monitoring
- Payment system
- Load management strategies
- Maintenance

What are the total energy needs?

- Understanding total airport energy needs
- Coordinating with utility on existing and future needs
- Load management strategies

When, and how, to collect data?

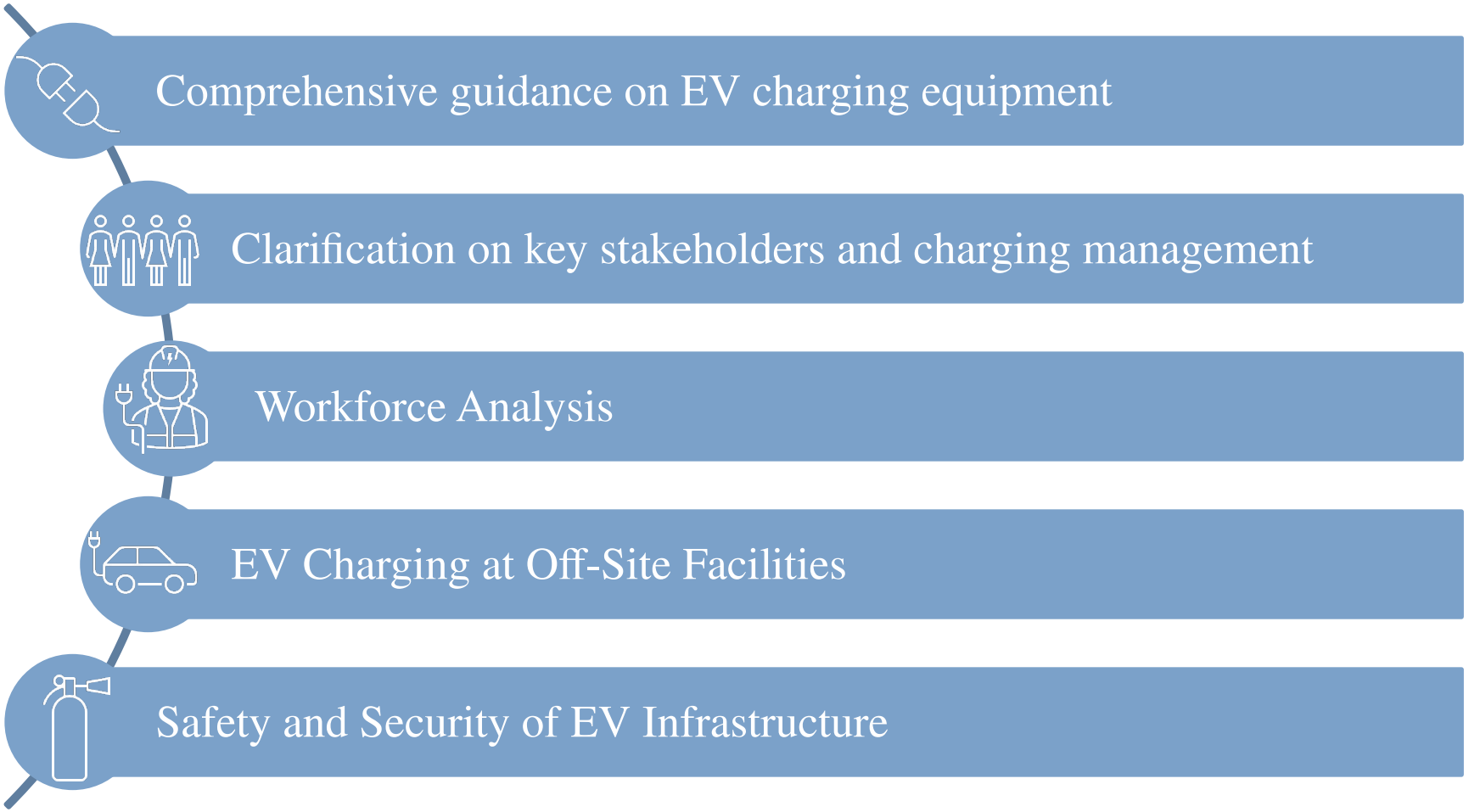
Potential data collection needs:

- Tax reporting,
- Environmental metric tracking,
- Power consumption,
- Dwell time on chargers,
- Uptime and maintenance needs, and
- Reporting for environmental or accreditation programs.

What are the staffing needs?

- Can existing staff handle maintenance?
- Is additional training required?
- At what point would additional staff be required?

Remaining Research Needs



ACRP Project 03-71

CADMUS

Planning for EV Growth at Airports

Geoff Morrison, Cadmus
Rex Hazelton, Cadmus

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TRB TRANSPORTATION RESEARCH BOARD

ACRP AIRPORT COOPERATIVE RESEARCH PROGRAM

Geoff Morrison, PhD, PMP
Principal Investigator

- Principal Consultant, Cadmus
- Technical lead for 50+ electric vehicle planning projects
- PI/PM on 5 prior ACRP projects
- Former Navy Nuclear Officer

Rex Hazelton, PMP
Project Manager

- Senior Associate, Cadmus
- Currently leading Interstate 95 EV charging corridor implementation
- Electric vehicle fire safety certification
- Proud owner of Hyundai Ioniq 5

ACRP 03-71 Oversight Panel

Katie Zarachowicz, City and County of Denver

Janet Birch, Alaska Airlines, Inc.

Adam Cohen, University of California, Berkeley

Kingsley Coppinger, City of Austin, TX, Department of Aviation

Jonathan Ells, Eastern Research Group

Andrew Jones, Hartsfield Jackson Atlanta International Airport

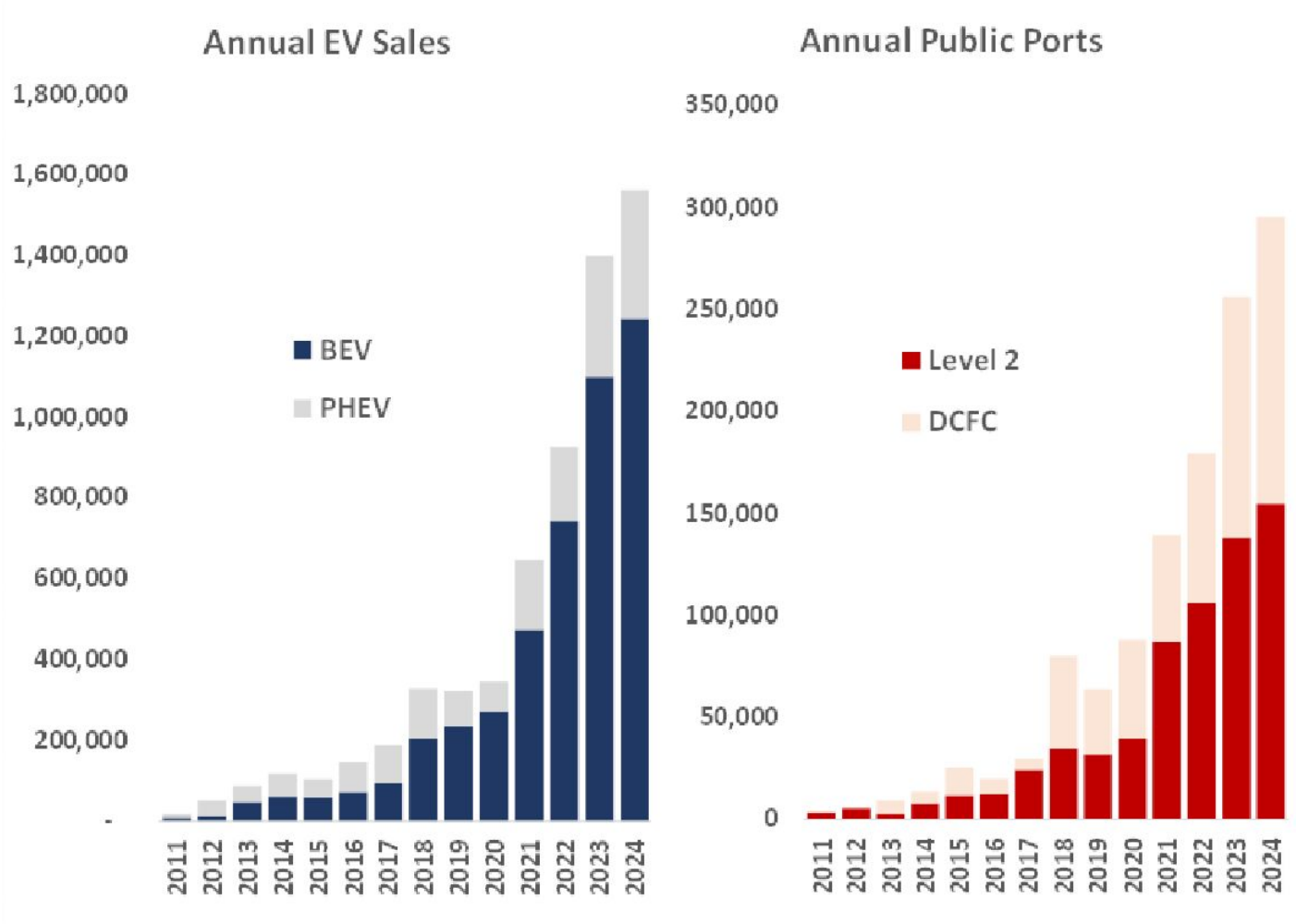
Jacqueline Kuzio, Texas A&M Transportation Institute

Matt Griffin, ACRP Senior Program Officer

Motivation for Project

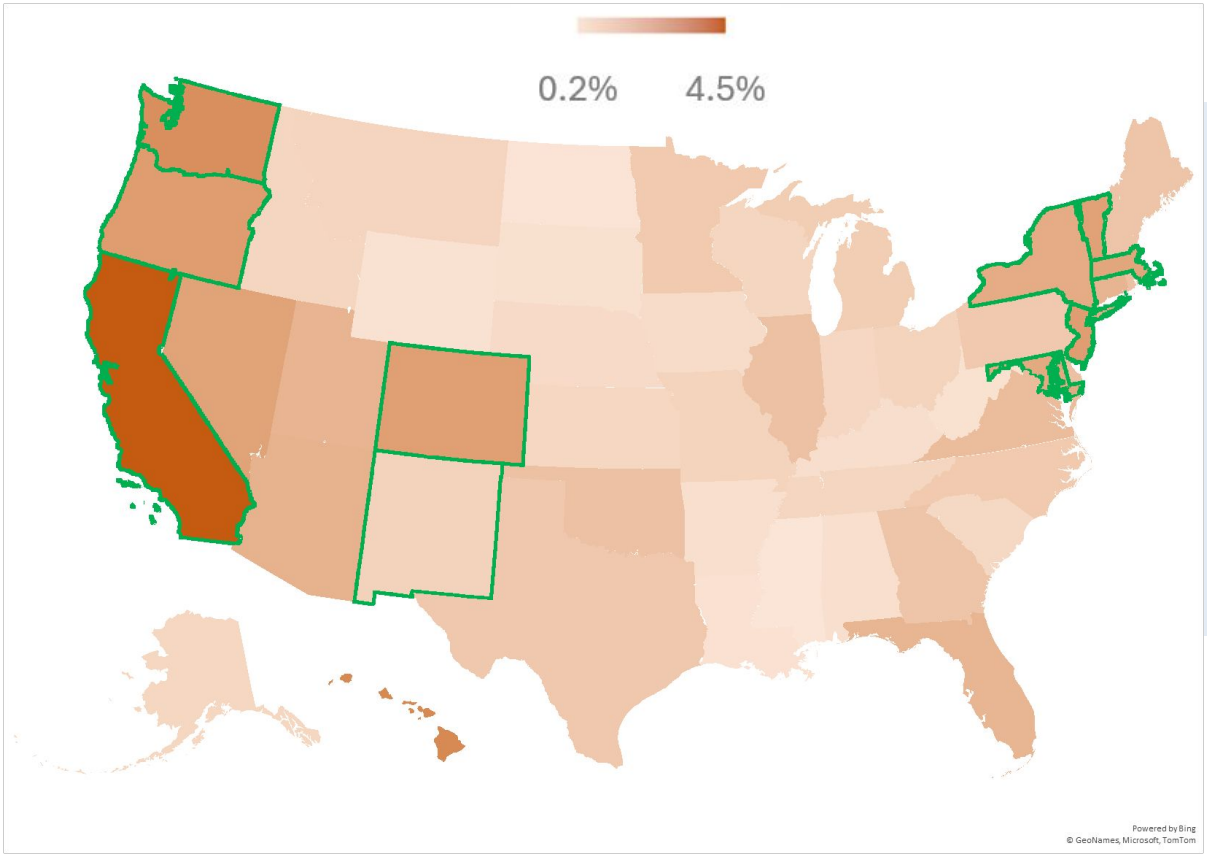
- EVs accounted for 10% of new vehicles in the US in 2024 (30% in some jurisdictions)
- Airports are rapidly building charging stations on both the landside and airside
- The airport community lacks resources on key concepts and best practices

Background


Annual EV Sales
1,800,000
1,600,000
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
-
BEV
PHEV
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
Annual Public Ports
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
Level 2
DCFC
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024

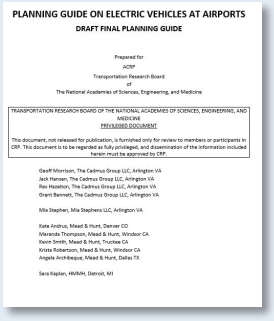
Background

EVs as Percentage of Total Vehicle Stock, 2024



- States in green adopted Advanced Clean Cars II (ACC II) regulation
- Numerous states that have not adopted ACCII see high levels of EV adoption, including Arizona, Florida, Hawaii, Utah and Connecticut.

Key Products from ACRP 03-71


PLANNING GUIDE ON ELECTRIC VEHICLES AT AIRPORTS
DRAFT FINAL PLANNING GUIDE

Prepared for
ACRP
Transportation Research Board
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The National Academies of Sciences, Engineering, and Medicine

TRANSPORTATION RESEARCH BOARD OF THE NATIONAL ACADEMIES OF SCIENCES, ENGINEERING, AND MEDICINE
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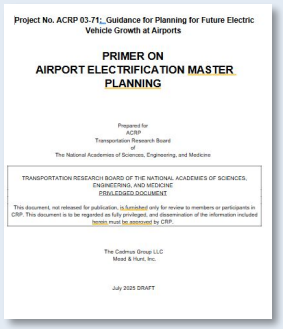
Electric Vehicle Planning Guide


Project No. ACRP 03-71: Guidance for Planning for Future Electric Vehicle Growth at Airports

PRIMER ON
AIRPORT ELECTRIFICATION MASTER PLANNING

Prepared for
ACRP
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The Cadmus Group LLC
Mead & Hunt, Inc.

July 2025 DRAFT

Primer on Airport Electrification Master Planning

Planning Tool for Airports


Output Summary

Key Summary Outputs	
Total L1 Ports	146
Total L2 Ports	510
Total DCFC Ports	885
Installed Site Capacity (kW)	58,203
Annual Energy Consumption in 2035 (MWh)	40,338
Highest Peak Load (kW)	41,906
Managed Flat Load (kW)	1,746
Avg. Cost Per Parking Space ($/port)	$31,366
Avg. Cost Per Kilowatt of Installed Charging Capacity ($/kW)	$831

Total Cumulative Cost Breakdown by Category

Total Cumulative Cost Breakdown by Use Case

DETAILED OUTPUTS

Year	Total Cumulative L1 Ports Needed	Total Cumulative L2 Ports Needed	Total Cumulative DCFC Ports Needed	Cumulative Cost of Installing All Ports	Annual Electricity Consumption from EVs (MWh)	Peak Load (kW) (Assumes 80% of ports used concurrently)
2025	4	39	126	$11,866,696	5,640	5,496
2026	8	70	197	$14,905,562	7,097	8,794
2027	42	97	268	$17,934,944	10,861	12,101
2028	47	184	339	$21,338,716	14,616	16,059
2029	51	211	410	$26,482,230	17,255	19,340
2030	80	273	481	$30,869,281	20,852	22,768
2031	84	357	552	$34,252,985	24,623	26,817
2032	88	414	623	$37,461,027	28,464	30,205
2033	92	456	694	$40,571,479	32,162	33,540
2034	128	483	814	$45,316,941	36,431	38,613
2035	146	510	885	$48,337,503	40,338	41,906

Total L1 Ports Needed

Total L2 Ports Needed

Total DCFC Ports Needed

Cumulative Cost of Installing Needed Ports

Annual Electricity Consumption (MWh)

Peak Load (kW)

Electric Vehicle Use Cases at Airports

Use Cases are vehicle-charger combinations, defined by their unique operational and charging characteristics (e.g., duty cycle, power level, plug type, time of use, load curve).

Level 1 <1.9 kW 

Level 2 <19.2 kW 

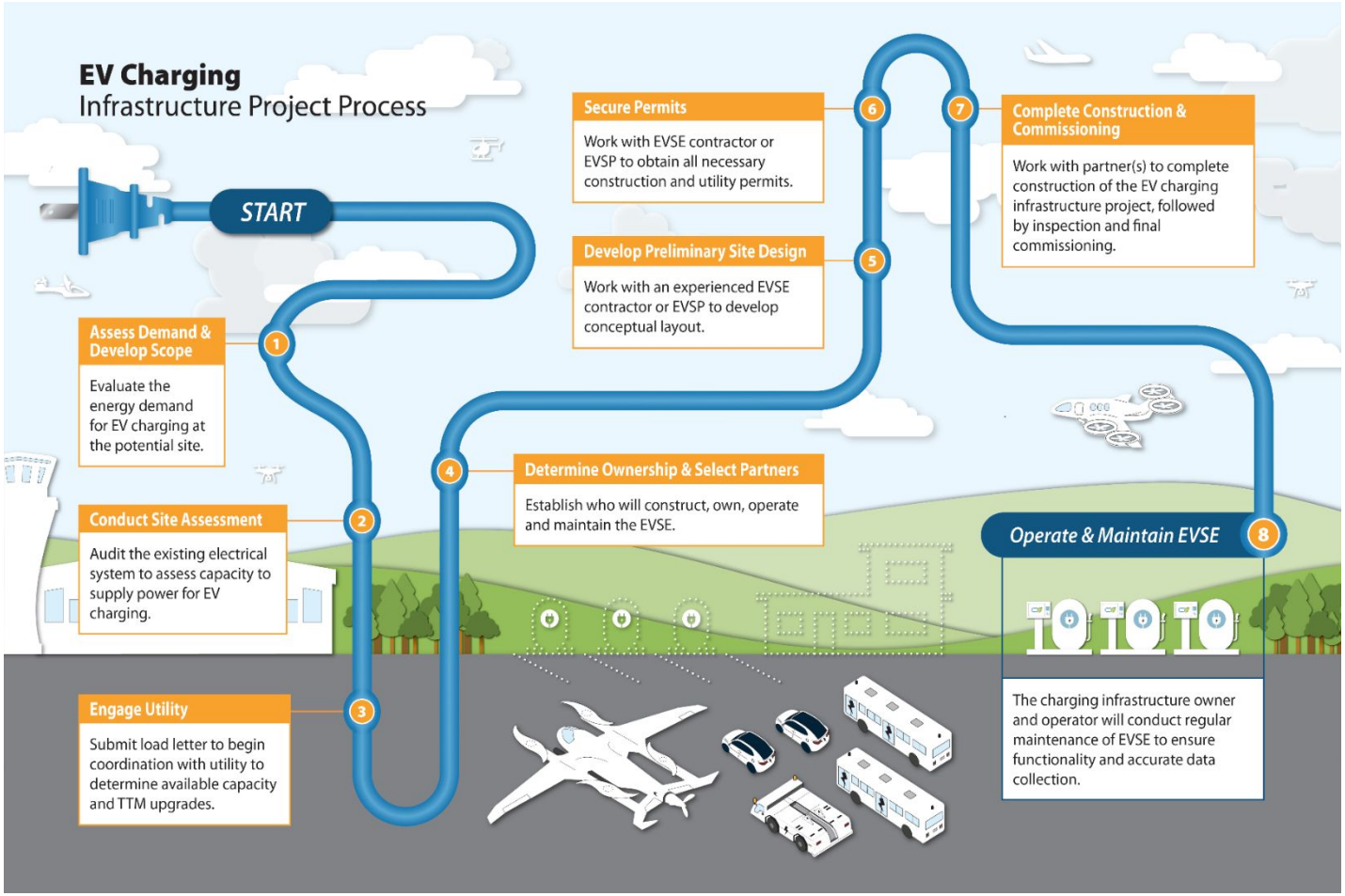
DCFC 50kW+ 

											
Use Case	Long-Term Parking	Short-Term Parking	Employee Parking	Peer-to-Peer Car Share	Rental Cars	For Hire Vehicles	Bus & Shuttlebus	Airport Fleet Vehicles	Non-Airport Owned Airside Vehicles	Ground Support Equipment	Electric Aircraft
Location	Landside	Landside	Landside	Landside	Landside	Landside	Airside and Landside	Airside and Landside	Airside	Airside	Airside
Access	Public	Public	Public and Restricted	Public	Public and Restricted	Public	Public and Restricted	Public and Restricted	Restricted	Restricted	Restricted
Dwell Time	Days to Weeks	Hours or Days	Hours	Hours to Days	Minutes, Hours or Days	Minutes to Hours	Minutes to Hours	Minutes, Hours or Days	Minutes, Hours or Days	Minutes to Hours	Minutes to Hours
Charger Owner	Airport, Third Party	Airport, Third Party	Airport, Third Party	Airport, Third Party	Airport, RAC, Third Party	Airport, TNC, Taxi, Third Party	Airport, Third Party	Airport, Third Party	Airport, Tenant, Third Party	Airport, Airline, FBO, Third Party	Airline, FBO, Third Party
Charging Port Type	J1772, J3400	J1772, J3400, CCS	J1772, J3400	J1772, J3400, CCS	J1772, J3400, CCS	J3400, CCS	J1772, J3400, CCS	J1772, J3400, CCS	J1772, J3400, CCS, Proprietary	J1772, J3400, CCS, Proprietary	CCS, MCS, Proprietary
Charging Power Level											

Steps to Install Charging

Learning Application 1

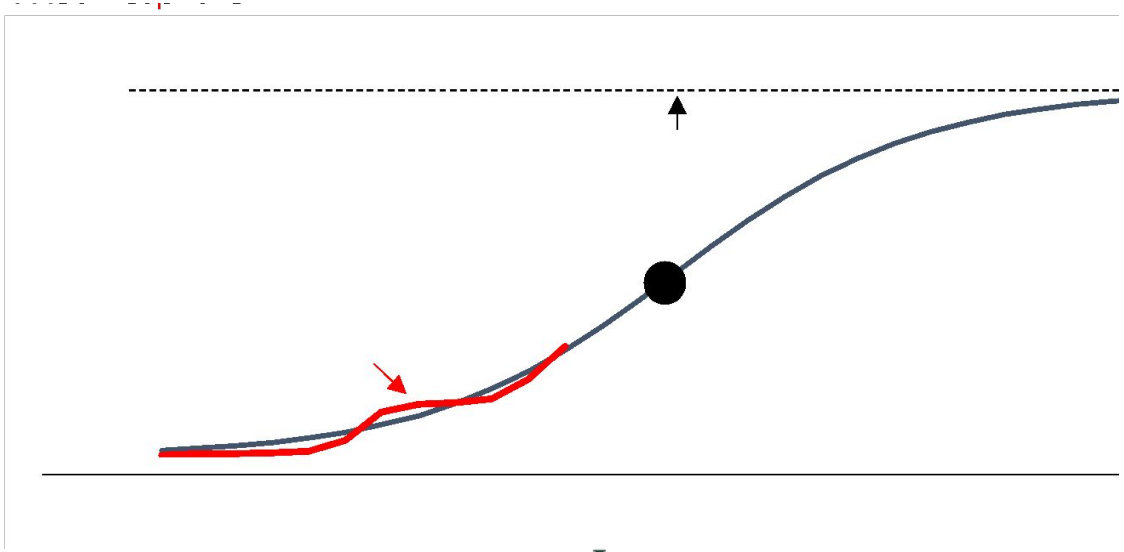
Question: What are the steps to installing charging infrastructure?



Load Forecasting for Public/Rental EVs

Learning Application 2

Question: What will EV load be in 3, 5, 10, 20 years?



$$S_i = \frac{L}{\left(1 + e^{\left(-k*\left(x_i - x_0\right)\right)}\right)}$$

Load Drivers:

- Number of EVs in airport catchment area
- Number and type of ports
- Pricing of charging
- Proximity of airport to population center

Demand Charges
Learning Application 3

Question: What are the financial impacts of demand charges?

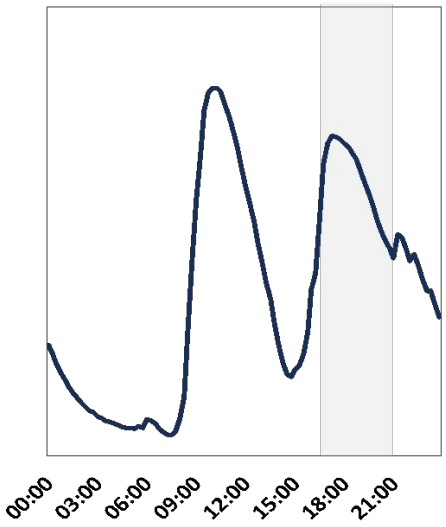
EXAMPLE: Station at an airport CONRAC has eight 150 kW DCFC ports which are sometimes used concurrently:

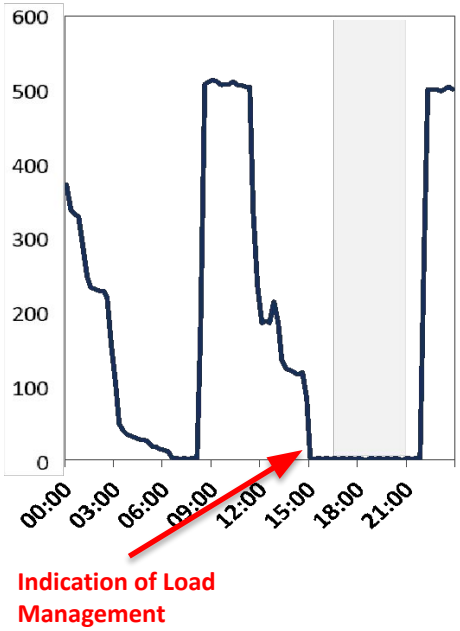
- **Scenario 1:** Simultaneous charging at rated capacity is 150 kW x 8 = **1,200 kW**
- **Scenario 2**: Power sharing with a not-to-exceed power of **300 kW**

If the demand charge is $10/kW, savings under Scenario 2 are **$9,000** per month

Load Management
Learning Application 4

Question: How can airports ensure fleets are actively managing load?





- To spot load management in load shapes look for drop offs in high-cost periods, typically around 4 PM.
- Many fleets don't practice load management because of lack of knowledge or communication failures between drivers, fleet managers, and finance departments.

Charger Selection
Learning Application 5

Question: What mix of chargers is needed in the long-term parking facility?

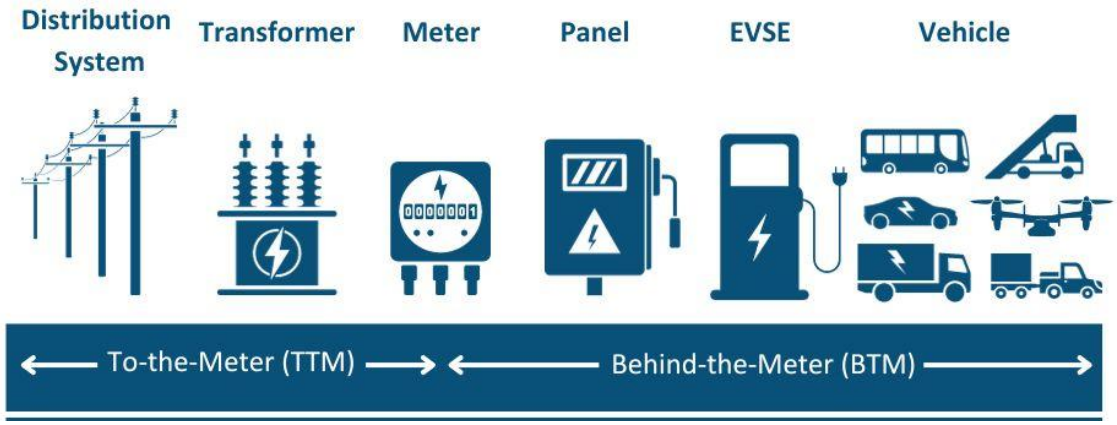
- What is the profile of travelers in the parking facility?
- What is their dwell time?
- What is the expected EV population in the catchment area?
- What fraction of vehicles need are low on fuel?
- What are the ADA requirements in your state?

Cost to Install Charging
Learning Application 6

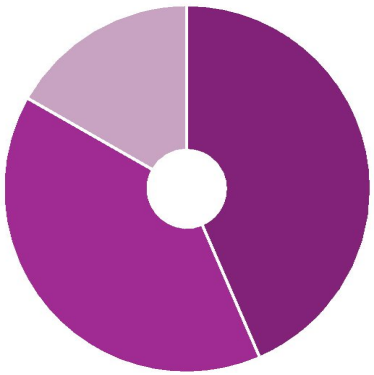
Question: You have an $820,000 budget. Should you invest in L1, L2, or DCFC ports in your passenger parking?

Assuming new surface lot construction, for the same budget you could either install:

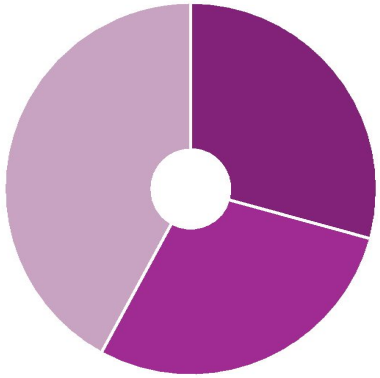
- 800 L1 ports
- 50 L2 ports
- 18 50 kW ports
- 4 350 kW ports



50 x L2 Ports (19kW)



4 x 350 kW Ports



Rental Car Scenario
Learning Application 7

Scenario:

- Installation of a new rental car surface lot facility in Tucson AZ
- 60 ports being installed in phases between 2027-2030
- 54 Level 2 (19.2 kW)
- 6 DC Fast Charge (150 kW)

BASIC INPUTS

Instructions: Enter inputs to yellow cells. View outputs in purple cells and graphs.

	User Inputs	Units	Notes
State	AZ	State Abbreviation	Select your state.
Airport Metro Area	Tucson, AZ	N/A	Select your metro area. This auto-populates EV projections.
Type of Facility (Optional)	Surface Lot	N/A	Select type of parking facility. This impacts the cost of installation.
Type of Building Project (Optional)	New Facility Construction	N/A	Select type of building project. This impacts the cost of installation.
Required Electrical Infrastructure Upgrades	Low	None/Low/High	Click on input cell to see instructions.
Year of Distribution System Upgrades (Optional)	2028	N/A	Select the year in which distribution system upgrades will occur. Default 2025.
Total Rental Car Parking Spaces	300	Parking Spaces	Enter the number of parking spaces for all vehicles.
Maximum EV-Ready Parking Spaces	20%	%	Enter the maximum percentage of EV-ready spaces.
L2 Power Capacity (Optional)	19.2	kW	Enter the power capacity of the L2 ports. Default 19.2 kW
DCFC Power Capacity (Optional)	150	kW	Select the power capacity of the DCFC ports to be installed. Default 50 kW

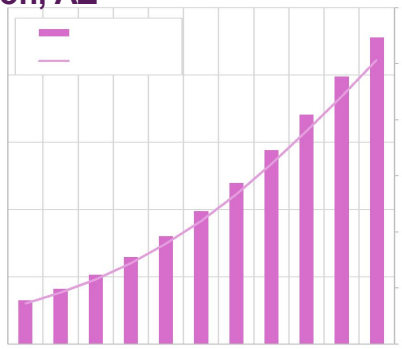
CHARGING INPUTS

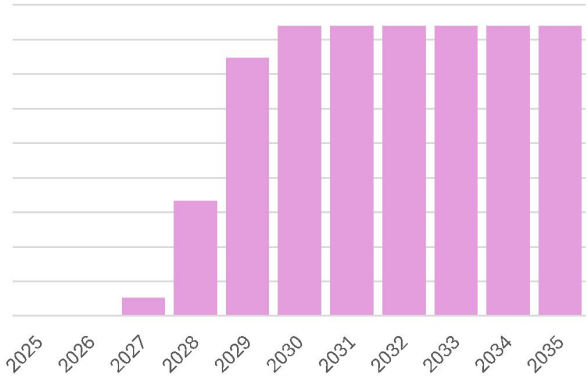
Instructions: Allocate the 60 charging ports between years in the yellow cells based on the planned development timeline

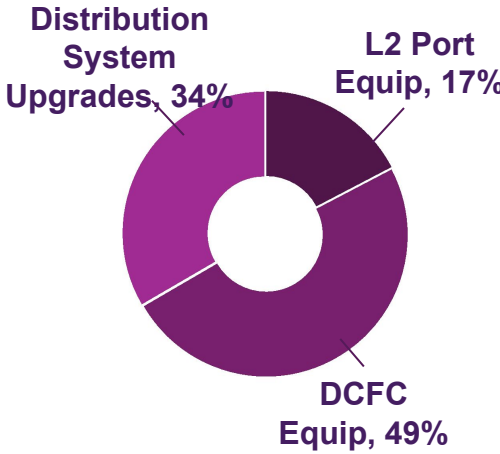
Installed Charging Ports Target	60			Remaining Charging Ports to Allocate		0							
Project Year	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	Total by Type	% by Type
Level 2 Charging Ports			20			34						54	90%
DCFC Charging Ports					6							6	10%
Total Installations	0	0	20	0	6	34	0	0	0	0	0	60	
% of Total Installations	0%	0%	33%	33%	43%	100%	100%	100%	100%	100%	100%		

Rental Car Scenario
Learning Application 7

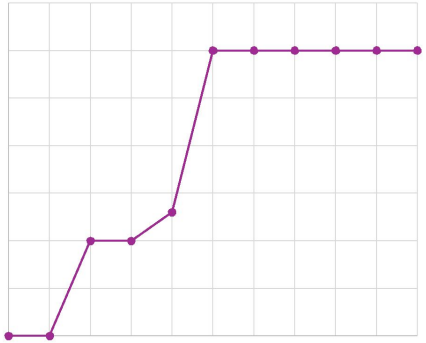
Estimated EV Population in Tucson, AZ

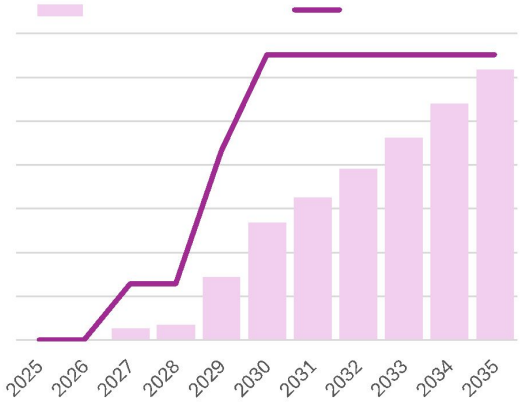






Cumulative Ports





Long-Term Parking Scenario
Learning Application 8

Scenario:

- Renovation of existing airport fleet vehicle lot.
- Project starts in 2027.
- Facility has 250 vehicles, 80% of which will be electrified by 2035 (planned acquisitions in 2028, 2030, and 2032).
- Four vehicles will share each port.
- 80% of ports L2 (19.2 kW)
- 20% of ports DCFC (50 kW)

BASIC INPUTS

Instructions: Enter inputs to yellow cells. View outputs in purple cells and graphs.

	User Inputs	Units	Notes
Total Vehicles in Operation	250	Vehicles	Enter total number of vehicles operating for this use case.
Target EV Adoption Proportion	80%	%	Enter the target maximum proportion of fleet to be electrified.
Vehicle to Port Ratio (Optional)	4	Vehicles per Port	Enter the ratio of vehicles to charging ports.
Type of Building Project (Optional)	Renovation at Existing Facility	N/A	Select the type of building project.
Required Electrical Infrastructure Upgrades	Low	None/Low/High	Select the level of electrical infrastructure upgrades needed.
Year of Distribution System Upgrades (Optional)	2027	N/A	Select the year in which distribution system upgrades are planned to occur. Default: 2025
L2 Power Capacity (Optional)	19.2	kW	Enter the power capacity of the L2 ports to be installed. Default: 19.2 kW
DCFC Power Capacity (Optional)	50	kW	Select the power capacity of the DCFC ports to be installed. Default: 50 kW

FLEET INPUTS

Instructions: Allocate the 200 electric vehicles between years in the yellow cells based on the planned development timeli

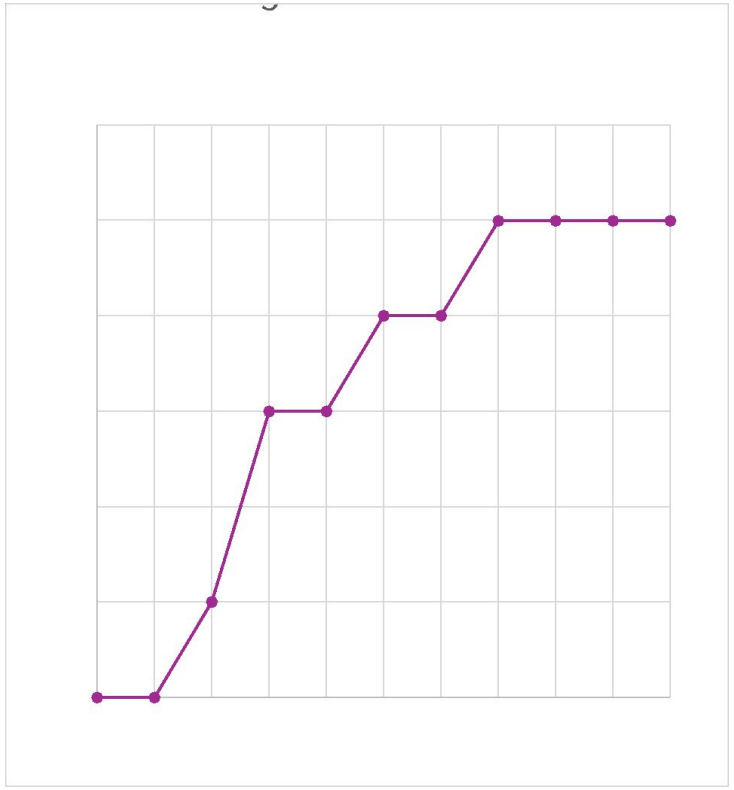
EVs Operating in Fleet Target	200			Remaining EV Procurements to Allocate			0						
Project Year	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	Total	
EVs Procured for Use Case				100		60		40				200	
% of Total Installations	0%	0%	0%	50%	50%	80%	80%	100%	100%	100%	100%		

CHARGING INPUTS

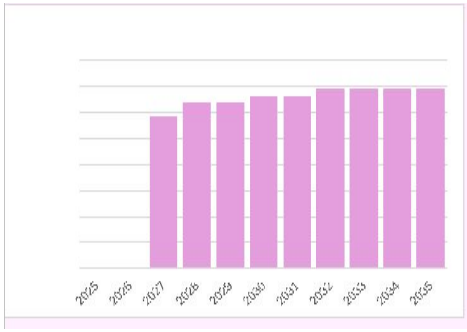
Instructions: Allocate the 50 charging ports between years in the yellow cells based on the planned development timeline

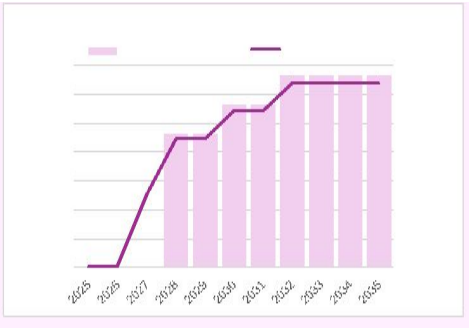
Installed Charging Ports Target	50			Remaining Charging Ports to Allocate			0						
Project Year	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	Total by Type	% by Type
Level 2 Charging Ports				20		10		10				40	80%
DCFC Charging Ports			10									10	20%
Total Installations	0	0	10	20	0	10	0	10	0	0	0	50	
% of Total Installations	0%	0%	20%	60%	60%	80%	80%	100%	100%	100%	100%		

Long-Term Parking Scenario
Learning Application 8

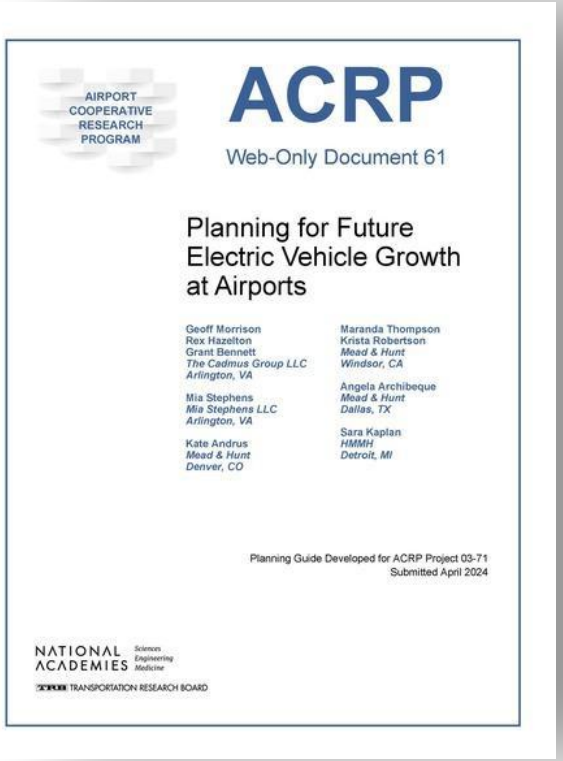


Year	Annual Electricity Consumption from EVs (MWh)	Annual Peak Load (kW) *(Assumes 80% of ports used concurrently)*
2025	0	0
2026	0	0
2027	0	288
2028	929	509
2029	929	509
2030	1,131	620
2031	1,131	620
2032	1,333	730
2033	1,333	730
2034	1,333	730
2035	1,333	730





FOR ADDITIONAL INFORMATION



Download here:
https://nap.nationalacademies.org/catalog/27889/planning-for-future-electric-vehicle-growth-at-airports

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October 30, 2025

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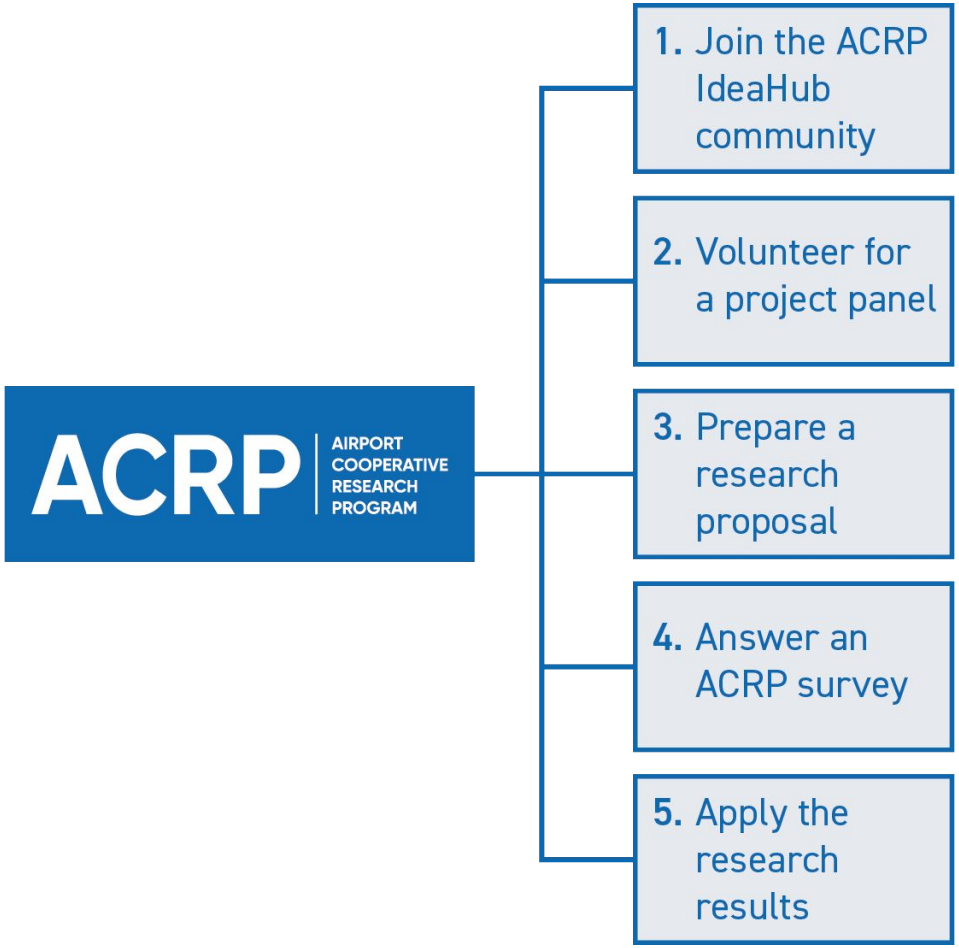

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