

ELECTRIC VEHICLES FOR YOUR BUSINESS

AN INTRODUCTION TO TRANSPORTATION ELECTRIFICATION

2020 PNM ENERGY SOLUTIONS WEBINAR SERIES

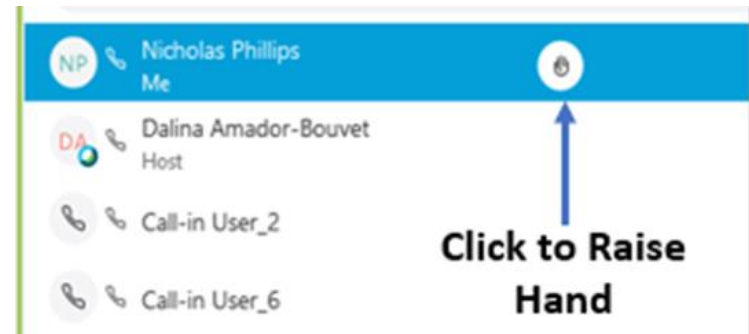


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HOUSEKEEPING

- You will receive an email with a link to [PNM.com/business-events](https://www.pnm.com/business-events), where you can access today's recorded webinar and presentation.
- All participants will be on mute upon entering. We will address questions at the end of the webinar. Please raise your hand by selecting **(*3)** on your phone to be unmuted or use the chat icon if you have a question.
- We are committed to answering all submitted questions. If we are unable to get to them today, we will provide a response after the presentation.



ABOUT PNM

PUBLIC SERVICE COMPANY OF NEW MEXICO

- Founded in 1917
- New Mexico based energy company focused on clean energy transformation
- Over 500K retail customers
- 2,811 MW resource portfolio
- Over 15K miles transmission and distribution lines



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TODAY'S SPEAKERS



Alaric Babej
Program Manager



Travis Suazo
Sr. Account Manager



Colin Messer
Director
Land of Enchantment Clean Cities



Kelsey Rader
Sustainability Officer
City of Albuquerque



Laura Vanoni
Planner
Pueblo of Sandia



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AGENDA

1) PNM Topics



Introduction to EV's



Economics of EV's



Charging Infrastructure



PNM EV Efforts

2) Panel Presentations



Statewide Efforts

Colin Messer
Land of Enchantment Clean Cities Coalition



Fleet Electrification

Kelsey Rader
City of Albuquerque



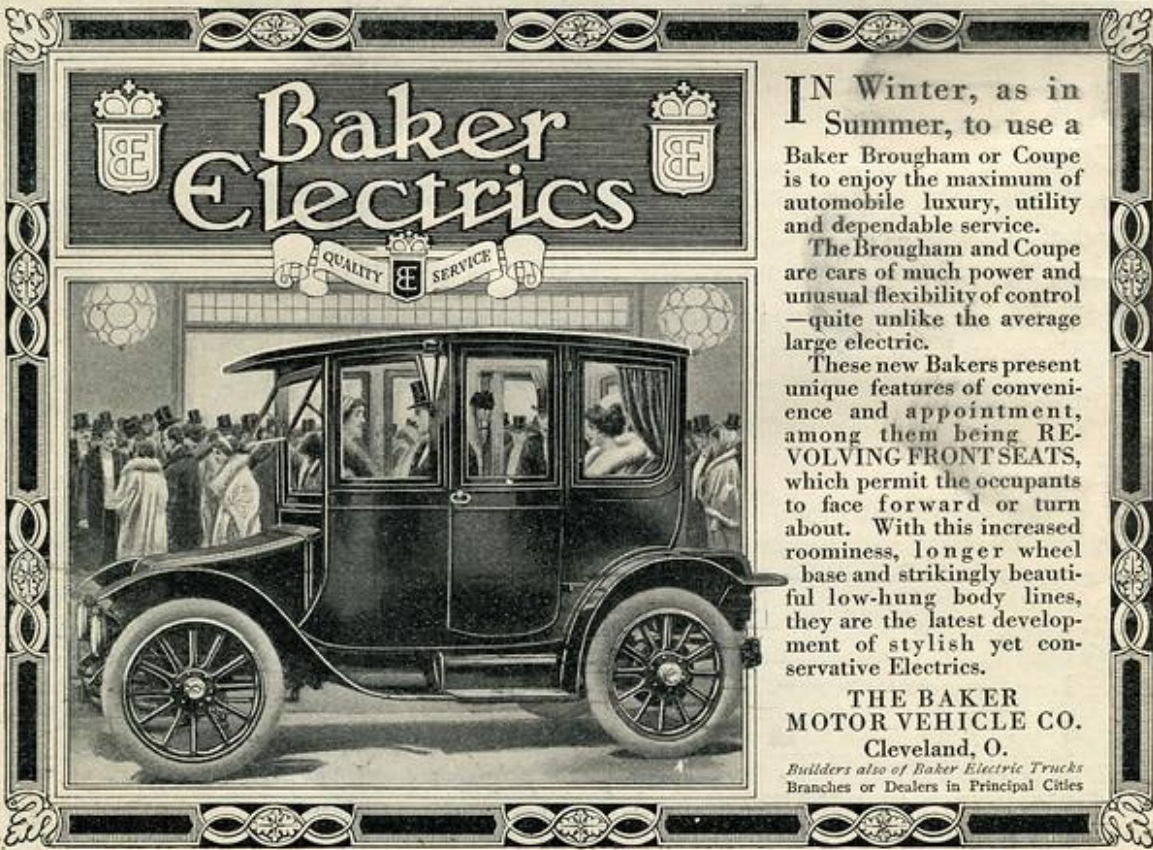
Charging Station Installation

Laura Vanoni
Pueblo of Sandia



Questions

INTRODUCTION TO ELECTRIC VEHICLES



**Baker
Electrics**

QUALITY SERVICE

IN Winter, as in Summer, to use a Baker Brougham or Coupe is to enjoy the maximum of automobile luxury, utility and dependable service. The Brougham and Coupe are cars of much power and unusual flexibility of control—quite unlike the average large electric. These new Bakers present unique features of convenience and appointment, among them being **REVOLVING FRONT SEATS**, which permit the occupants to face forward or turn about. With this increased roominess, longer wheel base and strikingly beautiful low-hung body lines, they are the latest development of stylish yet conservative Electrics.

**THE BAKER
MOTOR VEHICLE CO.**
Cleveland, O.
*Builders also of Baker Electric Trucks
Branches or Dealers in Principal Cities*

When answering advertisements it is of advantage to mention McClure's.

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ELECTRIC VEHICLES (EV)

TYPES AND DEFINITIONS

Type	Definition
ICE	Internal Combustion Engine
Hybrid	ICE that charges electric system
PHEV	Plug-In Hybrid Electric Vehicle
BEV	Battery Electric Vehicle

The infographic illustrates the differences between four vehicle types: Conventional, Hybrid, Plug-In Hybrid, and All-Electric. It shows the energy source, consumption, emissions, and examples for each.

	CONVENTIONAL	HYBRID	PLUG-IN HYBRID	ALL -ELECTRIC
Sources of Energy				
Consumption				
Emissions				
Examples		Toyota Prius (C, V) Ford C-Max, Fusion Hybrid Hyundai Sonata Hybrid Volkswagen Jetta Hybrid Lexus RX 450h Infinity Q70 Hybrid	Ford C-Max, Fusion Energi Honda Accord PHV Chevy Volt Toyota Prius PHV Cadillac ELR Porsche Panamera S E-Hybrid	Nissan Leaf Tesla Model S BMW i3 Mitsubishi MiEV Chevrolet Spark EV

COURTESY ON: team-BHP.com

ELECTRIC VEHICLES (EV)

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	CONVENTIONAL	HYBRID	PLUG-IN HYBRID	ALL -ELECTRIC
Sources of Energy				
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Examples		Toyota Prius (C, V) Ford C-Max, Fusion Hybrid Hyundai Sonata Hybrid Volkswagen Jetta Hybrid Lexus RX 450h Infinity Q70 Hybrid	Ford C-Max, Fusion Energi Honda Accord PHV Chevy Volt Toyota Prius PHV Cadillac ELR Porsche Panamera S E-Hybrid	Nissan Leaf Tesla Model S BMW i3 Mitsubishi iMIEV Chevrolet Spark EV

Source: Team-BHP.com

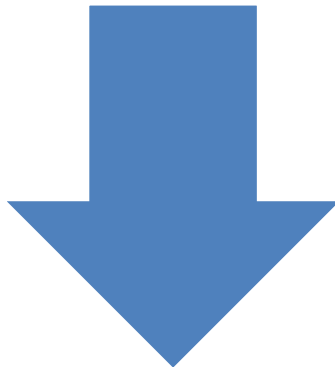
ELECTRIC VEHICLES (EV)

TRADE-OFFS FOR ADOPTION



Benefits

- Reduced & More Stable Fuel Cost
- Lower Maintenance Costs
- Environmentally Friendly



Barriers

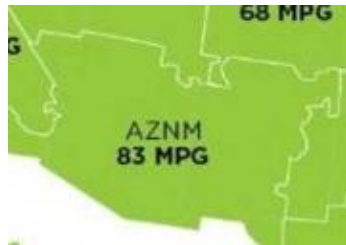
- Knowledge about EVs and Infrastructure
- Limited Vehicle Availability
- Often Higher Upfront Purchase Cost
- Range Anxiety due to Limited Charging Infrastructure

ELECTRIC VEHICLES (EV)

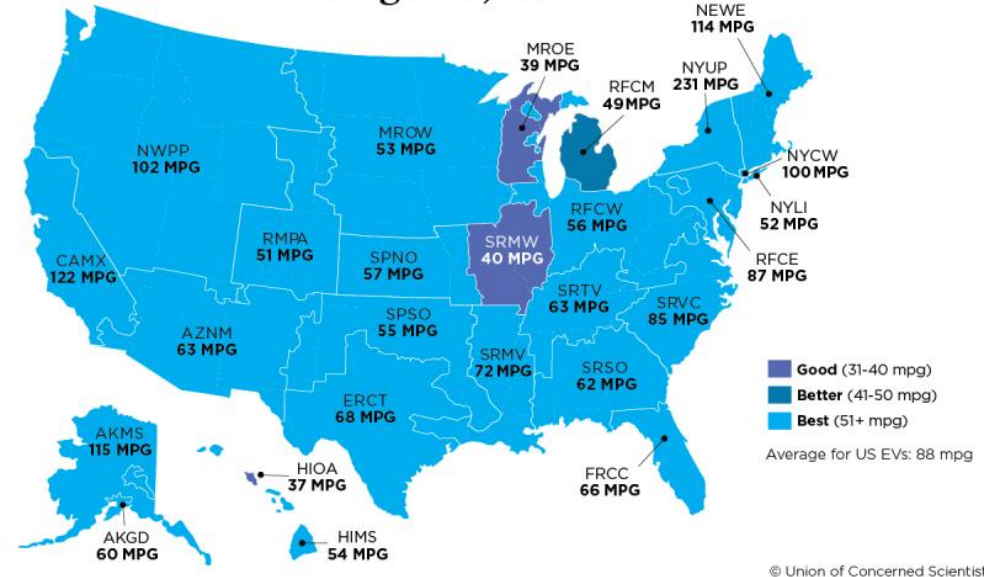
ENVIRONMENTAL ATTRIBUTES

In 2018, the average EV in New Mexico gets the equivalent of 63 MPG, while the most efficient EVs got 83 MPGe.

EVs will continue to get cleaner through the Energy Transition Act.



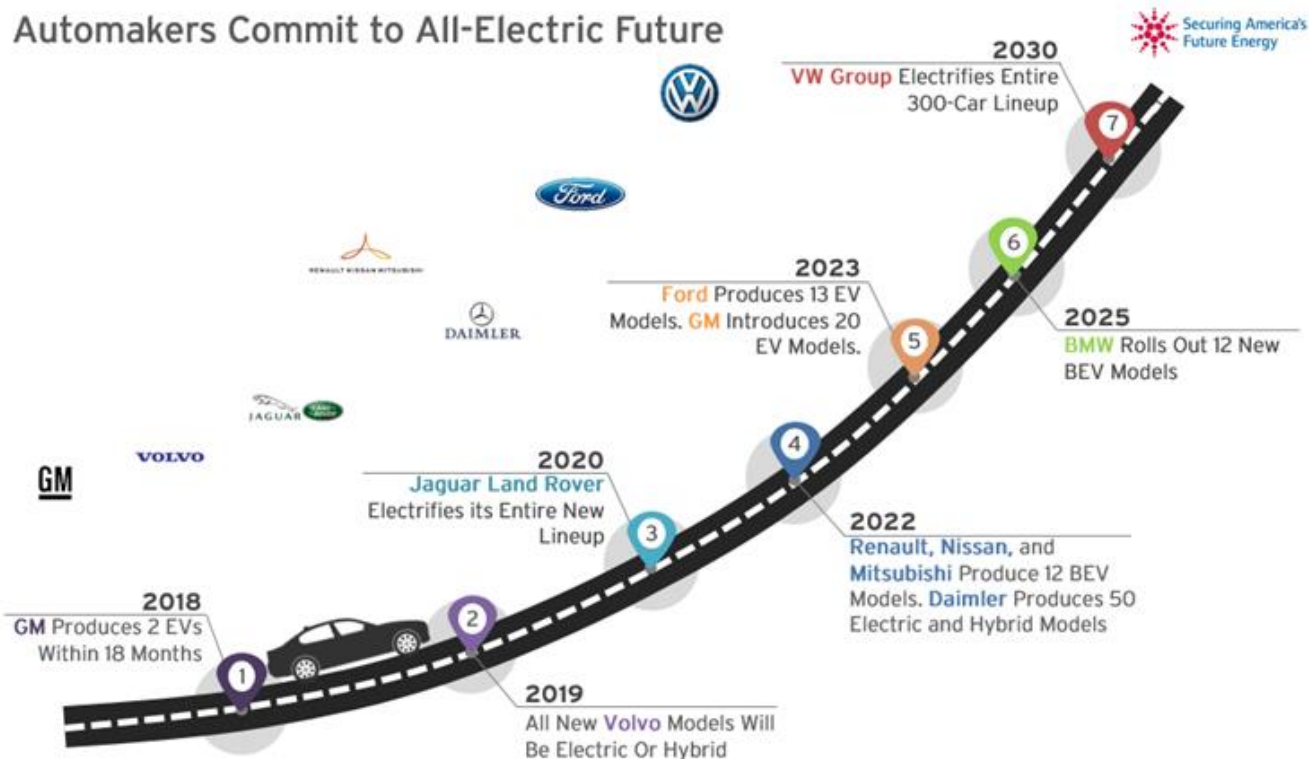
EV Emissions as Gasoline MPG Equivalent Average EV, 2018



ELECTRIC VEHICLES (EV)

VEHICLE AVAILABILITY

Automakers Commit to All-Electric Future



Manufacturers are on track to expand EV models across all vehicle classes.

The increase in manufacturing coincides with improved battery technology and lower cost.

https://www.google.com/imgres?imgurl=http%3A%2F%2Fenergyfuse.org%2Fwp-content%2Fuploads%2F2017%2F12%2Ffactpackq31.png&imgrefurl=https%3A%2F%2Fenergyfuse.org%2Fsafe-fact-pack-highlights-significant-growth-u-s-ev-market%2F&ibid=mu1f0h4m4HDAM&vet=12ahUKewjDvofmzLrAHUTFTQIHeFAB_YQMygBegUIARCTAQ_I&docid=8dvOI2nMtcbiRM&w=740&h=428&q=electric%2Dvehicle%2Davailability&ved=2ahUKewjDvofmzLrAHUTFTQIHeFAB_YQMygBegUIARCTAQ



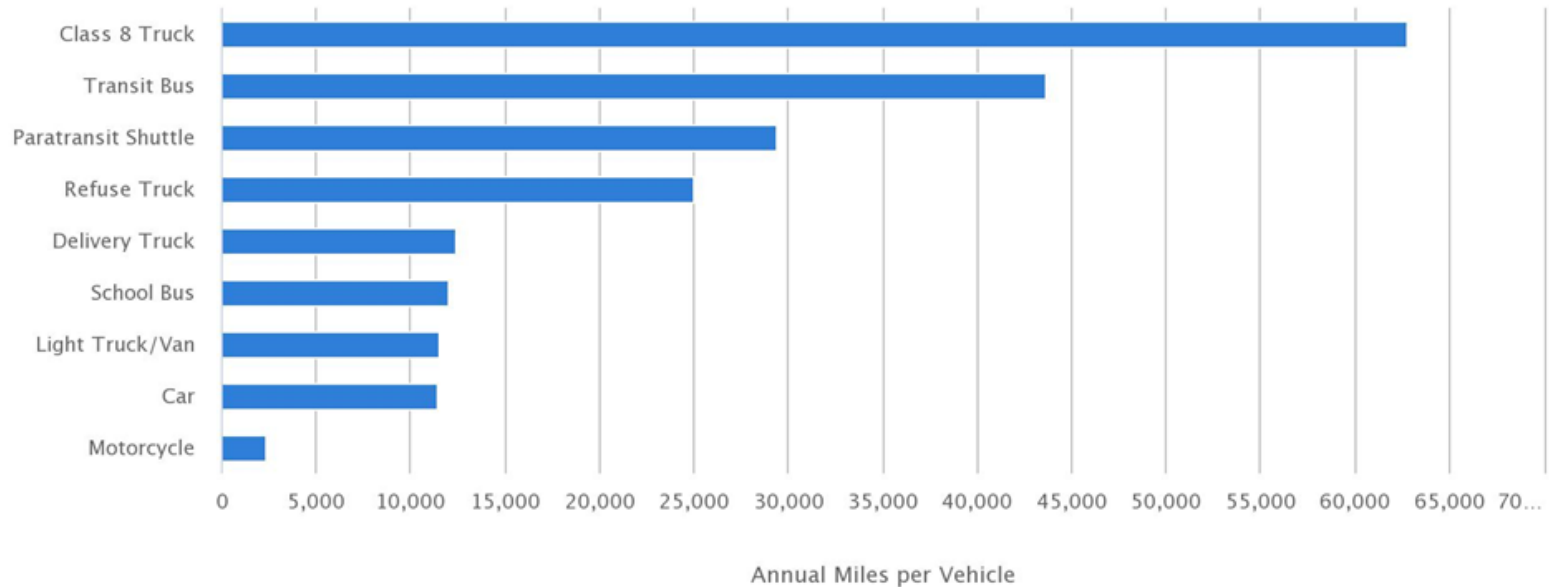
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ELECTRIC VEHICLES (EV)

RANGE REQUIREMENTS PER VEHICLE CLASS

Average Annual Vehicle Miles Traveled by Major Vehicle Category



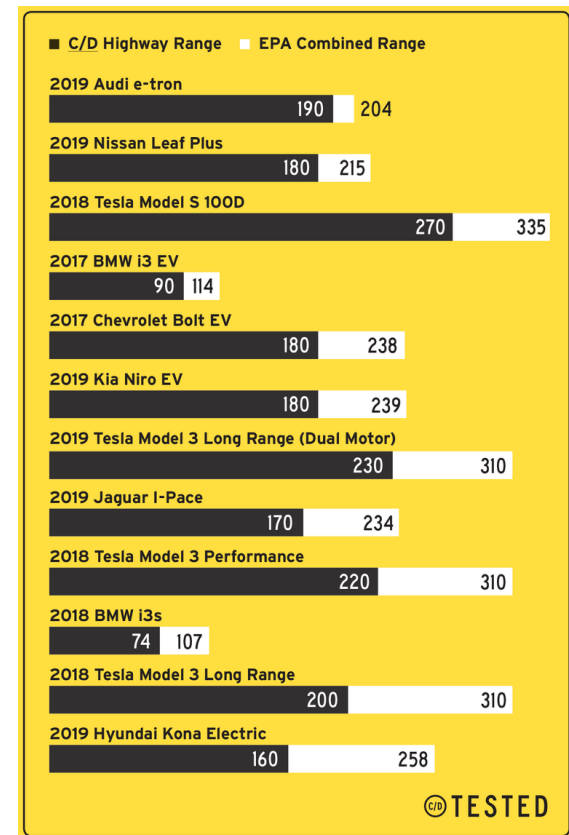
Last updated: February 2020
Printed on: August 5

Light-Duty vehicles travel on average less than 50 miles per day

ELECTRIC VEHICLES (EV)

ELECTRIC VEHICLE RANGE IMPROVEMENTS

- “Range Anxiety” describes the nervousness that an electric vehicle will not have enough range to reach the target destination
- Average EV range has increased significantly over the past 5 years.
 - In 2015, average range was approximately 100 miles per charge, whereas today many vehicles on the market are between 200-300 miles per charge
- Note the difference between Combined Range vs. Highway Range



CHARGING INFRASTRUCTURE



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CHARGING INFRASTRUCTURE

CHARGING LEVELS DEFINED

KNOW YOUR EV CHARGING STATIONS

AC Level One

**VOLTAGE**

120v 1-Phase AC

AMPS

12–16 Amps

CHARGING LOADS

1.4 to 1.9 kW

CHARGE TIME FOR VEHICLE

3–5 Miles of Range Per Hour

AC Level Two

**VOLTAGE**

208V or 240V 1-Phase AC

AMPS

12–80 Amps (Typ. 32 Amps)

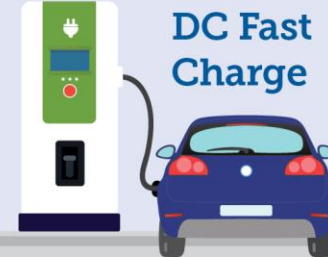
CHARGING LOADS

2.5 to 19.2 kW (Typ. 7 kW)

CHARGE TIME FOR VEHICLE

10–20 Miles of Range Per Hour

DC Fast Charge

**VOLTAGE**

208V or 480V 3-Phase AC

AMPS

<125 Amps (Typ. 60 Amps)

CHARGING LOADS

<90 kW (Typ. 50 kW)

CHARGE TIME FOR VEHICLE

80% Charge in 20–30 Minutes

Babej, A. (8/5/20).

https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.carolinacountry.com%2Fyour-energy%2Fenergytech%2Fknow-charging-options-to-keep-your-ev-rolling&psig=AOvVaw0WdObHLk6wdlqJsFhYFydC&ust=1596736219400000&source=images&cd=vfe&ved=0CAIQjRxqFwoTCMjo4o_QhOsCFQAAAAAdAAAAABAD

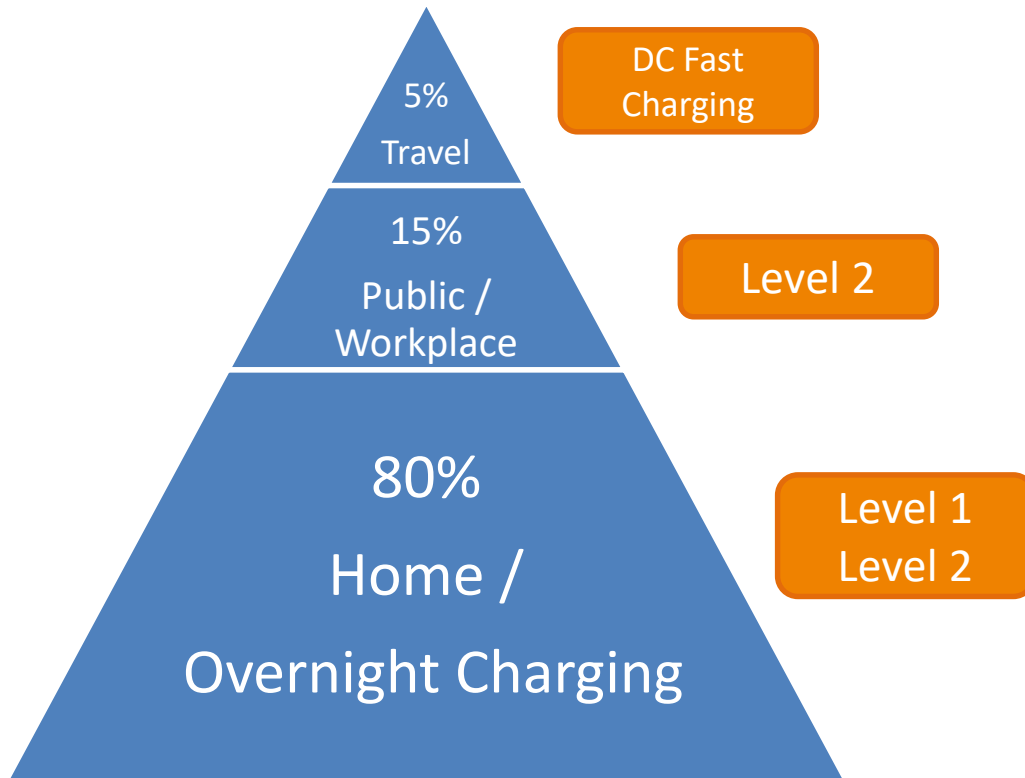


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CHARGING INFRASTRUCTURE






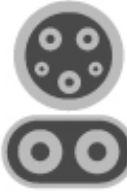



A NEW FUELING PARADIGM



- Vehicles are typically parked 95% of the time
- Fueling will typically occur when parked, not en route
- EVs start each day with a full tank
- Longer routes are served by DC Fast Charging (DCFC)

CHARGING INFRASTRUCTURE

TYPES OF CONNECTORS – LACK OF STANDARDIZATION

	N. America	Japan	EU <i>and the rest of markets</i>	China	All Markets <i>except EU</i>
AC	 J1772 (Type 1)	 J1772 (Type 1)	 Mennekes (Type 2)	 GB/T	 Tesla
DC	 CCS1	 CHAdeMO	 CCS2	 GB/T	

Babej. A, (8/5/20).

https://www.google.com/url?sa=i&url=https%3A%2F%2Fevcharging.enelx.com%2Fev%2Fabout%2Fnews%2Fblog%2F552-ev-charging-connector-types&psig=AOvVaw0WdObHLk6wdlqJsFhYFydC&ust=159673621940000&source=images&cd=vfe&ved=0CAIQjRxqFwoTCMjo4o_QhOsCFQAAAAAdAAA AABAI

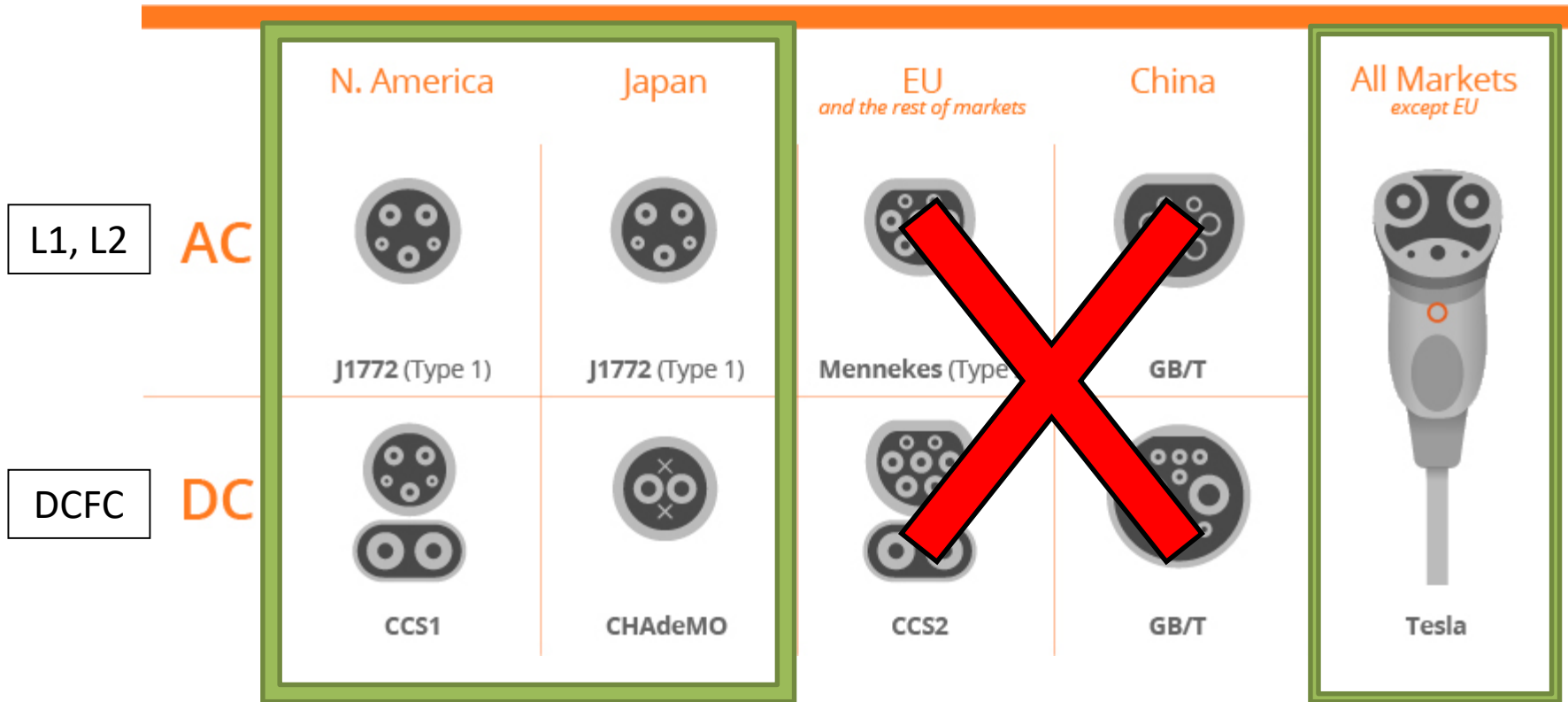


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CHARGING INFRASTRUCTURE

TYPES OF CONNECTORS



Babej. A, (8/5/20).

https://www.google.com/url?sa=i&url=https%3A%2F%2Fevcharging.enelx.com%2Fen%2Fabout%2Fnews%2Fblog%2F552-ev-charging-connector-types&psig=AOvVaw0WdObHLk6wdlqJsFhYFydC&ust=1596736219400000&source=images&cd=vfe&ved=0CAIQjRxqFwoTCMjo4o_QhOsCFQAAAAAADAABAIAA



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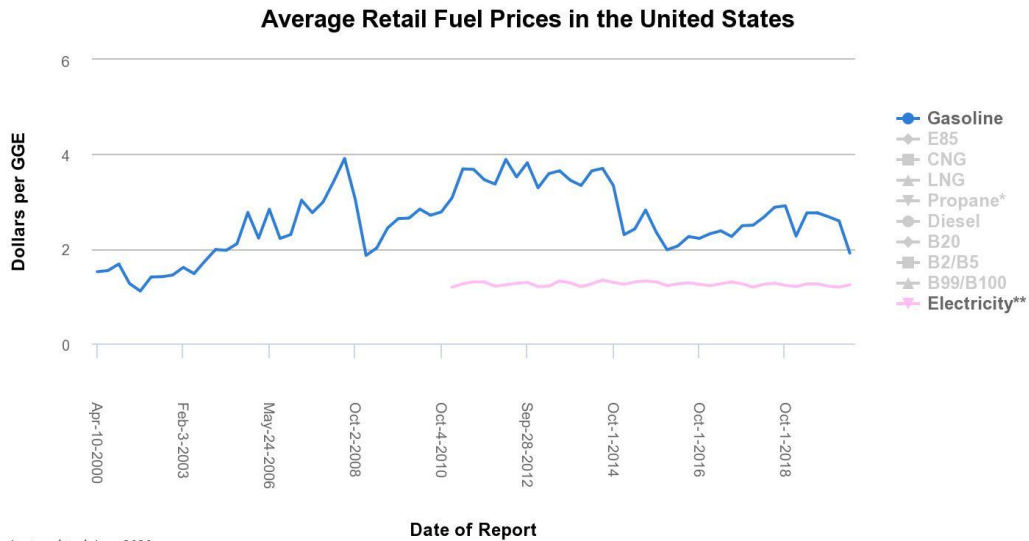


ECONOMIC IMPACTS OF EVS



ECONOMIC IMPACTS

COST OF FUEL



Last updated: June 2020
Printed on: August 28

Find out how much it costs to fuel an electric vehicle in your state

New Mexico

regular gasoline 1.81

electric eGallon 1.11

ENERGY.GOV

Babej, A. (8/28/20).
<https://afdc.energy.gov/fuels/prices.html>

Babej, A. (8/28/20).
<https://www.energy.gov/maps/egallon>



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ECONOMIC IMPACTS

COST OF INFRASTRUCTURE

EVSE Unit Costs

EVSE Type (single port)	EVSE Unit Cost Range
Level 1	\$300-\$1,500
Level 2	\$400-\$6,500
DCFC	\$10,000-\$40,000

Table 1. EVSE unit cost ranges based on units available in 2015

Costs depend on many factors:

- Existing utility infrastructure
- Site layout
- Networked vs. Non-networked
- Unit architecture

Ballpark EVSE Installation Costs

EVSE Type	Average Installation Cost (per unit)	Installation Cost Range (per unit)
Level 1	not available	\$0-\$3,000* <i>Source: Industry Interviews</i>
Level 2	-\$3,000 <i>EV Project (INL 2015b)</i>	\$600-\$12,700 <i>EV Project (INL 2015b)</i>
DCFC	-\$21,000 <i>EV Project (INL 2015d)</i>	\$4,000-\$51,000 <i>EV Project (INL 2015d) and (OUC 2014)</i>

Table 2. Ballpark costs for installation of Level 1, Level 2, and DCFC EVSE (not including the EVSE unit.)

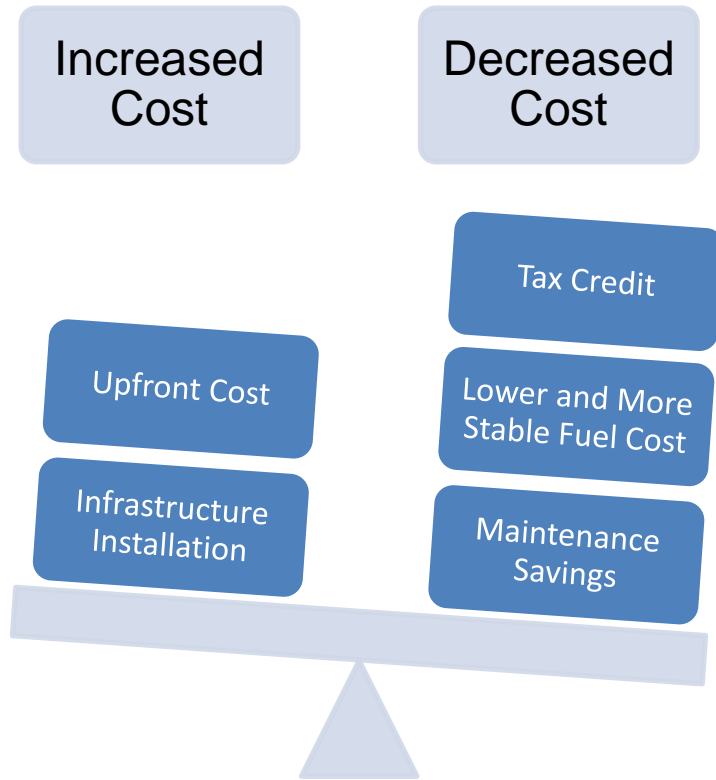
*The \$0 installation cost assumes the site host is offering an outlet for PEV users to plug in their Level 1 EVSE cordsets and that the outlet already has a dedicated circuit.



ELECTRIC VEHICLE CHARGING STATION

ECONOMIC IMPACTS

THE BOTTOM LINE



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Vehicle Cost Calculator

This tool uses basic information about your driving habits to calculate total cost of ownership and emissions for makes and models of most vehicles, including alternative fuel and advanced technology vehicles. Also see the [cost calculator widgets](#).

	Leaf (all-electric)	Prius (hybrid)	Fusion (gas)
Purchase price	\$25,797	\$22,984	\$22,866
Cost of fuel / yr	\$141	\$326	\$765
Maintenance / yr	\$317	\$859	\$1,287
EV charger	\$2,656	\$0	\$0
Ownership cost / yr	\$3,620	\$3,738	\$4,592
Total cost (9 years)	\$32,580	\$33,644	\$41,328

PNM EV EFFORTS

TRANSPORTATION ELECTRIFICATION PLAN

- HB 521 accomplished two objectives:
 - Allow those who re-sell electricity as transportation fuel to not be regulated as a utility
 - Requires utilities to file an application with the PRC by Jan 1, 2021
 - Allows for filing every two years
 - Encourages investments or incentives to deploy charging infrastructure, allow for rate design, and customer education and outreach
 - Recover costs of the program through commission-approved tariff rider or base rate, or both



PNM EV EFFORTS

CUSTOMER ENGAGEMENT - PNM EV COMMUNITY

Please enter your information below to join our Electric Vehicle (EV) Community:

PNM Customer Information

Name *

Company

Address *

Email *

Phone

Get Plugged In:

Join the PNM EV Community!

Sign up online at:

www.pnm.com/ev

Let us know about the EV you own, or if you just want to sign up for updates and we will include you on updates about the transportation electrification efforts at PNM.



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PNM EV EFFORTS

FLEET ELECTRIFICATION COMMITMENT



2014 – Initial Commitment

- Committed 5% annual fleet budget for purchase of EVs
- Made in conjunction with the Edison Electric Institute



Current – Success to Date

- 5.5% of total PNM Resources fleet is electrified
- 45 vehicles across all classes



Future – New Commitment Announcement

- By 2025, 25% of all light duty vehicle purchases will be EVs
- By 2030, 50% of all light duty vehicle purchases will be EVs



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PANEL PRESENTATIONS

EXPERTS AROUND NEW MEXICO



Statewide Efforts

Colin Messer

Land of Enchantment Clean Cities Coalition

Fleet Electrification and City Charging

Kelsey Rader

City of Albuquerque

Charging Station Installation

Laura Vanoni

Pueblo of Sandia



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Customer Energy Solutions

Colin Messer, Director/Coordinator


Land of Enchantment Clean Cities Coalition

September 17, 2020

A photograph of a ChargePoint electric vehicle charging station in the foreground. The station is orange and grey with a large white 'E' logo. A black car is partially visible on the left. In the background, there is a large, multi-story building with a flagpole on top. The sky is overcast with grey clouds. An orange horizontal bar is located in the top left corner of the image.

Land of Enchantment Clean Cities' Mission

- Operates as a not-for-profit supported by U.S. DOE Clean Cities network
- Advances the nation's economic, environmental, and energy security by supporting local actions to reduce greenhouse gas emissions, cut petroleum use, and improve efficiency in transportation
- Promotes non-petroleum, alternative transportation fuels defined by DOE – natural gas, propane, hydrogen, ethanol, and electricity
- Incorporated in 1994 serving the entire State of NM



LOECC Vehicle Electrification & Infrastructure Support

- Clean Cities toolbox consists of presentations, buying and cost-of-operation calculators, technical resources – DOE publications, coalition network, and national laboratory collaboration;
- Coalition assists public and private entities with EV development guidelines, partner introductions, vehicle and charging specifications, technical advice from national network (other coalitions & national labs), and funding opportunities;
- Coordinator, board members, stakeholders, and partners provide LOECC with EV: general information, professional contacts, and technical resources;



Recent EV Related Activities

- Participated in multiple EV events including hosting a Clean Car event at the 2019 NM State Fair, participating in the Santa Fe Green Chamber of Commerce and Taos EV Expo events.
- With PNM, LOECC produced EV-charging infrastructure proposal “ready and pending” -- now recognized by U.S. DOT as a key Alternative Fuels Corridor participant (I-10, 25 & 40), with possible future-funding and higher-corridor ranking.



Recent EV Related Activities

- Worked with Energy, Minerals and Natural Resources Development on recent deployment of statewide EV charging infrastructure survey to assess obstacles and opportunities related to EV charging in rural New Mexico.
- Developed EV Charging Checklist for businesses and governmental entities that provides information on critical factors that need to be considered before installing charging infrastructure. Can be found at www.loecleancities.org/electric.

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Need a Jump?

Ten ways to get rolling on petroleum savings, emissions reductions, and lower fuel costs.

Information by State >

 select a state

Information by Fleet Application >

 Delivery Services	 Refuse Collection
 Public Transit	 School Transportation

Maps & Data >

- U.S. Alternative Fueling Stations by Fuel Type
- Alternative Fuel Vehicles in Use
- U.S. Hybrid Electric Vehicle Sales by Model

Fuel Prices



Tools >

- Laws & Incentives
- Electricity Sources & Emissions
- Vehicle Cost Calculator
- Vehicle Search
- Petroleum Reduction Planning Tool

Station Locator



The AFDC is a resource of the U.S. Department of Energy's

 Clean Energy

- ✓ Specific information on fuels, vehicles, technologies, and strategies
 - ✓ Tools
 - ✓ Publications
 - ✓ State-specific information
 - ✓ Fleet-specific information
- <https://afdc.energy.gov/>



Contact Us

Colin Messer

Executive Director, Land of
Enchantment Clean Cities Coalition,
loecleancities@newmexico.com

505-438-7356



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EV's and the City of Albuquerque

Kelsey Rader, Sustainability Officer
krader@cabq.gov, 505-250-3433



Sustainability Office



Advance projects and policies to enhance environmental stewardship



Work alongside city departments to adoption of sustainable practices



Connect with the public to educate and enable community action

EV Goals

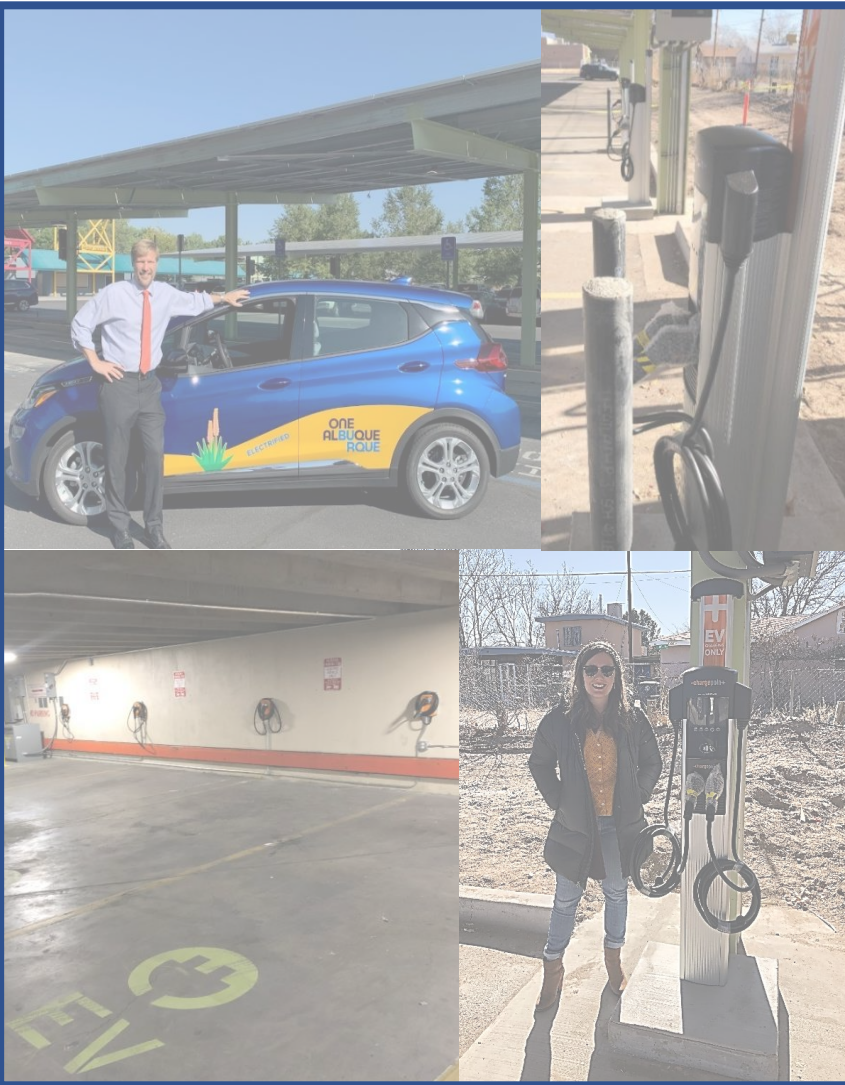
- **Lead by Example**
 - Enact policy to ensure 100% EV and hybrid adoption for eligible vehicles
 - Convert heavy duty vehicles to electric and alt fuel
- **Community Adoption**
 - 40 EV charging stations by 2021



Progress To Date

- **EV Adoption**

- Added 4 EVs and 27 hybrids to fleet in 2019-2020 and onboarding 40 more
- Updated to City vehicle policy to “ZEV First”
- Secured 3.5 million for electric buses



Vehicle Procurement (AI 4-3)

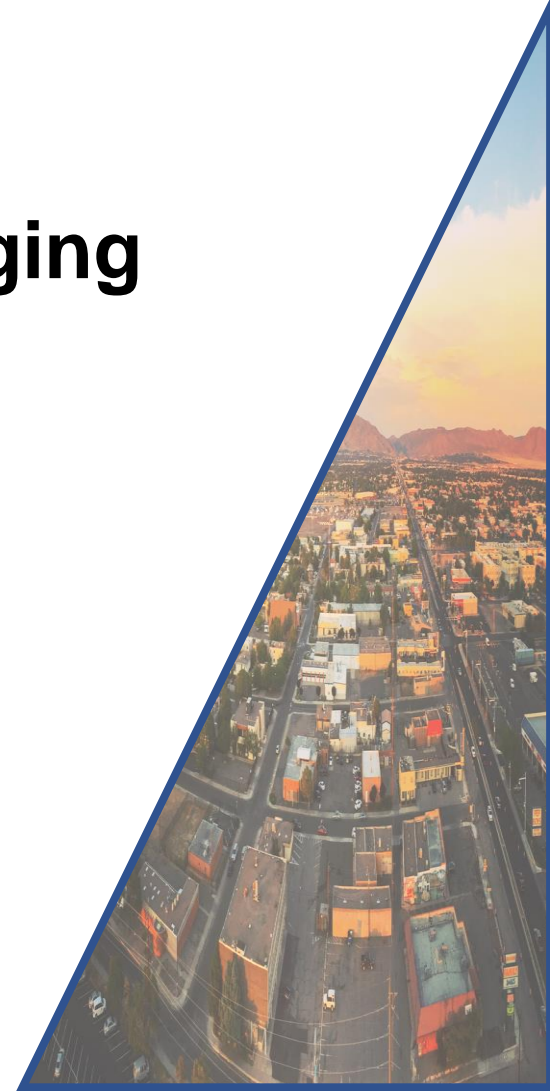
“ZEV First” Key Components:

- Prioritize vehicle purchase by lowest emissions
 1. ZEV – Zero emissions (i.e. EV)
 2. Plug-in hybrid
 3. Hybrid-electric
 4. Alt fuel or demonstrated lowered emissions
- Cost-competitive determined by *total cost of ownership*
- Must *apply* for exemption from ZEV

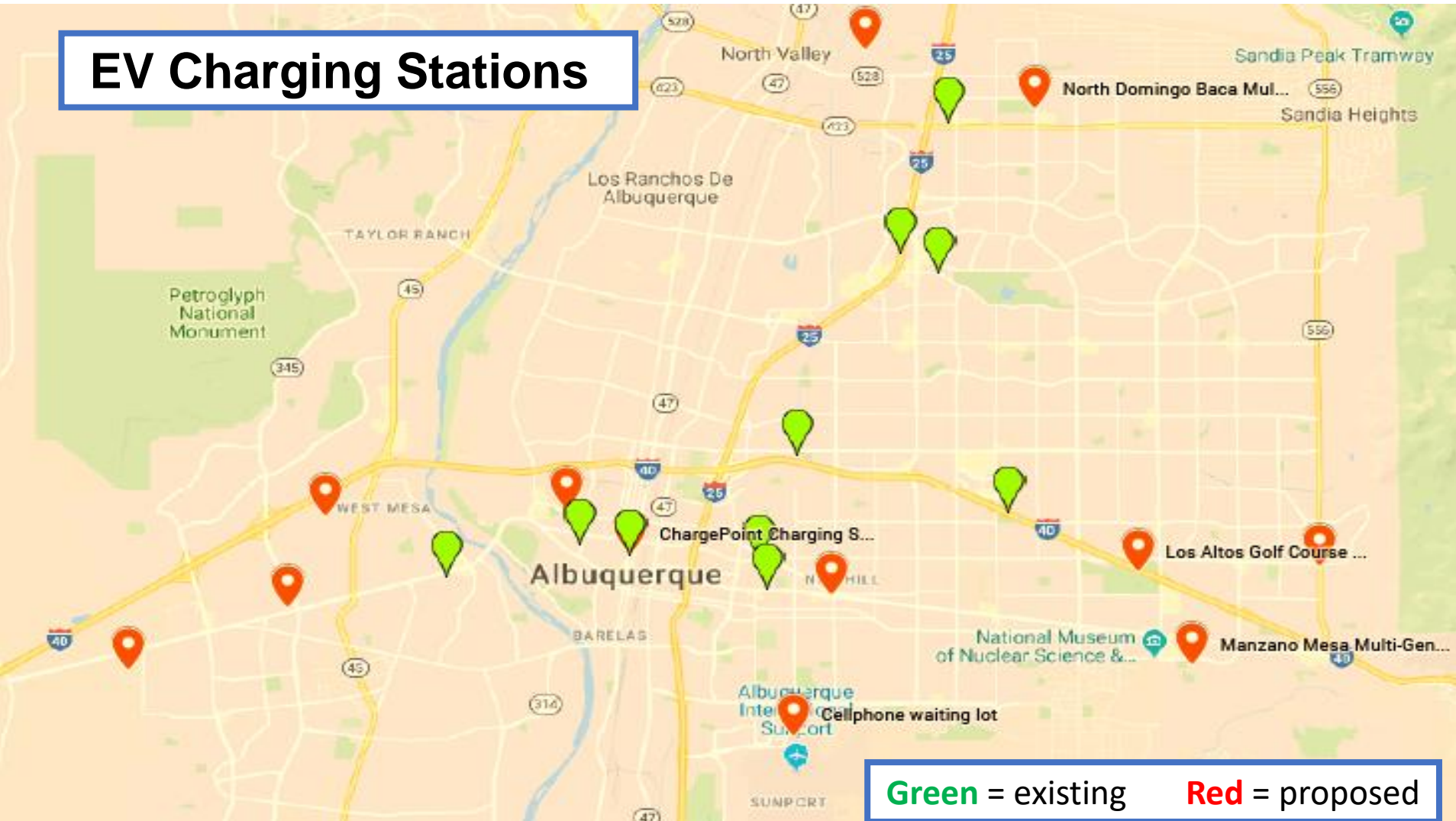


Progress to Date: EV Charging

- Added 14 EV charging stations in 2019
- Secured over 300k from VW fund for 24 new EV charging stations



EV Charging Stations



Green = existing **Red = proposed**

Future Objectives



Low Income Access



EV Infrastructure Gaps



Community Awareness

Contact Us

Email Albuquerque's Sustainability Officer,
Kelsey Rader at krader@cabq.gov



@CABQEHD



@CABQEHD



@CABQEHD

www.cabq.gov/sustainability

Electric Vehicle Charging Stations

Laura Vanoni, Planner
Pueblo of Sandia



Grant through the State of New Mexico



- In August 2019, Sandia received a letter of invitation from NM Indian Affairs Department
- \$2.7 million available for Electric Vehicle Charger's (EVC) across the State through the NM Environment Department
- Contacted NMED to find out additional requirements
- Researched - what exactly does this mean? What is an EVC? What companies manufacture EVCs? What is the companies' performance in the U.S.?



- Excellent opportunity to showcase the Pueblo's green initiatives

Questions Asked

- Closest charging stations in area?
- What are the specifications on the different EVCs?
- Average cost to install
- Average cost to maintain
- What is the timeline to implement?
- How do we connect with PNM? What are the power requirements?
- What permits are required?
- What about charging fees?
- What charging station level do we provide? Costs per different levels
- How many charging stations? (volume of traffic)
- Location, Location, Location?



Location, Location, Location

- Four sites were considered
 - RailRunner - Sandia, Casino Parking Garage, Casino Parking Lot, Eastside Gas Station
- Key questions
 - Does the selected site have electric access?
 - Does the selected site have amenities? What amenities?
- Consultations with external stakeholders
 - Had talks with NMED about the best location at the Pueblo.
 - Met with PNM to discuss potential sites, electricity access, and charging station contacts
- Selection Made
 - The parking garage at the Casino was the selected site for 3 sets of level 2 charging stations



Budget Determinations

Project Component	Cost	Description
Chargers (3)	\$20,620	Two bollard, one wall mount dual charging station
Electrical system upgrades	\$2,200	Materials for three charging stations
Labor Installation	\$12,300	Labor for electrical installation
Warranties and Plans	\$14,790 \$6,630	\$4990 for 10-year warranty assurance plan x 3 \$2,210 for 10-year network plan x 3
Total Estimated Project Cost	\$56,540	

Project Awarded to Sandia Pueblo

- Only tribe in the State to receive a direct grant award
- Coordination with tribal department staff and tribal enterprise staff on location and specs.
- Researched companies authorized to install EV chargers
- Contract recently executed with State of NM
- RFP solicited from authorized contractors
- Expected project completion January 2021

Contact Us

Laura Vanoni
Tribal Planner
Pueblo of Sandia

Email: lvanoni@sandiapueblo.nsn.us

Phone: (505) 771-5064

QUESTIONS AND ANSWERS



UPCOMING WEBINARS

2020 PNM ENERGY SOLUTIONS WEBINAR SERIES



- **Understanding Your PNM Bill**
 - » Thursday October 22 at 2:00 pm



- **Copper Theft Awareness - What you need to know to protect your business**
 - » Thursday November 13 at 2:00 pm

[PNM.com/business-events](https://www.pnm.com/business-events)



Talk to us.



Thank you for attending!

Please share your feedback with us via our survey after the webinar.

Contact us: EV@pnm.com

PNM Business Customers

Phone: (888) 245-3659

Hours: Weekdays, 7:30 a.m. to 6 p.m.



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