ELECTRIC VEHICLES FOR YOUR BUSINESS
AN INTRODUCTION TO TRANSPORTATION ELECTRIFICATION

2020 PNM ENERGY SOLUTIONS WEBINAR SERIES
HOUSEKEEPING

• You will receive an email with a link to 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.
WHO WE ARE

PUBLIC SERVICE COMPANY OF NEW MEXICO

- Core mission to provide safe, reliable, low-cost, and environmentally responsible energy to our customers
- Founded in 1917
- First New Mexico business on the NYSE
- Annual revenues $1.4B
- Employs 1,500 team members in NM
- Gives over $4M to local non-profits annually
PNM PROUDLY SERVING NEW MEXICANS FOR OVER 100 YEARS

- 530,000 customers in 40 communities
- 15,158 miles of transmission and distribution lines
- 2,701 MW generation capacity
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
AGENDA

1) PNM Topics

- Introduction to EV’s
- Charging Infrastructure
- Economics of EV’s
- 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

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.

When answering advertisements it is of advantage to mention McClure's.
**ELECTRIC VEHICLES (EV)**

**TYPES AND DEFINITIONS**

<table>
<thead>
<tr>
<th>Type</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICE</td>
<td>Internal Combustion Engine</td>
</tr>
<tr>
<td>Hybrid</td>
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<td>Plug-In Hybrid Electric Vehicle</td>
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<td>BEV</td>
<td>Battery Electric Vehicle</td>
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### Sources of Energy

<table>
<thead>
<tr>
<th>Type</th>
<th>Conventional</th>
<th>Hybrid</th>
<th>PHEV</th>
<th>All-Electric</th>
</tr>
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<tbody>
<tr>
<td>ICE</td>
<td></td>
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<td></td>
</tr>
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<td></td>
<td>+</td>
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</tr>
</tbody>
</table>

### Consumption

- **ICE**: 
- **Hybrid**: +
- **PHEV**: +
- **BEV**: 

### Emissions

- **ICE**:
- **Hybrid**: +
- **PHEV**: +
- **BEV**:

### Examples

<table>
<thead>
<tr>
<th>Type</th>
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<tbody>
<tr>
<td>ICE</td>
<td>Toyota Prius (C, V)</td>
</tr>
<tr>
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<td>Ford C-Max, Fusion Hybrid</td>
</tr>
<tr>
<td></td>
<td>Honda Accord PHV</td>
</tr>
<tr>
<td></td>
<td>Chevy Volt</td>
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<td>Chevy Volt</td>
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<tr>
<td></td>
<td>Nissan Leaf</td>
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<tr>
<td></td>
<td>Tesla Model S</td>
</tr>
<tr>
<td></td>
<td>BMW i3</td>
</tr>
<tr>
<td></td>
<td>Mitsubishi i-Miev</td>
</tr>
<tr>
<td></td>
<td>Chevrolet Spark EV</td>
</tr>
</tbody>
</table>

**Type**

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

# ELECTRIC VEHICLES (EV)

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<td></td>
<td></td>
<td></td>
<td>Cadillac ELR</td>
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<td></td>
<td></td>
<td></td>
<td>Porsche Panamera S E-Hybrid</td>
<td></td>
</tr>
</tbody>
</table>

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
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.
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.
ELECTRIC VEHICLES (EV)

RANGE REQUIREMENTS PER VEHICLE CLASS

Average Annual Vehicle Miles Traveled by Major Vehicle Category

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
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).
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

<table>
<thead>
<tr>
<th></th>
<th>N. America</th>
<th>Japan</th>
<th>EU and the rest of markets</th>
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</tr>
<tr>
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<td>Mennekes (Type 2)</td>
<td>GB/T</td>
<td></td>
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<tr>
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<tr>
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<td>CHAdeMO</td>
<td>CCS2</td>
<td></td>
<td>GB/T</td>
<td>Tesla</td>
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Babez, A. (8/5/20). 
## CHARGING INFRASTRUCTURE

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<td>L1, L2</td>
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<td>Mennekes (Type)</td>
<td>GB/T</td>
<td>Tesla</td>
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<td></td>
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<td></td>
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</table>

ECONOMIC IMPACTS OF EVS
ECONOMIC IMPACTS

COST OF FUEL

Average Retail Fuel Prices in the United States

[Graph showing fuel prices by type and date]

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

Last updated: June 2020
Printed on: August 28

https://afdc.energy.gov/fuels/prices.html

https://www.energy.gov/maps/egallon
ECONOMIC IMPACTS

COST OF INFRASTRUCTURE

Costs depend on many factors:
• Existing utility infrastructure
• Site layout
• Networked vs. Non-networked
• Unit architecture

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

<table>
<thead>
<tr>
<th>EVSE Type (single port)</th>
<th>EVSE Unit Cost Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
<td>$300-$1,500</td>
</tr>
<tr>
<td>Level 2</td>
<td>$400-$6,500</td>
</tr>
<tr>
<td>DCFC</td>
<td>$10,000-$40,000</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>EVSE Type</th>
<th>Average Installation Cost (per unit)</th>
<th>Installation Cost Range (per unit)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
<td>not available</td>
<td>$0-$3,000*</td>
</tr>
<tr>
<td>Level 2</td>
<td>-$3,000 EV Project (INL 2015b)</td>
<td>$600-$12,700</td>
</tr>
<tr>
<td>DCFC</td>
<td>-$21,000 EV Project (INL 2015d)</td>
<td>$4,000-$51,000</td>
</tr>
</tbody>
</table>

*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.
## ECONOMIC IMPACTS

### THE BOTTOM LINE

<table>
<thead>
<tr>
<th>Increased Cost</th>
<th>Decreased Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upfront Cost</td>
<td>Tax Credit</td>
</tr>
<tr>
<td>Lower and More Stable Fuel Cost</td>
<td>Maintenance Savings</td>
</tr>
</tbody>
</table>

### Table: Alternative Fuels Data Center

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

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

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.
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
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
Customer Energy Solutions

Colin Messer, Director/Coordinator
Land of Enchantment Clean Cities Coalition
September 17, 2020
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, 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.logecleancities.org/electric
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
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

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

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