Forth's mission is to electrify transportation by bringing people together to create solutions that reduce pollution and barriers to access.
OUR FOCUS AREAS

Access to Electric Cars
Forth builds programs for drivers who have traditionally faced the most barriers to electrification.

Access to Charging
Forth is working to make it as easy to charge a car as it is to park a car.

Progressive EV Policy
We build influence and knowledge at the national, state and local levels.

Events & Partnerships
Forth convenes diverse stakeholders to collaborate and advance equitable transportation systems.

Access to Emerging Modes
We’re increasing access to micro-mobility, electrifying farm equipment, school buses, and supporting e-mobility in lower-income countries worldwide.
Agenda

- Basics of EVs - (30 mins)
- Mini Q/A (10)
- Charging - (30 mins)
- Break - (10)
- Innovations and Final Q&A (40)
Electric Vehicle Types

• **Battery Electric Vehicle**
  ○ 100% electric
  ○ Plug-in to recharge
  ○ Ex: Chevy Bolt, Ford Mustang Mach-E, all Teslas (pictured)

• **Plug-in Hybrid Vehicle**
  ○ Both electric and gasoline powered
  ○ Most have an “Electric only” mode
  ○ Plug-in to recharge, fill tank when needed
  ○ Ex: RAV4 Prime (pictured), Kia Niro PHEV, Chevy Volt, BMW i3 w/ Range extender
Poll Questions

Please raise your hand if you have ridden in an EV?
Please raise your hand if you drive a BEV regularly?
Question 3

Please raise your hand if you have driven a PHEV?
Some Crossovers here or coming soon

Kia EV6
Hyundai Ioniq 5
Blazer EV
Ford Mustang Mach-E
Nissan Ariya
Polestar 3

Even if the vehicles aren’t particularly easy to find in ID, they will be here sooner than you think
Trucks/SUVs here or coming soon

- Ford 150 Lightning
- 2023-24 Chevrolet Silverado EV
- 2025 RAM 1500 REV
- Rivian R1S SUV
- 2024 GMC Hummer EV SUV
- 2024 Kia EV9
Some Vehicle Cost Trends

1. Small Battery Entry model vs Longer range (Larger pack) models only available in a higher trim. **Don’t trust the “Starting at” phrase**

1. Usually AWD option adds $2500-5000+ and reduces range by 5-10%

1. Range, Size, and AWD basically determine price with few exceptions

1. Demand > Supply for most vehicles models right now

If you have questions about Vehicle cost trends, write them down!
Clean Vehicle Credit

- $7,500 non refundable tax credit
  - $3,750 domestic battery assembly
  - $3,750 domestic critical minerals

- Types of restrictions
  - Income restrictions
    - $150,000 - individual
    - $300,000 - household
  - MSRP caps
    - SUV, pickup truck, van $80k
    - Sedan/Hatchbacks $55k
Previously Owned Clean Vehicles

- $4,000 or 30% of the vehicle sale price (whichever is lower)

- Types of restrictions
  - Income restrictions: 75k Filing Single | 150k Married
  - Vehicle type:
    - 2+ yrs old
    - <14,000 lbs (Class 1-3)
    - <$25,000
    - Not have previously used the credit (check by VIN)
    - Sold by a dealership
  - Credit can be claimed once every 3 yrs
Used BEVs under $30k

- Chevy Bolt EV
  238 mile range 2017-2019

- Nissan Leaf
  150 mile range 2018-19

- Hyundai Kona EV
  258 mile range 2018-19

- Kia Niro EV
  238 mile range 2018-19

- Hyundai Ioniq EV
  125 mile range 2018-19
  170 miles 2020

- 2019 Tesla Model 3*
  240 mile range 2019
3.5 Million sold since 2010!
Social benefits of EVs

Cleaner Air
● Improved air quality for every EV

Energy Dollars Generally Stay Local
● Electricity is produced locally or regionally

Climate Change Mitigation
● Transportation is the number one source of CO2 emissions in ID and US

EV Drivers Can Save Money
● Over the lifetime of ownership, EVs can be less expensive than ICE (Internal Combustion Engines)
EVs are Cleaner

Life Cycle Global Warming Emissions: EVs vs. Gasoline Cars and Trucks

- Gasoline Car (32 MPG)
- Electric Car (300-mile range, 0.31 kWh/ml)
- Gasoline Truck (19 MPG)
- Electric Truck (300-mile range, 0.48 kWh/ml)

- 52% reduction
- 57% reduction

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EVs are getting even Cleaner

Comparing Emissions: Driving the Average EV as a Gasoline MPG Equivalent, 2020

US average: 91 mpg (EV sales-weighted)
Not just 4 wheels

- Transit buses
- PHEV bucket trucks
- School buses
- Garbage trucks
- Yard Trucks
- Delivery/Box Trucks
EVs are Everywhere

Valley regional transit
(introduced in Treasure valley)

Electrified recycling vehicle
(by Republic services and City of Boise)
BEVs are cheaper to maintain

BEV maintenance costs a fraction of that of gas-powered cars:

- A 2020 Consumer Reports study
  - EVs can cut maintenance costs by 50% over similar gas cars
- EVs offer solid warranties
  - Batteries and electric drivetrains (usually around eight years or 100,000 miles)
EVs are fun to drive!

- Instant acceleration and torque
- Lower center of gravity for tight handling
- Quiet
- Regenerative braking
Nothing is Perfect

EVs are still expensive

Public charging experience can be rough
(Especially in Rural locations)

Used market not really here yet

Affordable Long Range AWD vehicles

Weather can dramatically impact range
Trends

- 200+ miles of range standard for short-range EVs
- 300+ miles of range standard for longer range EVs

- Towing still a conundrum due to battery size/range/weight/aerodynamics

- Costs of many new vehicles types will remain high for a few more years

- Companies adjusting business model to sell EVs

- Used market will evolve, usually/unfortunately 3+ year lag time from when vehicles are launched

- Vehicle efficiency is key to range and will be prioritized long-term due to impact on range/price
Questions on EVs?
Q/A + Mini Break

Up next: Charging
Hold your Charging Questions for later!
Please raise your hand if you have used an EV charger?
How many of you have a L2 charger at home?
How many of you have used a DC charger?
How many of you have used a DC charger on a road trip (500+ miles)?
Level Setting for EV Charging

(Pun intended)
Electric vehicle charging - Level 1

- Cable included with purchase of car
- 2-5 miles gained per hour of charge (light-duty vehicles)
- Best for
  - Plug-in hybrids
  - Short commutes
  - People that don’t drive every day

120 Volt outlet → Standard Port
Electric vehicle charging - Level 2

- 12-40+ miles gained per hour of charge
- Ideal for installation in homes, apartments, or workplace

240 Volt Outlet or Hardwired

Standard Port
DC Fast charging (Level 3)

- Fleet or Public Infrastructure
- 10->80% in 15-60 minutes depending
  - Charger’s Max charging speed
  - Vehicles Max charging speed
  - State of charge start/stop
  - Battery management System factors
    - Temperature of battery
    - Ambient Temperature

CCS
Basically the standard

CHAdeMO
No new US models use this

Tesla
<table>
<thead>
<tr>
<th>Slowest</th>
<th>Level 1</th>
<th>Level 2</th>
<th>DC Fast Charging</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Level</strong></td>
<td><strong>Use Case</strong></td>
<td><strong>Power</strong></td>
<td><strong>Plug Shape (Into Vehicle)</strong></td>
</tr>
<tr>
<td><strong>Use Case</strong></td>
<td>Home</td>
<td>Home/Work/Public</td>
<td>Public</td>
</tr>
<tr>
<td><strong>Power</strong></td>
<td>&lt;2 kW (Usually 1.2 kW)</td>
<td>2.4 - 19.2 kW (Usually 6.7 kW)</td>
<td>25 - 350 kW (Usually 150, 50, or 250 kW respectively)</td>
</tr>
<tr>
<td><strong>Plug Shape (Into Vehicle)</strong></td>
<td>J1772</td>
<td>J1772</td>
<td>CCS</td>
</tr>
<tr>
<td><strong>Outlet Shape</strong></td>
<td>120 V</td>
<td>240 V</td>
<td>Electric Vehicle Supply Equipment (EVSE)</td>
</tr>
<tr>
<td><strong>Cost</strong></td>
<td>$</td>
<td>$$</td>
<td>$$$$</td>
</tr>
</tbody>
</table>
Chevy Bolt EUV Display

KiloWatts (kW) - measure of power

Electric motors are super efficient (90%+) and they work as generators when going downhill or slowing down.
Some “math stuff” for those that want it

- Miles per kilowatt-hour is equivalent to miles per gallon
- Most vehicles have between 40 and 120 kWh battery packs
- Most efficient sedans/hatchbacks get 5+ miles per kWh
- Least efficient trucks/SUVs are getting 2 miles per kWh
- When you go uphill you may be getting ½ mile per kWh or worse, but going downhill your efficiency can be extremely high due to recharging the battery

Some common battery cell sizes and battery packs are often made up of thousands of cells like these. Source
Charging use cases put simply

Single Family Homes-L1/L2
Multi-Family Homes- L2 but it can depend on electrical configuration
Public charging-L2/DC
Destination- L2
Workplace- L1/L2 (very unusual cases DC)
Corridor charging-DC
Fleet (depends on fleet vehicles/use profile)

It is all about how long the car is parked for
Find Public Charging Stations

Chargeway (App only)

PlugShare (Website & App)

Public EV Charging Companies have **phone apps** that can be used to find chargers and start charging sessions

ChargeHub (Website & App)
Travel longer distances

Apps like **A Better Route Planner** or **Chargeway**

- Plan longer trips and see charging times
- How long to expect to be charging
1. Read instructions at site

1. Using Phone apps
   a. Download app
   b. Create an account and card details

1. When in doubt, plug in charger and start the charge through the phone app

1. Check that you’re starting the charge on the right charger (find charger ID to help with this)

1. Sometimes chargers will need rebooting, in which case a phone call may be required
   a. Check charger for phone number
Plug and Charge Protocols
(Like what Tesla already has)

Simply plug in and charging will start quickly and account associated with the car will be billed
EV Charging Tax Credits
For Individuals:

- Beginning January 1, 2023
- Purchase qualified equipment may receive a tax credit of up to $1,000
- Non refundable
- You must file your taxes to claim the credit

Talk with a Tax expert to learn more
Beginning January 1, 2023

- Nonrefundable
- Eligible for a tax credit
  - 6% or up to $100,000 per port so long as:
    - Property subject to depreciation
  - 30% (or up to $100,000) if:
    - Prevailing Wages
    - % of work done by apprentices
    - Location specific
      - Not an urban area
      - Poverty rate is at least 20%
      - Median family income is less than 80% of the state median family income level

Talk with a Tax expert to learn more
Break

Up next: Questions and Innovations
What are some topics you’d like to hear more about?
Charging Use Cases
Charging at Single Family Homes

- **L1 or L2 chargers**
  - Need access where you are parked
  - Outlet or Hardwired

- **Factors to consider, while choosing the right home charger**
  - Hardwire/Plug-in
  - Length of cable
  - Size
  - Weatherproofing if outdoor
  - Features
  - UL Listed
Multi-Family Charging

- Hard to want to buy an EV if you don’t know where you’re going to charge it
- People want to charge where they park
- Many barriers such as
  - Parking
  - Electrical access
  - Electrical Capacity
  - Internet signal
  - Billing
  - Appropriately allocating costs
Workplace Charging

● Workplace charging implementation
  ○ Employee amenity
  ○ Can double for Fleet charging when not used by employees
  ○ Customers

● Resources on planning, organizing, and executing successful and educational workplace charging events in the Clean Cities Workplace Charging Toolkit.
Public Charging Overview

● Level 2 or DC fast charging
  ○ Should be deployed based on community needs
  ○ At destinations like business or neighborhood parks
  ○ Along highway corridors or at urban charging hubs

● Builds range security (as opposed to range anxiety)

● Destination charging can sometimes be public charging
Corridor Charging

Primarily DC chargers

Best for:

- Long distance trips
- Regular mid-distance trips
- If you live nearby, backup for a lack of access to chargers at SF or MF homes
Key differences are

- More space needed
- Turning Radiiuses
- Charging speeds
- Utility infrastructure
- Battery storage
- Faster Charging speeds (MegaWatt Charging Standard-MCS)
Vehicle to X
Vehicle to Grid
V2Load
V2Home
V2Building
V2Vehicle

When your vehicle can export power at high levels, what will you do?
MCS-MegaWatt Charging Standard

Still in the works
Up to 4.5MW per port

Ships
Airplanes
Semi trucks
Construction
Mining
More
Do our public spaces magically become greenified with perfectly located chargers wherever people want them?

Where do chargers need to be? Where should they not be?

Let’s not install chargers we’re going to need to rip out in a few years, right?
Roadmap Conference
May 15-17, Portland, OR

https://www.roadmapforth.org/
ENABLING COMMUNITY ACCESS TO CHARGING FUNDS

• If the groups with the most barriers receive public investments, everyone benefits

• Under a grant from the GM Climate Fund, Forth is helping communities access this generational investment

• Make sure the money is spent efficiently and in ways that center equity

• Matchmaking partners and funding sources

• Educating local governments excited about applying

• Forth workshop to help communities win federal TE funding May 15:
  https://www.roadmapforth.org/rm23/workshop
QUESTIONS?

WhitakerJ@ForthMobility.org