GM EV Infrastructure
An Ecosystem Approach

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UIC Beneficial Electrification – 2nd Workshop

GENERAL MOTORS
OUR VISION IS TO CREATE A WORLD WITH ZERO CRASHES, ZERO EMISSIONS, ZERO CONGESTION.

and our people are the driving force behind making this a reality.
Requirements for broader EV adoption

• Longer range
• Affordability
• Charging Infrastructure
• Performance & Utility
GM EV CHARGING VISION

HOME:
Seamless charger installation and EV as a smart grid resource
GM Role: Installation services partnership; enable smart grid services

PUBLIC:
Simply find and use chargers that enable you to go anywhere
GM Role: Create ideal app experience; enable 3rd party investment for additional DCFC

WORKPLACE:
Charging is available & easy
GM Role: Implement internal workplace charging policy; advocate with other companies

FLEET:
Turnkey solutions
GM Role: Enable fleet comfort with EV technology leveraging in-house knowledge and EV Infrastructure partnerships
## EV CUSTOMER CHARGING USE CASES

<table>
<thead>
<tr>
<th>Power Level</th>
<th>Grid Input Voltage</th>
<th>Max EVSE Output to Vehicle</th>
<th>Max Peak Power (kW)</th>
<th>Max Charge Rate (mi in 10 min)</th>
<th>Estimated Total Cost</th>
<th>Home Charging Role</th>
<th>Workplace Charging Role</th>
<th>Public Charging Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
<td>120 V AC Single Phase</td>
<td>~ 430V DC</td>
<td>1.9</td>
<td>~1</td>
<td>$0 - $1k</td>
<td>⌂</td>
<td>⏤</td>
<td>⏤</td>
</tr>
<tr>
<td>Level 2</td>
<td>240V AC Single Phase</td>
<td>~ 430V DC</td>
<td>19.2</td>
<td>~12</td>
<td>$2k - $10k</td>
<td>⌂</td>
<td>⌂</td>
<td>⌂</td>
</tr>
<tr>
<td>DC Fast Charge</td>
<td>480V AC 3-Phase</td>
<td>~ 430V DC</td>
<td>~ 200</td>
<td>~90</td>
<td>$50k - $150k</td>
<td>⌂</td>
<td>⌂</td>
<td>⌂</td>
</tr>
<tr>
<td>DC Fast Charge</td>
<td>480V AC 3-Phase</td>
<td>~ 1000V DC</td>
<td>~ 400</td>
<td>~180</td>
<td>&gt; $200k</td>
<td>⏤</td>
<td>⌂</td>
<td>⌂</td>
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- **Importance of charging mode for use case**
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Qmerit Offering:

• Recruit, vet and manage electricians nationwide
• Offer mobile app survey for customer to quickly obtain qualified electrician quotes
• Provide white-labeled process and tech for seamless home charger quote and installation
Hardware and telematic solutions are able to unlock value by ensuring vehicles are charging when most beneficial for the customer (e.g. low cost) & for the grid (e.g. low impact).
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GM EV DRIVERS HAVE ACCESS TO OVER 68,000 PUBLIC CHARGING PLUGS ACROSS THE US & CANADA

Thousands of additional public fast charging stations in the US are needed to satisfy goals. GM is working across all stakeholders, e.g. charging providers and utilities, to accomplish these goals.

GM’s focus is on the SAE CCS standard.
PUBLIC CHARGING: ENERGY ASSIST APP OVERVIEW

All Chevrolet Bolt EV drivers have access to Energy Assist through their myChevy app.

**TODAY’S FEATURES:** Mobile & Projection Functionality; Dynamic Station Data; Initiation of Charging Sessions; Customer Feedback, Integration with Battery Data and Driving Behaviors for intelligent routing functionality and predictions.

**FUTURE OPPORTUNITIES:** Further CPO Integration, Charging Session Notifications, and more...
PUBLIC CHARGING: ENERGY ASSIST OVERVIEW

GM is improving the public charging experience by simulating interoperability: integrating CPO enrollment, network data, and session initiation functionality into the myBrand mobile app.

Aggregating existing public networks gives GM customers access to a virtual charge network.

+ More Coming
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GM IS TRIPLING ITS EMPLOYEE WORKPLACE ELECTRIC VEHICLE CHARGING

22.5 MILES per day is the average commute for drivers.

OVER 90% of EV owners charge at home and/or at work.

1 HOUR = time to fully recharge from an average daily commute. *

6.5% of new vehicle sales will be electric by 2025.**

3,500 new charging plugs installed across GM U.S. and Canadian facilities.

*When using a Level 2 charger
** According to IHS Markit Data
Workplace Charging: Supporting Investment

- GM has installed workplace charging at our facilities around the country
- Workplace charging has a role even for longer-range EVs:
  - Helps grow adoption
  - Fills charging gaps
  - Enables load-shifting
- Utilities, EVSPs, and states are key partners

“...Workplace charging can also help attract and retain a cutting-edge workforce and demonstrate leadership in adopting advanced technologies”
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FLEET SOLUTIONS APPROACH

Leveraging GM’s breadth of capabilities and partnerships, enable comprehensive charging solutions.

EXAMPLE SOLUTIONS FOR VARIOUS FLEET USE CASES / MENU OF OPTIONS:

• Dedicated vehicles, taken home each night
  ❑ Installation Services via current Partners
  ❑ Telematics-leveraged solutions for tracking

• Pool vehicles or vehicles returning to centralized location
  ❑ Facility management support through GM consulting support
  ❑ Installation Services via GM CPO partnership(s)

• Public / On the go or EV Fleet without the charging investment
  ❑ Access to GM’s Virtual Charge Network through Energy Assist
  ❑ Leverage GM CPO partnerships and retail/fleet scale.
MARKET & POLICY CONSIDERATIONS
3 Key Barriers: Infrastructure, EV Cost, and EV Awareness

- Home Simplification; VGI services
- Highway corridor DC fast-charging
- Urban DC Fast-Charging Hubs
- Workplace charging
- Multi-unit dwelling charging
- In a way, we are “Story-telling”

- Vehicle Incentives – federal and state
- HOV Lane Privileges
- Building Codes
- Preferential EV electricity rates
- Fleet purchase commitments

- Drive Consumer Demand
- Build Awareness
- Ride & Drives
- Utilities as trusted 3rd parties
Infrastructure Policy Recommendations

- **Infrastructure Deployment**
  - Need to reach all market segments (including MUD, DCFC, and fleet)
  - Utilities are key partners; regulators should approve programs testing different models
  - Rebate programs can enable market
  - Building codes have longer-term role

- **Electricity Rates**
  - EV rates, demand charges under review
  - Done right, EV drivers should see savings

- **Vehicle-Grid Integration**
  - Utilities/regulators are essential for VGI
  - EV driver’s mobility needs are paramount

- **Interoperability and open standards are key**

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States with Approved Utility Programs ($1.47B)

Source: AtlasPolicy.com/EVhub
THANK YOU