Electric Vehicle Strategy
MPSC Technical Conference
February 20, 2018

NOTICE: This document may contain “forward-looking statements;” please refer to our SEC filings for information regarding the risks and uncertainties that could cause our results to differ materially.
Michigan can take a leadership role in defining a scalable model for EV infrastructure and adoption.

Michigan leverages its energy and automotive legacies to develop customer-focused solutions for EV infrastructure that can be replicated across the U.S.

Source: US DOE
Why plan for EVs?
Electric vehicle growth forecasts vary but all point to rapid growth from a relatively small base today

- **Michigan EV forecasts vary through 2030, but all show positive growth rates**
- **The U.S. EV market is still small (1% of market), but growing quickly (36% YOY)**
- **Primary factors of growth:**
  - Lower battery costs
  - Faster charging speed
  - EV investment and policy
  - Parallel trends in autonomy, connectivity, and ride-sharing
Parallel trends in autonomy, connectivity, and ridesharing are bolstering EV momentum, with AV/EV poised to be the true needle-mover.

Cost-per-mile analysis in 2030, across car travel options

- **Buy new ICE car**: $0.78
- **Buy new EV**: $0.61
- **Drive current ICE car**: $0.31
- **Use on-demand AV/EV, owned by fleets**: $0.10

By 2030, on-demand AV/EV could be the most economical travel option due to:
- High utilization
- More miles driven over lifetime
- Lower operating costs

1. RethinkX
To responsibly address obstacles, we must acknowledge there is still high uncertainty about the pace and requirements of electric vehicle adoption.

Experts predict growth in PEV ownership – but how much?

Charging infrastructure will be needed – but how much?

All forecasts are based off different assumptions for vehicle quantity, battery technology, customer behavior, and regulatory conditions, leading to high uncertainty for planning.
Why utility investment?
Due to their flexible load potential, EVs could be a burden or benefit to the grid, depending on vehicle charging behaviors.

**EVs as a grid burden**

An unprepared grid will be burdened by increased load demand at peak times, such as when drivers return home in the evenings.

![Graph showing peak demand at 18:00 with 4 hours of EV charging]

**EVs as a grid benefit**

A grid prepared with smart charging and off-peak incentive rates can adjust EV loads to off-peak hours, optimizing the grid.

![Graph showing a flat demand curve with 4 hours of charging]

Further work is needed to understand localized distribution system impacts in areas with very high concentrations of EVs.

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1. Analysis assumes a neighborhood with ten households, two EVs and a 3.6 kW/h vehicle charge rate.
2. In theory, vehicle to grid (V2G) capabilities would also increase grid benefits by utilizing EVs as a mobile battery and pulling power when needed; however, there are additional considerations (e.g. grid flow, battery life) that make V2G a longer-term prospect.
An analysis of AEP Ohio’s service territory shows EVs are a source of incremental value to the system.

**NET BENEFITS OF EV ADOPTION**

In April 2017, E3 modeled the impacts of PEV adoption over the next 20 years in AEP Ohio’s service territory based on EVs being 15% of all personal LDV sales in Ohio by 2025.

![Cost-Benefit Analysis Diagram]

We are in the process of calculating the lifetime value of a PEV customer based on what we know about EV charging behavior in Michigan and our rate structure.

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*Cost-Benefit Analysis of Plug-in Electric Vehicle Adoption in the AEP Ohio Service Territory report by Energy and Environmental Economics, Inc. (E3)*
Utilities are uniquely suited to deploy the EV infrastructure required and ensure that the impact is a benefit, not a burden, to the grid

Each EV owner adds a ‘lifetime value’ benefit to the grid, in the form of increased electricity usage

Activities spur more EV ownership, increasing overall system benefits

Prepared utilities can reinvest benefits towards further EV infrastructure, rebates, and pilots

Remaining benefits allocated across all ratepayers, including non-EV drivers

Grid benefits from EV customers
Utilities are uniquely suited to capture and redistribute the ‘lifetime value’ of grid benefits from EV owners, reinvesting in EV infrastructure and passing along benefits to all ratepayers
Real world examples are showing that proactive infrastructure investments can break the chicken-egg logjam.

In America’s Heartland, A Power Company Leads Charge For Electric Cars

More charging spots, more driving

Incentivizing EV growth is not growth for the sake of growth; each EV added to the grid is a benefit to all utility customers.
Consumers Energy: Approach to EVs
There are multiple opportunities to improve today’s EV customer journey.

**Illustrative customer pain points**

- Lack of awareness
- Gap in dealer incentives
- Installing a home charger
- Adjusting home electric rates
- Completing a long-range trip
- Understanding maintenance

**LEARN**

**ONBOARD**

**OWN**
In 2018, we will pursue opportunities along the EV customer journey where customer impact potential and utility fit are high.

<table>
<thead>
<tr>
<th>Customer journey phase</th>
<th>Activity</th>
</tr>
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</table>
| LEARN                  | Increasing Customer Awareness  
Develop methods to **educate our customers** on EV information that CE is best suited to provide, with initial focus on website resources |
| ONBOARD                | Home EVSE Installation  
Develop a solution that **clarifies installation** in a simple and user-friendly way and takes the pressure off customers |
| OWN                    | Smart Charging  
Collaborate with GM on **at-home smart charging** to gather data and track load impact from Bolt owners  
**IT Integration**  
Develop in-house capability to transmit residential **charging data** and avoid need for second meter |
We also plan to file an updated EV foundational infrastructure proposal

### 2016 Filing

**Plan Components = $15.1 million**
- $2.5M in rebate incentives
- $6.6M for Level 2 public charging
- $6M for fast charging network

**Challenges**
- Request for more plan detail and quantitative justification for spend
- Limited stakeholder engagement prior to filing

### Approach for 2018 Proposal

- **Enhance justification** for cost recovery
- **Ensure broad stakeholder collaboration**
- **Scale back infrastructure plan** with emphasis on no-regrets, ‘foundational’ installation to allow time to assess impact
- Augment with activities in 2018 on customer research and initial pilots to ensure continued learning
OBJECTIVE
Enable Michigan drivers to own and use EVs by deploying foundational infrastructure across our territory

OVERVIEW
- **Three-year program** of initial infrastructure investment designed to seed the EV market in the CE territory
- **Run as rebate programs** rather than utility ownership, with rebate terms dictating maintenance, equipment choice, and utility data/demand response access
- **Emphasis on learning**: track utilization, customer behavior, and market response to determine future steps to take

FOUR COMPONENTS:
1. Residential Charging
2. Public / Workplace Charging
3. DC Fast Charging
4. IT Infrastructure
The proposed foundational infrastructure program would run for three years.

### Year 1
- **Receive program approval**
- **Foundational Infrastructure Program**
  - Residential charging
  - Public / Workplace charging
  - DCFC
  - IT Infrastructure

### Year 2
- **Implement program; begin gathering data**

### Year 3
- **Propose program changes if required**
  - Illustrative program changes
    - Unexpected outcomes (e.g. market changes, technology advancements, program responses)
    - Recommended modifications (e.g. program caps, rebate amounts)
- **Submit final report**

### Final Report
- Insights into how plan assumptions proved true/false
- Usage/grid analysis and impact on Michigan EV market
- Recommendations on continued investment, pricing structures, rebate levels, and utility ownership
OBJECTIVE
Incentivize customers to install home chargers and use EV as a demand resource

Initial Pilot
- Offer a rebate to CE customers who enable their home for Level 1 or Level 2 charging
- Rebate terms:
  - EV on a TOU rate
  - Approved list of Level 2 chargers
  - Utility ability to collect data and conduct demand response tests
- Plan to avoid second meter by utilizing station data (will require setup in 2018)

Post-Pilot
- Evaluate program response and determine if rebate has properly incentivized market or should continue

Rationale
- Residential EVSE installation is a priority area with high customer impact and high utility fit
- Defraying installation cost is one of several possible incentives to catalyze EV adoption
Foundational Infrastructure Plan: Public/Workplace Charging

**OBJECTIVE**
Increase awareness of and access to chargers, and allow CE to test EV as a demand resource

**Initial Pilot**
- Enable installation of ~200-300 Level 2 stations at public locations and workplaces through a rebate program
- Location types will vary in rebate amounts and site recruitment methods
- Will proactively recruit site hosts where required to ensure coverage across territory
- Will cap the number of stations per program and number of stations per site
- Open to MDUs, and also exploring MDU-targeted program options for 2019
- Rebate terms to include approved charger list, station maintenance and utility ability to collect data and conduct demand response

**Post-Pilot**
- Evaluate program response and determine if/where to adjust caps and rebate amounts
- Assess site usage across programs
- Reassess approved charger list and maintenance contractors

**Rationale**
- Public infrastructure, particularly at workplaces, known to increase EV ownership
- Seeing chargers in day to day locations will increase customer awareness of EVs
Foundational Infrastructure Plan: DC Fast Charging

OBJECTIVE
Ensure coverage in our territory so that an EV driver does not have to worry about finding a charger while traveling

Initial Pilot
- Install 20-25 DCFC along highway corridors/travel routes, 2 per site
- Set up as a rebate program with parameters for site host eligibility (e.g. highway proximity, safety, amenities)
- Rebate terms to include cap on price, station maintenance, and utility ability to collect data and conduct demand response
- 150 kW DCFC installation
- Coordinate with Electrify America and other state-wide initiatives

Post-Pilot
- Evaluate program impact and EV market to determine if more/where more DCFC are needed in territory
- May integrate higher powered chargers (e.g. 350+ kW)
- May move to a TOU rate

Rationale
- Critical to incentivize the BEV market
- Major gap in Michigan today
OBJECTIVE
Build a back-end EV charging control system to support foundational infrastructure

Initial Pilot
- Will collaborate with a third party to integrate capability into existing systems
- System will have three functions:
  - Enable demand response across all pilot infrastructure
  - Interface with residential EVSE to bill for usage and negate need for second meter
  - Pull smart meter data analytics on EV usage grid-wide

Post-Pilot
- Will re-evaluate usage and need; dependent on next steps for overall infrastructure plans

Rationale
✓ Proper operation and analysis of EV infrastructure will require new IT capabilities
Our 2018 activities are designed to support and prepare for the potential foundational infrastructure plan.

<table>
<thead>
<tr>
<th>2018 Activities</th>
<th>Residential</th>
<th>Public/Workplace</th>
<th>DCFC</th>
<th>IT Infrastructure</th>
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<tbody>
<tr>
<td>1. Increased customer awareness with website update and other initiatives</td>
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<td>2. Home EVSE installation program</td>
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<td>3. Smart charging pilot</td>
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<td>4. IT integration with residential EVSE</td>
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THANK YOU

Questions?