Michigan Plug-in Vehicle Preparedness Taskforce

House and Senate
Energy & Technology Committees
May 10, 2011

Overview and History
Orjiakor Isiogu, Chairman
Michigan Public Service Commission
# Michigan's Plug-in Preparedness Taskforce

- **Automotive Manufacturers**
- **Clean Cities Coalition**
- **Dept. of Licensing and Regulatory Affairs** *(formerly DELEG)*
- **Electrical Contractors**
- **Environmental Groups**
- **Michigan Public Service Commission**
- **Not for Profit Corporations**
- **Utilities (both regulated and public)**
- **Other Interested Parties**

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### Key Milestones

- Supported passage of building code rules regulating charging station installations - 2010
- Hosted Ride and Drive event - 2010
- Transitioned to Taskforce member-led group - 2011
Automotive Perspective
Kristin Zimmerman, General Motors
Charlie Pryde, Ford Motor Company
Jay Iyengar, Chrysler

Select Battery Charge Mode
- Immediately upon plug in
- Delayed based on departure time
- Delayed based on departure time & departure time

Kristin Zimmerman
Advanced Technology Infrastructure – Chevy Volt Program
General Motors
### Definition of PEV & EVSE

**PEV =** Plug in Electric Vehicles - All PEV categories are listed below:
- BEV - Battery Electric vehicles (e.g. Nissan Leaf, Tesla Roadster)
- EREV - Extended Range Electric Vehicles (e.g. Chevy Volt) and
- PHEV - Plug-in Hybrid electric vehicles (e.g. Ford Escape Plug in Hybrid)

**EVSE = Electric Vehicle Supply Equipment:**
- Charging cords and stations are called EVSEs – Mfers include:
  - Lear/Voltic, Coulomb Technologies, Clipper Creek, EcoTality, Eaton, Leviton, GE, PEP.... There are over 40 manufacturers
- The Society of Automotive Engineers (SAE) J1772 developed the common/standard charge coupler for the vehicle
- The actual charger is located on-board the vehicle. Specific vehicle charging requirements vary by each auto OEM
- The Volt charges in 3-4 hours with a level 2 (240v) EVSE and 8-10 hours with a common house plug (120v).

### Vehicle Roll-Out Plans for Chevy Volt

- Model year 2011 production is on schedule with strong/growing demand
- Made in Michigan:
  - Detroit-Hamtramck - Vehicle
  - Brownstown - Battery System
- March - Michigan Market opened
- Chevy Volt sales and orders in Michigan continue to grow and are nearing 500 vehicles through April
- Model year 2012 production begins in September 2011
- Chevy Volt retail markets will be national by 4\textsuperscript{th} quarter 2011
- Chevy Volt in Canada July 2011
- Chevy Volt - launching in late 2011 in Europe and China
Early Adopters Influence and Drive Mainstream Adoption:
- Volt early launch markets targeted early adopter markets
- Many Volt customers are former Prius owners – 90% of current Volt customers previously from outside the brand
- Early Volt customers include:
  - the environmentally/energy security conscious;
  - the electrical contractors/inspectors who play an integral role in safely and cost effectively installing level two charging at the home; and
  - early technology adopters
- Prospective customers are motivated by current customers blogging of experiences with their Volt to date: (5 months of real data)
  - fun to drive;
  - exceeds expectations;
  - experiencing over 1,000 miles per 9 gallon tank of fuel;
  - great ride and handling on snowy roads; and
  - safe (IIHS highest safety pick)

Barriers being removed by the MPSC PEV Taskforce
Over 5,000 “free” residential EVSEs for PEV customers in MI

Ongoing Challenges: Continue to ...
- Target cost reductions for the customer by removing purchase, ownership and operation barriers:
  - Install residential charging with favorable utility, smart PEV charging options
  - Streamline permitting, inspection and electrical contractor training
- Educate the broader public and policy making entities on the activities of the state/nation regarding PEV/Smart Grid Planning (MI Smart Grid Collaborative)
- Develop on-line tools empowering purchase choice for the customer

Opportunities:
- GM’s early notification process – Volt customers opt in to inform utilities where they live – assists future local grid planning
- Vehicle to Grid (V2G) Communications Demonstrations – OnStar
- Secondary Battery Use – Community Energy Storage, power quality/reliability & frequency regulation for the grid, back up storage, etc.
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Charlie Pryde
Regional Governmental Affairs Director
Ford Motor Company

Electrified Vehicle Alternatives: Customer Driven

**HEV**
- Urban and Highway (highest volume and best FE/S)

**PHEV**
- Primarily Urban and Some Highway (promotes energy diversity)

**BEV**
- Urban (zero emissions but with range limitations)
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**Ford Sustainability Strategy**

**TECHNOLOGY MIGRATION**

**NEAR TERM**
- BEGIN MIGRATION TO ADVANCED TECHNOLOGY
- EPAS
- 6-SPEED TRANSMISSIONS
- ECoboost
- WORLD-CLASS HYBRIDS
- BEGIN BEV INTRODUCTION

**MID TERM**
- FULL IMPLEMENTATION OF KNOWN TECHNOLOGY
- AUTO STOP-START
- SUBSTANTIAL WEIGHT REDUCTION
- WORLD CLASS BEVs
- WORLD CLASS PHEVs

**LONG TERM**
- CONTINUE LEVERAGE OF ELECTRIFIED VEHICLES AND DEPLOYMENT OF ALTERNATIVE ENERGY SOURCES

*Ford’s Sustainability Strategy, Founded On Affordability For Millions Of Customers, Remains In Place As We Move To The Mid-Term*

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**2011-2017 U.S. EV Volumes by Technology Type**

<table>
<thead>
<tr>
<th>Year</th>
<th>HEV</th>
<th>PHEV</th>
<th>BEV</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td></td>
<td></td>
<td>200</td>
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<tr>
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<td></td>
<td>400</td>
<td>400</td>
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<td>2013</td>
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<td>2014</td>
<td>400</td>
<td>100</td>
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<tr>
<td>2015</td>
<td>600</td>
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<tr>
<td>2016</td>
<td>800</td>
<td>300</td>
<td>2000</td>
</tr>
<tr>
<td>2017</td>
<td>1000</td>
<td>400</td>
<td>2200</td>
</tr>
</tbody>
</table>

Source: JDPA U.S. Hybrid-Electric Vehicle Forecast - Second Quarter 2019
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New Electrified Vehicles

THE POWER OF CHOICE

C-MAX

Ford's Strategy Is To Electrify Global Platforms With All 3 Electric Solutions – To Drive Choice Of Top Hats, Scale And Affordability

Focus

C-MAX

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Michigan Assembly Plant Wayne, Michigan

- Transformed Michigan Assembly Plant (MAP), which will produce the fuel-efficient new global Ford Focus for North American customers, features flexible manufacturing, environmentally friendly practices and a highly trained work force
- A $550 million investment transformed the plant, creating new benchmarks for flexible manufacturing. Multiple models to run down the same production line, making Michigan Assembly the world's first plant to build gasoline-powered, battery electric, hybrid electric and plug-in hybrid electric vehicles on the same line
- The plant has about 3,200 employees
- MAP also features one of Michigan’s largest solar-powered generation systems and electric vehicle charging stations
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- Electric motor design, development and production technologies are critical drivers for electric drive efficiencies.

- Electronic transaxle (PHEV/HEV) and Electronic Drive Unit (BEV) manufacturing in the U.S. will support growth of supply chain — from machining suppliers to commodity providers.

- Battery Pack and Cell manufacturing and R&D builds upon U.S. future as the Center of Vehicle Electrification. Assembly alone does not bring long-term value of R&D and manufacturing.

Sourcing decisions for key electrification components during the transition to these technologies will define where the jobs go for decades...the U.S. must compete and win.

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Ford's Tier I Supply base in Michigan

2689 locations, $15.8 Billion in 2010
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Electrification Overview

Technology Choices – Degrees of Electrification

Mild HEV : Stop-Start, KERS (Kinetic Energy Recovery)
HEV : Hybrid Electric Vehicles
PHEV : Plug-in Hybrid Electric Vehicles
ReEV : Range Extended Electric Vehicles
BEV : Battery Electric Vehicles

Vehicle generated CO2 Reduction %
Overall Fuel Economy %

0 miles 2 miles 20 miles 40 miles 75 miles
e-Drive Range
**Challenges of Plug-in Technology**

- Battery Technology – Cost, size, weight, energy density, aging, thermal management
- Grid Interface – Standardization
- Customer Acceptance - Availability of infrastructure

**PHEV Ram Truck DOE Demonstration Program**

- Demonstrate 140 pickup trucks in diverse geographies and climates, across a range of drive cycles and consumer usage patterns
- Smart Grid Interface and Bi-Directional Power flow capability
- Support the creation of “Green” Technology jobs and advance the state of Plug-in technology for future production integration

**Ram Truck PHEV DOE Demo Project Summary**

- V8 engine: Advanced Technology Partial Zero Emissions
- Next Generation Lithium ion Battery
- 6.6 kW charger, Charge Times: 2hrs at 220V
- Fuel Economy (City): Charge Depleting 32MPG
- Electric Drive Range (City): 20 miles equivalent
- Range: 655 miles
- Transmission: Advanced Technology Two-Mode Hybrid
- Brakes: Regenerative Brake System
- On-board AC power generation

- DOE Demonstration program to accumulate 6 million miles, 2 million in extreme ambients
- Partnership with Academia, Suppliers, Vehicle Fleets, and Utility Companies
Utility Perspective
Steve Kurmas, Detroit Edison
Kellee Christensen, Board of Water and Light
Sue Swan/ Dan Malone, Consumers Energy
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Is the Grid Ready for PEVs?

Overall, our grid is ready to handle PEV load.

10% PEV Adoption
On-Peak Charging

10% PEV Adoption
Off-Peak Charging

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Impact of PEVs to the Distribution System

We anticipate clusters of plug-in electric vehicles, but there are ways to manage impact on the distribution system.

PEV Impacts on the Distribution System
Level 2 – On-Peak vs. Off-Peak Charging

How can we mitigate the risk?
• Create incentives to promote off-peak charging
• Educate customers of the advantages of off-peak charging

Chevrolet Volt: Programming for Delay Charge
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DTE Energy Electric Vehicle Program

<table>
<thead>
<tr>
<th>EV Rate (D1.9)</th>
<th>EVSE Incentive²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option 1</td>
<td>Customers that enroll in our EV Rate qualify for up to $2,500* which covers EVSE, installation and separate meter wiring.</td>
</tr>
<tr>
<td>On-Peak</td>
<td></td>
</tr>
<tr>
<td>18 cents kWh</td>
<td></td>
</tr>
<tr>
<td>Off-Peak</td>
<td></td>
</tr>
<tr>
<td>8 cents kWh</td>
<td></td>
</tr>
<tr>
<td>Option 2</td>
<td></td>
</tr>
<tr>
<td>Monthly Flat Bill: $40</td>
<td>Limited first 250 customers</td>
</tr>
</tbody>
</table>

¹ D1.9 requires 240V, separate meter.
² Rate Schedule: On-Peak: 9 a.m. – 11 p.m. (Mon – Fri) Off-Peak: 11 p.m. – 9 a.m. (All day weekends and Mon – Friday)
³ Available for the first 2,500 customers that enroll, or until December 31, 2012.

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DTE Energy EVSE Installation Process

Step 1: Complete application
Step 2: Online Site Assessment
Step 3: Onsite Quote
Step 4: Installation Scheduling
Step 5: Permitting and installation
Step 6: Post Installation Inspection
Step 7: Meter Installation
Step 8: Post-Install

• Welcome Pack
• Customer Survey
• Ongoing Support
Goals

- Identify and address barriers to deployment of vehicles and infrastructure
- Assess the impact of charging vehicles on the electric distribution system
- Gain the support of the community for continued deployment and use of electric vehicles
- Bridge our community project to surrounding communities to further the goal of making Michigan plug-in ready
Where We Are Now

- We have 5 Chevy Volts in our electric service territory as part of our program
- We have installed 4 charging stations and associated infrastructure
- Served on the Michigan Preparedness Taskforce to assist with addressing barriers new plug-in electric vehicle drivers may encounter

Plug-In Electric Vehicle Community Project

- The BWL Received Federal Appropriation in 2010 towards implementation of plug-in electric vehicles and supporting infrastructure
- In cooperation with surrounding communities and participating residential customer we will demonstrate the practicality and usefulness of electric vehicles for a number of purposes
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Sue Swan, VP of Smart Grid
Dan Malone, SVP Dist & Cust Operations
Consumers Energy

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Consumers Energy PEV Rate Options

Rate Option 1
- Whole house time of use (TOU) rates
- Single meter
- PEV charger wired into existing panel

Rate Option 2
- TOU rates for PEV only
- Separate meter for PEV
- Standard meter and rates for all other usage

Rate Option 3
- Monthly flat rate of $35 for PEV charger usage
- Separate meter
- Standard meter and rates for all other usage
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Consumers Energy Incentive Program

Consumers Energy will provide up to $2500 to cover the cost of purchase, installation and home wiring of a charging station.

- Incentive program specialists available
- First 2500 customers eligible for reimbursement
- Charging station installed by licensed electrician
- Customer reimbursed up to $2500

Consumers Energy's PEV Installation program Nov. 1, 2010 - Dec. 31, 2012

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Private Charging Stations

Map of private charging stations in Michigan.
Michigan Economic Impact
Jim McBryde, VP Governmental Affairs
Michigan Economic Development Corporation

Michigan Assets: Strong Supply Chain

- Over 35 companies across 9 key supply chain segments
  - More than any other state in the US
- More than $5.7 billion in announced investment since November 2008
- World class Universities developing engineering curriculum to support this new industry
- A robust pipeline of companies looking to become a part of the Michigan energy storage 'eco-system'
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Michigan Assets: Leading The Way With Education

- Energy Systems Engineering (UM) – Master’s Degree
- University of Michigan - $2.5 Million ARRA Grant
- Michigan Technological University - $2.98 Million ARRA Grant
- Wayne State University - $5 Million ARRA Grant
- Michigan Academy for Green Mobility (MTU & WSU)
Michigan Assets:
Battery Manufacturers Update

- **A123's Livonia** facility was commissioned Sept. 2010 and is running to full capacity; second facility in **Romulus** has commenced operations
- **Dow Kokam** and **LG Chem** are finishing construction on their plants in **Midland** and **Holland**; product to start shipping Q1 2012
- **Johnson Controls-Saft's Holland** facility is supplying battery packs to **Azure Dynamics (Oak Park)** for Ford's Transit Connect Electric assembled by **AM General (Livonia)**
- **Fortum Power Cell** will commence groundbreaking in **Muskegon** Summer 2011

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**Future Focus: Complementary Markets**

- **Power Electronics**
  - An industry that can leverage Michigan's automotive, energy storage, and renewable energy assets

- **Advanced Materials – Carbon Fiber**
  - A materials opportunity to leverage Michigan's automotive, energy storage, and renewable energy assets
The route is:
Begin at Michigan Ave, in front of Capital Building (star) There is a check in table to verify Drivers Licenses, sign waivers and receive tickets. A single lane around the Capitol is blocked off for this event. Proceed South on N Capitol Ave two blocks to W Allegan St. (against traffic) Turn right. Proceed West on W Allegan St. two blocks to S Walnut St. Turn right. Proceed North on S Walnut St one block to W Ottawa St. (against traffic) Turn right. Proceed East on W Ottawa St two blocks to N Capitol Ave. Turn right. Proceed South on Capitol to starting point.