

DTE Energy



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Plug-In Electric Vehicles and Infrastructure

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DTE Energy

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Power Your
Plug
Electric
Vehicle



in



IEEE PES GM 2011 Electric Vehicle Super Session



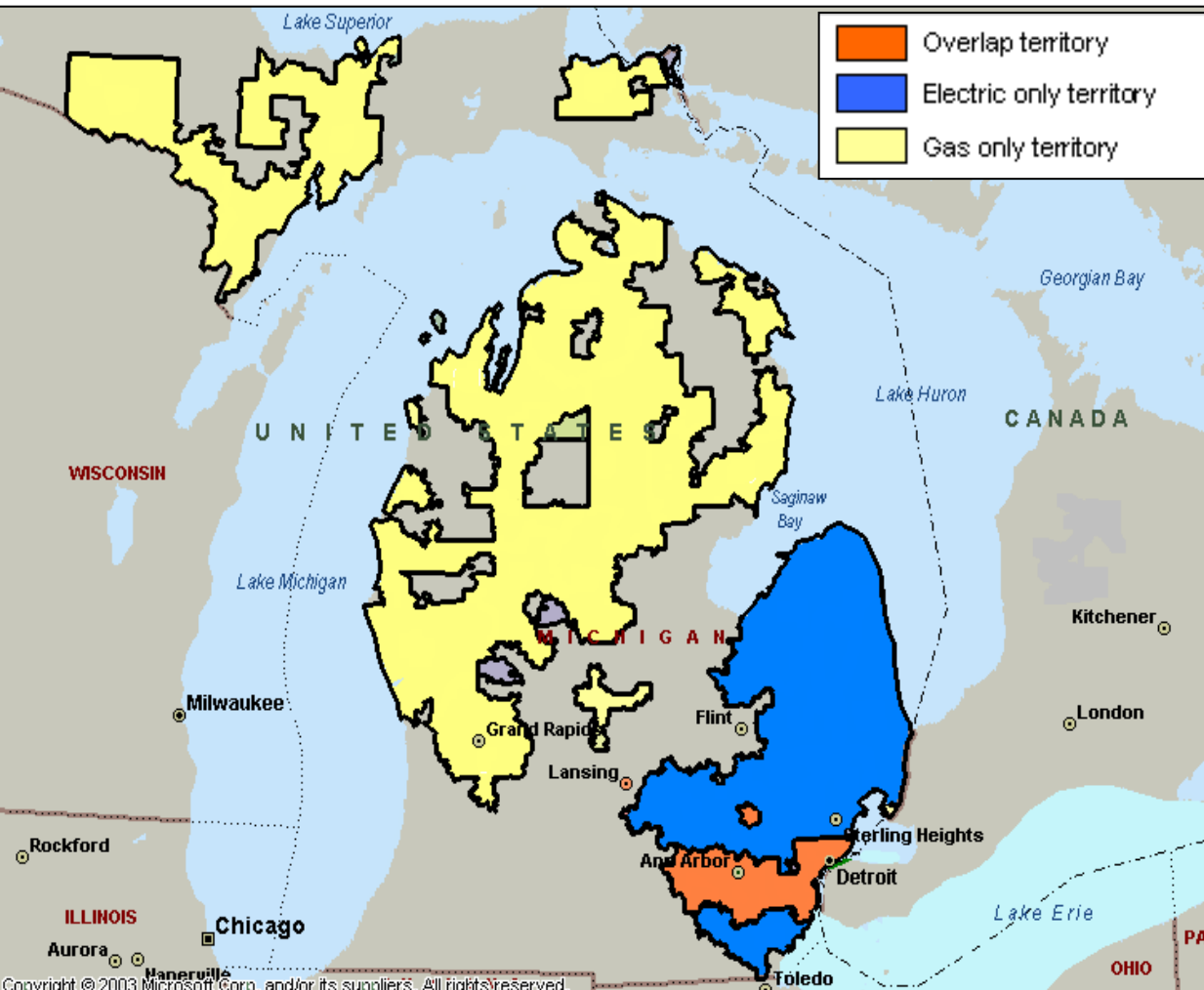
- DTE Energy Background
- History of Electric Transportation in Detroit
- PEV Environmental Impact
- PEV Grid Impact
- DTE Energy Electric Vehicle Program
 - EV Rates
 - Customer Communication

DTE Energy – Electric & Gas Regulated Businesses

Power Your
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Electric
Vehicle



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Detroit Edison

- Tenth largest US electric utility
- 7,600 square mile service
- 2.2 million customers
- \$4.9 billion in revenue
- Gen Capacity: 11,080 MW
- Annual Sales: 50,000 GWH

Michcon

- Eleventh largest US natural gas utility
- 14,700 square mile service territory throughout Michigan
- 1.3 million customers
- 679 bcf of gas sales
- \$1.8 billion in revenue

Detroit Edison Service Area



System Peak Load:	12,762 MW
Annual Sales:	50,000 GWH
Distribution Substations:	662
Distribution Circuits:	2,808
	1,876 @ 4.8kV
	932 @ 13.2kV
Distribution Circuit Miles:	38,939
	20,184 @ 4.8kV
	18,755 @ 13.2kV
Subtransmission	802 @ 24 kV
	2,743 @ 41.6kV

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In 1914, Detroit was the first American city to use electric taxi cabs

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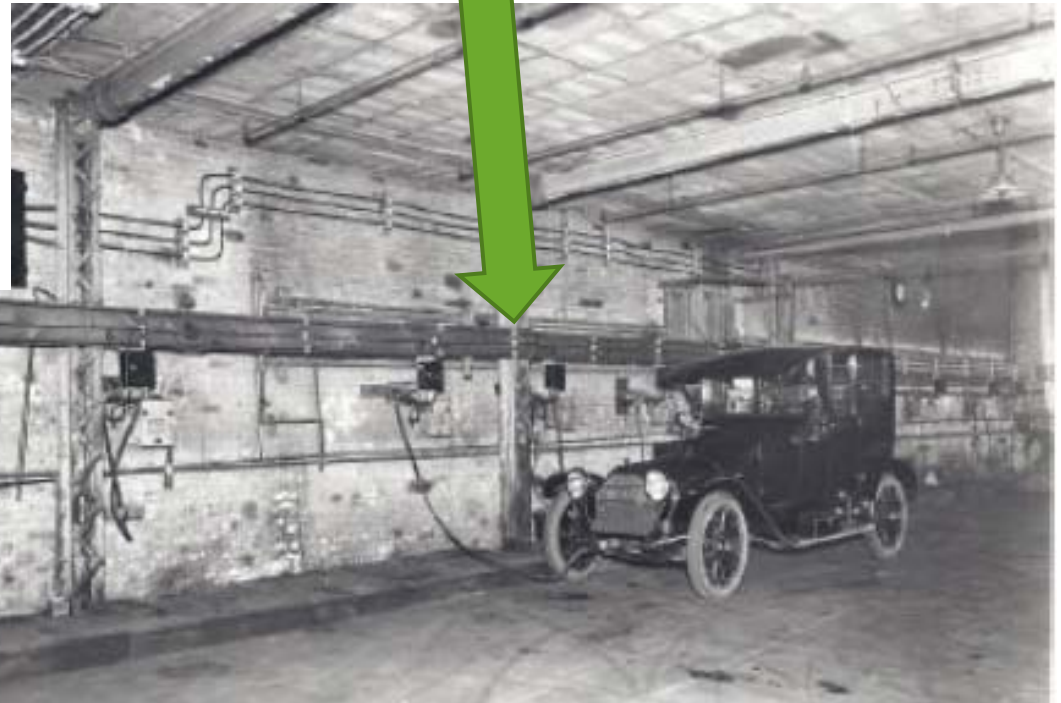


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Detroit's first electric taxi accumulated more than 46,000 miles in its first two years of operation.

Note the curb-side charging port and main charging stations.



Detroit Edison & Electric Vehicles

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Electric AMC Pacer wagon



1960's

Subaru electric van



1970's

1980's

Ford Ecostar



1990's

Ford Escape Plug-in



2010



30 families participated in a study on the use electric VW Rabbits



"Park & charge" credit card system, tracked energy usage and parking time for billing



Chevy S-10 Pickup



Chevy Volt

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Why is it different today?

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- The battery ...
- Standard plug (J772) ...
- The environment ...
- Domestic fuel source ...
- Lower operating cost ...
- Extended range PEV. Range anxiety ...
- Energy independence ...
- Every automaker is doing it ...



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- Your Local Electric Utility
 - The fuel company for the electric vehicle



For Michigan there is an overall GHG reduction driving PEV's (UofM study)



- State of Michigan assessment 2010 to 2030
- In all scenarios, PEVs decreased statewide GHG emissions by 0.4% to 10.9% & displaced 0.6 to 9 billion gallons of gasoline
- A 46% reduction in annual GHG emission substituting nuclear generators for some of Michigan's predominately coal base load power plants
- Criteria air pollutant emissions were reduced in most scenarios

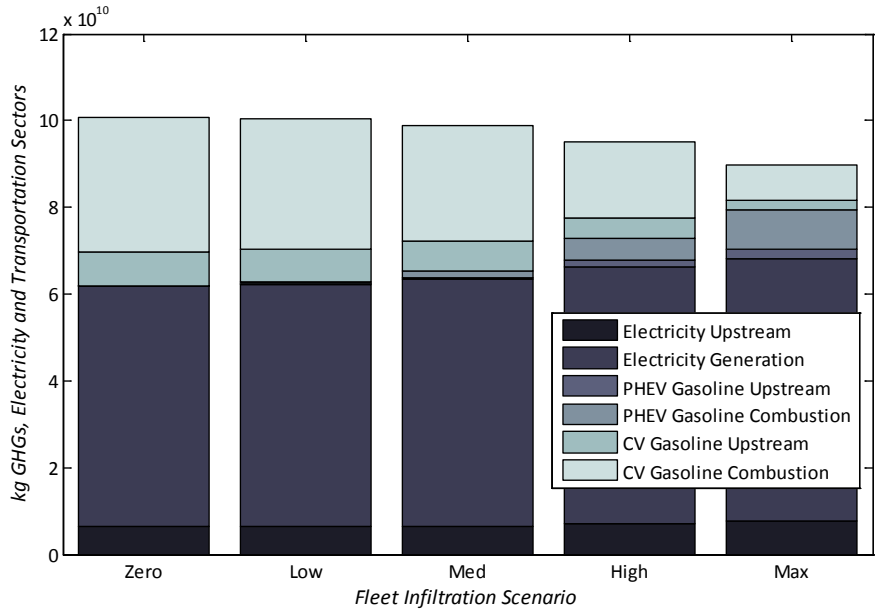


Environmental Assessment of PEVs

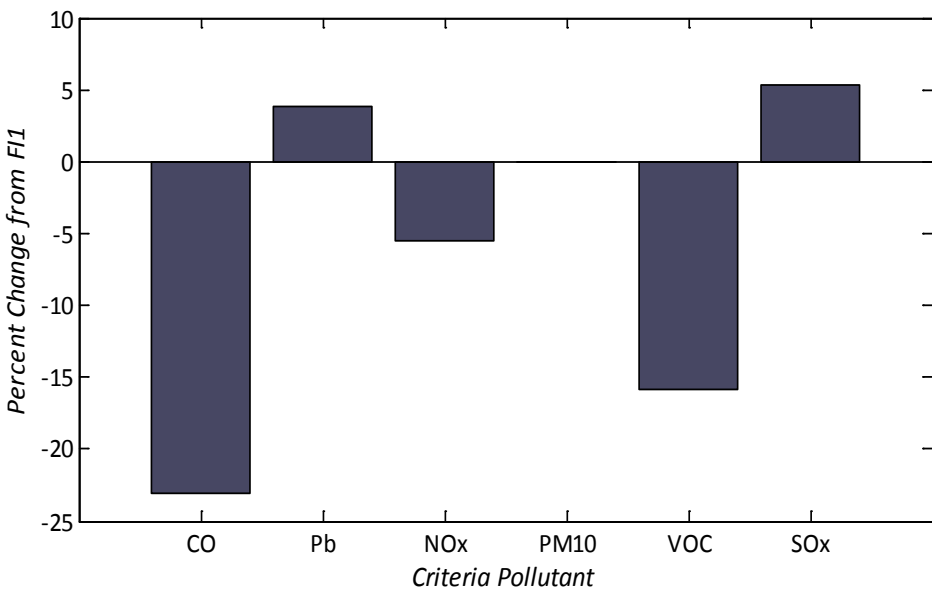
Well-to-wheel analysis



- Total GHG - electric and transportation sector



- Criteria pollutants change from zero PEV case

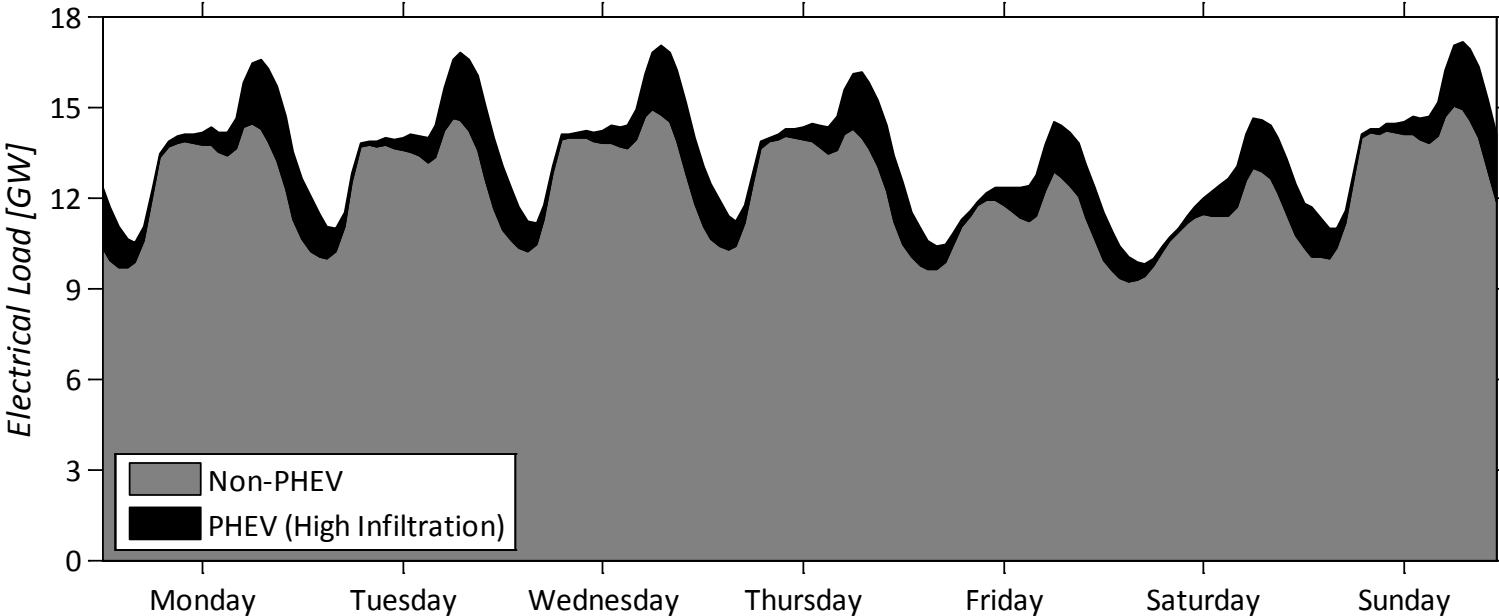


- PEV adoption rate scenarios through 2030
 - Low = 3.2% ; Medium = 13.3%; High = 42.6%; Max = 73.3%



Environmental Assessment of PEVs

Electrical System Demand



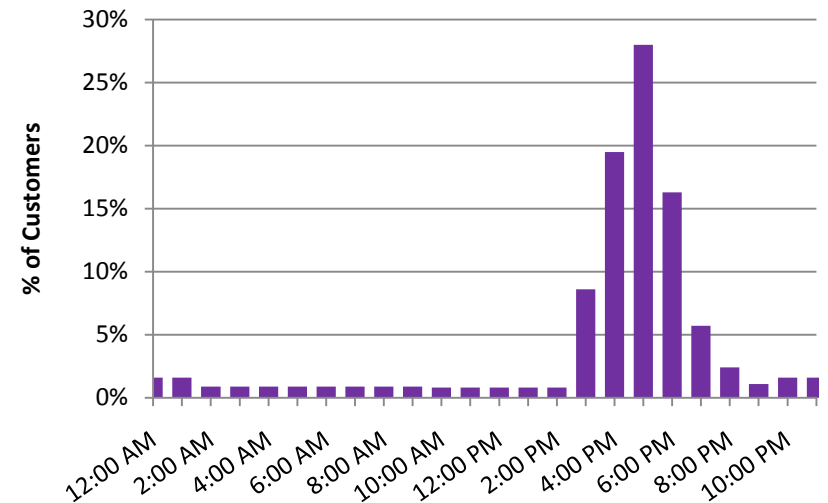
Electric system demand in Michigan, one week in January, 2030



□ ***Uncontrolled or On-Peak Charging***

- The customer plugs in their vehicle upon arrival at home from work
- 80% of customers arrive between 3 and 8pm
- Level 1 and Level 2 charging studied at 5 to 30% adoption²

Distribution of Arrival Times at Home¹



□ ***Controlled or Off-Peak Charging***

- Charging start time is controlled by the vehicle, EVSE or the utility
- Level 2 charging studied from 7pm – 1am

1: Data gathered from 2000 U.S. Census

2: “Adoption” in this study is the percent of residential customer meters with a PEV

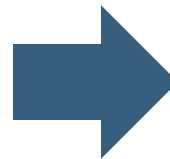
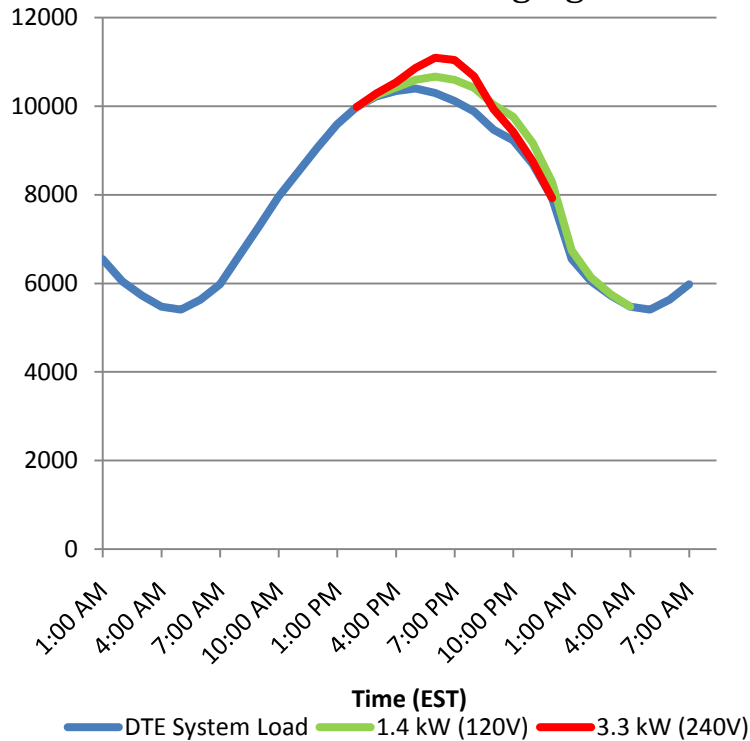


PEV Load Impact on DTE Energy's System

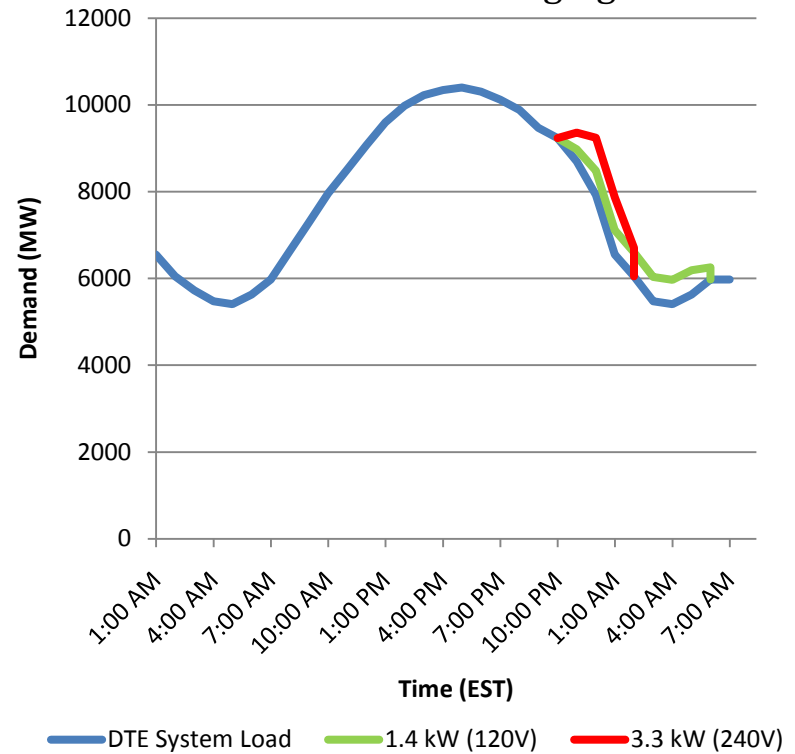
Summer Load : On-Peak versus Off-Peak



10% PEV Adoption On-Peak Charging



10% PEV Adoption Off-Peak Charging



Based on SE Michigan arrival time at home from work.

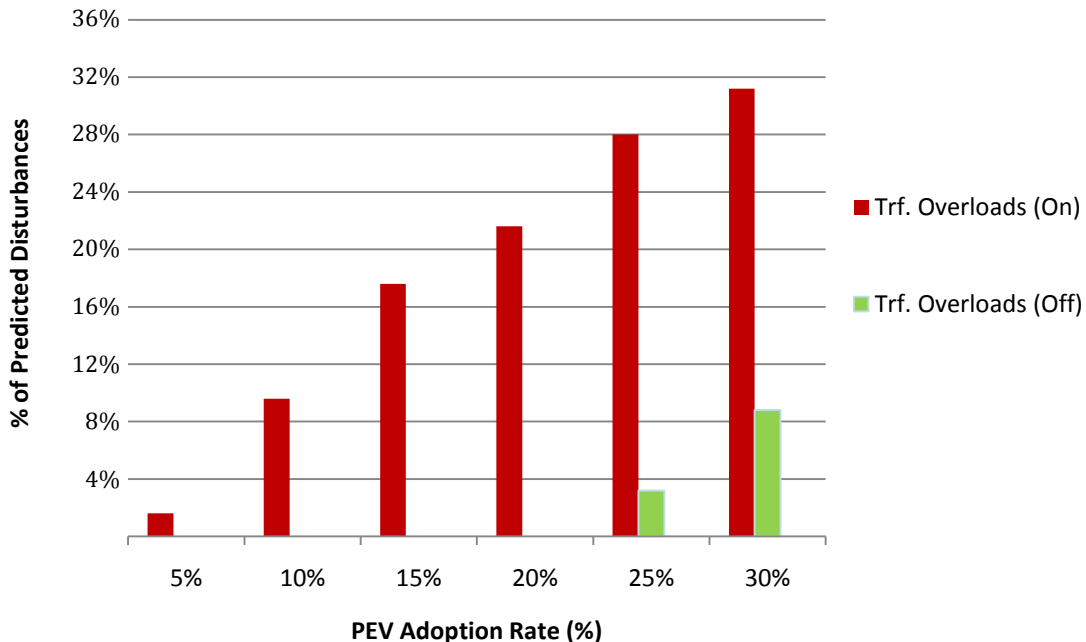


Charging Impact on Distribution System

Heavily Loaded Circuit – Worst Case Scenario

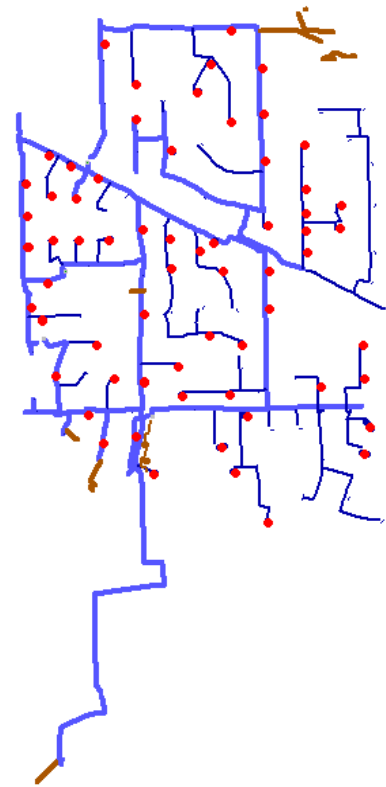


PEV Impacts on the Distribution System On-Peak vs. Off-Peak Charging



- Red bars – Percent overloaded transformers with uncontrolled charging
- Green bars – Percent overloaded transformer with controlled charging starting at midnight

Studying PEV Charging on a Distribution Circuit



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*There are a total of 125 distribution transformers on the distribution circuit

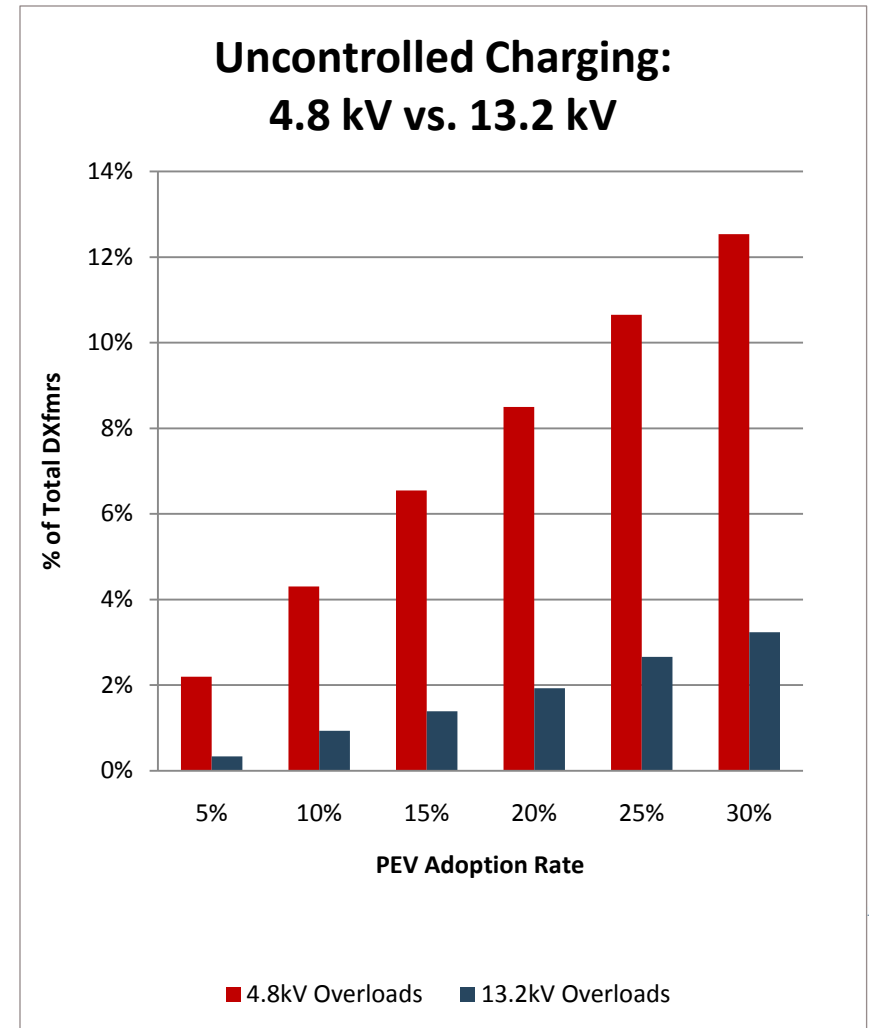
Uncontrolled Charging

Level 2 at 3.3 kW



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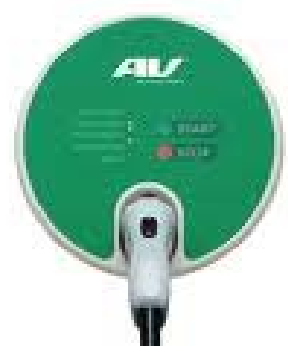
- Circuits in early adopter areas
- 93 circuits studied
- 4.8 kV circuit have greater number of overloaded transformers than 13.2 kV circuits
- 4.8 kV circuits are dominated by 25 kVA transformers
- Evaluation of first wave of Volt customer
 - No over loaded circuits
 - Potentially two overloaded



Home Charging - Sample



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DTE Energy Electric Vehicle Program for Residential Customers

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EV Rate (D1.9)¹

Option 1	On-Peak 14 cents kWh Off-Peak 3.5 cents kWh
Option 2	Monthly Flat Bill: \$40 Limited first 250 customers

Requires a 240 V separate meter circuit



EVSE Incentive²

Customers that enroll in our EV Rate qualify for up to \$2,500* which covers EVSE, installation and separate meter wiring.



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¹ RD1.9 requires 240v, separate meter.

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)

² Available for the first 2,500 customers that qualify, or until December 31, 2012.

Electric Vehicle Rate

Time of Use Rate

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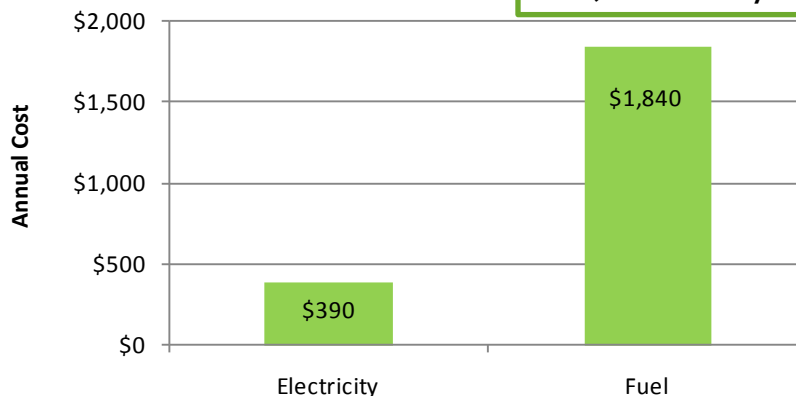
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- 40% off the regular residential rate. On-peak 9 am to 11 pm. M-F. Everything else off peak.
- Flat \$40/month rate
- Eligible for up to \$2,500 towards charging station and installation

Electricity versus Fuel

Annual Cost

\$2,335 -- \$4/Gallon



You can save up to **\$1,400** a year if you charge using our TOU Off peak rate¹

\$1,945 saving -- \$4/Gallon

Programming your vehicle for delay charge is very easy

Select Battery Charge Mode

- Immediately upon plug in
- Delayed based on departure time
- Delayed based on electric rates & departure time



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¹ Calculation based on the Chevy Volt; Assumptions: \$3.15/Gallon, and 25mpg
For other calculations assumptions, please visit our PEV Calculator at www.dteenergy.com/pev

As predicted, PEVs are starting to Cluster...

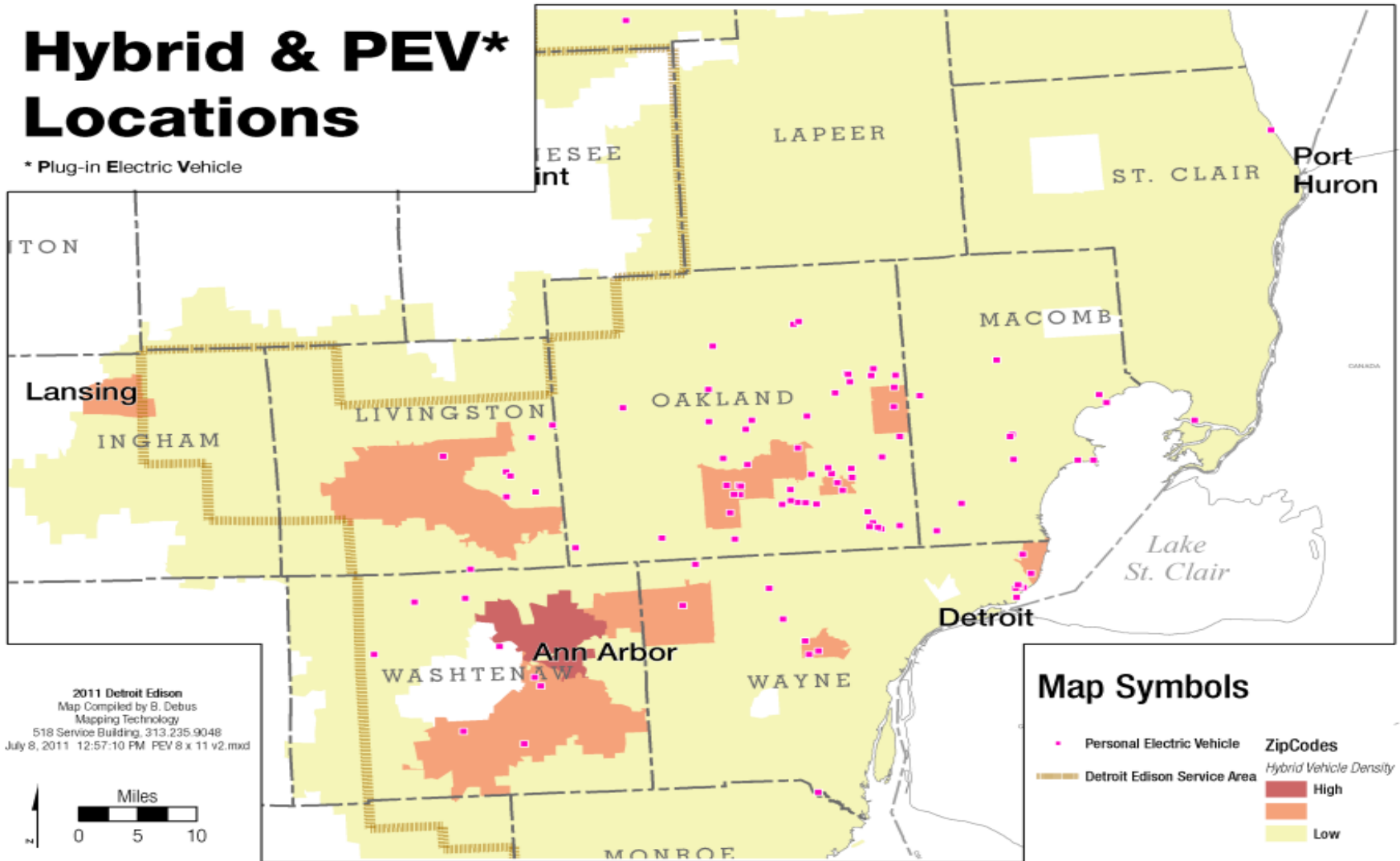
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Hybrid & PEV* Locations

* Plug-in Electric Vehicle



Status of our Residential Program

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Customer
Applications
100



EVSE
Installed
82



Meter
Installed
64



Over 90% of DTE Energy Volt owners are participating in our program and selecting to share their information with us for distribution system planning

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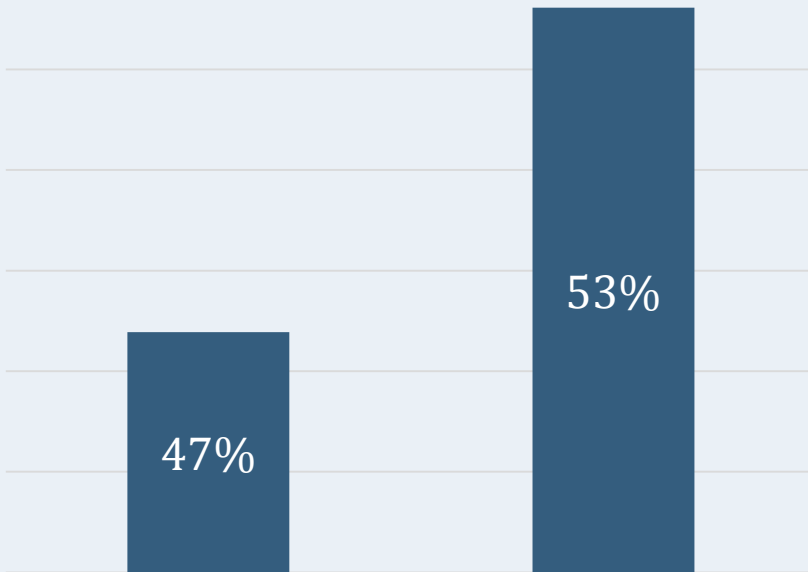
Initial EV Rate Adoption, and Preliminary charging behaviors

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Electric Vehicle Rate Adoption



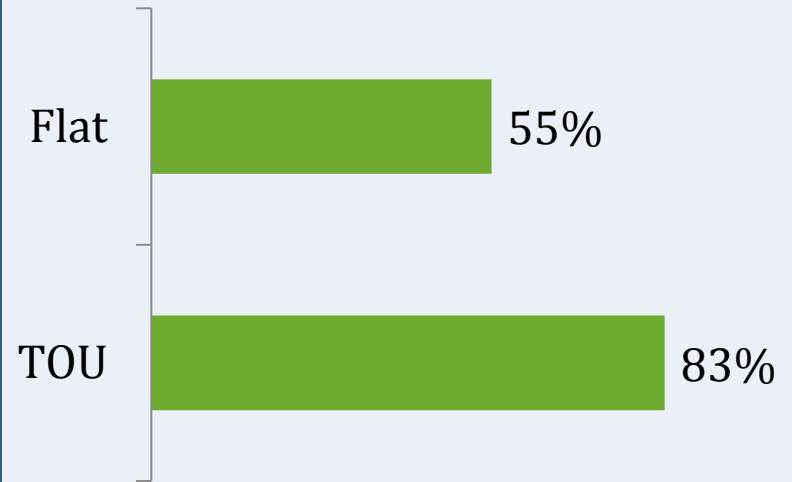
PEV RATE OPTION #2
Flat Monthly Bill \$40



PEV RATE OPTION #1
Time of Use (TOU)



Off - Peak Charging (Avg % Usage during Off Peak per Customer)



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Vehicle Electrification Demonstration

DOE Program Number: DE-EE-000-2628

Volt Demonstration Project Objectives:

- Evaluate and demonstrate various EVSE technology at numerous charging locations
- Utilize advanced metering infrastructure (AMI) to:
 - Monitor charging data at Volt charging locations
 - Demonstrate charging control techniques (i.e. demand response)
- Explore the development of residential and commercial charging and EVSE tariffs

Charger Installation Plans:

Number Charging Stations		
Residential	Work Place	Public
12	2	14

Volt Total: 10

Special Project(s):

- Participant in the OnStar Smart Charging demonstration

Set Weekday Rates

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A screenshot of a web application interface for setting weekday rates. The browser window title is "OnStar Communications: Welcome - Microsoft Internet Explorer provided by DTE Energy". The address bar shows "http://go868-r17a:7001/ovWeb/welcome.jsf". The page has a blue header with the DTE logo and "Welcome". Below the header is a "Search Criteria" section with a "VIN" input field. The main content area is titled "Search Results" and "Vehicle Information". A "Weekday Rate" section is highlighted, showing a "Start Date For Weekday Rate" of "07/20/2011". Below this is a slider control for "On Peak" time, with a marker at "08:30am" and a range from "12:00am" to "11:45pm". Underneath the slider are two input fields: "Weekday Rate Off Peak" with the value ".15" and "Weekday Rate On Peak" with the value ".17". Below the "Weekday Rate" section is a "Weekend Rate" section with the text "Vehicles that rate applies". The browser's taskbar at the bottom shows "Local intranet" and "100%" zoom.

Establish the Start Date for the Rate Change for the Vehicles

Set the Peak and Off-Peak Rates Weekdays or Weekends.



Select Vehicle or Fleet

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A screenshot of a web browser displaying the OnStar Communications website. The browser window title is 'OnStar Communications: Welcome - Microsoft Internet Explorer provided by DTE Energy'. The address bar shows 'http://go868-r17a:7001/ovWeb/welcome.jsf'. The website header includes the DTE Energy logo and the text 'OnStar Communications'. Below the header, there is a 'Welcome' section with a 'Search Criteria' area containing a 'VIN' input field. A yellow callout bubble with the text 'Apply TOU Rates and Times to Single or Multiple Vehicles' points to the search results area. The search results show a list of VINs under the heading 'Vehicles that rate applies to'. The first VIN, '1G1RD6E42BU200060', is highlighted in blue. To the right of the list is a button labeled 'Apply Rates to Selected Vehicles'. The browser's taskbar at the bottom shows 'Local intranet' and '100%' zoom level.

OnStar Communications: Welcome - Microsoft Internet Explorer provided by DTE Energy

http://go868-r17a:7001/ovWeb/welcome.jsf

File Edit View Favorites Tools Help Links Customize Links EO Data Tracking

OnStar Communications: Welcome

DTE Energy OnStar Communications

Welcome

Search Criteria

VIN

Search Results

Weekday Rate

Weekend Rate

Vehicles that rate applies to

Vehicles that rate will apply to:

- 1G1RD6E42BU200056
- 1G1RD6E42BU200057
- 1G1RD6E42BU200058
- 1G1RD6E42BU200059
- 1G1RD6E42BU200060**
- 1G1RD6E42BU200016
- 1G1RD6E42BU200017
- 1G1RD6E42BU200018
- 1G1RD6E42BU200019
- 1G1RD6E42BU200020

Apply Rates to Selected Vehicles

Local intranet 100%

Energy



Rate Results



OnStar Communications: Welcome - Microsoft Internet Explorer provided by DTE Energy

http://go868-r17-1:7001/oviWeb/welcome.jsf

File Edit View Favorites Tools Help Links Customize Links EO Data Tracking

OnStar Communications: Welcome

VN Vehicle Type <All Types> Search

Search Results Vehicle Info

Weekday Rate
Weekend Rate
Vehicles that rate applies to

Vehicles that rate will apply to:

- 1G1RD6E42BU200058
- 1G1RD6E42BU200059
- 1G1RD6E42BU200060
- 1G1RD6E42BU200016
- 1G1RD6E42BU200017
- 1G1RD6E42BU200018
- 1G1RD6E42BU200019
- 1G1RD6E42BU200020

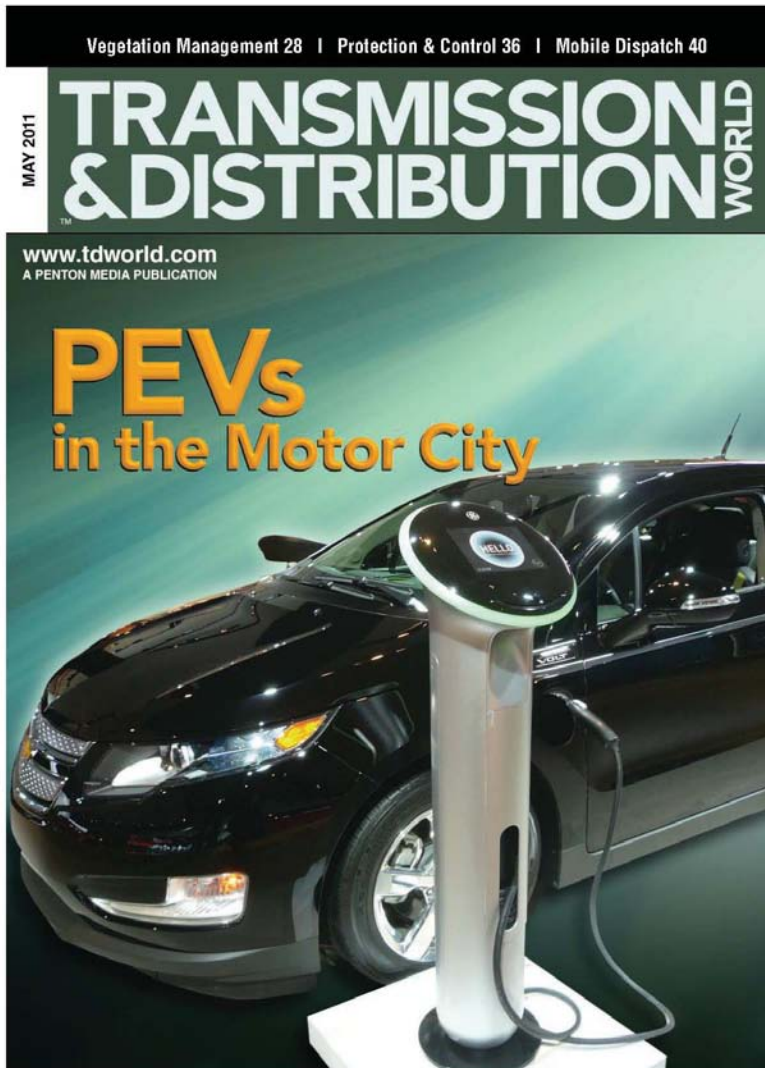
Apply Rates to Selected Vehicles

Rate Type	Effective Date	Off Peak Rate	Off Peak Hours	Vehicles	Result
Weekday	07/20/2011	0.15	12:00am-09:00am 11:00pm-11:59pm	1G1RD6E42BU200058	Result Code : Success Correlation ID : 1483
				1G1RD6E42BU200059	
				1G1RD6E42BU200060	
				1G1RD6E42BU200016	
Weekend	07/20/2011	0.15	12:00am-11:59pm 11:59pm-11:59pm	1G1RD6E42BU200017	
				1G1RD6E42BU200018	
				1G1RD6E42BU200019	

Done Local intranet 100% 11:20 AM

Vehicles Updated Status Off-Peak Rate and Times for Weekend and Weekday





- DTE Energy has a long history working with the automotive industry
- PEVs are environmentally friendly
- The grid is ready ... but early planning is important
- Metering challenges

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