DEMAND MANAGEMENT PILOT FOR PLUG-IN VEHICLE CHARGING IN MARYLAND

Pepco Holdings, Inc

Maryland Electric Vehicle Infrastructure Council Meeting

Presented by: William Gausman, Sr VP, Strategic Initiatives

October 1, 2013

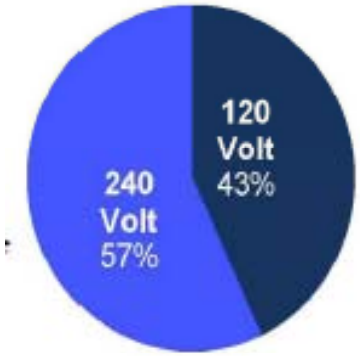
Pepco History with Electric Vehicles

- Member of DOE Site Operator Program
  - Maintained a fleet of 6 all-electric conversion vehicles
- Founding Member of EV America
  - Developed first utility standards for electric vehicles
  - Later turned over to DOE / INEL
- GM PrEView Drive Program
  - 60 customer drivers for two weeks at a time
  - Installed over 75 Level 2 chargers
- Toyota RAV4 EV Program
- Ford Ranger EV Program

Plug-In Vehicles are ~~coming~~.... Here

- Penetration projections are inconsistent
- Customers favor Level 2 charging at home.
- Significant penetration is still years away
- Washington, DC region is an early target market for several manufacturers

Preferred Electrical Service To Charge Vehicle At Home

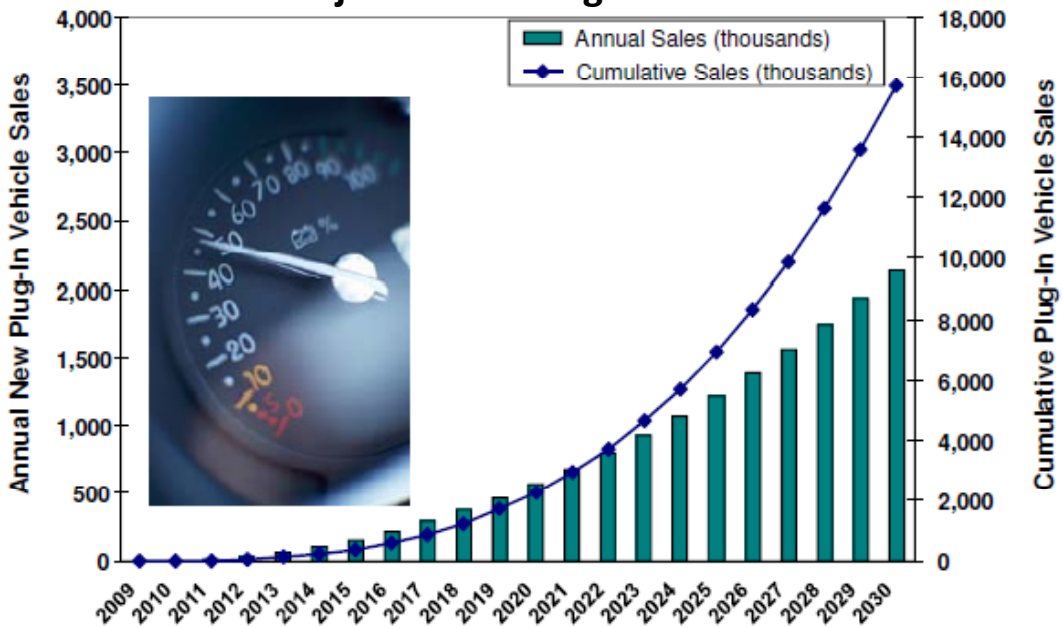


86% of those who would pay at least $200 to upgrade to a 240V system already have an appliance with 240V service.

OEM Deployment in the Washington, DC Region

Ford Transit Connect	2010
Chevy Volt	2011
Nissan Leaf	2011
Ford Focus	2011
Ford Fiesta	2012
Tesla "S"	2012
Ford PHEV	2013
Fisker Atlantic	2013?
BMW Megacity	2013

EPRI National Projection for Plug-In Vehicle Penetration



Calculating PEV Demand

In order to estimate demand for PEVs, population and number of vehicles per capita of the PHI service territories was used as a proxy for actual car sales.

Total Expected Vehicles in Each Jurisdiction				
Jurisdiction	Population	PHI Customers	Vehicles per Capita	Vehicles
Pepco MD	1,774,000	531,000	0.79	419,490
Pepco DC	209,880	256,000	0.35	89,600
Delmarva	840,856	498,000	0.95	473,100
ACE	1,629,231	547,000	0.69	377,430

From total vehicle count to plug-in vehicle count. Two data sources were used to derive PEV vehicle counts for each jurisdiction:

1. Aggregate PEV market share forecasts were used to determine a range of possibilities

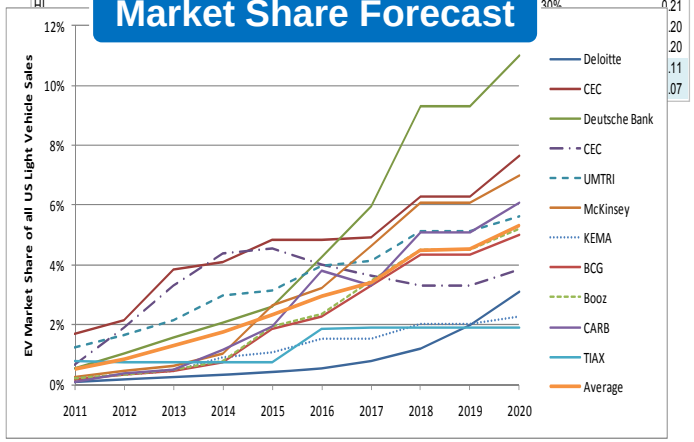
2. The number of hybrid sales per state over the 2007-2009 time frame was used to determine the premium or discount that each PHI served state can expect when compared to the national average level of PEV market share

Regional Demand Premiums

Hybrid Sales 2007-20

State	Sales	Percent of Total	Population		Hybrids per Capita	Premium/Discount
						0.25%
CA	199958	24.71%	36,962,000	12.30%	0.54%	1.15
VT	2994	0.37%	621,000	0.21%	0.48%	0.92
OR	17403	2.15%	3,687,000	1.23%	0.47%	0.88
WA	29676	3.67%	6,664,000	2.22%	0.45%	0.77
DC	2597	0.32%	599,617	0.20%	0.43%	0.72
CT	14503	1.79%	3,518,000	1.17%	0.41%	0.64
NH	5444	0.67%	1,325,000	0.44%	0.41%	0.63
VA	30397	3.76%	7,883,000	2.62%	0.39%	0.53
MD	20798	2.57%	5,699,000	1.90%	0.36%	0.45
CO	17598	2.17%	5,025,000	1.67%	0.35%	0.39
AZ	22148	2.74%	6,596,000	2.20%	0.34%	0.34
ME					31%	0.24
HI					30%	0.21
						.20
						.20
						.11
						.07

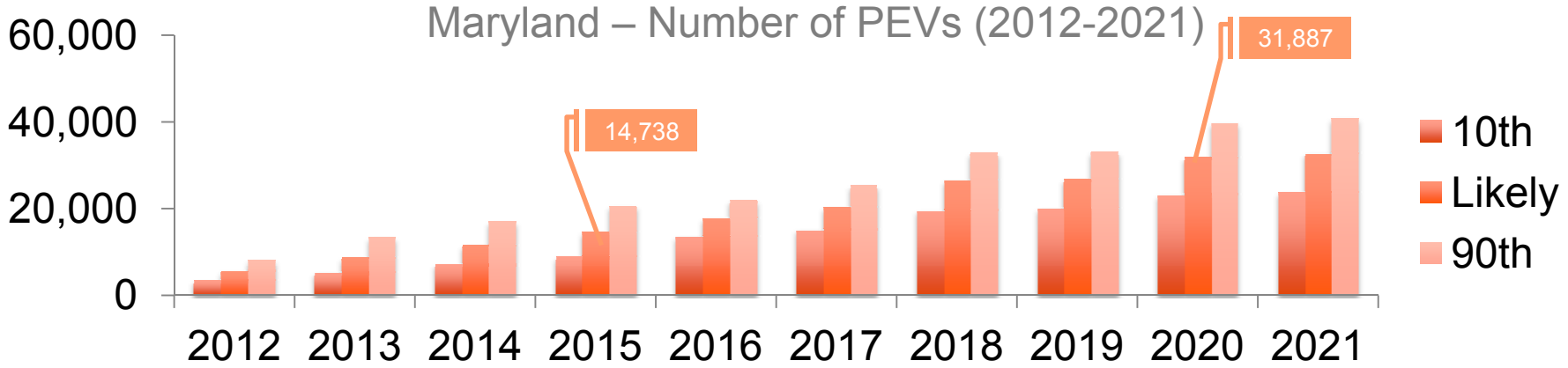
Market Share Forecast

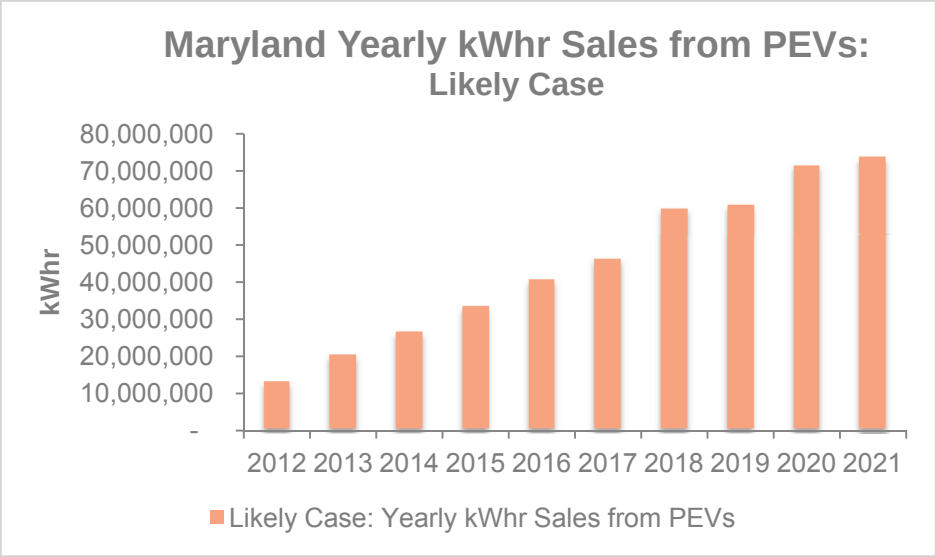


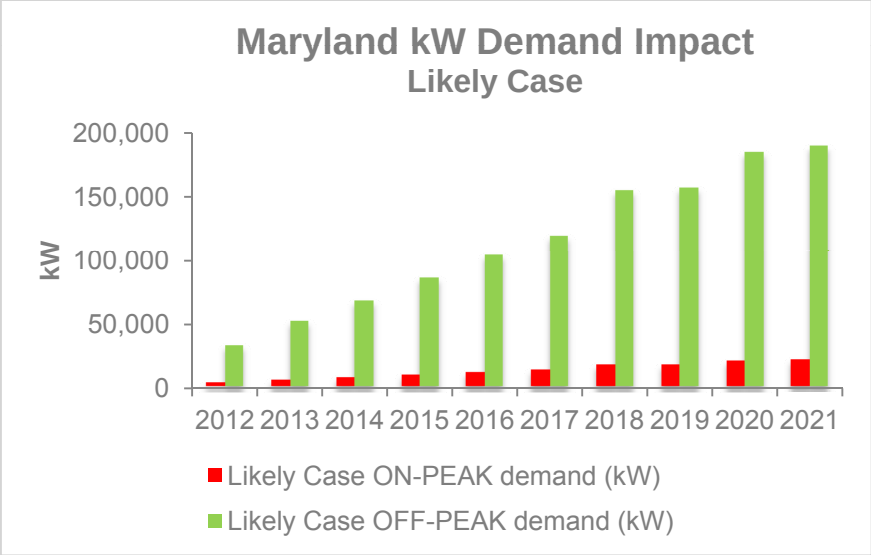
Maryland (DPL & Pepco)

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
10th	3,460	5,124	7,273	9,123	13,632	15,174	19,640	20,147	23,257	23,982
Likely	5,636	8,859	11,672	14,738	17,947	20,531	26,652	27,056	31,887	32,847
90th	8,233	13,572	17,187	20,852	22,145	25,555	33,035	33,271	39,873	41,064

MD Service Territory Data







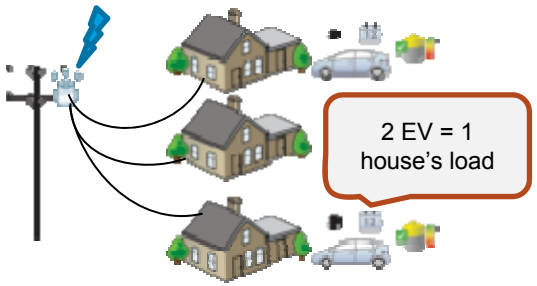
Assumptions:

Plug-in electric vehicles (PEVs) / consumption:
- An individual PEV will use 7 kWhr per day per charge
- Each PEV will charge 320 days per year

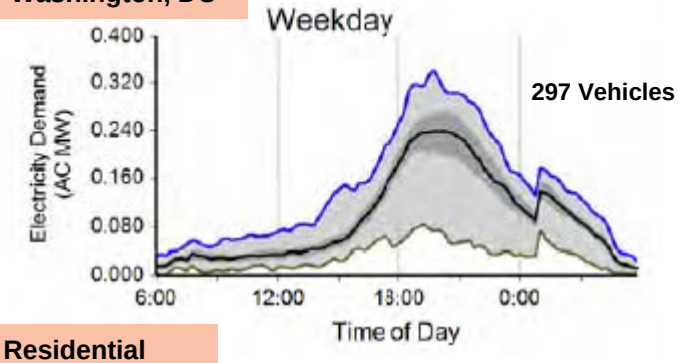
Chargers/Demand:
- The demand of a Level 2 charger is 7.68 kW
- The demand of a Level 1 charger is 1.4 kW

Other assumptions:
- 80% of chargers are Level 2 chargers, 20% are Level 1
- 90% of charging is done off-peak, 10% on-peak

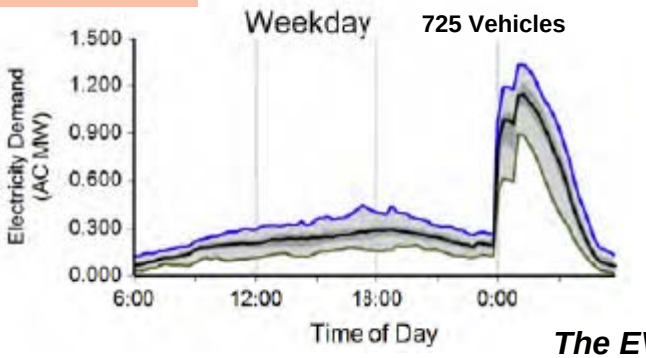
Unmanaged EV charging can create reliability problems for utilities…..



Residential Washington, DC[1]



Residential San Diego, CA[1]



Local Distribution System Impact

- EV load is equivalent to ½ of full home load, so adding EVs may overload local transformers
- Older, more established neighborhoods with higher concentrations of EVs will be particularly at risk (e.g., Montgomery County and Prince Georges's County Suburbs)

Local Peak Load Increase

- Most drivers will return home and plug in between 4-8 PM, resulting in an increase to the normal afternoon peak
- Uncontrolled charging will create the need for additional Infrastructure and result in longer and higher peak demand
- Potential for Impact to Distribution System reliability

Operational Needs

- Metering EVSE as separate load for Innovative Rates
- Back-office integration of EVSE for control, billing
- Remote diagnostics for lower maintenance costs
- Ability to manage charging in pockets to prevent stress on the Distribution System
- Need to validate the accuracy of on-board metering in EVSE in order to eliminate the need for a second AMI meter

The EV Project Report, Q1 2013, US DOE[1]

Recent Legislation

Recent State Sponsored Activities prompting the development of Pepco's Pilot program:

1. Maryland Senate Bill 179

Goals

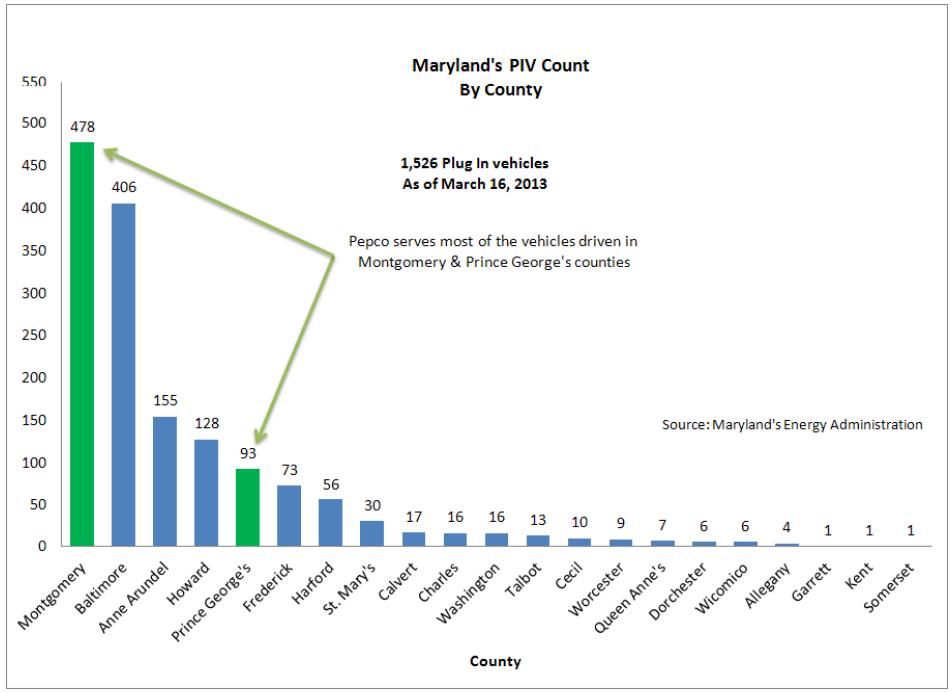
- Increase reliability & efficiency of the electric distribution system
- Lower electricity use at time of high demand (peak)

Incentives

- ***TOU Pricing***
- ***Credits on Distribution Charges***
- ***Rebates on the Costs of Charging Systems***
- ***Demand Response Programs***
- ***Other Programs as approved***

2. Maryland PSC Case No. 9261

- Created a Working Group with major stakeholders
- Issued the Final Report (Feb 13, 2012)
  - Focused on reliability and promoting "off peak" charging
  - Developed consensus for desirable elements of a pilot (Pilot Framework)



Source: Maryland Energy Administration

The Working Group defined framework for evaluating proposed pilot programs

The Commission's Working Group established a broad array of criteria which a proposal could address. It is intended that the Working Group assess the strength of each proposal in light of these criteria.

Pricing

- Ability to shift behavior
- Ability to lower use at peak
- Off Peak incentives
- Customer communication
- Scale of pricing offering
- Acceptance & satisfaction
- Tracking of behavior change
- Participant feedback of price options

Demand Response

- Ability to shift behavior
- Ability to lower use at peak
- Facilitate DR contributions
- Mitigate load imbalances
- Load reduction level from participants
- Viability of technology to facilitate demand response
- Effectiveness of technology

Customer Education

- Ability to shift behavior
- Ability to lower use at peak
- Channel effectiveness
- Participant preferences
- Consumer feedback tracking
- Response to various incentives and technology offerings

Smart Technology

- Ability to shift behavior
- Ability to lower use at peak
- Demonstrate functionality
- Tech & utility interconnection requirements
- Accuracy of the meter within the EVSE
- Installation/permitting issues
- Data/communication network capability

Baseline Information

- EV sales
- Clustering implications
- Energy use profiles
- EVSE to installation, operation and maintenance costs

Pilot Proposal Overview

Pepco is proposing to implement a Voluntary Demand Management Pilot for Plug-In Vehicle (PIV) Charging in the Pepco's Maryland service territory.

Pepco has developed a proposal focused on reliability and the framework developed by the working group. The proposal is centered around a mix of infrastructure offerings. A summary of the proposal is as follows:

- A Whole House time of use rate (TOU) for SOS residential customers with a PIV.
- A PIV Only TOU rate for those customers that only want a vehicle rate *(customers with existing Electric Vehicle Supply Equipment or EVSE will require a second meter)*.
- The installation of 50 smart level II charging stations to provide to customers along with a PIV Only TOU rate. This will allow for Pepco to test active Demand Response, where the time and output of the EVSE can be remotely managed.(This solution will also require a second meter).
- Customers selecting a PIV Only TOU rate will have the option of receiving 100% renewable energy (PIV-Green) in the form of an "Adder" to the PIV specific rate.

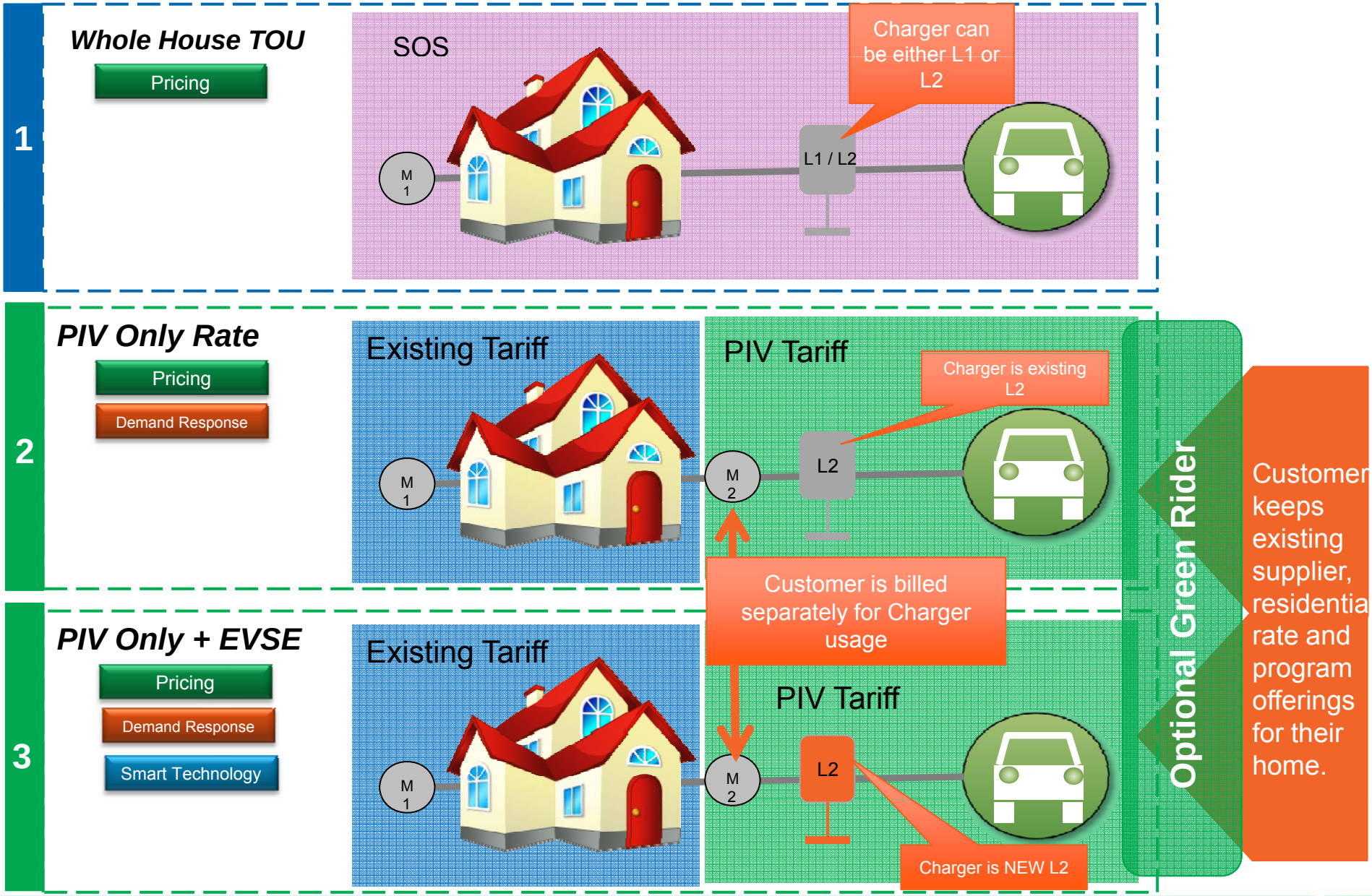
Scope and Scale:

- The Program will begin accepting customer applications within two month after approval and operate until the end of the third quarter of 2014.
- This experimental program will cover up to 250 total customers for at least one year. The whole house rate offering will be applicable for up to 1,000 customers.

Measurement:

- Pepco will use customer load data comparisons, surveys and Pilot learnings to evaluate the success of the Pilot based on the requirements set forth in the Legislation.

Pepco Pilot Offers at a glance



Proposed Experimental Rates

Pepco has developed the following rates for residential customers with Plug-in Vehicles:

- Whole House Time of Use
- PIV Only – Time of Use rate for the PIV
- PIV Green – Renewable Energy Adder for PIV Only

	PIV Only[1]		Whole House	
	Summer	Winter	Summer	Winter
On-Peak	$0.18230	$0.15782	$0.18230	$0.15782
Off-Peak	$0.07268	$0.06045	$0.10751	$0.09209

MD Residential Service Schedule R Rates	
Summer	Winter
$0.1268	$0.1072

Applicable to all hours for SOS customers.

PIV & Whole House TOU :

Peak: 12:00 PM – 8:00 PM

Off-peak: 8 PM – 12 PM; and all hours weekends and holidays

Rates are designed to be revenue neutral

[1]PIV Only Rate will require the installation of a separate AMI meter to measure the charger consumption

Proposed rates evaluation under different scenarios

Pepco assessed the financial benefits that could be gained by Volt and Leaf owners by enrolling in either the PIV specific rate or the whole house TOU rate.

Potential Annual Savings
Nissan Leaf a/
As Compared to Existing Residential Rate Schedule R (SOS)

Charging Hours	12AM-8AM	6 AM-2 PM	2 PM-10 PM
	100% Off-Peak	75% Off-Peak 25% On-Peak	75% On-Peak 25% Off-Peak
PIV Only	$ 276.10	$ 134.07	$ (149.99)
Whole House TOU	$ 93.32	$ (3.01)	$ (195.68)

Potential Annual Savings
Chevy Volt b/
As Compared to Existing Residential Rate Schedule R (SOS)

Charging Hours	12AM-8AM	6 AM-2 PM	2 PM-10 PM
	100% Off-Peak	75% Off-Peak 25% On-Peak	75% On-Peak 25% Off-Peak
PIV Only	$ 154.19	$ 74.87	$ (83.76)
Whole House TOU	$ 52.11	$ (1.68)	$ (109.28)

a/ Based on annual consumption estimate of 5,544 kWh = 462 kWh*12
b/ Based on annual consumption estimate of 3,096 kWh = 258 kWh*12

Assumptions:

Nissan Leaf:

- Level II Charging
- Daily energy use: 23.1 kWh
- Days driven per week: 5
- Weeks per month: 4
- Monthly Energy Use: 462 kWh

This assumes that the vehicle is charged from zero to a full charge on a daily basis.

Chevrolet Volt:

Level II Charging

- Daily energy use: 12.9 kWh
- Days driven per week: 5
- Weeks per month: 4
- Monthly Energy Use: 258 kWh

This assumes that the vehicle is charged from zero to a full charge on a daily basis.

Proposed Renewable Adder to PIV Only Rate

As an option, we are providing our customers a "Green" choice,

Component	% Solar	REC Cost Wind	REC Cost SREC	State	Cents/kWh
100% Wind	0.0%	3.5	190		0.35
MD RPS Blend (2012)	**1.56%**	**3.5**	**190**	**(MD)**	**0.64**
MD RPS Blend (Out-of-State SRECS)	1.56%	3.5	45	(DE)	0.41

- The purpose of this option is to test whether customers will be willing to apply savings to claim zero tailpipe emissions
- It will reduce annual savings by $20 - $30

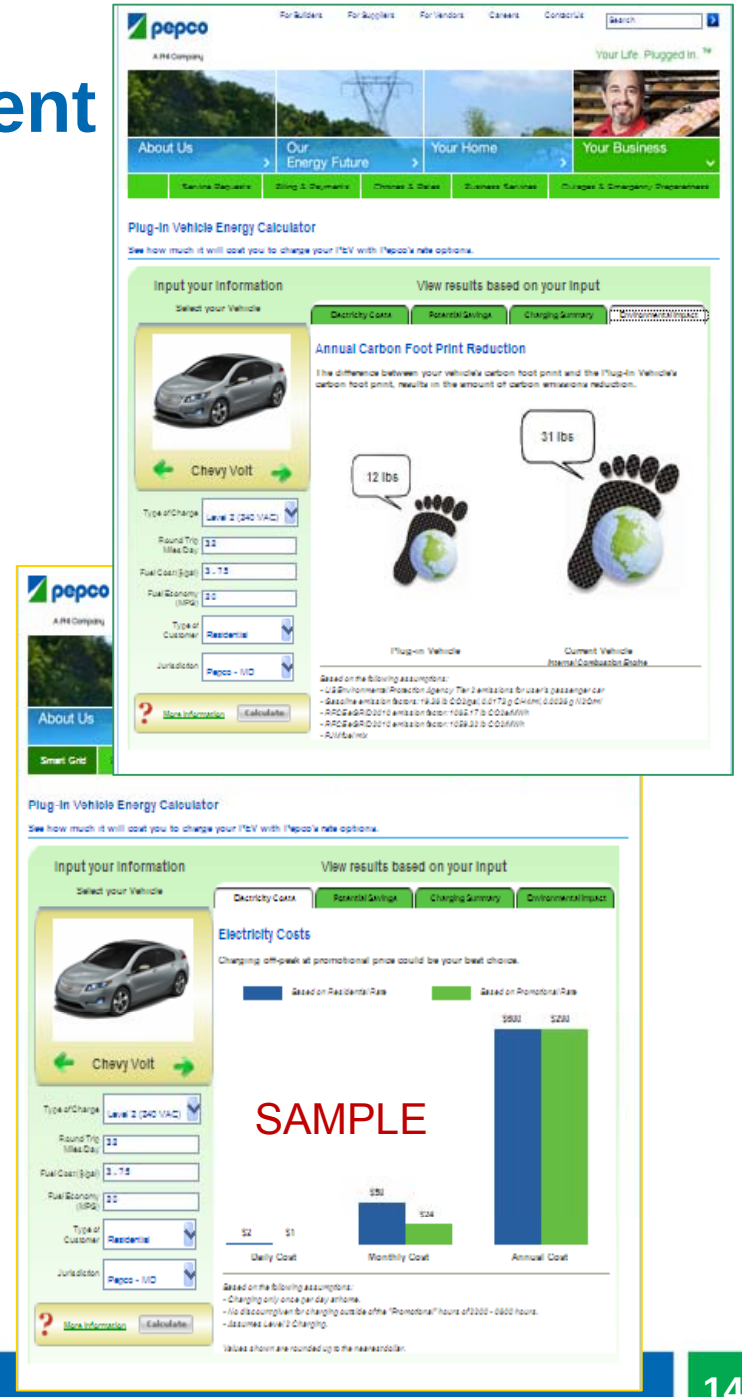
	PIV Only	
	Summer	Winter
On-Peak	$0.18230	$0.15782
Off-Peak	$0.07268	$0.06045

Adds $.0064 / KWh to proposed PIV rate

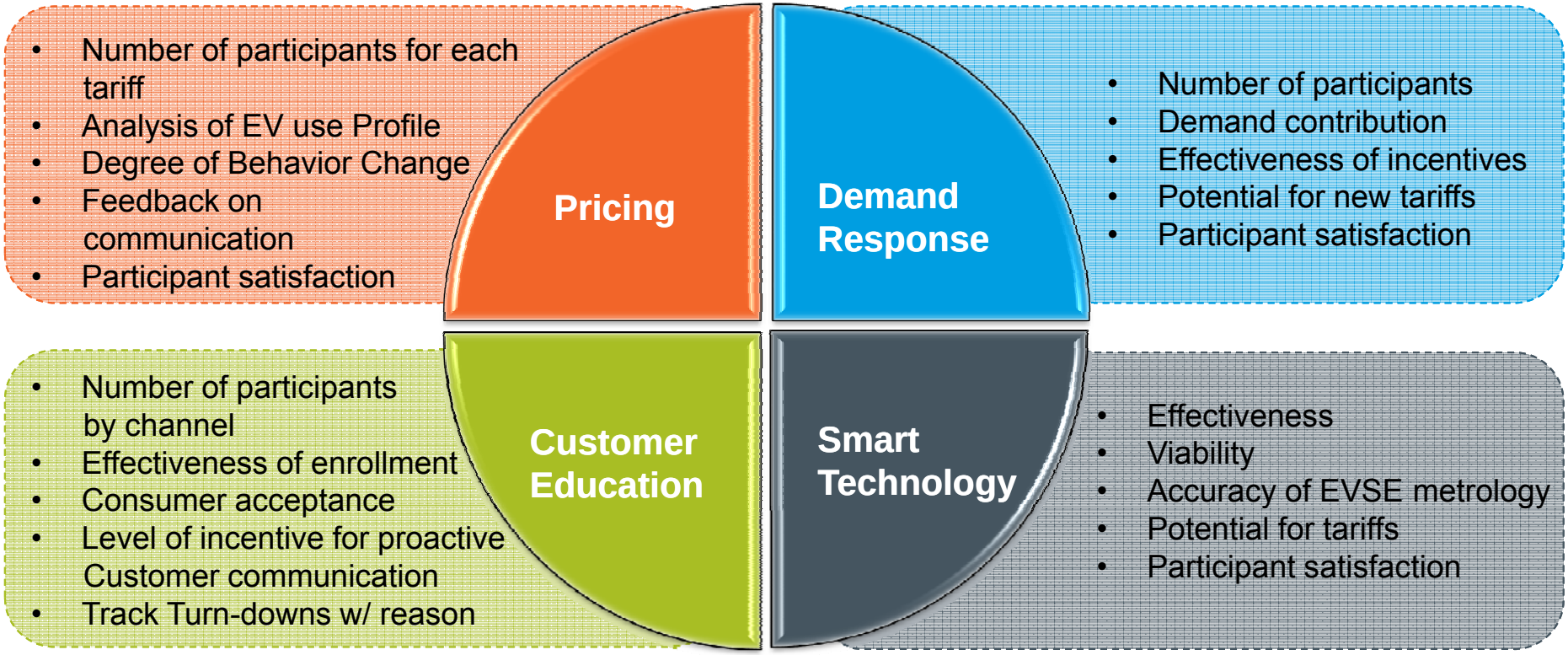
	PIV Green	
	Summer	Winter
On-Peak	$0.18870	$0.16422
Off-Peak	$0.07908	$0.06685

Customer Outreach & Enrollment

- Created the Vehicle Charging Customer Advisory Council
  - One-on-one relationship
    - Customers want a dialog, not a monolog.
    - Listen to the voice of the customer, seek their feedback and work together to overcome barriers.
- Company Website Information
  - General vehicle and charging levels information
  - Program Enrollment tool
  - Developing a PIV Calculator
    - Estimated cost to charge based on selected vehicle
    - Fuel comparison vs. current vehicle
    - Carbon Foot Print Reductions
- Bill Inserts
- Community Events
- Social Media



Proposed Metrics



Pepco proposes to utilize an outside consultant to ensure accuracy and timeliness of data collection and reporting

PHI Next Steps with EVs

- Demand Response Pilot Proposal : approved 8/12/13
- RFP for EVSE has been developed and has been released
- RFPs for Installers has been developed and released
- Reconvene the 9261 Working Group to review proposed metrics
- Launch Program Late October
- Continue established EV Leadership
  - Board Member of Electric Drive Transportation Association
  - MD Electric Vehicle Infrastructure Council
  - MD PSC EV Working Group
- Continue to support standards as well as State regulatory and legislative efforts to prepare for PEVs