Smart Meter Capabilities and Implications for Net Metering

Pepco Holdings, Inc

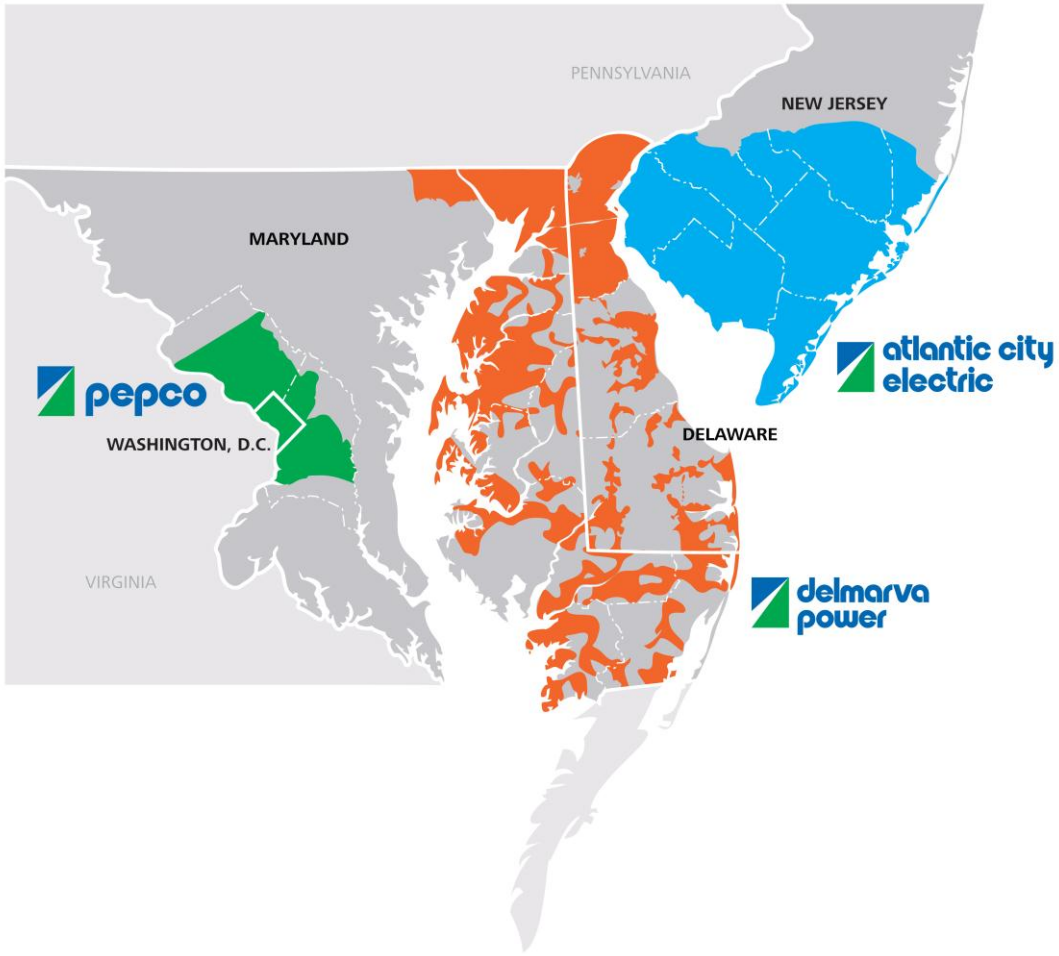
MADRI – Smart Meters and Distributed Resource Data Issues

Presented by: Robert Stewart, Manager of Advanced Technology and New Business

February 20, 2013

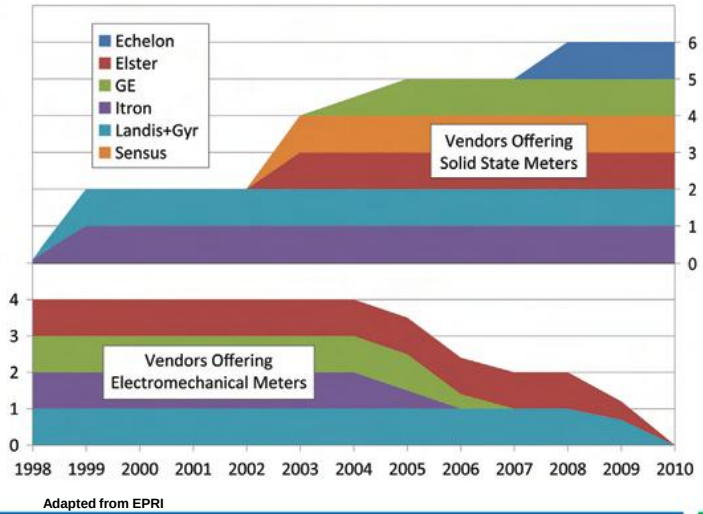
Pepco Holdings, Inc. Quick Facts

- Incorporated in 2002
- Service territory:
  8,340 square miles
- Customers served
  - Atlantic City Electric:
    - 540,000 – electric
  - Delmarva Power:
    - 503,000 – electric
    - 125,000 – natural gas
  - Pepco:
    - 793,000 – electric
- Total Population Served:
  5.6 million



AMI Capability at the Meter

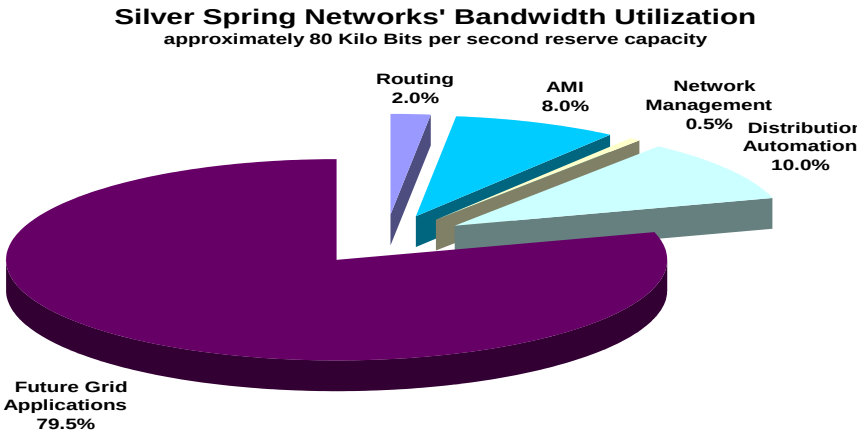
- Two-way communication to the meter
- HAN using ZigBee or other wireless protocols
- Power quality reporting
- Hourly or 15 minute interval data recording for electric customers, depending on their rate
- Daily consumption for gas customers
- Tamper reporting
- Time stamped outage and restoration reporting
- Remote programming and software upgrade capabilities
- Backup memory in the meter
- Net energy metering capability
- Capable of supporting remote turn on/off under glass



Adapted from EPRI

System Capacity Exists For Some Future Applications

- AMI Meter was never intended to be a PMU
- Home Area Network (HAN) will all for In-Home Display of Energy Information
- Near-real time interactive data needs will need to utilized some form of broadband backhaul
  - HAN will likely be the interface



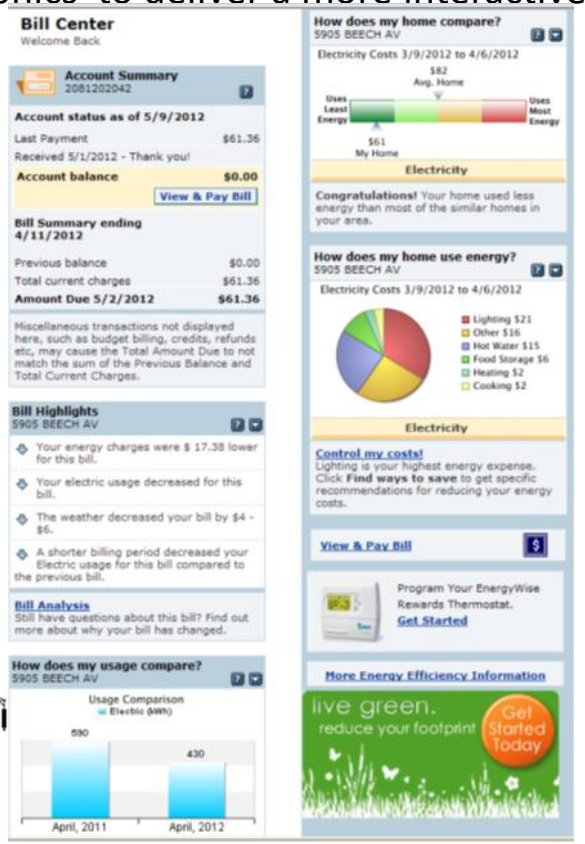
- Near-term benefits are targeting the following areas:
  - DR / DLC / Smart Stats
  - NEM / Smart Inverters
  - EV Charger Management
  - Conservation Voltage Reduction CVR
- Additional capabilities should be considered carefully

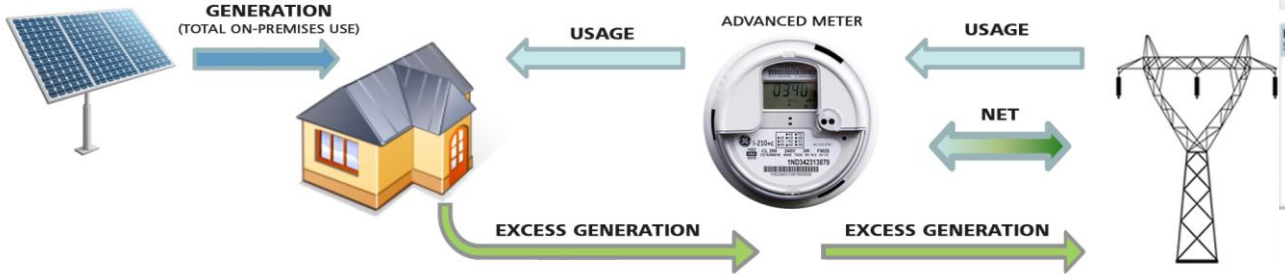
Communication Networks must be designed to allow sufficient bandwidth capacity to accommodate future needs

Challenges with Visibility of Generated Solar

My Account is designed to provide customer with information to help them understand, compare and manage their energy use. The feature goes beyond traditional on line bill history to assist customers by offering energy savings suggestions and side-by-side comparisons and graphics to deliver a more interactive experience.

- The customer's bill reflects the net amount of electricity delivered and received by Pepco. PHI systems do not capture the amount that's self-generated and therefore are not capable of reflecting a net energy metering customer's total on-premise usage.
- As a result, the My Account feature will render a partial portrayal of the energy use for the NEM customer's premise.

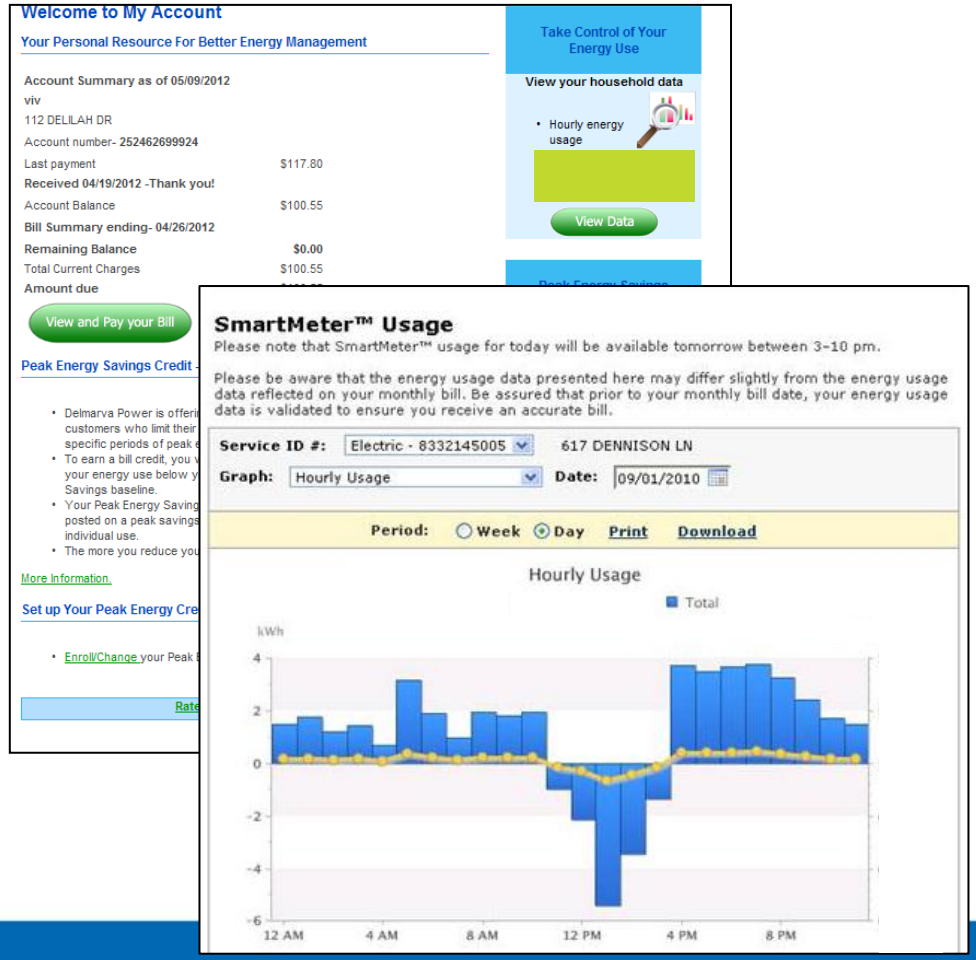




Current Efforts

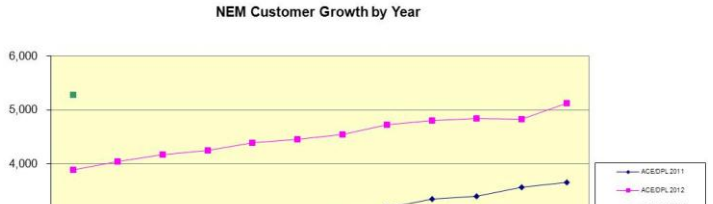
PHI is working aggressively with it's vendors to provide solutions that enable My Account tools for NEM customers

- Providing an interim solution that allows NEM customers to sign-up for My Account to view/pay their bills on-line
- Activation of Pepco's AMI NEM meters, will provide the company with the NEM customer's hourly net meter data
- Once the interim solution is in place and the NEM meter has been activated, NEM customers will be provided with a new "My Account" landing page where they will see information specific to their Net Energy use.



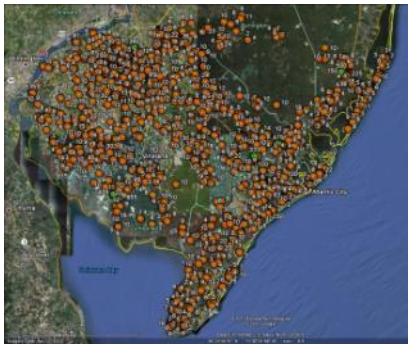
Current State of Net Energy Metering

- PHI has successfully completed the interconnection of over 7,200 customers
- Density of solar requests in NJ requires detailed studies to prevent flicker and other power quality issues for customers on the circuit with high solar penetration (high voltage complaints are on the rise)
- Saturated circuits can cause voltage fluctuations that are outside of company criteria, ANSI Standards or regulated requirements
- In NJ, 5 out of 300 circuits are closed to any new intermittent generation
- Up to 49 additional circuits are restricted from solar installations above 250 KW based on active/pending requests. These “Restricted Circuits” already have 3 MW of large (>250 kW) projects active or pending.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
ACE/DPL 2011	2,396	2,540	2,596	2,756	2,846	2,902	3,120	3,178	3,348	3,396	3,568	3,647
ACE/DPL 2012	3,881	4,046	4,174	4,249	4,386	4,447	4,542	4,723	4,799	4839	4,834	5122
ACE/DPL 2013	5,284											
PEPCO 2011	736	795	846	859	891	946	977	1,042	1,089	1122	1,154	1193
PEPCO 2012	1,243	1,300	1,353	1,401	1,453	1,511	1,578	1,635	1,701	1,781	1,845	1,918
PEPCO 2013	1,968											

Active Renewable



Circuits Closed

Efforts to Accommodate Higher Penetrations of Renewables

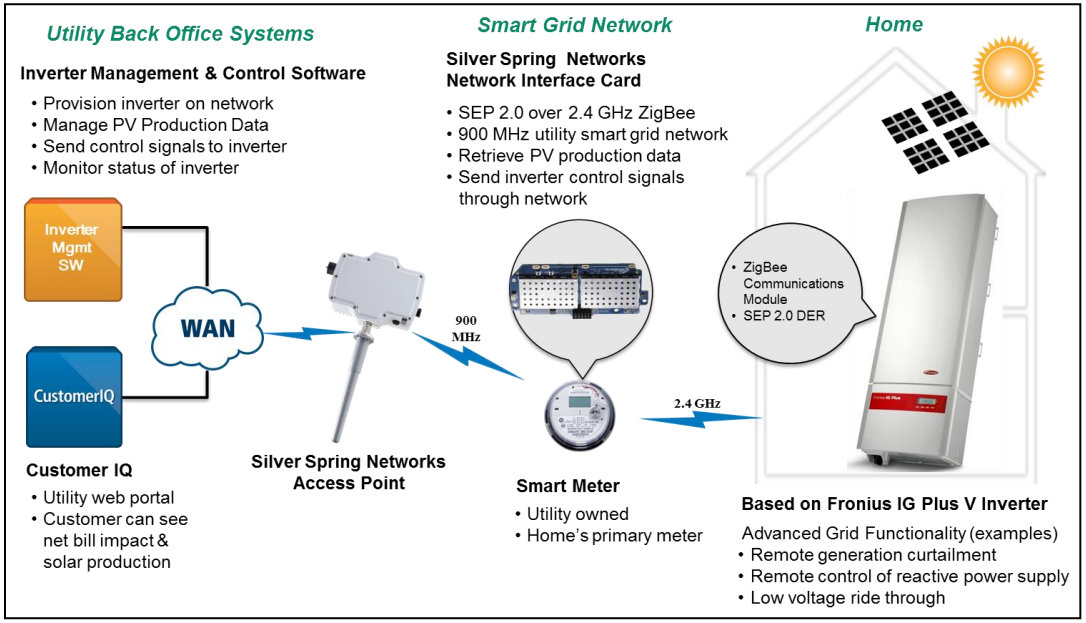
- Advanced Modeling
  - PHI has implemented Distribution Engineering WorkStation (DEW)
    - Developed by EDD, Blacksburg, VA
    - Provides advanced system and powerflow analysis for complex DG projects

- Standards
  - IEEE 1547 – Modifications to existing Standard
    - Frequency Ride Thru
    - Low or High Voltage Ride Thru
    - Voltage Regulation
    - Dynamic Settings

- Advanced Technologies and Monitoring
  - Multiple vendors -Advanced Inverter Functionality Testing
  - EPRI - High sample rate monitoring
  - DOE, Hawaii Natural Energy Institute – Smart Inverter Demonstration

SGI Team

HNEI Hawai'i Natural Energy Institute, University of Hawai'i at Mānoa	Project Lead
Maui Electric Company	Co-Utility Lead
Pepco Holdings, Inc	Co-Utility Lead
Hawaiian Electric Company	Co-Utility Lead
Silver Spring Networks	Technology Lead
OG&E	Inverter Testing Lead
SolarCity	Co-Services Lead
RISINGSUNSOLAR+ELECTRIC	Co-Services Lead
Fronius POWERING YOUR FUTURE	Inverter Technology Lead
HITACHI Inspire the Next	Inverter Technology Provider

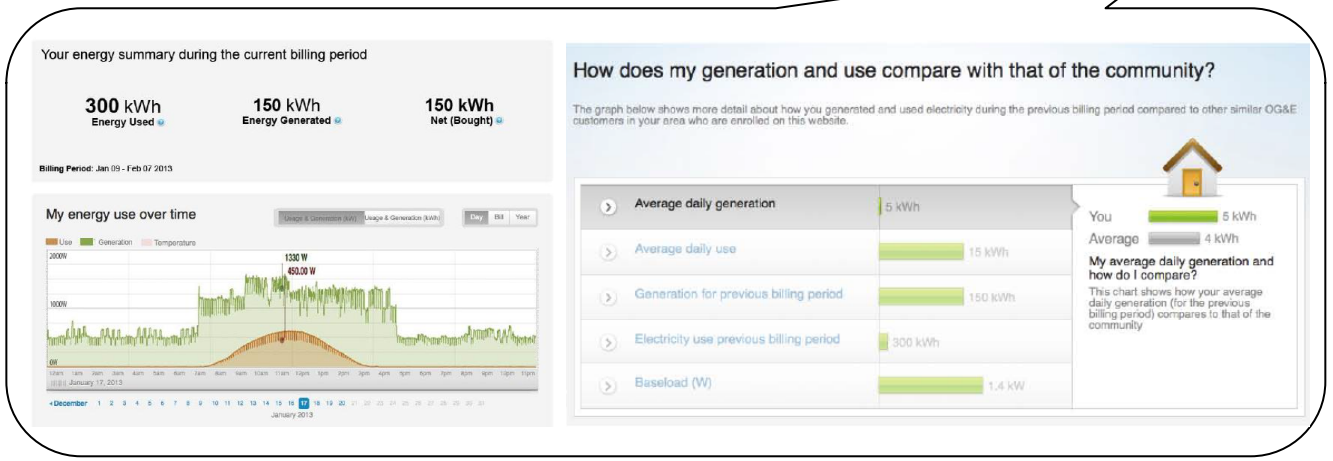


SGI Project Benefit:
Integrated view of utility usage & solar production

1. Home Primary Meter collects Smart Grid Inverter for interval data for production data

2. Home Primary Meter collects and communicates production data from Smart Grid Inverter & home consumption information in batches to Customer IQ Portal

3. Customer IQ app analyzes & presents PV production, home consumption, dollar value information to customer



Conclusions and Recommendations

- Solutions to many existing challenges are on the way
  - It will take time for capabilities to mature and stabilize
- Interoperability and Standardization will be a critical component to realize investments over their full life
  - PHI is actively involved with the development efforts of key standards through NIST and IEEE
- PHI is currently on a trajectory to deliver the benefits promised by the Smart Grid
  - Success will require continued and successful execution of our current roadmap
- Key to this success will be a constant scan of developing technologies that can be efficiently integrated along the way.
- Policy changes may be necessary as penetration increases
  - Limits on % Overgeneration
  - Interruptible Solar Tariffs