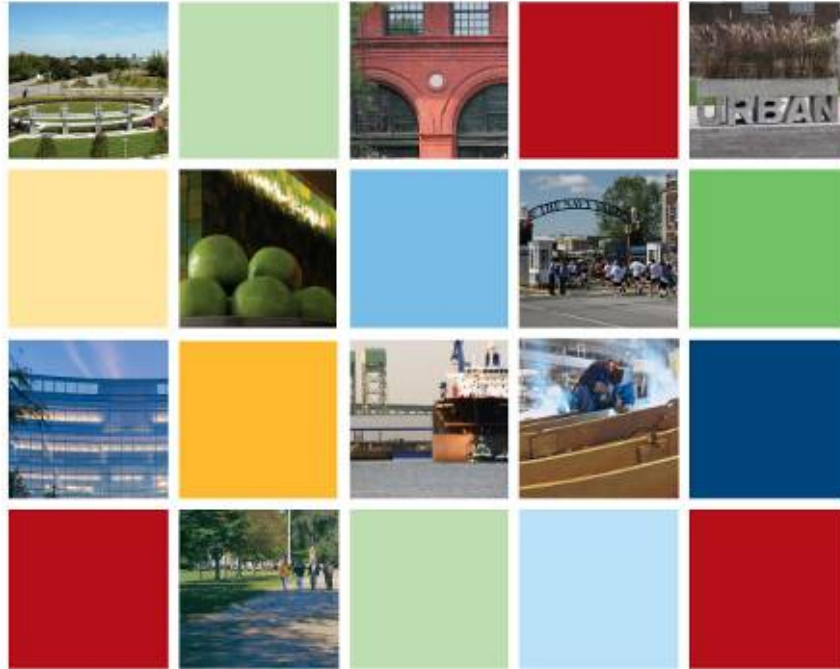


THE NAVY YARD



The Navy Yard Background

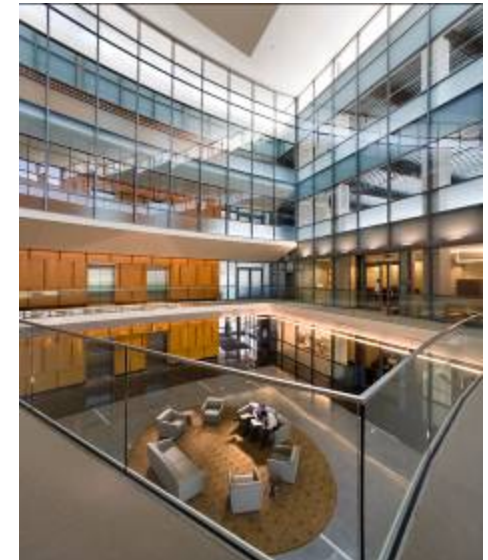
- 125 years as an active military base & shipyard
- Regional economic hub
- 1,000 acres acquired in 2000
- Growth capacity
- Access to:
 - ✓ *Airport*
 - ✓ *Universities*
 - ✓ *Regional Highways*
 - ✓ *Labor Force*
- Historic Waterfront Campus



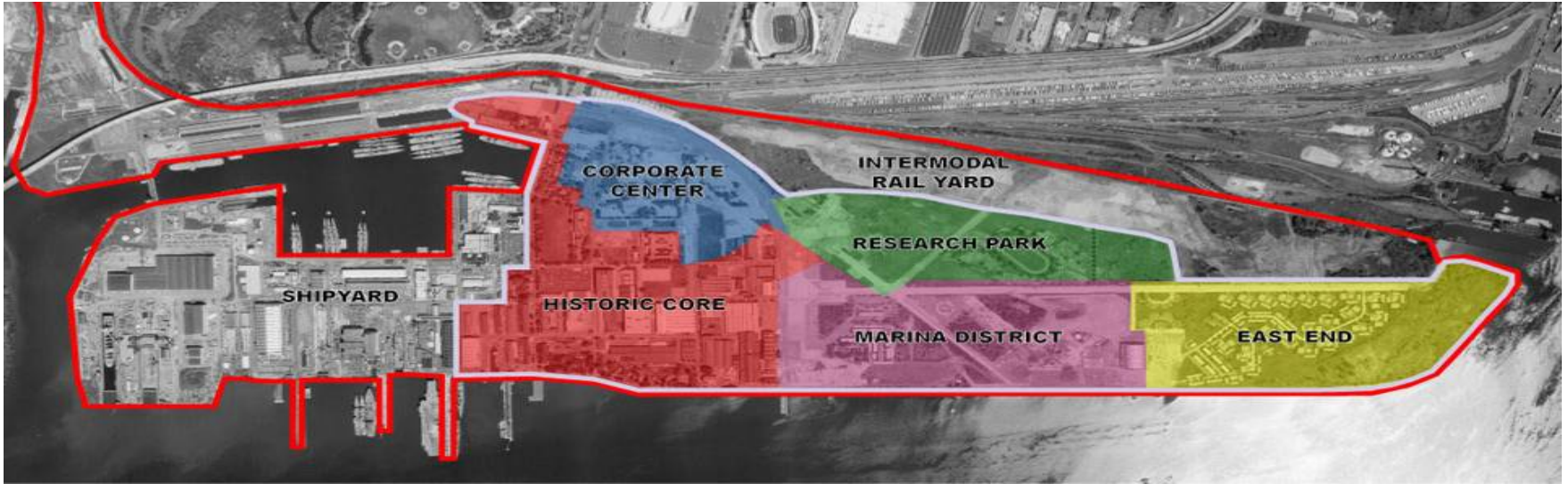
Master Plan: Sustainability



- Building Design – LEED & Design Review
- Open Space
- Stormwater Management
- Site Operations
- Smart Grid & Renewable Power
- Business Development Opportunity



Master Plan



The Navy Yard Today



- Over 120 companies and 3 Navy activities
- 10,000 employees by end of 2012
- In excess of 6.5 million sq ft occupied
- +\$650 million of private investment
- Industrial, Office and R&D campus



The Energy Efficient Buildings Hub



A U.S. Department of Energy Innovation Hub located at The Navy Yard, our goal is to reduce annual energy use in the Greater Philadelphia commercial buildings sector by 20 percent by 2020 through informed people, validated information, and proven technologies.

The EEB Hub includes 22 performer organizations, led by Penn State, made up of research universities, DOE laboratories, industrial firms, and economic development agencies.

The EEB Hub will:

- Demonstrate and deploy market proven solutions
- Accelerate adoption of Advanced Energy Retrofits- an optimally engineered improvement that achieves significant energy *and* economic savings
- Promote regional economic growth and job creation



More information can be found at www.eebhub.org

The Navy Yard's "Un-regulated" Grid



- One of the largest non-municipal systems in the region
- Built up in stages since 1930's
- Diverse consumer base – Commercial, Military, Industrial
- Significant growth in demand and consumption
 - Currently 130 million kWh, growing to 300 million kWh, and 26 MW, growing to 100 MW (2025)
- 100+ miles underground cable
- 158 transformers, 107 switch gear, and 490 meters

Sandia National Labs

Enhanced Energy Reliability Using Microgrids

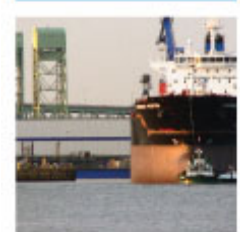


- **Background**

- Increase energy security and decrease dependence on fossil fuel, as specified by the DoD's 2010 Quadrennial Defense Review
- Emerging energy objectives might be more easily met through networking distributed energy resources

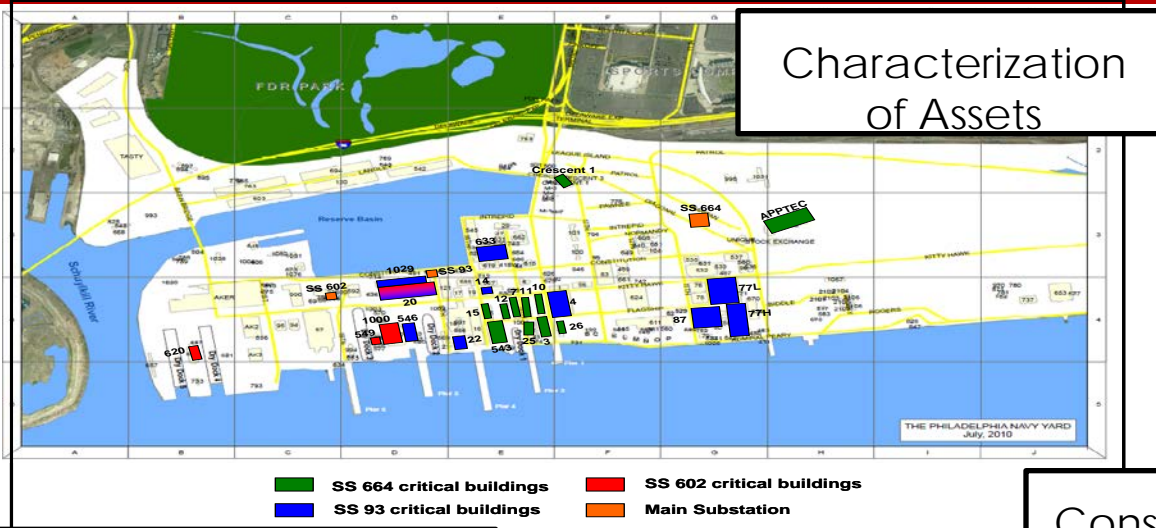
- **Status**

- Identified Navy and commercial mission critical buildings
- Mapped point of service of feeders to all mission critical buildings
- Identified peak demand
- Identified prototype microgrids serving military and commercial mission critical functions



DOE – Sandia National Labs Study

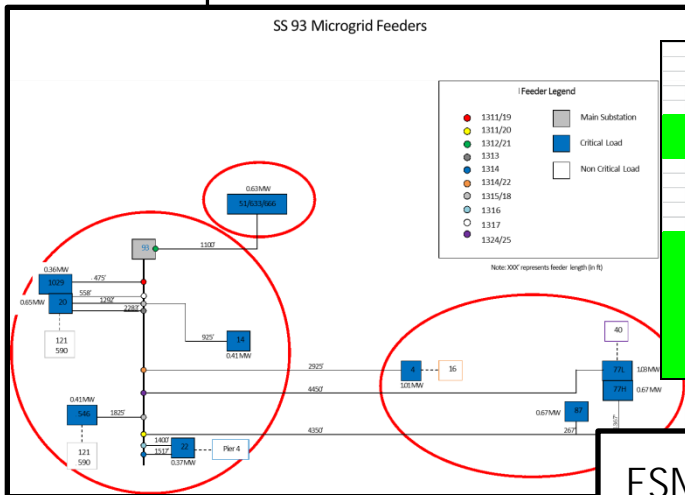
Enhanced Energy Reliability Using Microgrids Methodology



Characterization of Assets

■ SS 664 critical buildings ■ SS 602 critical buildings
■ SS 93 critical buildings ■ Main Substation

Consequence Modeling



ACCOUNT INFO		LOCATION INFO			Meter ID	Usage (KWH)	KW Demand Reading	Peak Demand
Name	Invoice	BLDG #	FEEDER	SUBSTATION ROUTE				
Menasha	2010-01	694	F 905	664SS	106175699	54,480	1,4600	175.2
Menasha	2010-02	694	F 905	664SS	106175699	61,560	1,4900	178.8
Menasha	2010-03	694	F 905	664SS	106175699	56,760	1,2800	153.6
Menasha	2010-04	694	F 905	664SS	106175699	32,640	0,8500	102
CP Rail	2010-01	CP Rail	F1391	664 SS	13099	7,010	0,0000	0
CP Rail	2010-02	CP Rail	F1391	664 SS	13099	7,931	0,0000	0
CP Rail	2010-03	CP Rail	F1391	664 SS	13099	4,112	15,2000	15.2
CP Rail	2010-04	CP Rail	F1391	664 SS	13099	3,404	12,3000	12.3
CP Rail	2010-05	CP Rail	F1391	664 SS	13099	3,545	11,4000	11.4
CP Rail	2010-06	CP Rail	F1391	664 SS	13099	4,309	11,5000	11.5
CP Rail	2010-07	CP Rail	F1391	664 SS	13099	4,778	11,4000	11.4
CP Rail	2010-08	CP Rail	F1391	664 SS	13099	4,777	10,7000	10.7
CP Rail	2010-09	CP Rail	F1391	664 SS	13099	4,203	10,2000	10.2
CP Rail	2010-10	CP Rail	F1391	664 SS	13099	3,094	9,5000	9.5

ESM Conceptual Design

Clean Energy Campus: Energy Master Plan



The Five Point Action Plan

- **“Smart Grid” Infrastructure:** Generation, Distribution, Storage, System Reliability and Smart Infrastructure
- **The Business Model:** Tariffs, Procurement, Ancillary Services, Other System Revenues and Business Modeling
- **Building Owner Opportunities:** Building Management, Efficiency, Distributed Generation/Storage and Strategic Islanding
- **Test Bedding Outreach and Protocols:** Scaling Up Technology & Other Innovative Solutions
- **Carbon Reduction and Sustainability:** Demonstrate best practices to achieve economic growth will reducing carbon output

Energy Master Plan



THE Burns GROUP

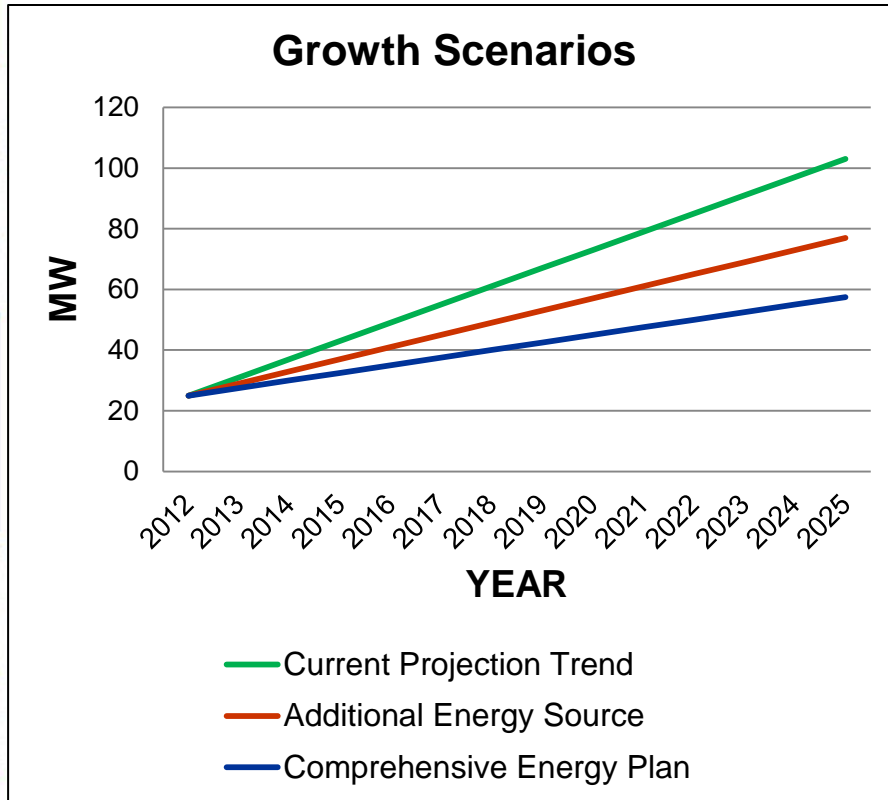
Focus Area 1	Focus Area 2	Focus Area 3	Focus Area 4	Focus Area 5
Infrastructure/ Operations/ Smart Grid	Business Plan	End User Efficiency	Innovative Technologies and Test Bedding	Carbon Footprint Baseline



Technical Advisor:



Balancing Supply & Demand



Comprehensive Energy Approach

- Reduce PJM Demand
- Minimize Capital Investment
- Improve Energy Pricing
- Reduce Carbon Footprint

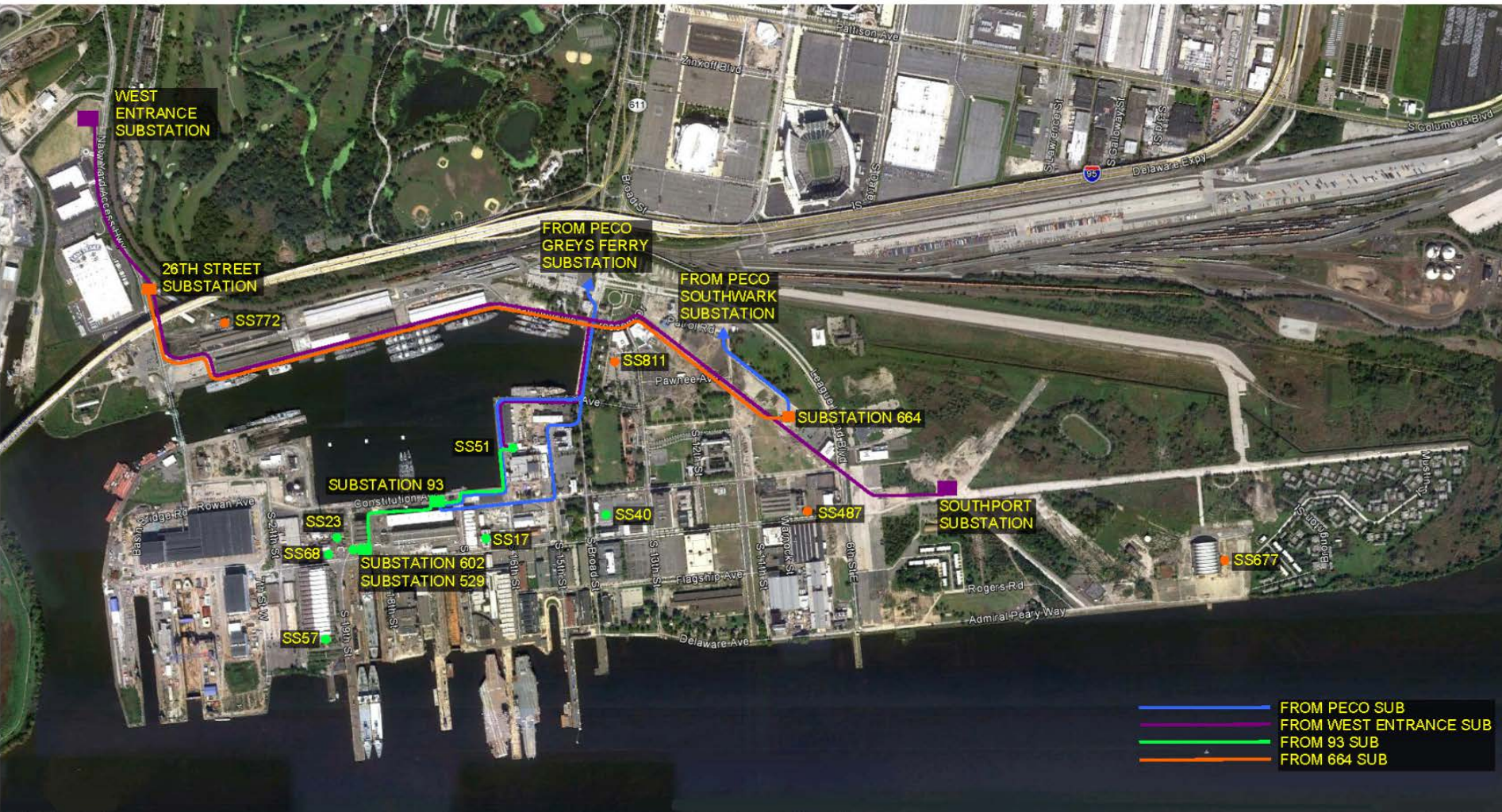
Opportunities for District Energy DG & Load Optimization

- Micro-turbine/CHP
- Fuel Cell/Solar
- High Performance Building Clustering

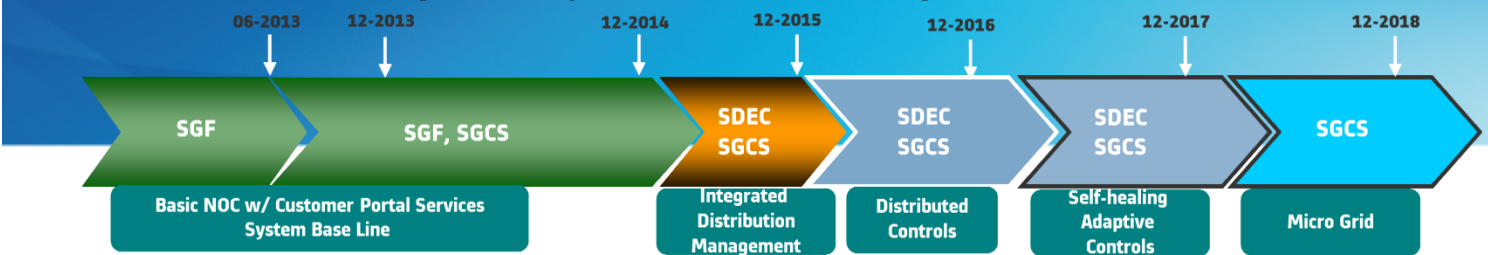
Smart Grid Implementation

- Distributed Energy Resource Management
- Demand Response
- Smart Meter
- Distribution Management
- Microgrid Evolution

Substation and Ductbank Locations



Smart Grid Implementation Plan



PNY - Smart Grid Foundation (SGF)

Smart Monitoring [0.5M to 1.5M]	Smart Monitoring [0.5M to 2.0M]
Must-Do On-going Capital Projects	Power Quality & Reliability
Substation / Feeder / Transformer	Building Energy Management
Automated Meter / On Demand Read	DER Energy Management
Communication [1.5M to 3.0M]	
Model Architecture & COMS NMS	
WAN and AMI Network	
GRID NOC [1.5M to 2.5M]	
Distribution Operator Cockpit	
Grid Data Analytics	
Integrated Meter Data Management	
Distribution Customer Portal	

PNY - Smart Distribution – Eco City (SDEC)

Communication [2.0M to 5.0M]	
Field Area Network	
Building C&I Network	
GRID NOC [1.5M to 4.0M]	GRID NOC [1.0M to 5.0M]
Power Delivery & Outage Management	Demand Side Resource Controls
Operation Training Simulator	Distributed Generation Controls
SCADA & COMS Management	DER Asset Optimization
Customer Product Service & Billing	

PNY - Smart Grid Circuits & Smart Substation (SGCS)

Transmission Interconnection [15M to 25M]
Grid Circuits with Ring Main [5M To 10M]
Smart Substation & Micro Grid [7M To 15M]

Navy Yard Energy Master Plan

Infrastructure Growth Scenarios – 10 year CAPEX

- PECO transmission substation 34KV interconnection / expansion
- Incremental build out-PECO 13 KV line extensions

Demand Reduction Programs

- Demand-response with Navy and large commercial customers
- On-site peak generation
- Reduce cost by lowering PJM ‘capacity’ charge component of supply

Supply Options

- PJM market via ESP
- Distributed generation-Natural Gas & Renewables

Smart Grid Technology Application

- AMI, Digital SS, Grid NOC
- Phased to need

Tariff Flexibility

- TOU with incentives

Energy Efficiency Collaboration

- DOE EEB Hub retrofit demo to commercial R&D

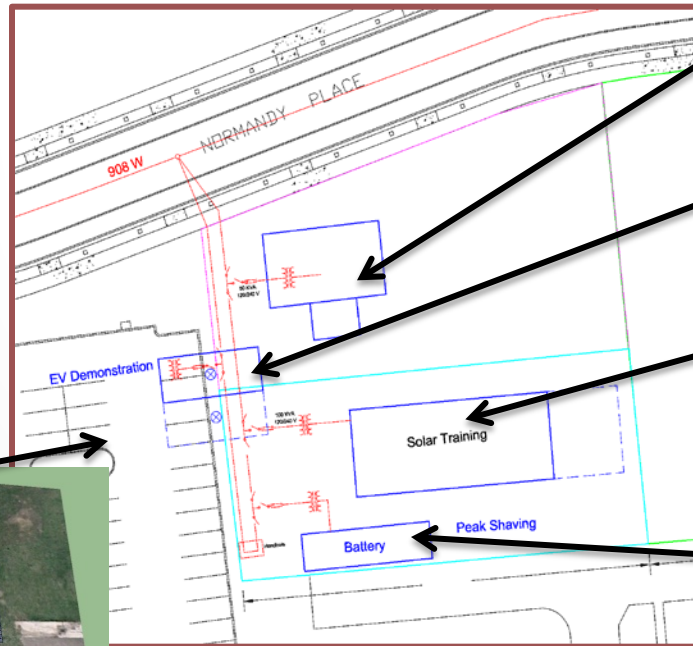
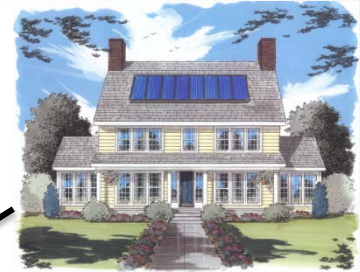
Proactive Customer Projects

- 600KW base load fuel cell
- 3MW CHP – absorption chillers
- 2500 ton District energy-geothermal

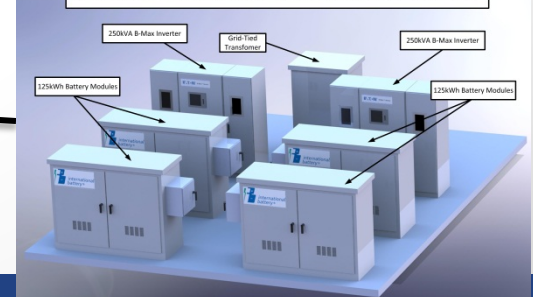
DOE GridSTAR Center

Plug & Play Test Microgrid

- Solar house with Electric Vehicle charging station
- Electric Vehicle Charging Stations
- Community and grid scale energy storage
- Solar PV units and training infrastructure
- Building energy management systems & Smart Meters
- Smart Distribution Infrastructure



International Battery Inc. 500kW/500kWh Bulk Energy Storage System (BESS)



THE NAVY YARD

Thank You



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PHILADELPHIA'S ECONOMIC DEVELOPMENT
CORPORATION SINCE 1958

