Philadelphia Navy Yard Microgrid Modernization

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The Navy Yard Background

- 125 years as an active military base & shipyard
- 1,000 acres acquired in 2000
- Significant additional employment and economic growth capacity
- Access to:
  - Airport
  - Universities
  - Regional Highways
  - Labor Force
- Historic waterfront campus
The Navy Yard Background
The Navy Yard Today
The Navy Yard Transformation

- More than 11,000 employees
- 145 companies; 3 Navy activities
- In excess of 7.0 million SF occupied and in development
- $700+ million of private investment
- $130+ million of publicly funded infrastructure improvements
- Office, R&D, and industrial campus
The Navy Yard Master Plan
Building Workplaces for the Future
A Manufacturing and Industrial Campus
A Historic Preservation Story

Driving growth to every corner of Philadelphia
A Historic Preservation Story: URBN
A Modern, Progressive, and Sustainable Office Campus
A Modern, Progressive, and Sustainable Office Campus
Smart and Sustainable Infrastructure
A New Model: the Dynamic, Urban Campus

Driving growth to every corner of Philadelphia
Energy and Innovation at The Navy Yard
A Center for Research & Development

CORPORATE

ACADEMIC & GOVERNMENT

PARTNERSHIPS

Driving growth to every corner of Philadelphia
A Smart Energy Campus

- Unregulated electric microgrid
  - PIDC grid modernization of $31 million (2014-2016)
  - Microgrid deployment providing on-site generation and advance resilience
- Collaborative R&D and deployment:
  - GridSTAR Smart Grid Experience Center
  - DOE award for microgrid controller research
  - Progressive tariff structures
  - Navy collaboration opportunities
- Market driven private and public deployment
- Test bedding and demonstration
The Navy Yard Grid Today

- 13.3 kV/2300 V Primary
- 27 MW Peak Demand
- 34 MW Capacity
- 98% External Sourced Supply
- Currently no NOC or SCADA
- 164 Transformers
- Two primary substations - 15 MW & 19 MW
- 100 miles of Distribution Feeders – Subsurface
- 70 Customers (8 Customers - 90% Usage)
- 182 Revenue Meters – 3 Tier Tariff
- On-site Generation – 600 kW Fuel Cell
The Navy Yard Energy Master Plan

The Five Point Action Plan

- **Infrastructure**: Capacity, Generation/Supply, Technology - Microgrid
- **Business Model**: Forecasts, Tariffs, Procurement, O & M, Capital
- **Building Owner Opportunities**: DG, EE, DR – Programs & Partnership
- **Test Bedding Outreach and Protocols**: Energy Innovation Campus
- **Carbon Reduction and Sustainability**: Reduce Carbon Intensity
Energy Master Plan – Creating 4 Microgrids
Community Solar and Energy Storage – 125 KW

Energy – 14,591 kWh
Power – 609 kW-Peak
CO₂ Reduction – 21,738 lbs
DOE Microgrid Controller System Project

Microgrid Controller System R&D - $1.5M ($1.2M funded by DOE)

**DOE Driver**
- Reducing outage time of critical loads by >98% at a cost comparable to non-integrated baseline solutions (such as an uninterruptable power supply [UPS] with backup generator),
- Reducing emissions by >20%, and
- Improving system energy efficiencies by >20%.

**Project R&D Scope**
- Grid - Micro Grid Disconnection
- Grid - Micro Grid Re-synchronization
- Micro Grid Steady State Frequency, Voltage and Power Quality management (Both – Connected and Islanded mode)
- Micro Grid Protection (Both – Connected and Islanded mode)
- Micro Grid Dispatch
- Grid Resilience

**Project Funding / Budget / Submission Schedule**
- DOE awarded 6 projects
- Each project funded at $1.2M by DOE
- Awardee expect to contribute at least 20% of the project cost
- Detailed work plan to be submitted by December 31

**Our Interests**
- Collaboration with DOE’s Office of Electricity
- Highly visible project
- Acceleration for TNY Micro grid Implementation
- Position TNY as the “National Center of Excellence” for Micro grid R&D – Commercialization Program
### DOE: USA – China Collaboration for Smart Community Energy System

#### DOE International and State Department Collaboration

- International collaboration to position United States Leadership in Smart City / Smart Community Domain
- DOE selected 2 projects at Country Level for USA – China Collaboration Initiative
  - DOE Funded SCE Project @ UC Irvine, Irvine, CA
  - The Navy Yard @ Philadelphia, PA

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<tr>
<th>Deliverable No</th>
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| 1              | Build Unified Communication & Smart Metering for multi-service operation (a) Unified Communication Platform for Grid and Customer Operation (b) Multi-Function Smart Meter | 2014.1  
|                |                          | 2015.1              |
| 2              | Build Grid NOC (Network Operation Center) for smart distribution operation (a) Monitoring & Data Analysis for Grid & Customer Operation (b) Optimization & Control for Electric System Energy Efficiency (c) Integrated Customer Automation & Operation | 2014.2  
|                |                          | 2015.2              |
| 3              | Build Smart Substation for advanced protection and control (a) Advanced Protection for DG Integration (b) Self Healing Grid control (c) Foundation for Micro grid Controls | 2014.2  
|                |                          | 2015.2  
|                |                          | 2016.2              |
| 4              | Build Active Distribution Network by Integrating and Optimizing DG & DR (a) DR-DG Operational Planning and Optimization (b) Integrated DR-DG Control for Smart Distribution Grid Operation | 2016.1 |
| 5              | Implement Alternative Tariff / On-Bill Financing for Customers | 2014/15/16.4 |
| 6              | New Smart Substation to support capacity expansion Phase 1 (10MW) | 2014/15/16.3 |
| 7              | Community Solar to reduce peak and carbon footprint (500 kW) | 2014/15/16.4 |
| 8              | Natural Gas Generator to meet peak capacity need (6 MW) | 2014/15/16.5 |
Planning for the Future
Planning for the Future
Summary at Full Build-Out

- 30,000 employees
- 1,500 residential units
- +15 million SF
- $4 billion of investment
- $11 billion of local and state impact annually
- $275 million of state and local tax revenue annually