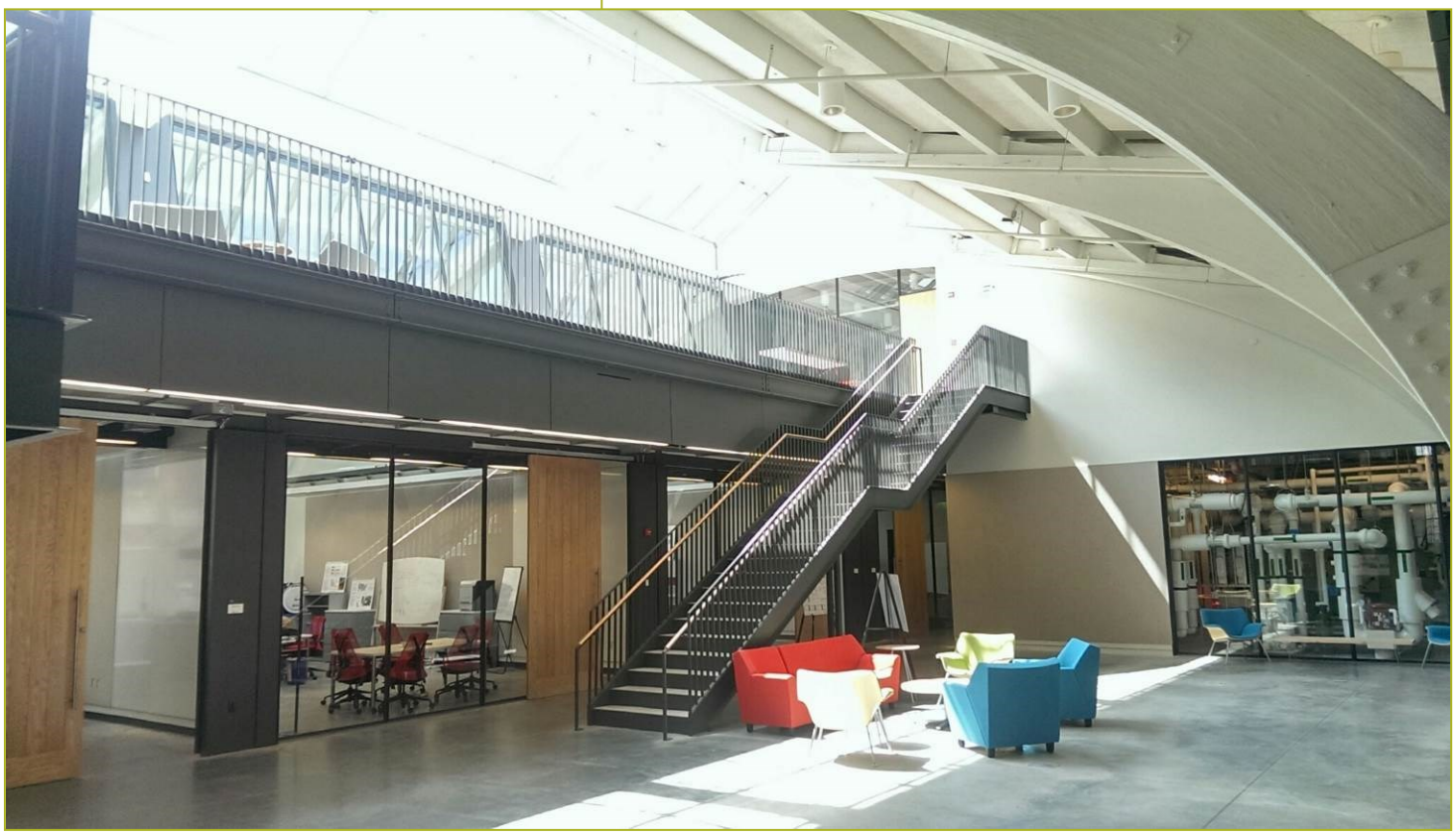
CONSORTIUM for BUILDING ENERGY INNOVATION

REPORT

Title: On-bill Financing Case Study of Projects

Report Date: April 29, 2016

Report Author: Rudolph G. Terry



Funded by U.S. DOE

Report Abstract

On-bill financing (OBF) for implementation by utility programs in a regional setting is evaluated through a case study of two committed buildings at The Navy Yard (TNY) in Philadelphia, PA.

The OBF case study provides program types, implementation strategy and related materials, and feedback from TNY customer engagement.

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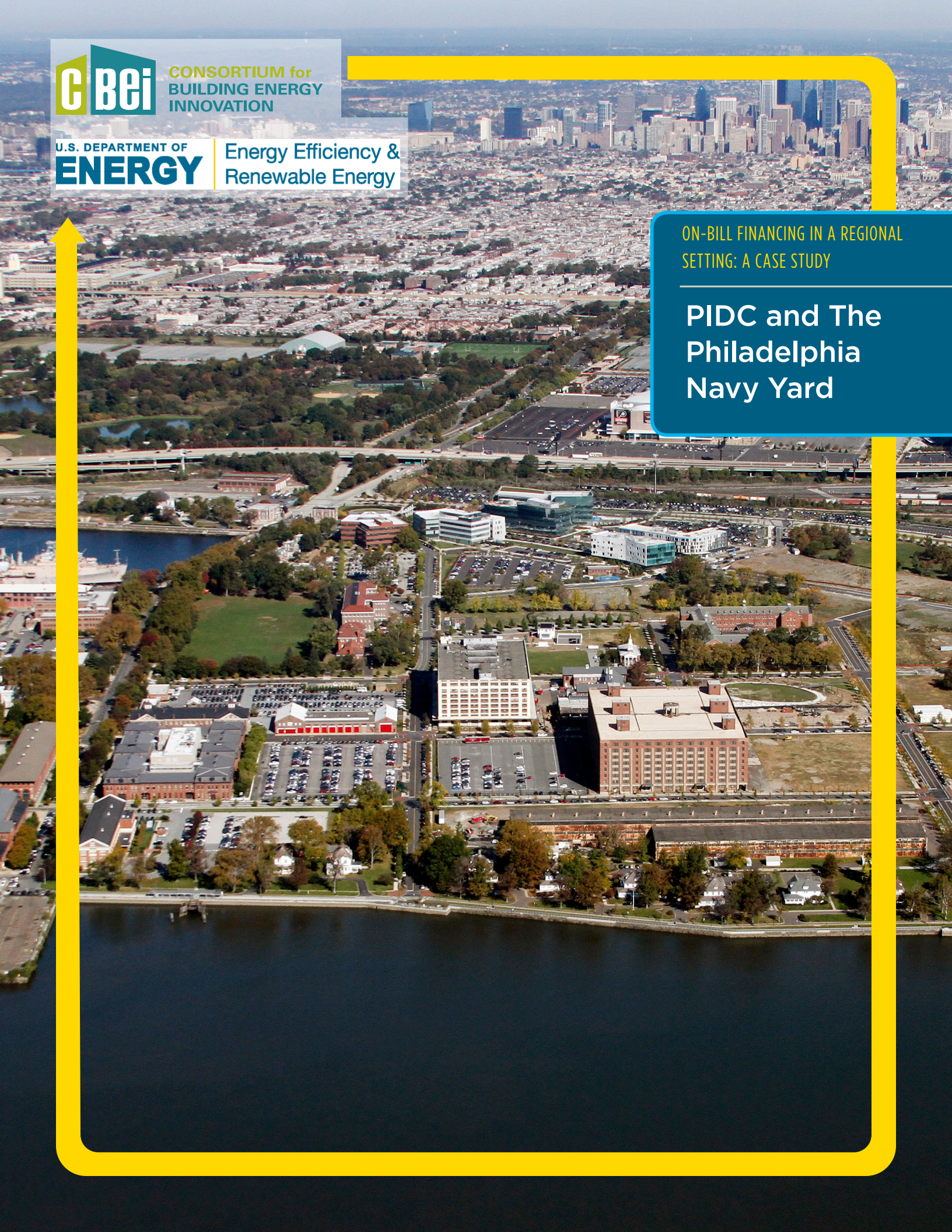

ON-BILL FINANCING IN A REGIONAL SETTING: A CASE STUDY

PIDC and The Philadelphia Navy Yard

I. INTRODUCTION

A significant challenge to deep energy retrofits in small- and medium-sized commercial buildings (SMSCB) is the availability of capital for the high up front cost of a major energy efficiency retrofit. Many SMSCB tenants are also small business owners who want to use any access to capital to grow their business instead of fund a retrofit. They generally do not also have the in-house expertise to properly assess energy saving options and likely will not pursue an energy efficiency retrofit without some external assistance. While the cost of energy to these SMSCB tenants is a significant, on-going expense, and often a business case for energy efficiency upgrades can easily be demonstrated, the path to project implementation is not always simple.

On-bill financing (OBF) helps to overcome these hurdles to make financing of energy efficiency measures available. OBF allows for capital cost recovery of energy efficiency improvements directly through the utility bill. The regular monthly payments are collected by the utility on the customer's bill until the costs of the improvements are recovered. OBF can provide opportunities to have longer payment periods, allowing for more substantive improvements and greater overall energy savings.

There are many examples of OBF across the country. However, in a review of 23 state programs, few allowed for repayment terms longer than three years and few provided for financing payments tied to the meter, yet the industry is interested in an OBF structured this way. The project summarized in this case study is an ongoing effort to develop an OBF program for customers located on The Navy Yard of Philadelphia (TNY) to incentivize and support deep energy retrofits of the largely SMSCB stock on the site.

II. THE NAVY YARD OF PHILADELPHIA - OVERVIEW

In March 2000, as a result of the Base Realignment and Closure Commission process, the United States Navy conveyed approximately 1,000 of the total 1,200 acres of the former Philadelphia Navy Yard to the Philadelphia Authority for Industrial Development (PAID), while retaining ownership and operations of roughly 200 acres. PAID is a public authority incorporated by the City of Philadelphia, with its day-to-day affairs managed by the Philadelphia Industrial Development Corporation (PIDC), a public/private partnership. Among other activities, PAID is a vehicle through which PIDC manages properties and industrial sites on behalf of the City, including property acquisition, improvement, environmental remediation, and sale. PIDC is overseeing the redevelopment and management of TNY.

TNY has been developed into a diverse commercial and industrial campus over the past 15 years, and currently is home to more than 150 companies, with over 12,000 employees, occupying about 7 million square feet of new and renovated buildings. TNY's impressive portfolio of buildings – commercial and industrial – were constructed over a 100-year period beginning in 1874, and this portfolio is expanding with newly constructed buildings since 2003. These structures now serve a wide variety of commercial and industrial users, as well as the Navy's continuing engineering, manufacturing, and research presence. Figures 1 and 2 provide an overview of the current building types and energy use. At full build-out, expected by 2030, TNY will support up to 20 million square feet of development, 30,000 people, and represent over $3 billion of private investment.

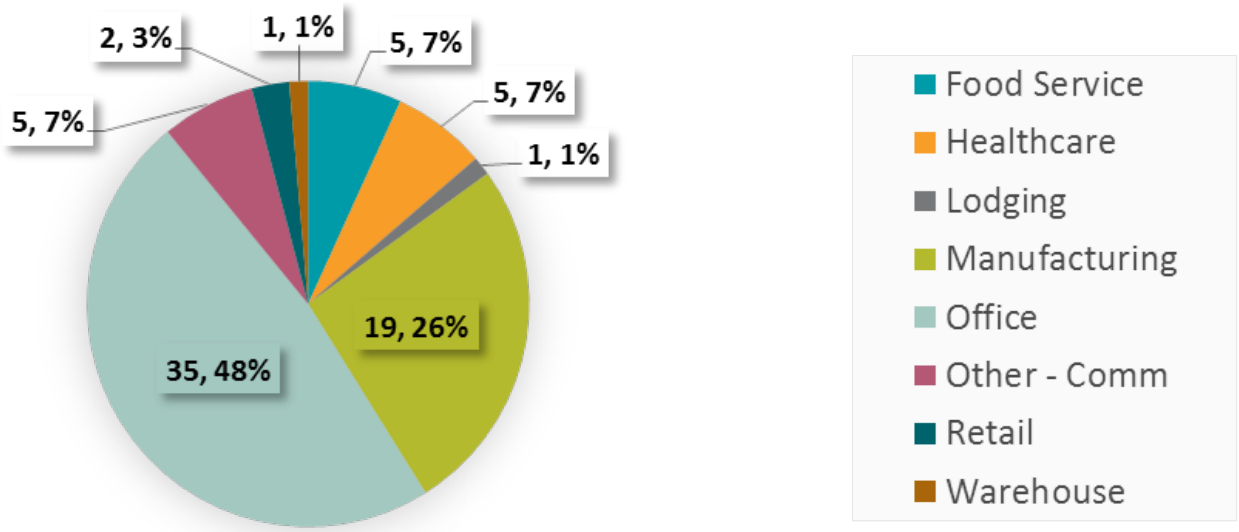

Figure 1. Number and Percent of TNY Buildings by Building Type

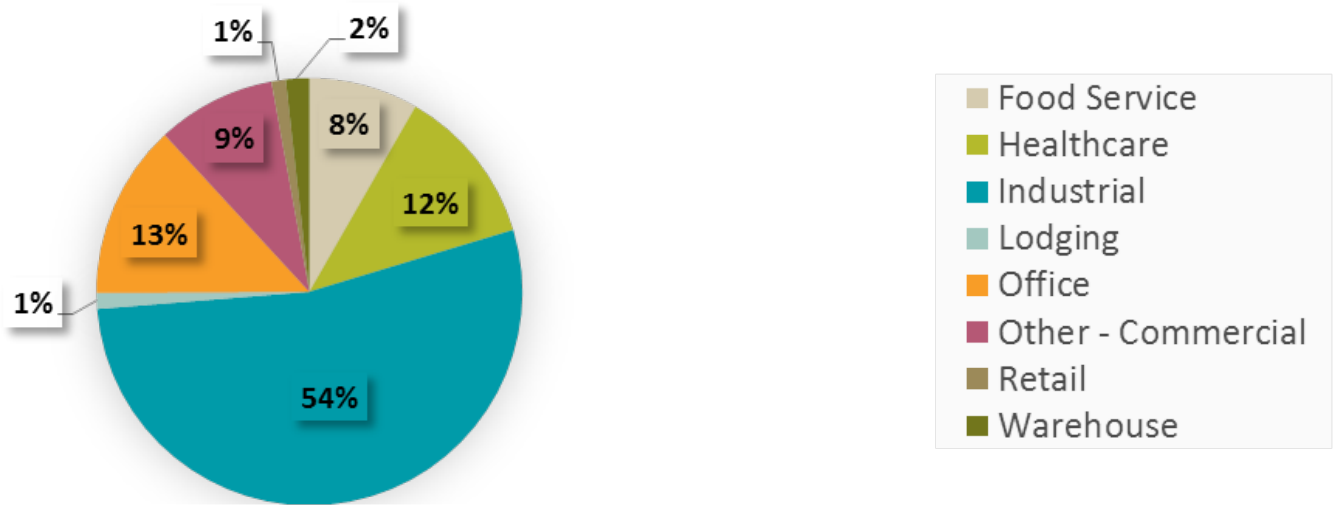

Figure 2. Annual Percent of Energy Consumption by Building Type

The Navy Yard Electric Utility (NYEU), a self-funding business entity within PAID, provides electric supply and distribution services to TNY's campus. By virtue of a declaratory ruling of the Pennsylvania Public Utility Commission, the NYEU operates as a private utility distribution system, and is among the largest non-public utilities in the nation by measure of area served, energy consumption, and magnitude of demand. PECO Energy Company (PECO), the local public utility, delivers power to TNY. The NYEU delivers the power to TNY customers through NYEU's electric grid and bills them for the services provided.

To support TNY's projected growth, PIDC commissioned completion of The Navy Yard Energy Master Plan (EMP) in 2012, with periodic updates undertaken since then. The EMP establishes the vision and deployment of a "Smart Energy Campus," inclusive of LEED® certified buildings and a micro-grid providing a unique platform for research, testing, and deployment of innovative, integrated solutions for distributed generation, energy storage, sustainable energy sources, alternative tariffs, peak demand management and infrastructure resilience.

The EMP has among its goals reduction in electric usage at TNY by 20% by 2022 as compared to a baseline load growth scenario. The EMP calls for this to be accomplished through collaborative energy efficiency and reduction in peak demand by approximately 20% through implementation of demand management, demand response, and energy efficiency measures. To meet these 10-year EMP goals, the NYEU has created a strategy that will help mitigate the growth in energy consumption and demand caused by TNY economic development activities, while also increasing TNY's on-site electric generation capacity. This strategy will effectively reduce strain on the external PECO and regional grids while helping to power newly constructed and refurbished buildings, and to provide energy choices to TNY's building owners and tenants.

III. TNY ON-BILL FINANCING OBJECTIVES

Nearly seventy-five percent of the energy use on TNY is not within the control of the NYEU, so retrofits performed by PIDC of buildings PAID owns will not be sufficient to meet the EMP reduction goals. The NYEU is very interested in making energy efficiency retrofits easier for its customers to implement, and thus support its energy reduction goal. However, many of the owners and tenants, in spite of their strong interest in reducing energy costs, lack access to capital or are using their balance sheet to support and grow their businesses. Also, for many of the customers, there is a desire to lower their monthly energy bills.

Thus, an OBF program appears to be a promising solution for promoting greater investment in energy reduction at TNY and achieving the objectives of both the NYEU and its customers to cost-effectively manage energy consumption. Based on its analysis of potential energy conservation retrofits in current TNY building stock, the NYEU estimates that an OBF program can contribute as much as an 8,000 MWh reduction in annual energy consumption by 2023 through both direct participation and indirectly through a spillover effect (i.e., while not directly participating, TNY end-users and/or facilities owners are influenced to implement energy conservation measures they otherwise would not have undertaken by virtue of the fact that NYEU has conversations about the OBF program with its customers).

Table 1. Representative Customer Feedback on an OBF Program

	REPRESENTATIVE CUSTOMER			
	A	B	C	D
BUILDING USE	Industrial, including heavy metal fabrication and ship repair services	Retail, including offices, showroom, and warehouse	Data center, office, and remote education center	Industrial, including ship engineering and construction
OWNER/ TENANT RELATIONSHIP	Owner occupied	Single tenant lease from 3rd party owner	Single tenant lease from 3rd party owner	Single tenant lease from 3rd party owner
POTENTIAL ECMS	LED high bay lighting, HVAC, Larger motor VSC, BEM BTM-solar generation with energy storage Demand response project: NG generation	LED high bay lighting BEM	Envelop enhancement for improving climate control around all essential electrical equipment	Improve portable heating to docked ships
REACTION TO OBF	Business is strong but capital is very tight and reserved for business needs On-bill would facilitate their desire for and ability to invest in EE /DR projects	Entrepreneurial company with strong interest in energy efficiency and corporate sustainability	Interested in on-bill but would need further opportunity assessment to make commitment	Cost intensive operation funded principally by each new ship contract No contract, no company EE/DR savings revenu relatively small but can create a large distraction
LEVEL OF INTEREST IN OBF	High	High	High	Low

IV. OBF PROGRAM STRUCTURE

PROGRAM DEVELOPMENT APPROACH

Through a pilot program, the NYEU has designed a flexible OBF program to meet its customers' diverse needs and perceptions of value with regard to financing and implementing energy conservation measures. The structure of the program was developed based on feedback from customers throughout the pilot program. At the beginning of the pilot, NYEU interviewed multiple customers to solicit their inputs on whether an OBF program would be valuable to them. A sample of perspectives from customers is provided in Table 1.

The interested TNY end-users displayed a range of attributes with respect to usage characteristics (e.g., product manufacturing, office, laboratory, data center, research/educational), energy conservation measures, financing preferences (e.g., off-balance sheet, self-fund), and occupancy status (e.g., owner occupied, tenant).

To make a clearer case to TNY's building owners and tenants on how the program would work, the NYEU conducted walk-through audits of two buildings on TNY and identified potential energy conservation measures (ECMs) to create example retrofit packages. The NYEU then compared predicted savings to current energy use to determine overall annual savings for each building and the expected savings to the building occupant (owner or tenant) responsible for paying the NYEU utility bill. For these analyses, the interest applied to service the debt was 3.5%, the shared savings pass-through was 75%, and the repayment term was 10 years. In Building 1, the retrofit would result in 34% demand reduction, which translates to an average of $877 per month of savings that would go to service the debt and $295 per month savings on the utility bill realized by the building occupant. In Building 2, the retrofit would result in 39% demand reduction, which translates to an average of $2,970 per month of savings that would go to service the debt and $1,459 per month savings on the utility bill realized by the building occupant. The savings calculated do not include cost avoidance (e.g., projected cost avoided in maintenance of existing lighting when they are replaced with LEDs). This cost avoidance ranged from $2,400 - $18,000 annually. The overview of the retrofit packages and resulting savings are shows in Figures 3 and 4.

In addition to working closely within TNY and the customer base, the NYEU has been collaborating with PECO and the Pennsylvania Public Utilities Commission (PA PUC) to ensure that lessons learned in the process of developing this program are available if PECO should decide to propose an OBF program to the PA PUC for approval. Separately, the NYEU reached out to multiple smaller utilities and nonprofits with interest in OBF to brief them on the lessons learned in the program, and will continue to share lessons as the NYEU builds out the program.

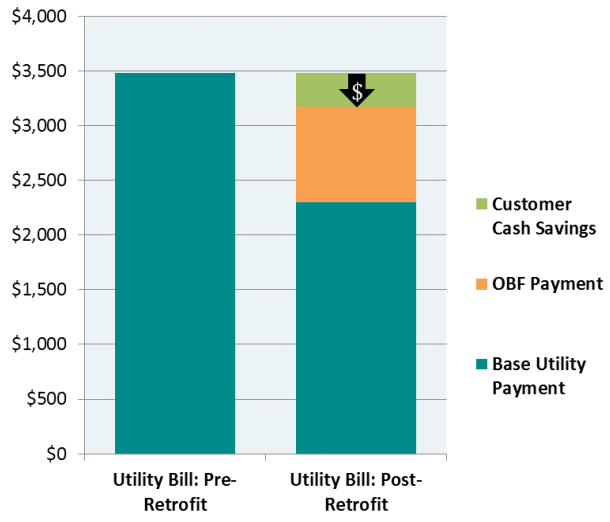

Figure 3. Building 1 (Simple Retrofit)

- *Interior lighting replacements: Halogen Pars and T8s to LED*
- *Install 24 occupancy sensors to control*
- *Perform retro-commissioning to restore HVAC control capability*
- *Install building management system to reduce overall electric use*
- *Estimated Energy Savings: 34% Electric, 38% Gas*
- ***Annual Savings: $14,166***

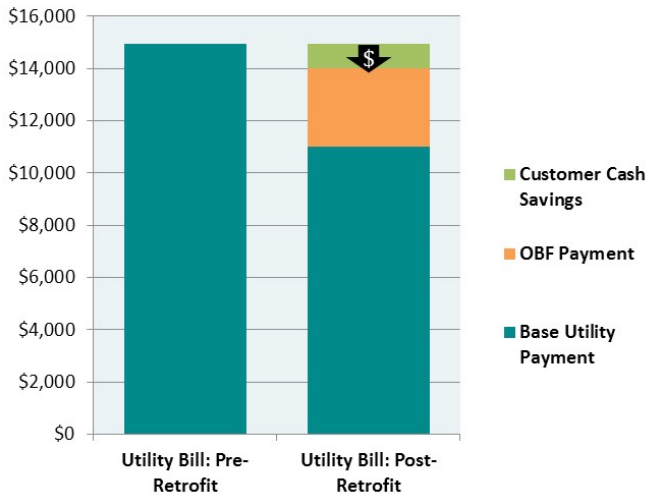

Figure 4. Building 2 (Deeper Retrofit)

- *Interior lighting replacements: Halogen MR16s, T5, and T8 to LED*
- *Exterior lighting replacements: Metal Halides to LED*
- *Replace AHU supply fan VFD drives*
- *Replace exhaust fan VFD drives*
- *Implementing a Building Automation System*
- *Estimated Energy Savings: 40% Electric, 42% Gas*
- ***Annual Savings: $70,025***

PROGRAM DESIGN

Based on the need for flexibility, feedback from customers, and projected growth at TNY, the NYEU identified a set of general concepts for designing the TNY OBF program, including:

- NYEU will administer the program and will make financing available through NYEU to customers. NYEU has access to several 3rd party financing providers and is in the process of evaluating when and how to engage them in the program. In either case, NYEU will collect principal and interest through a line item charge on the customer's monthly bill for electric service (unless other repayment arrangements are negotiated). The term of the financing and the monthly repayment charge will be designed to provide the customer with a net savings, that is, the savings realized from reduced energy consumption through ECMs installation will be greater than the amount of the line item repayment charge. The NYEU does not guarantee that cost savings will be realized by the customer through program participation.
- All customers of the NYEU are eligible to participate in the program. The NYEU will fund ASHRAE Level 1 or equivalent audit of customer facilities, and will develop a non-binding letter of intent (LOI) to engage the customer to proceed with the project.
- The NYEU's standard terms for customer disconnection for non-payment of utility bills apply to financing. If the customer is not the property owner, participation by the property owner in the program may be a requirement in order to secure repayment of financing or other project costs funded by the NYEU. Participation may include the obligation to provide notice to prospective lessees of the repayment obligation of the NYEU-financed project costs through the line item charge on the bill for electric service.
- The program may apply to the installation of ECMs in new facilities. If the NYEU is financing the ECMs, the program will cover only the incremental cost between the lowest allowable or "standard" efficiency equipment or measure required in the facility and the higher efficiency equipment or measures chosen by the customer, or property owner if applicable.
- TYEU is open to a diverse set of ECMs, as long as the measures improve either energy use intensity or peak demand (e.g., controls, storage, on-site generation, envelope upgrades).

PROGRAM STEPS

Based on the preliminary work in the pilot to inform program structure, the NYEU has designed a process for customer participation in the TNY OBF Program, outlined as follows.

1. Upon customer interest in OBF program participation, the NYEU will review consumption history, conduct a walk-through audit of the customer's facilities and prepare a high-level (ASHRAE Level 1 or equivalent) analysis of the potential for cost-effective installation of ECMs.
2. If cost-effective ECMs are identified, the NYEU will prepare a non-binding letter of intent (LOI) to be executed by the customer indicating willingness to proceed to project development, subject to execution of mutually agreeable project contract documents as applicable. A standard form LOI is shown in Appendix A.
3. The NYEU and the customer will work to identify responsibilities for project performance and to establish the basis for preparation and execution of project contract documents. The NYEU may offer to provide project financing, which the customer may choose to accept subject to mutually agreeable financing terms and conditions. If the NYEU provides financing, the customer will repay the loan through a line item charge on its monthly bill for electric service, or at the NYEU's discretion through a separate bill.
4. Regardless of the NYEU's role in the project, the NYEU will facilitate the customer's (or property owner's) receipt of rebates and incentives offered by PECO Energy, under its Energy Efficiency and Conservation Plan implemented pursuant to Pennsylvania's Act 129 of 2008, for the customer's (or property owner's) installation of qualifying ECMs.

Table 2 provides additional perspective on the program characteristics, as currently developed. Further details will be developed as NYEU proceeds through projects past the current pilot phase.

LESSONS LEARNED

- Conversations about an OBF Program Spurs Customer Interest in Retrofits: The NYEU found that the majority of customers engaged about the OBF program during the pilot expressed interest in performing a retrofit of their building(s). This was true whether or not they were interested in OBF. Few of those expressing interest in a retrofit were considering a retrofit prior to the conversations about the OBF program. The act of engaging with customers and describing a new NYEU service for the customers resulted in increased awareness and interest in retrofits. The percent of interested customers that pursue a retrofit will be tracked and

evaluated as the program matures.

- Most Customers Expressed Interest in OBF: Many customers (12 of 22 responding in a survey) expressed interest in evaluating the benefits of on-bill financing. For some customers in a significant growth phase of their business, off-balance sheet financing was of particular interest, because they wanted to use available credit for business growth. Others expressed interest from a branding perspective. The campus attracts businesses that are drawn by the innovative environment on TNY. Some customers felt that a retrofit and utilizing OBF

Table 2. Program Characteristics

CHARACTERISTIC	APPROACH	
FUNDING INSTRUMENTS	**INTERNAL FINANCING**	**3RD PARTY FINANCING**
Credit Worthiness	Customers in good standing on payment of utility bills are eligible for financing; additional credit checking will be required for large financing amounts, at discretion of NYEU.	Per 3rd party requirements.
Type	Conventional term loan, collateralized at NYEU discretion. Term flexible, subject to factors including payment schedule to product net savings to customer, term of customer's occupancy lease if customer is a lessee, and securing property owner payment backstop if customer is a lessee.	Both conventional term loan and off-balance sheet term financing options (equipment lease, energy services agreement) available from 3rd party. Construction loan per 3rd party offering/terms.
Transferability	Receptive to assignment of loan to successor customer, subject to meeting credit worthiness standards, non-removal & transfer of equipment title; property Allowable for PIDC-owned buildings, must obtain agreement from non-PIDC owned buildings.	Per 3rd party discretion.
Value	NYEU's minimum and maximum loan amounts to any one customer are $5,000 and $500,000, respectively; NYEU will consider higher loan amounts on case specific basis.	Per 3rd party discretion.
Term Interest Rate	Favorable rates consistent with market conditions.	Per 3rd party discretion.
Billing and Payment	No substantial modifications to NYEU billing system required to add loan repayment as a line item charge on customer utility bill.	NYEU may agree to act as billing and collection agent for 3rd party; recourse to NYEU utility services disconnection as remedy for non-payment negotiated between 3rd party and customer.
Documentation	Standard form commercial loan agreement, as adapted for NYEU use.	Per agreement between 3rd party and customer.
PROJECT DESIGN/ EXECUTION		
Retrofit Design	Customer or property owner to engage project design/ engineering contractors, subject to NYEU approval, not unreasonably withheld.	Per agreement between customer and one or more contractors; counterparty may be financing 3rd party under turn-key or energy services form of agreement.
Retrofit Execution	Customer or property owner to engage construction contractor, subject to NYEU approval, not unreasonably withheld.	Per agreement between customer and one or more contractors; counterparty may be financing 3rd party under turn-key or energy services form of agreement.
Eligible Measures	Lighting & controls; HVAC; VFDs; building management system; building envelope; renewable and on-site generation and storage; custom measures for industrial & process applications.	Per contractor offering.
POST RETROFIT		
Measurement & Verification	NYEU may conduct M&V to evaluate performance of selected ECMs to further improve OBF program.	NYEU may conduct M&V to evaluate performance of selected ECMs to further improve OBF program. M&V may be required depending on form of agreement (e.g., an energy services agreement with performance standards will require M&V to verify energy savings).

was another way that they could demonstrate their commitment to sustainability. In these cases brand reputation was a strong driver in their interest in OBF. However, not all customers expressed interest. Those few who did not express interest in OBF noted that they had financing available that they could use for a retrofit, and they did not need any assistance.

- Program Design Should be Informed by Market Interest: TNY has a diverse C&I customer base. Applying a cookie-cutter approach to the program would not have allowed the NYEU to achieve the interest that it has thus far. The interests in the program expressed by the customer base was diverse. The feedback during customer interviews in the pilot was critical to establishing many aspects of the program design. For example, the breadth of ECMs allowed in the program was a direct result of the interest by the customer base. Combined heat and power (CHP) was not originally envisioned to be included in the program; however, interest expressed by multiple customers resulted in adding CHP to make the program have broader appeal. Additionally, providing a walk-through audit free of charge to the customer resulted in greater buy-in by customers in pursuing a retrofit, regardless of whether the customer continued to express interest in OBF or intended to seek their own financing.
- Knowledge of the Customer Base Allowed More Efficient Targeting of Customers: The NYEU performed an analysis of all customers to characterize the customer base to assist in targeting those most likely to be interested. The characterization looked at building size, use, age, occupancy type (e.g., owner occupied or leased), annual energy consumption, and EUI. From this information, the NYEU could more easily identify those customers with the most to gain by conducting a major retrofit. The NYEU believes that this was instrumental in the high interest in retrofits and an OBF program. The NYEU will continue to evaluate factors that influence interest levels as it pursues conversations with additional customers not in the initial scope of the pilot. While not every utility may have the amount of data available as the NYEU does, this approach can be more easily applied in cities/regions where there is a benchmarking requirement for commercial buildings, because benchmarking programs provide the types of information necessary to assess opportunities but not always available to a utility.
- High Performance and New Buildings Can Be Options for Retrofits: Generally, it would be expected that the customer in a new or LEED certified space would have less interest in a retrofit. However, several customers had newer buildings with a LEED rating, and these businesses also had profit margins more easily affected by operating costs. In these cases, the customer was willing to include all cost-effective measures into a retrofit of a newer building, even though the building was new and certified.
- Wide Spectrum of Deep Retrofit Opportunities Found at Diverse Commercial and Manufacturing Campuses: A predominately C&I campus deploying a smart microgrid, such as is in the process of full development at TNY, appears to present opportunities for NYEU customers to achieve deep or advanced energy reduction and to implement energy management solutions that can leverage the microgrid technology for extracting value from advanced regional energy markets, such as through participation in demand response and energy efficiency resource programs. OBF can provide an attractive investment incentive to help these customers consider the complex retrofits involved in such market participation programs.

V. CONCLUSIONS AND NEXT STEPS

CONCLUSIONS

Developing an effective program for energy efficiency in a large C&I campus presents specific challenges. These include a variety of customer types and building end uses, diverse energy use profiles, and for the industrial customers, predominant process energy needs. This drives a greater interest in a flexible approach and openness to a broader set of ECMs than a typical utility incentive program allows. Also, C&I customers can exist in multi-tenant, single tenant or building owner facility relationships, thus complicating the cost/benefit alignments of deep energy retrofits. Through this project, we have confirmed that OBF can be an effective marketing tool to start the conversation and in some cases, incent the follow-through to develop ECM opportunities for deep energy efficiency retrofits in C&I facilities.

NEXT STEPS

The NYEU is continuing to build out the TNY OBF Program. In the near term, the NYEU will continue to address the gaps identified in Table 2 above, particularly focused on the financing terms for internal financing and identifying processes and documents for 3rd party financing. These terms and approaches will be refined as the NYEU pursues project development for at least two of the customers for which the NYEU has signed LOIs in the near term. Additionally, the NYEU will continue to engage with parties interested in the OBF program to share additional lessons learned.

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[ADDRESSEE]

RE: Letter of Intent; Energy Efficiency and Conservation Project

Dear _____:

This letter sets forth the terms by which the Philadelphia Industrial Development Corporation ("PIDC"), on behalf of the Philadelphia Authority for Industrial Development ("PAID"), and _____ ("Company") will collaborate on the design, financing, construction and operation of an economically viable energy efficiency and conservation project ("Project"), to be installed at Company's facilities located at The Navy Yard of Philadelphia.

To date, PIDC has provided for an audit of Company's facilities to evaluate the economic and technical feasibility of a Project. The results of the audit are attached hereto as Exhibit A, which indicate that a Project as described therein is economically and technically feasible, based on reasonable design assumptions and financial terms.

In consideration thereof, PIDC and Company agree in good faith to continue to collaborate on the development of the details of the Project, as described in Exhibit A. The Company further agrees to continue this collaboration to the point that a sufficient understanding of, and agreement with the economic and technical aspects permit a decision by the Company whether or not to proceed with an installation.

The Company further agrees, that in the case of a positive decision to proceed, PIDC and the Company will collaborate to complete development of the contract documents for installing the Project, between themselves and among themselves, and such third party contractors, financing entities and property owners as are necessary and appropriate to provide for a successful installation and operation of the Project over a specified term of years.

Other than the obligation to collaborate in good faith as described above, neither PIDC nor Company is obligated to undertake the Project or enter into any contract document as a result of this letter.

If Company is agreeable to proceeding with the Project subject to the terms outlined in this letter, please acknowledge in the space provided below. On behalf of PIDC and PAID, we look forward to working with Company on the Project to achieve mutually rewarding economic and related benefits.

Very truly yours,

/s/_____
NAME, TITLE

ACKNOWLEDGEMENT

The undersigned, on behalf of Company, acknowledges and accepts the terms of the foregoing letter.

/s/_____
NAME, TITLE

ACKNOWLEDGEMENTS

This material is based upon work supported by the Consortium for Building Energy Innovation (CBEI), sponsored by the U.S. Department of Energy under Award Number DE-EE0004261 and undertaken in partnership with PIDC, Mondre Energy Inc., and Booz Allen Hamilton.

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NAME, TITLE

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/s/_____
NAME, TITLE

Exhibit A

Energy Audit Results

PIDC conducted an audit of Company's facilities on _____date_____. The following energy efficiency and conservation projects were found to be economically and technically feasible based on reasonable design assumptions and financial terms:

- **Energy Conservation Measure 1:** product and project description
- **Energy Conservation Measure 2:** product and project description
- **Energy Conservation Measure 2:** product and project description

Assumed OBF Loan Terms: ___% Interest, __Year Term
Estimated Net Annual Savings Net of OBF Debt Service: _____
Estimated Annual Savings after Repayment of OBF Loan: _____

Projected Financial Performance of Proposed Projects*

Project	Installed Cost***	Payback - Years	Purchased Electric Savings $/Year
ECM 1			
ECM 2			
ECM 3			
Total			
Estimated OBF Debt Service (__%, __Years)			
Net Annual Savings			

*Preliminary until technical scope has been finalized, and value of PECO rebates not included.