EEB Hub
Team 2030

EXECUTIVE SUMMARY

One Montgomery Plaza provides a seminal opportunity to develop the U.S. Department of Energy's Energy Efficient Buildings Hub ("The Hub") in its institutional capabilities. As an organization dedicated to facilitating deep energy building retrofit projects, The Hub can demonstrate generative success with this project. This report provides relevant analyses and conclusions to guide Montgomery County leaders toward completion of energy-efficient and cost-effective execution of planned upgrades.

The Hub recommends that Montgomery County take full advantage of the opportunity to repair One Montgomery Plaza by simultaneously pursuing an Advanced Energy Retrofit. In addition to a new façade, roof, and structural repairs, we also recommend additional enhancements that will maximize energy savings while improving employee comfort and workplace satisfaction.

We believe this retrofit may be accomplished within a period of two years with only partial displacement of County workers to offsite facilities. We further believe the County's affiliated parking garages provide a monetization opportunity that will allow The Hub to attract outside investment which, supplemented with authorized low-interest public financing programs, will allow us to finance the project with low investment risk.

This investment is expected to yield an energy improvement of 20-40% over the building's present energy performance, which is already better than a typical office building thanks to HVAC improvements made in 2004.

Finally, the successful renovation of One Montgomery Plaza will reinvigorate downtown Norristown, spur economic growth of sustainable industries in the region, and provide a model for exiting building renovations that can be duplicated elsewhere. A successful project will integrate the Hub's mission of demonstrating market viability of integrating energy saving technologies for whole building system solutions; identifying programs that accelerate market adoption of energy efficient retrofits of commercial buildings; and informing, training, and educating the public about proven energy saving strategies and technologies in the design, ownership, construction, maintenance, or occupation of such buildings.

Memorandum

Date:	February 24, 2013
To:	Montgomery County Director of Assets and Infrastructure
From:	EEB Hub Director of Market Deployment
Subject:	Approach for renovation and retrofit of One Montgomery Plaza (OMP)

The Advanced Energy Retrofit (AER) of OMP represents an important opportunity for Montgomery County to repair an aging building that has become a hazard while simultaneously leveraging energy efficiency and workplace improvements that will improve comfort and save taxpayer money. The AER will also help catalyze the green jobs movement in the region, and help reinvigorate downtown Norristown with new investment and opportunity. Through an innovative investment strategy, the project will not only drive regional economic growth in sustainable industries but also serve as a model that can be replicated with the many other existing buildings that are in need of renovation now and over the next 30 years.

Roles & Responsibilities

The Hub will act as facilitator for the OMP AER project, providing project support for Montgomery County (like a building agent). Our related responsibilities include providing engineering and economic analysis related to energy improvements, helping to assemble an integrated design team, modeling and advising on energy strategies, assisting in bid specs, supporting the County in decision-making and contractor selection, and working closely with the County's Director of Infrastructure and Assets, two space planners, and procurement specialist to ensure both execution and learning. We will play a central role in integrating the assessment, design, and financing processes to establish the Hub as a neutral *and* trusted advisor for deep energy retrofits in the greater Philadelphia region. Management of this project will enable the Hub to demonstrate expertise that it can monetize on a fee basis moving forward.

Analysis of Strategic Approaches to Implementation

Integrated Design (ID), a highly collaborative project delivery method that leverages whole-systems thinking for the design and build-out of projects, delivers greater savings through constant collaboration. Issues transcending disciplines can be resolved quickly with cooperative problem solving. ID involves all participants from the beginning of a project, bringing together the owner, architect, engineers, and subcontractors throughout the process.

- **Strengths**: An integrated design process allows for an accelerated construction schedule. The early cost guarantee helps provide a more accurate budget and can provide the best price for quality and performance.
- **Weaknesses:** It can be challenging to verify that the project owner is getting the most competitive price for project components. Changes to the construction plan and schedule after contracting are difficult to implement.

Energy Services Performance Contracts (ESPCs), allow the County to partner with an energy services company (ESCO) to improve energy efficiency. The ESCO takes on identifying and implementing opportunities for enhanced efficiency. The ESCO provides the up front capital, and the County would pay back the funds from the energy savings that occur as a result of the improvements over the period of the contract (U.S. Department of Energy, 2011).

- **Strengths:** An ESPC would allow the County to execute energy efficiency improvements

while avoiding raising taxes and issuing bonds. Montgomery County already has experience with using an ESCO, having done one ESPC project already at the Montgomery County Correctional Facility (Montgomery County, 2010, p. 11). Pennsylvania's Guaranteed Energy Savings Act (GESA) enables the County to execute just one contract for an ESCO project.

- **Weaknesses:** Depending on the exact format of the contract, and ESPC may not include facade improvements, since they do not result in large energy savings. Similarly, an ESPC is unlikely to include improvements that increase worker productivity and comfort. Specifically in this case, it does not make sense to separately contract an ESCO given the lower level of expected savings relative to capital needs.

Sale-Leaseback / Public-Private Partnership

In a sale-leaseback transaction, a given individual, business or institution sells real estate to a purchasing party in exchange for an upfront lump sum at market value, while concurrently entering into a long-term lease agreement with the buyer. The leasing cost is driven by duration and quantity of space the lessee commits to lease from the property's new owner. For public sector properties, such transactions commonly take the form of 'certificates of participation,' whereby the government sells certificates to investors, but remains responsible for the property's services and cost. Interest on the certificates is paid regularly through the life of the certificate, at which point the principal is repaid.

While a sale-leaseback is one type of Public-Private Partnership (P3), essentially any form of collaboration on financing can fall under this umbrella. Both the strengths and weaknesses depend on how the deals are structured and how the partnerships are formed. With the sale-leaseback example, the main advantage for the public partner is a large upfront capital payment. The primary weakness is a potentially higher long-term discounted cost. In this case, a sale-leaseback, under a certificate of participation arrangement, affords the County an attractive opportunity to finance OMP. The County's commitment to occupancy will go a long way in mitigating project risk and associated interest rates and should be pursued for much of the project's financing.

Recommended Approach for OMP

With a consideration of high-level options above, it is clear in this case that a combination should be pursued for successful rehabilitation that achieved shared goals.

Capital Improvement Plan

Advanced energy retrofit performance targets

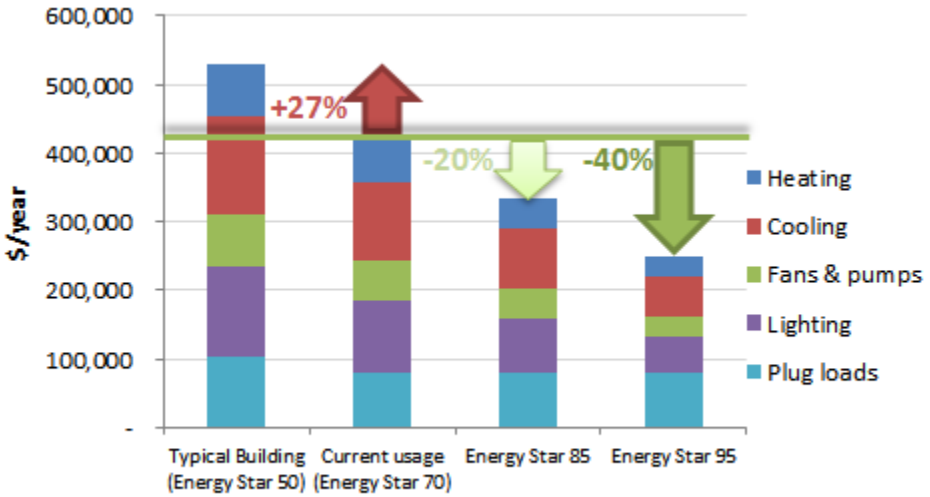
The term *advanced energy retrofit* refers to a process of achieving significant operational energy savings by evaluating whole-building energy performance, and identifying and implementing best-practice measures across a range of building systems. Energy savings targets are typically determined in reference to energy usage intensity (EUI) of similar building types in a particular climate zone. *ASHRAE Standard 100 - 2006: Energy Efficiency in Existing Buildings*, lists the target EUI for an advanced energy retrofit of a government building in Montgomery County (Climate Zone 4A) as 57 kBtu/SF.

Another critical issue is the current state of the building. An advanced energy retrofit aims to identify and address energy savings opportunities, and the availability of these opportunities varies between facilities. One Montgomery Plaza had a complete replacement of its HVAC

equipment in 2004, and as such has moderately efficient heating, cooling and air distribution equipment with over a decade of useful life remaining. While replacement with new, high efficiency would yield significant energy savings, this is not a prudent investment at this point in time, and should be delayed until the existing equipment is nearing the end of its life. In contrast, the facade of the building must be replaced urgently. Installation of a highly efficient facade and roof will reduce overall energy consumption by 2-3%. Furthermore, a number of "basic" energy conservation measures have been identified which will achieve a further 16-20% savings, provide excellent return on investment and can be coordinated with the facade replacement. Finally, there are several "advanced" measures which are capable of generating further savings in the order of 10-20%. These measures will considerably increase the cost and complexity of the project and should be further investigated to determine their technical and financial feasibility.

One Montgomery Plaza currently consumes a total of approximately 19.0 MMBtus per year in electricity and natural gas combined, which is equivalent to 93 kBtu/SF. Annual energy costs are $418,000. At this level of consumption, the facility outperforms a typical building by 27% ("Energy Star Target Finder", 2013), placing it in the 70th percentile of performance across all existing building stock. A 20% reduction in annual building energy usage, equivalent to an EUI of 74, would place OMP in the 85% percentile of performance. A 40% reduction achieves the ASHRAE Std. 100 target of 57 kBtu/SF and would place OMP in the 95% percentile of performance. These findings are summarized in the figure below.

In relation to the savings opportunities identified, a 20% reduction is achievable through implementation of the facade replacement and basic system upgrades. Savings of up to 40% may be achievable depending on the feasibility of the advanced system upgrades. Therefore, we have identified a performance target of 20-40% savings in annual energy consumption, corresponding to annual energy savings of $83,500 - $167,000. The average of our annual energy savings estimate, $125,250, is worth approximately $2.5 million to the County, which we can assume has a discount rate around 5% (versus 8-12% traditional hurdle rate for similar projects in corporations).



1. Necessary Repairs ($13.7MM investment, potential energy savings of 2 - 3%)
Replace Brick Piers with GFRC Panels
Upgrading the facade of One Montgomery Plaza will directly impact the building's energy usage,

saving in the order of 2-3% of total energy consumption through improved air tightness and thermal performance. While Insulated Metal Panels and EIFS may provide better insulating value than GFRC and precast concrete panels, the difference in overall energy savings between the five options is insignificant (less than $1,000 per year in all cases) when compared to differences in construction and maintenance costs, and is therefore not seen as a primary factor in this decision.

Like EIFS, GFRC panels are lightweight, reducing weight loading on the building and accelerating installation time, but unlike EIFS, GFRC does not require a field-applied epoxy overcoat, which is labor intensive and susceptible to application error. Maintenance for IMPs over 20 years is on average $21,000 less per year than GFRC panels -- a significant savings -- but considering the additional cost of $3.1MM for IMPs, it would take more than 150 years to recover the premium. Furthermore, IMPs and EIFS may not even be allowable options for OMP because of Norristown's Historical Architectural Review Board (HARB), which regulates exterior modifications in key historic districts, such as "Central A" -- the highest priority historic district in Norristown -- where OMP is located. It is unlikely that HARB, which reviews and regulates changes to the built environment in these districts, would allow metal or stucco cladding options, especially considering its location across from the Montgomery County Courthouse.

Therefore, the only true options are GFRC panels, which can be formed and tinted to look like brick, and precast concrete panels, which can have brick veneer embedded in the facade. Precast panels offer significant advantages, such as an expected service life of 100 years. But GFRC panels are roughly 1/5th the weight of precast concrete panels and could acceptably rest on existing spandrel beams, making them faster and easier to install. Precast panels will cost roughly twice as much at GFRC panels to install ($4.455MM vs $2.347MM) and $5,500 more per year to maintain. Given the cost of capital and uncertainty over the long-term future of the building, installing GFRC panels and planning to replace them at the end of their 50 year life is preferable to installing precast panels with a 100 year life.

For these reasons, the existing brick piers should be replaced with GFRC panels that are molded and tinted to match the original brickwork as closely as possible. GFRC panels could be factory-insulated to achieve a R26+ wall, and made to match the original character of the building. Insulation could also be added to the wall behind the panel, if determined to be valuable. Special attention should be paid to achieving maximum air tightness of the building envelope with liquid applied sealant and peel-and-stick flashing around all joints.

Windows

A new thermal-break curtainwall window system with double or triple-pane, tinted low-e glazing should replace the existing window wall system. Windows should be the maximum possible height -- 9'6" clear ceiling height with an 18" sill height above the floor -- to optimize daylight bouncing deeper into interior office space. If tall windows are coupled with removing interior drop ceilings, exterior passive shading on east, south, and west facades should also be added, helping to block direct summer sun while also acting as a horizontal fin to bounce light to the interior.

Roof

The roofing material of both buildings should be replaced, including a minimum of R20

insulation, new drains, and membrane. Whether a “cool roof” should be used or not should be professionally evaluated; simple calculations for the Philadelphia area on USDOE’s Oak Ridge National Laboratory v1.2 cool roof calculator indicated that a white roofing membrane would reduce air conditioning demand, but also create a “heating penalty” during winter months, offsetting summer savings. A professional should evaluate the most efficient membrane with an optimum Solar Reflectance Index. The roof replacement should also include a new parapet wall for fall protection, as requested by the maintenance crew.

Structural Overloading: Reduce & Digitize Archives
There are 34 areas believed to be exceeding live load capacities because of excess file storage. Two options are presented: reinforce structural beams and girders to accept the increased load, or rearrange and redistribute loads across office space. We propose a third path that would involve the evaluation and reduction of unnecessary files, and the creation of a new county digital archive.

A recent analysis in NJ of local government records revealed that 50 to 60% of paper documents were eligible for destruction; one county discovered that just one-tenth of a percent of a division’s records warranted retention (National Association of Secretary of States, December 2006). Furthermore, the cost of handling and storing paper files represents a tremendous administrative expense in archiving and retrieval. Digital archives are searchable by name, date, type, and other information, are easily accessible, and provide increased security; digital records cannot be altered, damaged, or removed, access can be controlled by password protection, and an audit trail records who accesses files and when.

Not only would a major reduction in storage volume eliminate the need for structural reinforcements (saving $100,000), it would also free up usable office space for workers. If, for example, the 34 areas being used for file storage represent just 500 square feet, the lost real estate value would represent approximately $255,000 per year.

2. Basic system upgrades
Building Controls and Automation (~$1MM investment, estimated savings of 12-15%)
The single largest current source of inefficiency in OMP is the lack of control and coordination in the HVAC systems. While DDC controls have been installed in all base building equipment, the building operators are currently unable to optimize operations or even control these devices remotely due to the lack of a Building Automation System (BAS). Furthermore, 370 of the 400 VAV boxes in the building have pneumatic controls, which need to be replaced with DDC controls to enable connection to a BAS.

A BAS will enable the operators of OMP to optimize the scheduling and settings of the building’s HVAC systems and dynamically respond to changes in internal and external loads at a zonal level. While the savings produced through a BAS vary greatly between projects, and are highly dependent on the extent to which the BAS is correctly installed, commissioned, and understood by the building operators, they are estimated to average 10% of total building energy usage (M.R. Brambley, 2005). The current inefficiency of the building’s operations - heating systems are run continuously in winter, and cooling systems are on a rough occupancy schedule in summer - indicates that the savings in this project are likely to be significantly higher.

Remove Drop Ceilings & Lighting Redesign (For ~$0.5MM, estimated savings of 4%)
Lighting represents 25% of energy use in OMP at 1.1 W/SF. ASHRAE 90.1-2010 mandates a maximum lighting load of 0.9 W/SF, which can be achieved without extensive redesign or addition of controls by upgrading all T-8 lamps.

Natural day lighting in the building will be greatly enhanced by upgrading the facade to create full height windows and removing the existing drop ceilings. Additional measures including reflective horizontal exterior louvers help shield direct solar radiation and reflect light into the office interior, increasing the depth at which daylight penetrates the building by at least 15' (Terrapin Bright Green 2013). Operable fabric blinds provide 50% shading and reduce glare on computer monitors.

Removal of the drop ceilings can be coordinated with a "simple" lighting redesign in which the existing linear fluorescent layout, wiring, and ballasts are maintained, but the current recessed scheme is replaced with a suspended multi-directional pendant configuration which provides the most comfortable lighting experience by evenly illuminating the ceiling, walls, and floors. Replacing the existing 32W T-8 bulbs with 25W T-8s is possible with their existing ballasts, and will reduce lighting consumption by 22%.

New Office Configuration
The needs, demands, and preferences of today's workforce are very different from prior decades. The structures, content, and processes of work have become increasingly complex, collaborative, social, technological, and fast-paced (Heerwagen, Kelly, Kampschroer, 2005). Organizations wishing to attract the best talent and reduce employee "churn" must create a work environment that responds to the new reality of today's workplace. The OMP renovation is an important and valuable opportunity for Montgomery County to modernize its workplace for energy efficiency, but also health and productivity, so as to have the best functioning, most productive operations possible.

The first and most important goal in any workplace reconfiguration is how to create a place where people want to come to work. Thermal comfort, acoustical privacy, and natural light are important contributors to a satisfying work environment. Office must provide a professional space where work can be done, with modern equipment and fixtures, and places for focused concentration. Rather than individual high wall cubicles, an open floor plan provides a feeling of relief, expanding the horizon while allowing more natural light to enter the office space. In a highly collaborative office, desks in an open floor plan space become quiet workspaces, balanced by a significant increase in 4-person small group meeting rooms and 1-person acoustically shielded "phone booth" type rooms with nothing more than a comfortable chair, telephone, and Internet connection for private conference calls.

The new OMP office layout should use these strategies to create a collaborative, productive, connected workspace, allowing for both informal communication as well as concentrated attention. Additional measures could include: highly mobile furnishings and dividers, wireless infrastructure, mobile video conferencing tools and software, and interactive whiteboards paced (Heerwagen, Kelly, Kampschroer 2005).

Biophilia, Health, & Productivity
Creating a workplace that supports the psychological and emotional wellbeing of employees may

provide the greatest benefit and return on investment for Montgomery County. New studies in what is called Biophilia – our innate connection to nature -- have proven that views of nature, access to fresh air, and ample natural light can significantly increase productivity and reduce absenteeism, and alleviate stress levels by as much as 19.4% (Terrapin Bright Green 2012).

Improving productivity may actually be the greatest benefit of the OMP renovation project. People are an organization's most value and expensive asset; in terms of operational expenses, companies spend 90.3% on salary, 8.9% on rent and mortgage, and 0.8% on energy (BOMA 2010, US Department of Labor 2010). Viewed over a 30 period, initial building investments account for 2%, operations and maintenance 6%, and personnel 92% of total dollars spent (Sustainable Building Technical Manual 1994). Companies spend 112 times the amount of money on people as they do on energy (Terrapin Bright Green 2012). While difficult to quantify, improvements in worker productivity represent massive savings potential.

The proposed AER of OMP would provide staff with key elements that contribute to workplace satisfaction: the ability to act on one's immediate surroundings by adjusting temperature or lighting, have meaningful social stimuli in collaboration with other employees, and have enhanced views to the outside world (Kellert 2008). The overall impact to Montgomery County's payroll could be sizable; based on an average salary of $33.24 per hour, reducing absenteeism at OMP by just 3% could save the County $1.1 million per year, and improving productivity by just 6% could save $2.3 million (Bureau of Labor Statistics 2011, US Department of Labor 2010, Terrapin Bright Green 2012).

Innovative ideas to connect with nature in an office setting could include, for example, a rooftop garden and greenroof on OMP North's rooftop (8th floor roof), which could become an outdoor refuge for employees to have lunch, hold meetings, or get a breath of fresh air, while also providing appealing views from the 9th and 10th floors of OMP South. Cost of such an improvement is estimated at $108,000.

3. Advanced upgrades (potential energy savings of 10 - 20%)
These options provide potential for significant additional savings that could elevate One Montgomery Plaza to an exemplar of high-energy performance, yet require significant investment and must be further analyzed for suitability. During the design phase, the project team should conduct a comprehensive investment evaluation. This list is not exhaustive, and the RFP Some of these measures are

Advanced Lighting Design and Controls
A target of 0.6 W/SF is achievable through a combination of improved daylighting, controls and task lighting.

Simple "on-off" controls for daylighting in perimeter spaces and occupancy in transient spaces and restrooms are capable of producing significant savings of 20-30% on average. Even greater savings of up to 50% (Terrapin Bright Green 2013) are possible through "smart lighting" dimming controls, such as those made by Enlightened Inc., though at a higher cost due to the expense of dimmable ballasts.

Rather than relying completely on overhead ambient lighting, occupants could be encouraged to rely on individually-controllable, targeted task lighting. This would allow overhead lighting to be

turned down or completely turned off, while also improving occupant comfort.

Advanced HVAC opportunities
Aside from replacing the base HVAC equipment, there are a number of other opportunities for improving the efficiency of the building's mechanical systems which should be considered.

Demand controlled ventilation, which controls ventilation rates at a room level using CO2 sensors, can produce significant savings in spaces with highly variable loads, as well as ensuring adequate fresh air is provided to all building occupants.

A heat recovery system, which captures the thermal energy of exhaust air, should also be considered. The ability of the current air handling units to provide economizer controls should also be assessed. This control strategy detects outside air temperatures and humidities and, when conditions are right, allows the air handling units to switch to providing 100% outside air rather than cooling return air, saving energy and improving fresh airflow in the building.
While these relatively advances controls are difficult to implement in the building currently, the installation of a BAS makes this process quite straightforward and possibly worth the associated capital costs.

Plug Loads
Plug loads account for approximately 20% of the existing building's energy use, which is consistent with national averages (NREL June 2012). Plug loads also produce considerable amounts of heat, increasing cooling demands. According to NREL, "Minimizing plug-loads energy consumption is a primary challenge in the design and operation of an energy-efficient building, because is an aggregate of small distributed loads under the control of individual occupants" (NREL June 2012). Effective means for reducing plug loads are still being explored, however in the very least, OMP should install nighttime shut off controls that automatically cut power to particular outlets after a certain hour, helping to eliminate vampire loads when the building unoccupied. Schedule timers have proven to reduce monthly energy usage by as much as 50% (NREL June 2012).

An alternative approach to managing plug loads is through procurement. Common strategies include Mandating that all office equipment be Energy Star certified, or evaluating procurement options based on total cost of ownership, which takes into account lifetime energy costs, rather than simply upfront cost.

Commissioning and Monitoring & Verification (M&V) Plan
OMP provides a perfect opportunity to collect data, measure the effect of energy conservation measures, and provide real-time feedback to building occupants. An M&V plan must be put into place to organize the equipment and whole-building data being collected by Penn State prior to construction. Post-construction, a comprehensive commissioning plan should be carried out to ensure all installed systems are functioning as designed. The installation of a BAS will facilitate the M&V process by collecting and recording real-time HVAC equipment data, however additional permanent whole-building metering must be installed to provide building operators and occupants with real-time feedback via a building dashboard (Lucid or similar). If feasible, floor-by-floor metering should also be installed to enable competition within the building for meeting energy reduction targets. Engaging tenants with a "Sustainability Update" newsletter would increase awareness and improve participation.

Indoor Air Quality
The importance of indoor air quality cannot be overstated. Sick Building Syndrome is a major drain on worker productivity, and special attention should be made in the renovation process of OMP to prevent air contaminants (US EPA 1991). Most indoor air pollution is VOC emissions from adhesives, carpeting, upholstery, and formaldehydes; the County should commit to no and low-VOC, formaldehyde-free paints, décor, and furnishings, as well as HEPA air filters with 95% particulate filtration for this project.

Project Scheduling and Phasing
1. Pre-Construction M&V: (0 - 24 months).
2. Planning Phase: Release RFP for design. Refine budget, value engineering, determine procurement, relocation plan. Conduct GSA Workplace Solutions survey (0 - 6 months).
3. Financing: Arranged through Qualified Energy Conservation Bonding, State Energy Works Loan Fund, and Certificate of Participation with private capital investor (6 - 24 months).
4. Design Phase: Refine budget estimates, cost management, evaluate alternative systems and materials. Finalize drawings and specifications, constructability review, integrated coordination across disciplines, identify cost-effective design solutions, code compliance. Engineering team to determine feasibility of "advanced energy upgrade" options. Finalize design. Release RFP for construction (6 - 24 months).
5. Procurement Phase: Complete all construction documents, source materials (12-24 months).
6. Construction Phase: Two year timeline made possible by choosing GFRC brick pier replacement scheme combined with partial relocation. Coordinated with interior upgrades and office reconfiguration (24-48 months).
7. Pre-occupancy: Commissioning of all new, existing systems, begin post-occupancy M&V process (48-54 months).

Worker Relocation Plan
Entirely vacating OMP would accelerate the construction timeline, but the County would need to find roughly 152,567 square feet of temporary office space for employees. About half the employees could utilize the 78,505 square feet of currently vacant space on the 1st, 2nd, 3rd, and 5th floors of the Human Services Center (3 HSC). The County would then need to lease 74,062 square feet of office space elsewhere for remaining staff. At a downtown lease rate of $15 per square foot per year, this temporary office space would cost the County roughly $2.6 million over a two-year construction timeline. This expense, however, would be offset by savings resulting from the accelerated construction timeline, which is estimated at 20-40% savings, or $2.7 million to $5.4 million.

Alternatively, because OMP is essentially two buildings with separate HVAC systems, it could be possible to separate construction into two phases, vacating one building completely for a streamlined renovation while continuing to utilize the other for office space. This could achieve the accelerated timeline of renovating an unoccupied building, but without having to relocate the entire staff at one time. The first phase would move employees from the 10-story southern building (OMP South) to the roughly 78,505 square feet of vacant office space available at 3 HSC, allowing employees in the northern 8-story building (OMP North) to remain in place while OMP South is renovated. Prioritizing OMP South would, upon occupancy, open an additional 27,800 of "extra" space on the 9th and 10th floors that would then be available for use. Once OMP South is ready for occupancy, staff located in 3 HSC could move in as well as some

additional staff from OMP North. This would reduce office space demand on 3 HSC (or other leased office space) to 46,262 square feet, which represents a lease value of roughly $483,645 per year. This would also achieve an accelerated construction timeline with a hybrid relocation model, estimated to save 15-20% overall, or roughly $2.5 million. A proper evaluation of the options is necessary to determine the most advantageous path forward, however it appears the staged relocation model would reduce exposure the most should the project take longer than two years, and is therefore more likely to save the County money.

Funding and Financing

One Montgomery Plaza's deep energy retrofit will be financed in the following manner:

- $8 million in Qualified Energy Conservation Bonds
- $2.5 million from the Energy Works Loan Fund (% of total funding)
- $19.4 million from Certificate of Participation financing by an outside investor

The Hub's deep energy retrofit will allow the project to qualify for Montgomery County's pre-authorized allocation of Qualified Energy Conservation Bonds at 2.31% interest and the State's Energy Works Loan Fund at 3.5% interest, both over 15-year terms. The difference between the $29.9 million project cost and these subsidized programs will be obtained by participating in a certificate of participation agreement with an outside capital provider. In addition to QECD and EWLF funds, monetization of affiliated parking structures at a rate of at or above $3.2k per parking spot is expected to provide sufficient capital to finance both renovation of One Montgomery Plaza and all three parking facilities. Evidence from comparable parking monetization efforts indicate that this level of financing is likely highly conservative and will be exceeded.

Costs			Yearly Costs
Initial Capital Cost		$ 29,900,000.00	
Interest	QECB (2.3%)		$ 184,800
	EWLF (3.5%)		$ 87,500
	REIT/IIF (6.1%)		$ 1,183,400
Annual Cost			$ 1,455,700
Annual Mortgage Payment			$ 3,449,033

Parking Revenue Needed to Finance	$ 3,449,033
No. Parking Spots	1,104
Price per spot to finance	$ 3,124.12

Monetization of Parking Assets

The monetization of the County's parking assets, specifically the 1,104 spots underneath OMP and in two nearby parking structures, is a key strategic opportunity. Since the County has already issued an RFI, the plan for securing this funding is already under way. The next step is to prepare for evaluation of RFI responses and issuance of an RFP, followed by an evaluation and selection of the right partner to execute once RFP responses are received.

Valuation: In the absence of condition assessments and engineering cost estimates for the rehabilitation of the County's three parking structures, we have applied $12 million as an appropriate cost estimate for a comparable Philadelphia-area parking garage renovation. Without constraints on rate increases and optimization of revenues for the spaces, a private partner investing in the spaces and garages as a standalone unit could drive around $15 million in present value from the investment. However, this is a public asset and as such there are political implications. The Hub believes a more sustainable approach for guiding RFP

issuance and evaluation is to use comparable recent transactions, which value the available parking spots at far more than $15 million in total.

Potential Investors: Real Estate Investment Trusts (REITs) comprise an asset class that has provided long-term development financing for over fifty years. By the equity-with-debt-like returns nature of this investment, the Hub believes that the County should target REIT investors with its RFP. This would work as follows: A private consortium composed of energy service providers (for the expertise to implement ECMs), infrastructure investors, and commercial lenders could pool capital to fund the project as identified by the County and Hub to include OMP retrofit and parking asset repairs. The County will continue to own all of these assets, but it will structure the RFP to attract a long-term investor to lease the assets). If a REIT, the private consortium would be able to sell shares of the project to the public, and as such it would demand a lower rate of return on the project than other sources of private capital. If an infrastructure fund, the County could work with the partner to establish a similar reduction capital costs where the fund can still earn an attractive return. The REIT is especially attractive, however, because given the requirements of REIT status the consortium would be required to operate the garage as part of the building and not as a standalone entity, making the OMP capital rehabilitation a non-negotiable for the entity.

Community Outreach Plan

As a major investment in the community, the OMP AER represents an opportunity to catalyze a downtown revitalization focused on green jobs and local, sustainable economic growth. In line with the Montgomery County Economic Plan to reinvigorate downtown, OMP could become the epicenter of a new "Norristown 2030 District" community organization that brings property owners, government entities, businesses, and community stakeholders together to develop and support a new business model for urban sustainability based on collaboration and shared resources. Participants would envision and articulate what they want to see in Norristown by the year 2030, developing and implementing strategies for progress.

"2030 Districts" exist in Pittsburg, Cleveland, Seattle, and Los Angeles, and serve as regional grassroots efforts to build strong environmental partnerships in their communities. Members make commitments to achievable goals, such as decreasing energy use by 10% in 2015 and 50% by 2030, for example. Montgomery County's Strategic Economic Development Policy, which targets communities like Norristown for revitalization, could support Norristown 2030 with its grant and loan programs for improved green infrastructure, streetscapes, workforce training, business relocation, master planning, and so on. In this way, the OMP renovation could become the tipping point for a bright green future in Norristown.

Conclusion

Rehabilitating OMP in the way proposed will help implement higher efficiency objectives, attract private capital to public projects using limited government financing support, and achieved the already planned capital improvements to a prominent county building. OMP is a key target for optimization efforts: demonstrating that even if a building scores alright on many efficiency metrics there are major improvements still to be made that yield higher real estate value and lower operating costs. Moreover, this pilot project provides a good example for the local community and broader regional efforts. The Hub, by providing technical support and facilitating risk sharing, illustrates efficiency as a bankable investment for commercial lenders and potential capital providers. Everybody wins.

REFERENCES

Heerwagen, J., Kelly, K. and K. Kampschroer. (2005). *Whole Building Design Guide.*

Kostelni, N. (2012). "$15 million parking garage overhaul is part of PPA lease." Philadelphia Business Journal.

Montgomery County. (2010). *July 21, 2010 Minutes - Montgomery County, PA.* Retrieved from http://montcopa.org/montco/cwp/fileserver,Path,MONTCO/Agendas%20and%20Minutes/Agenda_072110.pdf,assetguid,5ea4d41f-8997-400b-827abf7e6ece45fb.pdf.

Neuhauser, K. (2012). National Grid Deep Energy Retrofit Pilot. Retrieved from http://www.osti.gov/bridge

Wortman, Megan. Penn State College of Engineering study EIFS vs. GFRC. *Baltimore Washington Medical Center.* 2008. Retrieved from http://www.engr.psu.edu/ae/thesis/portfolios/2008/mlw268/Final%20Report/Tech%20Analysis%203.pdf

U.S. Department of Energy. (2013). *Energy Star Target Finder*. Retrieved from https://www.energystar.gov/index.cfm?fuseaction=target_finder.

U.S. Department of Energy. (2011). *A Guide to Performance Contracting with ESCOs* (PNNL-20939). Retrieved from http://apps1.eere.energy.gov/buildings/commercial/resource_database/detail.cfm?p=522.

Midcentury Unmodern: An Environmental Analysis of the 1958-73 Manhattan Office Building, Terrapin Bright Green 2013

Plug-Load Control and Behavioral Change Research in GSA Office Buildings. National Renewable Energy Laboratory, June 2012

Digital Archiving: from Fragmentation to Collaboration: National Association of Secretary of States, December 2006

Indoor Air Facts No. 4: Sick Building Syndrome, US EPA 1991

Friedman, Glen. (2011). ASHRAE Standard 100, http://www.slideshare.net/illinoisashrae/ashrae-standard-100

ASHRAE. (2012).*Energy Efficiency Guides for Existing Commercial Buildings.*

The Economics of Biophilia: Why Designing with Nature in Mind Makes Financial Sense. Terrapin Bright Green 2012.

Sustainable Building Technical Manual. Joseph J. Romm, Lean and Clean Management 1994.

Bureau of Labor Statistics. “Employer Costs for Employee Compensation new release.” United

States Department of Labor. Washington, DC. June 2011a.

Kellert, Stephen et al. *Biophilic Design.* Hoboken, New Jersey: John Wiley & Sons, Inc. 2008.

US Department of Labor. “Absences from work of employed full-time wage and salary.” Washington, D.C. 2010.

M.R. Brambley et al., “Advanced Sensors and Controls for Building Applications: Market Assessment and Potential R&D Pathways,” prepared for the U.S. Department of Energy by Pacific Northwest National Laboratory (April 2005), p. 2.7.