RECHARGED

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Reshaping DC's Energy Future

An examination of the state of the District's energy infrastructure – focusing on the commercial sector – and a new strategy to move towards a more self-reliant, lower-risk energy future.

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RECHARGED: EXECUTIVE SUMMARY

The District of Columbia has long worked to reduce energy costs, increase reliability, and protect the environment. Yet, periodically, the city must also assess its progress and identify options to recalibrate policies. In that spirit, this document examines the District's challenges – including the future risk of unreliable power, rising costs, and minimal clean energy generation – and then proposes a strategy to reshape its energy future.

The District's current energy infrastructure has several areas of concern. Some of these issues are inherent with an aging grid, while others are unique to the city:

- Reliability risk. Strains to the power system, apparent during recent weather extremes, will increase as numerous plants go offline in coming years.
- Expensive and volatile costs. DC businesses spend roughly $1 billion annually to power their buildings. With generation increasingly reliant on natural gas (a more volatile commodity than coal), these energy users also face increasing price risk.
- Disconnected programs and regulations. The regulatory constructs that define the District's utilities are often disconnected from opportunities made possible with 21st Century technology.
- Limited clean and distributed energy. The District has struggled to achieve scale with clean energy, including limited solar deployment and little large-scale distributed generation. The city also lacks a strategic plan to make progress in this area.

Moving forward, the District must fashion a strategy that leverages its advantages, employs global best practices, as appropriate, and reduces risks and costs. Three themes should define this new plan:

1. Modernize the grid and its regulatory constructs.

The District must move beyond a singular reliance on centralized energy infrastructure. A new paradigm should embrace distributed tools including onsite generation, neighborhood-scale energy systems, microgrids, combined heat and power facilities, and dynamic controls that can flatten and shape loads This new ecosystem will require regulatory modifications to equitably reward and incentivize key stakeholders to deploy new technologies that provide the needed increases in redundancy and resiliency to create a more durable system. This new ecosystem will also require regulatory modifications to equitably reward and incentivize key stakeholders to deploy new technologies.

2. Aggregate buying power and unleash new capital.

Billions of dollars in clean energy investments could be realized by aggregating demand, utilizing the inherent advantages of the District's deregulated market, and pursuing innovative public-private partnerships. Improved access to capital, often the 'last

mile' to securing clean energy investments, could go a long way to lower costs and reduce risks for the city's energy users.

3. Transform the market with data and performance transparency.

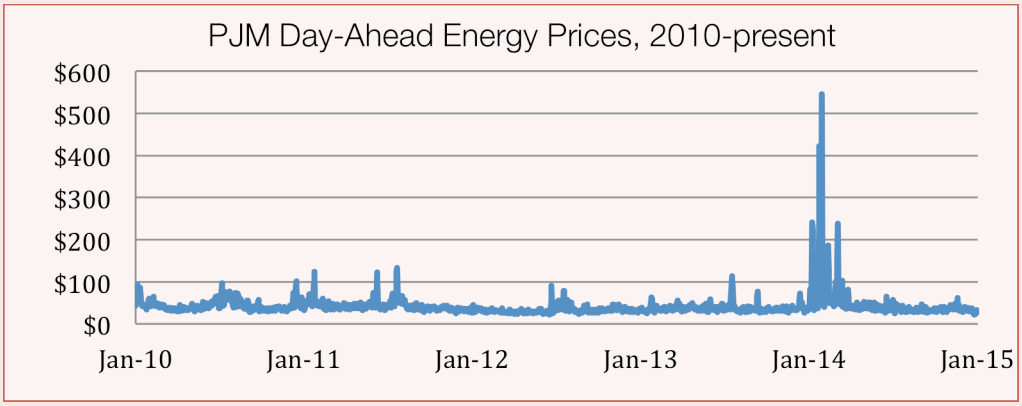
Surfacing clean energy's submerged value must be at the foundation of the District's plan to transform its energy future. From increasing data availability, to improving mandated benchmarking, to pursuing a collaborative community-based initiative, the city could attack a major limiting factor for clean energy deployment – lack of demand. Programs that create market awareness of energy performance (and thus catalyze demand) are vital tactics to any successful strategy.

2014 POLAR VORTEX: A GLIMPSE OF FUTURE CHALLENGES

PJM, the organization that coordinates the movement of electricity in 13 states and the District of Columbia, faced near dire circumstances in January 2014. Record demand from the so-called 'Polar Vortex' (extreme cold weather), combined with a shortage of natural gas, put extraordinary stress on the power system. PJM applied for, and received, emergency approval from federal regulators to remove price caps on electricity.

The lights stayed on. Nevertheless, the crisis sent power prices to record levels, and several energy suppliers went out of business. Though conventional wisdom held that summertime was the only time of possible threats to the balance of electricity supply, the grid faced severe strain in Winter 2014.

The risks to the power system could get worse in coming years. With a significant number of coal-fired power plants slated to retire, increasing demand, and the market's limited adoption of programs to cut peak consumption, there are now meaningful reliability risks.



CHALLENGES

While the District has the building blocks of an enviable environment for clean energy – including deregulation, a highly concentrated commercial building sector, deployment of smart grid technologies and an outstanding legislative history – the city has struggled to leverage its inherent advantages. Challenges and missed opportunities abound.

High Fees & Costs

District businesses face enormous utility-related burdens. Some examples of the costs to the commercial sector, which accounts for ~70% of the District's building energy load:

- ~$756 million on electricity[1]; ~$104 million on natural gas[2]; $132 million on water[3] (most recent annual totals)
- Commercial utility costs approach the total sum of commercial property tax collections ($1,250M in FY2013)[4]
- Businesses face enormous charges from utility-related fees enacted since 2008, including funding for the 'undergrounding' effort and the Sustainable Energy Utility (SEU)[5]

Despite bearing these significant costs, the commercial sector often sees minimal returns from the District's energy-related investment priorities. The DC SEU priorities reflect this disconnect, where a majority of its incentive programs target the residential sector, despite the majority of the resources coming from commercial fees.

The DC SEU's inability to significantly impact the commercial sector usage also raises questions. Even though businesses bear the highest burden for the entity's $20 million annual budget, the program as designed directs a majority of its incentive programs to the residential sector.

Reliability Risks

"The weather events experienced [during January 2014] provided an early warning about serious issues with electric supply and reliability… This country did not just dodge a bullet – we dodged a cannon ball."

-- Nick Atkins, CEO of American Electric Power, April 2014, Congressional Testimony

Within the energy industry, concerns about reliability have become increasingly stark. In the past, electricity blackouts were sometimes perceived as simply 'freak' accidents, but the polar vortex of 2014 was a stark reminder that power shortages are not out of the question.

The most notable effort to improve reliability is the District's plan to bury power lines. (The genesis for this endeavor was the 'derecho' weather event in 2012 that left thousands without electricity.) Though it is undoubtedly important to alleviate problems caused by downed power lines, the District's energy infrastructure faces risks far beyond thunderstorms.

Potential imbalances between supply and demand may pose the most serious long-term threat to reliability. As the region moves to close a number of large coal-fired power plants, these strains could increase significantly in future years. Said plainly: During times of high consumption and/or when supply is constrained, there is a chance that there will not be enough power to meet demand.

The grid has been sized for what are effectively several hours of high demand each year, with large centralized power plants and associated distribution systems built to accommodate those peaks. A century ago, this was a prudent strategy; indeed, it was the only system possible to meet the country's rapidly expanding energy needs.

However, two new facts define the grid in 2014. First, the previous century's system of centralized power distribution is near capacity, a problem exacerbated by the looming closures of coal-fired plants. Fortunately, however, the second feature that defines modern energy is promising: new technologies – from solar to dynamic controls – now enable cost-effective distributed generation.

> *"Since the late 1990s, most new power generating units have been built to burn natural gas. Unlike coal or oil, gas is not usually stored on site, so generators rely on real-time deliveries from the gas pipeline network.*
>
> *[During the 'Polar Vortex'] with gas consumption also hitting record levels, generators were unable to contract for sufficient volumes and arrange for delivery through an already congested pipeline network.*
>
> *The increase in gas-fired generation has introduced an unanticipated and dangerous link between the gas and electricity systems - with the risk of common failure."*
>
> *-- Reuters, "Will the Power Grid Survive Another Polar Vortex" October 9, 2014*

Disconnected Regulatory Constructs

Many jurisdictions are now working to modernize their antiquated energy systems. Maryland has had a "Utility 2.0" effort for nearly three years. New York's outstanding "Reinventing the Energy Vision," has brought together hundreds of stakeholders, from utilities to clean energy providers to rate payers, to fashion a new approach.

'REINVENTING THE ENERGY VISION'

In the aftermath of 2012's Hurricane Sandy, during which much of New York City was without power for days, New York began an effort that became known as the REV process. Spearheaded by N.Y.'s Chairman of Energy and Finance, Richard Kauffman, and the PSC, the state looked to reimagine its future energy infrastructure – and to reshape its regulatory constructs.

"The existing ratemaking structure falls far short of the pace of technology development," PSC Chair Audrey Zibelman has noted. "As we move to a system more dependent on renewable resources, what we want is a market that values these resources and a grid that's more flexible."

Although the District government currently has no such effort there has been discussion around these issues. The legislation to fund the undergrounding project makes reference to "alternative" means to improve reliability, as did the Undergrounding Task Force. A study along the lines of the New York effort should be undertaken by the D.C. Public Service Commission.

With the current regulatory system designed to serve only centralized power distribution, the lack of work to modernize regulations – to enable and incentivize the deployment of technologies from microgrids to solar – will have an increasingly noticeable impact.

Limited Clean Energy Deployment

The Clean and Affordable Energy Act of 2008, which has been amended several times, set forth ambitious benchmarks for renewable energy. In particular, clean energy advocates heralded its vision for solar power: ~66,000 MWh of generation by 2014, double that figure by 2018, and nearly 250,000 MWh by 2023. The goals were accompanied by a renewable energy credit (REC) policy that created historic incentives to go along with the requirements.

The desired solar market, which serves an indicator for broader clean energy deployment, has not materialized. It is likely that less than 17,000 MWh of solar was generated in the District in 2014, and it could be several years before production tops 35,000 MWh – far from the city's policy goals. Further, and perhaps most troubling, there has been almost no recent deployment of large-scale distributed assets such as combined heat and power (CHP) or microgrids.

No Plan

The very goals and mission of the SEU, an organization at the center of the District's work on these issues, illustrate the city's limited vision for its energy future. The SEU's current goal is to cut electricity use by just 60,994 megawatt-hours (MWh) per year – a small figure in the context of the District's annual load of more than 11 million MWh. Even if successful, the SEU now anticipates reducing the city's carbon footprint just 10% by 2032.

Yet, in line with cities around the globe, the District has also proclaimed a desire to cut consumption by 50% in that timeframe. How will the city make up this vast delta? There is currently no strategy. Even though regulations require the government to issue a comprehensive energy plan every five years – a foundational document to forge a path forward – the District has not formulated such a plan since 2003.

A NEW STRATEGY

Moving forward, a simple strategic imperative is proposed: Dramatically reduce the city's energy risks and costs. None of the missed opportunities are catastrophic, nor the challenges too great, to create world-class energy infrastructure. To make that happen, the District must leverage its inherent advantages, follow global best practices, and encourage innovation on three fronts.

1. Modernize Grid & Regulatory Constructs

Foundationally, the city must take actions that will jump-start the move to the future grid with an action plan to move towards an energy system that is more distributed, resilient, and efficient. The District, like many locales, has an infrastructure that was designed to distribute power from far-away resources in a one-way transaction. Moving away from this arrangement will not be easy. Such a transformation will require modifications to regulatory compacts that have defined the utility model for nearly a century. This transformation must build upon other initiatives focused on improving the grid so to leverage work already planned.

<u>Embrace Distributed & Dynamic Power</u>

The core of a modernized energy system is distributed power (including solar, fuel cells, microturbines, combined heat and power, electric cars, batteries, and more). This space

has seen tremendous innovation in the last 15 years and, as a result, now has marginal costs that rival those for traditional generation. Further, through tools such as demand response and dynamic controls, it is now possible to flatten loads so that demand does not spike beyond reasonable levels of supply. This means that, for the first time, distributed assets can provide enough reliable energy to satisfy the needs of modern buildings.

Ultimately, the grid must move from a "hub and spoke" system to a network that is increasingly nodal and multi-directional.

Integrate Distributed Resources

The major challenge to the success of this new strategy is to effectively integrate distributed assets into the grid and to properly incentivize all stakeholders – utilities, energy companies, and customers – to scale these resources.

The electric utility is vital to this shift. Not only will the ability to transmit power from centralized plants be required for generations to come, but the utility is also uniquely positioned to provide services to this evolving and distributed system. From properly structuring markets to providing information and price signals, utilities can create a competitive environment that provides customers with optimal energy services. Utilities can provide the connection between distributed resources and their customers, perform billing services, coordinate with other power sources and serve as the backup support when any individual distributed resource is not available. In other words the electric distribution system can serve as the system integrator that makes everything work together at the lowest combined cost to the customer.

The current regulatory construct, however, only rewards the utility for how much money it spends to deliver energy. This must be changed, so that the grid and the utility's investments are properly valued for modern-day performance. In the end, this means future rate cases in which utility returns are defined by more than power lines and substations – and, instead, by the manner in which distributed assets are enabled and deployed.

Seek Participation in EPA's Process to Regulate Greenhouse Gases

The U.S. Environmental Protection Agency (EPA) has embarked on historic rulemaking to regulate greenhouse gas emissions from power plants. Under section 111(d) of the Clean Air Act, the Agency is proposing to reduce carbon emissions 30% below 2005 levels by 2030.

Because the District of Columbia does not have any electricity generation within its borders, the Agency has not explicitly involved the city in the process. It would be shortsighted, however, to assume the District has no role to play. Instead, the city could take innovative steps to participate in the process and capture value for businesses and residents.

If prudent and forward-looking actions are taken (such as those proposed in this document), the District will be on a path to exceed goals set forth under EPA's proposed rulemaking. From energy efficiency to increased clean energy generation, the District could play a critical role in reducing the carbon footprint of the regional grid and serve as a model city to demonstrate the opportunities for a large urban area to move to an energy efficient city.

As such, the city could partner with other jurisdictions to create a coordinated effort to satisfy EPA's mandates. For instance, the District could aggregate the results of its energy efficiency programs – which reduce the need for electricity from nearby power plants – and help a neighboring state meet its carbon reduction benchmarks. If done correctly, this approach would yield significant health and financial benefit for the District, and it could spur the kind of regional collaboration required for prudent long-term energy planning.

Enable Dynamic Pricing

Customers and energy service companies are also essential players in "Utility 2.0." Notably, energy users must play a key role to minimize the grid's strain during peak loads. While demand response has been an important tool over the past decade, new programs must be created to go further. Fortunately, the District has already heavily invested in Advanced Metering Infrastructure (AMI, or "smart meters") that can enable robust programs to flatten and shape loads.

One of the best ways to incentivize such behavior is to move away from monolithic one-size-fits-all pricing and towards time-of-use rates. For example, higher prices from 3-5pm could incentivize energy users to "pre-cool" their buildings (to, say, 68 degrees) at 2pm and to turn off air conditioning from 3-5pm thereby reducing the strain on the grid with virtually no impact on occupant comfort. When end-users move loads away from peak demand they become integral components of the modernized grid.

Engage the Proposed Exelon – PEPCO Merger

Exelon, one of the nation's largest energy companies, is attempting to purchase Pepco. This transaction has created a rare occasion during which myriad parties (the utility, regulators, government officials, energy companies, community leaders, customers, etc.) are naturally and meaningfully engaged in utility matters. There is no better time set priorities, align relevant stakeholders, and begin pursuit of the dynamic modernization our energy infrastructure requires.

2. Aggregate Buying Power and Unleash New Capital

The District's considerable spending on energy should be used to its advantage. By leveraging and realigning the near billion dollars that businesses spend annually on power, the District can create mechanisms through which clean energy is deployed at unprecedented levels.

Utilize Competitive Markets

In many US markets, vertically integrated utilities mean that consumers must buy power from the same entity that distributes it. Through utility deregulation at the turn of the century, the District of Columbia took a different course, moving towards a more competitive environment in which users can purchase energy from third parties, a move that has been very successful. Currently the majority of energy used within the District is procured from third parties. This structure has several inherent advantages.

One of the primary benefits is the ease with which energy users can enter into Power Purchase Agreements (PPAs). Until relatively recently, PPAs were the unique domain of utilities and wholesale buyers. However, renewable and distributed energy is now economically feasible for retail energy users – and countless entities, from the District government to Google to Dow Chemical, have begun to pursue their own PPAs. There are two key advantages to these transactions:

1. *Low rates and long-term hedge against price volatility*. While traditional retail power supply can be hedged for only several years (i.e. it is impossible to lock-in prices after five years), renewable energy purchases can be done in which rates are fixed for a period of 5, 10, 20, and even 30 years. These contracts not only reduce prices on the first day of the contract but, critically, they provide invaluable reduction to price risk over the long term.

2. *No upfront capital requirements*. The energy buyer (e.g. business, government, institution) simply commits to purchase the energy generated, at a contracted rate, for the term of the PPA. This commitment is enough to attract third-party capital – and not the debt of the energy user – to finance construction of the generation infrastructure (e.g. solar, wind, combined-heat-and-power, storage, etc.).

In 2014, the DC Department of General Services developed two of the largest (non-utility) renewable energy procurements in the country. With PPAs to purchase 46MW of offsite wind and 10MW of onsite solar, the city will dramatically reduce costs and risks without any impact on its debt cap. Moving forward, the District government and local energy service companies should work with the commercial sector to scope similar programs.

Pursue Aggregated Purchasing

Another advantage of the District's deregulated market is the ability of energy users to pool together to purchase power collectively. The benefit is plain: With greater loads, aggregated procurements create scale that significantly reduces costs.

Collective purchasing could be combined with aforementioned PPAs to transform the energy supply for District businesses. From offsite renewable energy power plants, to onsite generation, to the creation of district-level microgrids, the aggregation of the District's buying power is capable of leveraging third-party capital and catalyzing truly game-changing efforts.

In 2014, George Washington University (GW), American University (AU), and George Washington University Hospital (GWUH) illustrated the promise of this approach with an historic aggregated clean energy purchase. The 'Capital Partners Solar Project' involves the delivery of 52MW of low-cost solar power to GW, AU, and GWUH. In the words of Greg Wold, president of Duke Energy Renewables (the deal's supplier), this purchase "provides [the consortium] with low-cost energy at a stable price for years to come."

Unleash Capital Through Strategic Lending

While "green banks" have become an increasingly effective tool to leverage third-party capital for infrastructure projects, the District's efforts have been muted. This need not be the case. The following approaches, which could be done under the umbrella of an Infrastructure Trust, should be pursued to catalyze high-impact projects without huge burdens on taxpayers and ratepayers:

- Co-lending and credit enhancements. The city can play a crucial role when entities without outstanding credit struggle to obtain loans, or when a project's risk profile is too big to attract traditional lending. This can be done through a number of mechanisms, including credit enhancements (e.g. interest rate buydowns) and/or co-lending (e.g., a small portion of the entire project is recognized as debt by a newly-created infrastructure trust).

- Liquidity reserves. Even when government subsidies provide enough incentive to make a project economically viable, many projects are not completed because of basic problems with cash flow. For instance, even when possible SEU investments suggest retrofits make theoretic economic sense, many small- and medium-sized businesses cannot afford to wait months for an incentive check to arrive. In these instances, even small amounts of short-term capital can help projects materialize.

- Standardize Underwriting and Measurement & Verification (M&V) guidelines. Securitization of energy efficiency investments is thought by many to be the holy grail of clean energy finance. In other asset classes, such as solar, securitization has led to lower costs of capital, and it is likely the same thing would happen with energy efficiency. Unfortunately, underwriting standards for efficiency retrofits have been disparate and fragmented. Without normalized terms, conditions, and benchmarks for performance, it is nearly impossible to put multiple projects into a single investment vehicle. Moving forward, the District should standardize metrics and, ultimately, help enable aggregated financial instruments for efficiency.

3. Transform the Market with Data and Performance Transparency

Too often, government clean energy programs take an "if you build it, they will come" approach. That doesn't work. Assuring that new technologies are available to customers is a necessary step, but alone it does little to create demand for its use. A central factor in catalyzing this demand, then, is to highlight the underlying conditions that make clean

energy attractive. The best way to make this happen, from the perspective of government action, is to enable transparency of energy data and performance.

Make Smart Meter Data Available to All Energy Users

PEPCO has spent $89 million on an historic deployment of advanced meters in DC. The promise of this technology includes aforementioned time-of-use pricing, unprecedented energy data analytics, and robust programs to flatten and shape loads. If energy users do not have access to the granular and timely information collected by the new advanced meters, however, their value is somewhat limited.

PEPCO made a significant commitment to ensure the benefits of smart meter technology is widely shared when it signed on to the White House Green Button initiative. The Green Button initiative, which focuses on data availability, rests on a core assumption: energy data can transform efforts to reduce demand.

In 2012-2013, PEPCO began to meet its Green Button commitment by partnering with the District government in an extremely successful pilot for municipally-owned facilities. Most recently, PEPCO has worked on a new system to make data available to all of its customers. PEPCO is now making sure that every energy user has easy access to their data by proving this information to customers through My Account, monthly bills and Resource Advisor. All of which provide the customer or their representative with historical energy usage data and benchmark data for similar classes of customers.

Streamline and Improve EnergyStar Benchmarking

The District was the first jurisdiction in the country to mandate EnergyStar Benchmarking for private buildings. The process was not without its hurdles. Moving forward, building owners now deserve a sober assessment of the program's early strengths and weaknesses – and the District should amend the process to minimize unnecessary regulatory burdens and to seek more impactful market transformation.

Create a 'SmartDC Network'

While there are countless plans and white papers about "smart cities" and "big data," very few cities have begun the process of deploying real solutions and making substantive progress towards realizing the benefits that those terms imply. The District could be one of the first.

By aligning utilities, government, building owners, and citizens – and empowering these stakeholders with real-time energy data– the city could create one of the world's first truly smart cities. Public touchscreens could show an aggregated 'pulse' of a neighborhood's energy use and compare it to others around the city. Building owners and tenants could have dynamic web-enabled displays of their energy use. Real-time leaderboards could foster competition to win prizes from the city. The possibilities are endless.

Through simply leveraging existing infrastructure and technology (including the aforementioned smart meters) the District could create community-wide solutions to cut energy use and better engage its citizens. These opportunities could range from aggregated demand response to cooperative energy purchasing.

RECOMMENDED FIRST STEP: CREATE 'GRID 2.0' PROJECT

Some of the actions in the three-point strategy discussed above will take many years, perhaps even a generation. Yet, to navigate each of these issues, including those that are long-term, an immediate action is required: begin a process that seriously examines and develops the path to a more distributed, self-reliant, and low-risk energy future.

For too long, the District has substituted disparate tactics for strategy. However, if the city is to forge a new path, one that meaningfully reduces its carbon footprint, that must change. The effort to create this transformation could be called 'Grid 2.0.'

Define the 'pie' and options to reshape it.

At the core of this project should be a simple exercise: plot a chart of the business-as-usual scenario over the next two decades and identify the factors that can reduce that baseline by 50%. What 'slice of the pie' can we expect from combined heat-and-power, solar, fuel cells, and other clean energy options? How much can efficiency contribute? These are not simple questions, of course, but the District must make a serious attempt to answer them.

Deep study of regulatory modifications is required to enable distributed, clean energy future.

The legal and regulatory remedies required to meet the needs of cutting-edge, 21st century technology will be complex. And while some other jurisdictions are looking at this issue (e.g. NY, MD), there is no playbook, yet, about how best to move forward. The District could take a leading role to help create this new model through a penetrating study, perhaps led by a leading expert in utility regulation.

Convene all stakeholders.

As New York's "Reinventing the Energy Vision" has shown, convening key stakeholders can have an enormously positive impact on grid modernization efforts. A comprehensive Grid 2.0 process for D.C. should pull together all relevant parties, energy users, utilities and regulators.

Develop More Robust Accountability

The business adage, ‘you can’t manage what you don’t measure,’ holds true in the energy space. And, in 2015, measuring things once every few years is insufficient; backward-facing assessments of energy performance, even on an annual basis, are antiquated and lack resonance.

To infuse Grid 2.0 with urgency and to create a new rhythm of accountability, the city should develop a state-of-the-art system of data feedback. This needn’t be difficult: By simply leveraging its smart meters and capturing data that’s already available, the District could create an almost real-time window into its performance. With a ‘pulse’ of the community’s carbon footprint, the city could drive ever-increasing standards of excellence.

NOTES

[1] DC Public Service Commission (PSC) website indicates 6,166,127 MWh of electricity consumed by commercial customers for the period December 2013 – November 2014; the US Energy Information Administration (EIA) indicates average retail cost for commercial during this period of $123/MWh [6,166,127 (MWh) *123 ($/MWh) = $754,254,819]

[2] PSC indicates 114,590,253 therms of natural gas used by commercial customers for the period November 2013 – October 2014; 114,590,253 therms equals 11,456,289 Mcf; EIA indicates average price of natural gas (commercial) during this period of $9.08/Mcf; 11,456,289 * 9.08 ($/Mcf) = $104,023,112

[3] DC Water indicates $131,533,000 in anticipated revenue from commercial customers for the period October 2014 – September 2015 (p6, FY2015 annual budget adopted December 5, 2013). indicates 2013 revenues of for commercial ratepayers

[4] DC's FY2015 Budget indicates Class 2 (commercial) tax collections account for 67% of total real property tax collections ($1,886,854M net in FY2013) [$1,886,854,000 * 67% = $1,264,192,000]

[5] SEU fees are $1.5/MWh for electricity and $.014/therm; AOBA testimony in front of the DC Council Committee on Government Operations on October 21, 2013 (p2) indicated "over $70 million" in annual costs related to undergrounding.