MEMORANDUM

DATE: February 2, 2015

TO: Deputy Treasurer Alan Gordon

FROM: Blake Johnson, Special Assistant

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SUBJECT: Commercial Energy Retrofits

This memo is in response to Deputy Treasurer Alan Gordon's request for an overview of the challenges and possibilities of commercial energy-efficient retrofits. The following briefing begins with historic barriers to retrofits, then details the potential environmental benefits and market size, concluding with brief case studies of existing retrofit programs. Included is an appendix of graphic information on commercial retrofits compared to other models, and government-owned bank structure and attributes.

Historic Barriers to Commercial Retrofits:

Case studies and various analyses have shown that the energy savings from energy-efficiency retrofits offer the potential for strong financial returns. However, a status quo bias, asymmetric information and structural barriers in the real estate industry have traditionally resulted in low levels of demand by home and building owners.

Building owners have historically had several options to fund the cost of retrofit upgrades. These options have not enabled retrofits to take-off at scale due a number of barriers, specifically:

- **Pay equity from their balance sheet / Fund upgrades from building cash flows**: Option constrained by structural barriers, split incentive between owners and tenants, and availability of capital. The opportunity cost of capital that another application may see a greater return on investment could create further disincentives for building owners to undertake a costly retrofit.
- **Take on parent-company level debt**: Option constrained by company appetite for indebtedness at the corporate level. May impact trading values of publicly listed vehicles.
- **Take on asset-level debt**: Mortgage covenants restrict the volume of debt on a building and require complex approval to secure. Many mortgages are held in securitized structures, making approval difficult

- **Utilize an Energy Services Company (ESCO**): Targeted option historically only adopted by certain segments. Seen by many as expensive. Not usually a source of financing; acts as conduit for other sources
- **Utilize various rebate programs / subsidized capital sources**: Option constrained by utility programs, government budget, and approval processes. Not viable as a long-term option; used by policy makers to kick-start early efforts to encourage use of other sources of capital.

Most potential energy retrofit projects in private commercial buildings do not receive external financing rendering access to capital a major constraint because:

- Liens on newly-installed equipment would require the consent of the primary mortgage holder
- Many private commercial buildings are held by shell LLCs with no credit-worthiness
- No contractual mechanism ensures that cost savings from lowered energy bills will be applied to loan repayment
- A hard cap on total business debt puts potential retrofit projects in intense competition with investment opportunities that would foster business growth
- The premium market value of high performance buildings has not yet been fully incorporated into the appraisal process
- Owners may wish to avoid debt and financiers may be unwilling to bear the risk of privately-owned buildings because the chances of default are higher relative to municipal and public-building risk

Barriers to internal financing of potential energy retrofit projects in private commercial buildings include:

- When retrofit costs and energy cost savings are passed from landlord to tenant some capital improvement costs and savings are amortized over a long period
- Even though ROIs are high, many retrofit projects are small in size compared to other investment opportunities.
- Internal capital is often not available for small and medium-sized businesses
- Due to the proprietary nature of pre- and post-retrofit energy consumption data, building owners, tenants, and banks face uncertain returns on retrofit decisions. Conventional financial products are insufficient for widespread retrofit adoption because energy retrofit savings can only be approximated. From a financial return perspective, a few percentage points separate good and bad investments. The difference between estimated and actual energy savings becomes significant— not only for the property owner but also for willing lending institutions. As a result, it is difficult to develop financing strategies with attractive terms for both lender and property owner.
- Since retrofits are region- and building-specific, it is difficult for knowledgeable retrofit decisions to be made without an audit from a third-party. Barriers include finding an appropriate audit company and paying for the audit itself. Without knowing the potential of retrofit returns or even the existence of potential retrofits, commercial building owners are unwilling to take this step
- The benefits of efficiency investments in existing commercial buildings accrue over the long term. If the return on investment is longer than what the building owner expects, he/she will not be willing to bear the upfront cost.

Split incentive limitations hold strongly for the commercial real estate sector, which accounts for a fifth of total domestic energy consumption or approximately 100 billion USD in annual power costs. According to the U.S. Energy Information Administration the average U.S. commercial building has the potential to reduce its energy costs by approximately 22% through energy efficiency retrofits and, according to the United States Department of Energy, commercial buildings could be made 80% more energy efficient.

Potential Environmental Benefits:

Commercial buildings in California account for 37% of primary energy usage and account for approximately 6.79 billion square feet of real estate space. Most buildings have a lifespan of 50-100 years, during which they continually consume energy and produce CO2 emissions. If half of new commercial buildings were built to use 50% less energy, it would save over 6 million metric tons of CO2 annually for the life of the buildings—the equivalent of taking more than 1 million cars off the road every year.

On the employment side, in the United States, more than $279 billion could be invested in energy retrofits across the residential, commercial, and institutional market segments. Nationally, this investment could yield more than $1 trillion of energy savings over 10 years, equivalent to savings of approximately 30% of the annual electricity spend in the United States. If all of these retrofits were undertaken more than 3.3 million cumulative job years of employment could be created.

In commercial buildings there exists a national investment opportunity of $72 billion. Such an investment would save 896 TBtus in annual energy consumption. This corresponds to an annual reduction in carbon dioxide (CO2) emissions of approximately 175.3 million metric tons, or the emissions equivalent of 2.1 million tanker trucks' worth of gasoline. Commercial retrofit market segments present a viable opportunity for development due to the relatively concentrated nature of energy savings, strong value proposition to owners and, therefore, potential demand. Additionally, consumers are willing to pay a premium rent for green buildings, and such buildings have less turnover. Recent U.S. research shows that green-buildings (those that are LEED or Energy Star certified) command higher rents (6-7% higher) and maintain higher occupancy rates than other buildings located within one quarter mile radius of them.

Energy efficiency retrofits, in addition to providing a sizeable investment opportunity and reduction in GHG emissions, also create demand for labor. Simple energy efficiency improvements such as insulating window films on can yield three 300% in savings for every dollar invested. Retrofits are relatively labor intensive: economists have estimated that **$0.54 of every dollar spent on retrofits goes toward direct or indirect employee compensation**. Second, they have high domestic content requirements, with **97% of economic activity occurring in the United States**. Finally, retrofit measures are associated with a relatively high number of entry-level jobs.

In commercial buildings, the potential national investment in retrofit measures would result in an estimated 876,000 direct and indirect cumulative job years, not including induced labor from energy savings. The above estimates are derived from analysis conducted by the University of Massachusetts, Amherst and use a standard input-output model, which provides information on 440 industries and is based on tables developed by the Department of Commerce's Bureau of Economic Analysis. This analysis suggests that **11.9 direct or indirect job years are created as a result of each million dollars of investment in green retrofits.**

Appendix:

Relevant Case Studies:

NEW YORK CITY:

New York has recently focused on commercial retrofits. New York's buildings account for 74% of the city's greenhouse gas emissions, while 2% of New York's properties account for 48 percent of the city's energy use. Energy consumption varies enormously, even among similar uses. In office buildings, for example, energy use per square foot can differ between neighboring buildings by a factor of six.

In New York City, mandatory energy disclosure and benchmarking laws generate demand for retrofits and the NYC Energy Efficiency Corporation (NYEEC) was created as a public-private mechanism to finance this demand. NYCEEC, incorporated as a public-private partnership, has received seed funding from the city in the amount of $37.5 million of federal stimulus money granted to New York under DOE's Energy Efficiency and Conservation Block Grant program NYCEEC is a non-profit specialty finance company that develops financing solutions to enable projects that save energy or reduce greenhouse gases. NYCEEC's custom-tailored solutions bridge financing gaps for buildings and clean energy project developers. NYCEEC is not an agency or unit of the City of New York, New York State, or any governmental body. NYEEC has financed $52 million in projects constituting 26 solutions over 41 buildings; eliminated 513,407 tons of CO2 per year, and 6,396 pounds of PM 2..5, while saving 17.1 million MMBtus of energy and creating 565 jobs (updated 2835 affordable housing units) 62% commercial and industrial properties, remainder split between multifamily affordable and market rate

MELBOURNE:

Melbourne has developed a program that encourages the owners of commercial buildings—which account for over 50% of the city's emissions—to improve energy efficiency. When the city debuted the program, five years ago, it sensed three obstacles in addition to its own non-authority over private property energy use. First, there was a general lack of knowledge about either the implementation or rewards of retrofitting. Second (this was peak credit crunch), a difficulty in procuring financing for the projects. Third, the so-called "split incentive": owners are wary of making improvements whose primary benefits—utility cost savings from capital investments—are transferred to tenants. To address the first, Melbourne is now a clearinghouse for information on benchmarking, auditing, costs, consultants, and other issues surrounding what can be a daunting process, particularly for the individual/family/small business-owned buildings that make up 25% of the city's office space.

To make the financial case for retrofitting stronger, the city developed an unusual agreement with the government of the State of Victoria. Essentially, the city acts as an intermediary between owners and banks, facilitating the loan process. These "environmental upgrade agreements" (EUAs) also include a provision to share costs between owners and tenants, thus solving the "split incentive" problem. This year, the city has brokered five EUAs with a value of $12.6 million, a “bit of a slow start,” according to city executives.

The city has estimated that 140 buildings underwent retrofit operations in 2011, and the results of a biannual retrofit survey will be released in two months. If the city can coax 38% energy use reduction from 1,200 of Melbourne's office buildings, the savings would amount to 383,000 tons of greenhouse gas emissions per year.

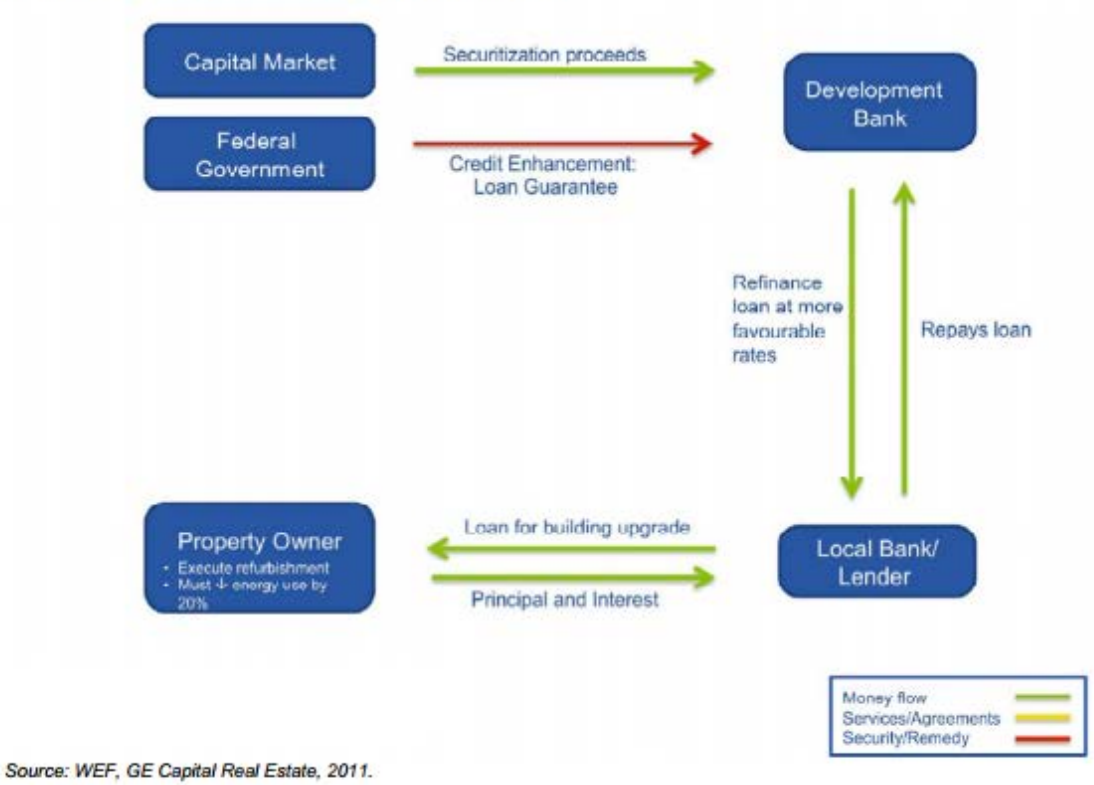
Relevant Charts:

Figure 4: Summary of other financing models

		Financing Source	Project Size	Upgrade Scope	Source of Repayment	Recipient of Energy Savings	Collateral / Security	Incremental Cost to Borrower	Sale Restrictions
Other models	Traditional Secured Lending	Private	NA	All	Loan payments funded from building cash flow	Owner/Tenant	Mortgage	Market interest rates	Repayment in full
	Energy Performance Contracts ("EPCs")	Private	Unlimited	Extensive retrofit	Loan payments funded from building cash flow	Owner/Tenant	Mortgage, general recourse	Loan payments less energy savings	Credit-worthy buyer, or pay out remaining value of contract
	Government-owned development bank	Public and private	Up to $14 million per project	Extensive retrofit	Loan payments funded from building cash flow	Owner/Tenant	Secured by collateral, backed by government. Also use credit default swaps and contingency funds	Interest + Cost of Retrofit	kFw Bank limited to Germany

Source: World Economic Forum, 2011; DBCCA, 2012.

Figure 52: Government-owned development bank



Source: WEF, GE Capital Real Estate, 2011.

Figure 1: Summary of impact by market size, climate and employment categories

	Residential	Commercial	Institutional	Total
Economic/Financial Impact				
Energy Savings (Trillion Btu)	1,892	848	293	**3,033**
Total Investment ($ Bn)	182	72	25	**279**
Social Impact				
Cumulative Job Years Created (# FTEs over course of investment program, '000s)	2,152	857	296	**3,305**
Environmental Impact				
Greenhouse Gas Emission Reduction (million metric tons of CO_2 mitigated per year)	382	175	59	**616**

Figure 33: Potential investment opportunity and employment impacts in the largest market segments

	Residential			Commercial		Institutional	
	Single Family	2-4 Unit	5+ Unit Building	Mercantile	Office	Educa-tion	Health Care
Total Investment ($B)	$144	$16.6	$16.7	$18.4	$17.1	$12.6	$7.3
Total Cumulative Job Years (# FTEs over course of investment program, '000s)	1,700	197	199	219	203	150	87

Source: Rockefeller Foundation, 2012.

Figure 28: Potential climate Impacts by building market segment

	Residential				Commercial									Institutional			
	Single Family	2-4 Unit Building	5+ Unit Building	Mobile Home	Food Sales	Food Service	Lodging	Mer-cantile	Office	Public Assem-bly	Service (other than retail & food)	Warehouse / storage	Other	Education	Healthcare	Public Order & Safety	Worship
Environmental																	
Greenhouse Gas Emission Reduction (million metric tons of CO_2)	302	35	35	10	9	18	18	44	41	15	10.7	11	10	30	18	5	7

Source: Rockefeller Foundation.

Employment Impacts

Figure 32: Potential employment impacts by building market segment

	Residential				Commercial									Institutional			
	Single Family	2-4 Unit Building	5+ Unit Building	Mobile Home	Food Sales	Food Service	Lodging	Mer-cantile	Office	Public Assem-bly	Service (other than retail & food)	Warehouse / storage	Other	Education	Healthcare	Public Order & Safety	Worship
Social																	
Cumulative Job Years Created (# FTEs over course of investment program, '000s)	1,700	197	199	56	43	73	89	219	203	75	54	52	49	150	87	23	36

Source: Rockefeller Foundation, 2012.

Figure 7: Potential impact by market category

	Residential				Commercial									Institutional			
	Single Family	2-4 Unit Building	5+ Unit Building	Mobile Home	Food Sales	Food Service	Lodging	Mer-cantile	Office	Public Assem-bly	Service (other than retail & food)	Warehouse / storage	Other	Education	Healthcare	Public Order & Safety	Worship
Economic/Financial																	
Energy Savings (TBtu annually)	1,497	173	174	48	42	71	88	217	202	75	53	52	48	149	86	23	35
Total Investment ($Bn)	144	17	17	5	4	6.1	7.5	18	17	6	4.5	4.4	4	13	7.3	2	3
Social																	
Cumulative Job Years Created (# FTEs over course of investment program, '000s)	1,700	197	199	56	43	73	89	219	203	75	54	52	49	150	87	23	36
Environmental																	
Greenhouse Gas Emission Reduction (million metric tons of CO_2)	302	35	35	10	9	18	18	44	41	15	10.7	11	10	30	18	5	7

Source: Rockefeller Foundation, 2012. McKinsey, Unlocking Energy Efficiency in the U.S. Economy (2009); Center for American Progress, The Economic Benefits of Investing in Clean Energy(2009); Energy Information Administration Commercial Building Energy Consumption Survey 2003, Residential Energy Consumption Survey 2005, Residential Energy Consumption Survey 2009; Environmental Protection Agency Online Clean Energy Resources Center; OHcp/INC/COWS analysis. Note: Analysis is based on an assumption of 30% energy savings in buildings built before 1980. All numbers rounded to closest thousand/million/billion as appropriate; TBtu = Trillion Btu.