Leveraging Carbon Markets for Green Buildings – in California and Beyond

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ABSTRACT

Despite the importance of the building sector in achieving deep cuts in greenhouse gas emissions both rapidly and cost-effectively, this "potential" remains just that – and emerging carbon markets have failed thus far to catalyze additional investment. The Pacific Carbon Exchange is working toward the creation of an Energy Efficiency Credit (EEC) market, which would be applicable to an expanded CA Renewable Portfolio Standard (RPS) that would allow utilities to meet part of their RPS obligations by purchasing EECs earned by building owner/operators, developers and buildings service providers through their investment in building energy efficiency technologies. By lowering energy consumption in buildings below a given baseline determined by building energy consumption models for new construction and major retrofits, owner/operators can earn EECs (one EEC = 1 Mwh saved) that could be traded on the open-market against the expanded RPS. Utilities will have the opportunity to purchase these credits, alongside renewable energy credits (RECs) and apply them against the expanded RPS. Set-asides of allowance allocations will be made through the Air Resource Board specifically for the purpose of providing for these energy efficiency credits and to prevent double-counting of these emissions under capped sectors. This energy efficiency credit market system would create hundreds of thousands of green construction jobs in the moribund construction industry in California, as well as reduce GHG emissions by as much as 40% in some building sectors. It would be applicable nationwide, and the quantification methodology was developed for international application under the UN Clean Development Mechanism.

INTRODUCTION

The single greatest challenges of our generation are global energy consumption and the climate change caused by this consumption - a now virtually indisputable fact. On the front line of these energy and climate crises are the single greatest consumers of energy in the developed world - buildings. With 48% of the energy consumed in the United States, buildings is the consumer, placing the architecture, engineering and construction (AECO) industry on the front lines for leadership in solving the problem. Like all great challenges the human species has encountered in its existence, we have faced and transcended these challenges with investment in technological innovation. The above tests are no different. This presents an exciting opportunity for public policy, markets, and private investment in the U.S. Private capital investment has played an outsize role in the last 30 years in building the technology edge enjoyed by

American startups in high-technology, biotech, and transportation. That opportunity is now presenting itself anew with the sustainable building movement and the rapid integration of technology in much of the new construction occurring around the world today.

Based on an existing computer modeling platform widely accepted in the AECO sector for quantifying building energy modeling and compliance under California Title 24, the energy efficiency market model discussed in this paper will create a basis for calculating *additional* energy-efficiency gains in building energy performance above business-as-usual efficiencies integrated into building designs under current California building codes.

We project a potential market for energy efficiency credits in California and the western region to be approximately $1-2 billion dollars, based on energy efficiency cost data provided to us from the utility sector and the CPUC. Utilities are currently spending between $20-40 dollars per MWh on energy efficiency programs with mixed results. There is significant appetite within the electricity sector to address energy efficiency costs through the RPS for this reason. It is our belief that activating an energy efficiency market where AECO service providers will be incentivized to create new business models around revenue streams generated by the trading of EECs will significantly scale the investment in and installation of energy-efficiency technologies into existing buildings and new building construction projects. These new business models will substantially lower costs for the utility sector to encourage energy efficiency investment, and will lower capital costs to owner/operators and developers through the creation of new sources of asset value and financing, creating a wave of building energy-efficiency technology investment and new green construction jobs never before seen in the AECO sector. It is the role of investment and emerging environmental commodities markets in the development of this new technology sector that we discuss in this paper.

EXISTING POLICY

In September 2008, The California Public Utilities Commission (CPUC) released its *Long Term Energy Efficiency Strategic Plan,* outlining the CPUC's approach to addressing energy efficiency savings in the state for 2009 and beyond. The CPUC has committed over $3 billion dollars to fund a number of energy efficiency programs as part of this strategic plan. These programs are a combination of consumer and commercial rebates for the installation of energy efficiency technologies in buildings, tax-incentives for the same, and loan programs allowing homeowners to finance energy efficiency retrofits of their homes with loans tied to their property tax bill. One such example rebate allows commercial property owners and residential homeowners to receive a rebate of $400 dollars toward the testing and sealing of HVAC systems ducts, a service that typically will cost thousands of dollars to execute. The property tax loan program was signed into law last year as AB 811, creating a financing mechanism for energy efficiency retrofits attached to the real property. The difficulty with many of these programs is they do not necessarily reduce cost of capital investment in these technologies, nor do the myriad and complicated list of local and state line-item rebate/tax incentives adequately scale the investment and installation of energy efficiency technologies in buildings.

We believe a more effective approach to scaling energy efficiency technology investment is through a combination of market economics and new renewable portfolio standard (RPS) policies. The renewable portfolio standard is a regulation that requires the increased production of energy from renewable energy sources, such as wind, solar, biomass, and geothermal. Another common name for the same concept is renewable electricity standard (RES), which is currently being contemplated as a national policy as part of comprehensive climate legislation now being considered by Congress. The California RPS was initially signed into law in 2002, and stated that 20% of all electricity generated in the state had to be from renewable sources by 2017. In 2008, Gov. Arnold Schwarzenegger raised the CA RPS target to 33% by 2020 (Executive Order 5-14-08). According to the Center for Resource Solutions and the California Air Resources Board, there are currently 29 states in the US with renewable portfolio standards. Fourteen of those RPS states also have provisions for tradable renewable energy credits (RECs).

The renewable energy credit is a complimentary policy instrument to the RPS that enables an open market for the trading of the environmental attribute of renewable electricity separate, or *unbundled*, from the electricity itself. In states like Connecticut, Massachusetts, and New Jersey, open renewable electricity markets allow the trading of RECs – the environmental attribute of renewable energy equal to 1 MWh of renewable electricity generated by wind, solar, biomass, or other renewable sources. These RECs can be generated by independent energy producers (IEPs) who invest in wind, solar, or biomass generation and are sold to utilities for use in compliance with their state's RPS. Utilities can purchase these RECs from the market, complementing their own efforts, and offering an alternative for their investment dollars in achieving their RPS obligations. REC markets also provide renewable generation capacity options to load serving entities (LSEs), who would otherwise be unable to invest in the building of renewable generation themselves on a timeline fast enough to meet RPS requirements. Tradable RECs allow utilities to support the building of renewable electricity generation capacity, independent of the utility itself by providing IEPs with supplemental revenue sources. These help justify the immense investments required to build renewable generation projects.

In addition to existing tradable REC markets, there are also comparative energy efficiency credit market models currently working in the European Union (UK, Italy and France) and in the United States. Here in the US, "White Tags" are being traded in Connecticut, Pennsylvania, and Nevada against each of these state's individual renewable portfolio standards. White tags are a tradable financial instrument equal to onemegawatt hour (MWh) of energy *saved*, comparable to a renewable energy credit (1 REC = 1 MWh of renewable energy *generated*). The most significant difference between the White Tags systems in these states and the proposed energy efficiency market is how these credits are issued and traded. White tags are essentially equivalent to the EEC, measured as 1 MWh/ credit, but are measured as energy not generated *at the facility,* rather than energy saved through energy efficiency technologies in individual buildings. Utilities in the white tags markets are required to purchase a minimum amount of credits to meet the energy-efficiency portion of their renewable portfolio standard – for example, Connecticut utilities must meet 3% of their RPS in 2009 through white tags, 4% in 2010. The market in CT is limited to utilities, and the certificates expire after one-year.

The white tag model puts ultimate responsibility on the utility sector to meet the energy efficiency percentage requirement without adequately incenting the private sector and AECO industry to make the huge scale energy efficiency technology investments needed to substantively mitigate GHG emissions through energy efficiency in buildings. This difference is key – in order to create a market of sufficient scale to adequately affect real reductions in energy usage by hundreds of thousands of buildings in California and billions of square feet of floor space, market incentives to utilize EECs as a revenue generator and cost-reducer must be openly available, as should the market be openly available to all who might wish to participate.

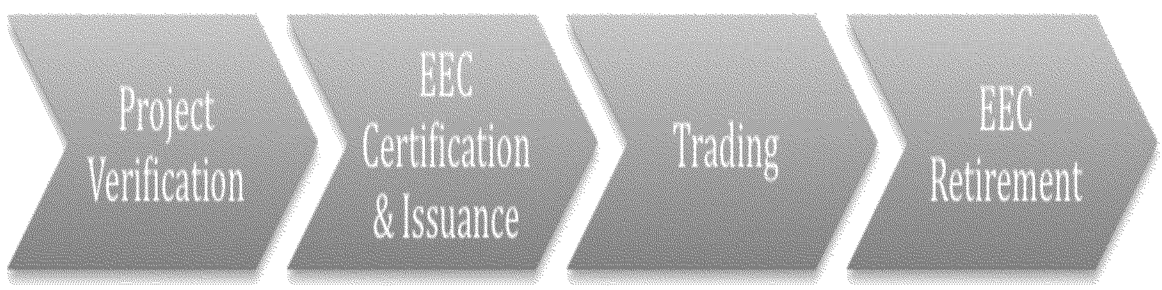
Gov. Schwarzenegger signed the groundbreaking Global Warming Solutions Act (CA AB32) in 2006 creating the legislative foundation for a cap-and-trade system in California beginning January 1, 2012. Underlying any energy efficiency credit system must be basic cap-and-trade policy creating the market underpinnings for a tradable credits system. A cap-and-trade system is the only market-based solution that is directly tied to emissions reductions through a progressively lower cap on allowed emissions. Cap-and-trade has generally been directly associated with carbon allowance and offset trading, but also applies to other asset types like RECs and EECs. The first cap-and-trade program in history was a result of the Clean Air Act of 1990 and dealt specifically with acid rain emissions (sulphur dioxide – SOx). Cap-and-trade is markedly different from a simpler carbon taxation approach, which is a straight-through cost to business, not tied directly to emissions reductions, and devoid of market-incentives for clean energy and energy efficiency investment.

Only through a market-based system, like cap-and-trade, can you create adequate market incentive, in the form of a clear emissions price signal, to shift investment away from artificially cheap fossil-fuel consumption and toward energy-efficiency, clean energy research and development, and the building of renewable energy generation capacity. Business as usual will always favor cheap oil, gas and coal, especially when the price of GHG emissions is left out of that cost equation.

OUR APPROACH

It has been widely acknowledged that hitting the CA RPS target of 33% by 2020 will be difficult to achieve through renewables generation alone. That is why California must create new policy initiatives to address the demand side of the RPS equation. The creation of an Energy Efficiency Credit (EEC) market, a sister credit to the REC, which would be applicable to the expanded California RPS, is just such an initiative. This EEC credits system would allow utilities to meet part of their RPS obligations by purchasing EECs earned by building owner/operators, developers and AECO service providers (ASPs) through their investment in building energy efficiency technologies. By lowering energy consumption in buildings below a given baseline determined by building energy consumption models for new construction and major retrofits, owner/operators can earn EECs (one EEC = 1 Mwh saved) that can be traded on the open market. Utilities will have the opportunity to purchase these credits, as they do renewable energy credits (RECs), and apply them against the expanded CA RPS.

Energy Efficiency Credits (EECs) are a financial instrument comparable to Renewable Energy Credits (RECs). In the case of new construction, an EEC is created by the difference between the Title 24 baseline for a target building project and the lower energy output achieved by the installation of energy-efficiency technologies in the new building project, beyond what is required by building codes. In the case of existing building retrofits, EECs would be issued for the difference between a building average consumption over the last three years and its consumption, while occupied, after retrofit. The difference is measured in energy saved per year; each MWh mitigated below the baseline renders a single energy-efficiency credit (1 MWh = 1 EEC). Each building project will have a crediting period, during which credits are issued, matching the actual energy saved. The crediting periods will be dependent on a number of criteria tied to the aggregate value of energy efficiency measures installed within the building, and can range from 5 to 10 years. This means a newly constructed building including energy efficiency technology features such as efficient lighting systems, HVAC, co-generation, low-carbon materials, etc. saving 687,000 kWh/year might generate 687 EECs each year for 10 years post-occupancy. These credits, once earned, could then be traded on open environmental commodities markets.



Set-asides of initial carbon allowance allocations will be required to prevent double counting of the related energy savings/emission reductions under capped sectors. This is a key requirement for energy efficiency markets to work in concert with CO2 reductions markets. Because the utility sector falls under the carbon GHG cap, utilities will be applying multiple modes of trading under cap and trade aimed at increasing cleaner sources of generation, for example switching fuel stocks from coal to natural gas, and reducing energy demand. To prevent the inadvertent double counting of reduction tons (those achieved through fuel switching vs. those achieved through energy efficiency savings), a set-aside of the initial allocation of permits to the utility sector will be required. This will allow utilities to use a portion of their allocation for compliance with the RPS through energy efficiency markets, which will likely be cheaper than carbon markets alone. The set-aside prevents those tons reduced through energy efficiency savings from being also counted as tons reduced from the resulting lowering of electricity demand.

According to the Building Owners and Managers Association (BOMA), as much as 30% of a building's energy consumption is lost through inefficient materials, systems, and construction methods. According to the US Dept. of Energy, once operating, buildings consume 68% of all electricity generated by the grid – 30% of this number by lighting (much of it antiquated and inefficient) and 40% by HVAC systems (much of them equally older generation, inefficient systems consuming 2.14 quadrillion BTUs of fuel oils and natural gas). This energy efficiency credit market system will spark huge investments in energy efficiency retrofits of buildings in California and create hundreds of thousands of green construction jobs in the moribund construction industry in California, as well as reduce GHG emissions by as much as 40% in some building sectors by replacing aging, highly inefficient lighting, HVAC, glazing, and management systems. This EEC market model would be applicable nationwide and make California and the western region a clear leader and innovator in energy efficiency and GHG emissions reductions policy.

The AECO industry sector would have substantial incentives along the supply chain of design, engineering, construction, and building services to create new business models incorporating an EEC market into their revenue projections and service models. AECO service providers (ASPs) would be able to approach building owner-operators and real-estate developers with the proposition of construction and retrofitting of buildings with energy efficiency technologies at low to no cost to the owner/developer. ASPs would be able to build their revenue and compensation models on the stream of EECs that would be rendered by the project. These EECs might potentially be more valuable to ASPs than current direct cost models that are heavily negotiated by owner/developers at the front end of building/retrofit projects. Cost has classically been the principal impediment to incorporating energy efficiency technologies in buildings due to their long payback periods and difficulty in determining return on investment. Tradable EEC markets would remove that cost pressure from the owner/developer and incent ASPs to evolve their business models.

MEASUREMENT PROTOCOL

The foundation of any energy-efficiency credit market would need to be based on a sound building energy-efficiency quantification protocol and our current thinking is that such a protocol should rely on building energy simulation modeling, coupled with post-construction / post-occupancy performance monitoring over time. We propose that this protocol be based on a methodology being developed that is based on calibrated building energy simulations utilizing the widely used eQuest/DOE-2.2 building energy simulation software platform developed by the State of California for use modeling CA Title 24 building code energy efficiency requirements for new buildings construction.

The methodology will require the use of eQuest, a general-purpose building energy simulation tool that uses DOE-2.2 as its underlying simulation program. DOE-2 was originally developed by Lawrence Berkeley National Laboratory in the early 1980's (Version 2.0), with continued development through 1993 (Version 2.1E). DOE-2.2 is the most up-to-date version of DOE-2 that is now maintained by a private company, J.J. Hirsch and Associates (JJH). In the late 90's, JJH also developed eQuest, which is a graphical interface and modeling environment that makes DOE-2.2 easy to use and accessible to non-specialists. Counting all its versions and user interfaces, DOE-2 is by far the most widely used building energy simulation program in the world, and has been the basis of most performance-based building energy standards in the United States, China, and at least 10 other countries, as well as being used for voluntary "Green Building" rating systems such as the US Green Building Council's Leadership in Energy and Environmental Design (LEED).

DOE-2 itself is an engineering program, with a text-based input and output procedure. It requires as input a description of:

- The physical building and its space conditioning system
- Its internal conditions (e.g., schedules for occupancy and lighting) and operations (e.g., thermostat schedules)
- Hourly weather conditions (e.g., temperature, humidity, wind speed, and solar radiation).

The main advantage of using a building energy simulation model to determine energy savings is that the operating conditions can be held constant, allowing determination of changes in energy use resulting from building mitigation efforts. The simulation model produces as output the energy consumption, as well as the indoor conditions, of the building. Using the program, however, requires in-depth knowledge about how buildings are constructed and operated, as well as training. The large amount of inputs can also produce large variations in the results, as different users make differing assumptions.

There have been several efforts to make DOE-2 easier for non-specialists to use by providing it with a graphical user interface, of which eQuest has been the most successful and is therefore now used for the overwhelming majority of LEED Green Building certifications. In addition to making the DOE-2 program easier to use, a graphical user interface such as eQuest can also make compliance calculations easier to do and more consistent, by insuring the modeling methodology, including the internal conditions and operating schedules, and how the reference building is defined, is correctly followed.

This methodology to determine greenhouse gas emissions reductions utilizes many of the same techniques first developed to verify building energy code compliance using whole-building energy simulations, including the definition of standard operating conditions, and the use of a computer-based benchmark building. The key difference from energy code compliance calculations, however, is that the benchmark building needs to be calibrated to the actual energy consumption within the local building sector. Calibration is not so important for energy code compliance, which is only concerned with relative energy performance, but it is critical for correct estimation of the amount of greenhouse gas emissions reductions or energy savings.

Table 1: Emissions sources included in or excluded from the project boundary

Source		Gas	Included?	Justification / Explanation
Baseline	Electricity generation to supply buildings	CO_2	Yes	Major source of GHG emissions
		CH_4	No	
		N_2O	No	
	Thermal energy generation to supply buildings	CO_2	Yes	Major source of GHG emissions
		CH_4	No	
		N_2O	No	
	Industrial gases in HVAC systems	Refrigerants that are GHGs	No	To be discussed
Project activity	Electricity generation to supply buildings	CO_2	Yes	Major source of GHG emissions
		CH_4	No	

		N2O	No	
	Thermal energy generation to supply buildings	CO2	Yes	Major source of GHG emissions
		CH4	No	
		N2O	No	
	Industrial gases in HVAC systems	Refrigerants that are GHGs	No	To be discussed

By calibrating the benchmark building to measured data, the resultant simulation methodology will produce savings estimates that are consistent with observable, measured energy usage. Although the general methodology is universally applicable, the calibration is in principle only relevant for the building stock covered, so when applied in other countries, the validity of the calibrated simulation model must be confirmed or the calibration process redone, should the building stock exhibit different construction or operating parameters. There may even need to be different benchmark building models even within one country, such as between Western-style buildings with central air-conditioning versus native buildings that do not have central HVAC systems.

VERIFICATION & MONITORING

A crucial aspect of this proposed methodology is to establish the benchmark building and its energy consumption through the use of computer simulation. Just as a building's energy usage is dependent not only on the building itself, but also on how it is used and operated, so too can building energy simulations produce large variations in building energy use depending on the discretion of the user. The key to the proposed methodology is to establish rules for producing a benchmark building that are objective and consistent with actual energy consumption data, and then embed these rules within the eQuest program. We propose to include the resulting calibrated version of eQuest as an integral part of the methodology, in the form of an annex – and to specify under which conditions this calibration should be considered to be valid for use by a given project developer (e.g., if the energy use calculated by the model is within some range of project-specific data). Users wanting to apply this methodology will have to define the characteristics of the project building using this customized version of eQuest, from which the program will automatically generate the appropriate benchmark building. In cases where the calibration does not prove to be valid, a new calibration would have to be developed and a request for revision granted by the EB to include the new calibration as another annex to the methodology.

Baseline energy consumption of the benchmark building is calculated by the calibrated simulation model. For new buildings, the benchmark building can be a building of the same size and shape but with energy measures that are either based on the code (for locations where code compliance is good), or typical of the building stock (for locations without codes or where code compliance is poor). For building retrofits, the benchmark building can be the building in its pre-existing condition, especially if utility bills are available for calibration. A computer simulation will then be performed by project participants to estimate electrical and thermal energy savings, and to calculate emissions reductions.

The calibrated simulation required by the methodology is used to calculate electrical and thermal energy savings (from which greenhouse gas reductions can be derived), by comparing baseline energy use with project energy use, which are simulated by running the model with the proposed project activity building characteristics under the same operating schedules and interior conditions as the benchmark. The methodology-specific user interface for running the DOE-2 building simulation model provided with this methodology submission may be used.

Monitoring requirements post-construction and post-occupancy will be certainly required to continue assess the efficacy of energy efficiency technologies included in the building and the performance of those measures over time. Monitoring will be critical in determining the net result of energy efficiency credits rendered by the new construction or retrofit project for the duration of the crediting period. Monitoring will likely be administered by running annual building models based on actual energy consumption and weather data for the year. Monitoring requirements will be fully drafted once initial modeling development outlined in this section has been completed.

Measurement, verification and certification will be critically important to create a robust market in energy efficiency where the quality and veracity of credits must stand to the most rigorous standards. Therefore a framework, much like the framework established to verify and certify carbon offset projects and resulting credits must be established. This will necessarily include the creation of an energy efficiency building project and EEC credit tracking registry. In CA, the California Public Utilities Commission (CPUC) and the California Energy Commission (CEC) will likely establish the regulations for the formation of this market framework. This regulatory framework will also likely include the creation of an organization that will verify and certify construction projects for the creation of energy efficiency credits like the California NGO, Climate Action Reserve (CAR), and its carbon offset registry. This organization will establish the necessary protocols based on the eQuest building energy performance models discussed above to verify and certify new construction and building retrofit projects as eligible to render EECs for trade on environmental markets. Credits themselves would likely carry the following attributes:

- Title to credits would be granted to the owner of the building project
- Projects would need to be completed by the start date of the EEC market
- Range may need to be set on credit prices
- Credits will have individual serial numbers and vintages
- Certification and verification required to generate credits
- Credits will not expire and may be banked
- Project technology types will include, but not necessarily be limited to lighting, HVAC systems, building envelope, energy co-generation, building management solutions, water management solutions, building integrated renewables.
- Purchase and trading of EECs will be open to general market interests and not limited to any specific player or industry sector.

Certified credits would be issued individual serial numbers, much as carbon reduction tons (CRTs) are issued serial numbers in the CAR system, then customer accounts would be credited with those serialized EECs to a registry – in the case of EECs we recommend that they be tracked by the Western Renewable Energy Generation Information System (WREGIS), the same registry which currently tracks renewable energy credits (RECs) in the West.

The registry ensures the integrity and keeps track of the credits throughout their life. It tracks each credit from project phase, through verification and issuance, trading between counter-parties, and finally, to retirement when they are submitted for compliance to the Air Resource Board and/or the CPUC.

CASE STUDY – 4 TIMES SQ.

Four Times Square is a 48-story high-rise comprising over 1.6 million square feet of floor space in mid-town Manhattan. Four Times Square was completed in January of 2000 as part of a larger project to redevelop 42nd Street. The architecture firm that designed the building, New York-based Fox & Fowle, is one of the earliest pioneering US firms in large-scale green building projects. Four Times Square was developed by the Durst Corporation and participated in New York State Energy & Development Agency's (NYSERDA) Technical Assistance Services and New Construction program pilots for sustainable building.

Four Times Square was designed from the beginning to be a cutting-edge sustainably designed and constructed building incorporating state-of-the-art energy efficiency building technologies to reduce energy and building operating costs by 10-15% below norms for a New York City office building. A comprehensive energy efficiency strategy was employed throughout the building's living systems, including lighting, HVAC (heating, ventilation and air-conditioning), building envelope, and waste management systems. Some of the systems included are: high-performance, low u-value window/building envelope, fluorescent and LED lighting fixtures with occupancy sensors and a centrally controlled lighting management control system, high-efficiency, CFC/HCFC free natural gas-fired absorption HVAC system using variable-speed electric drive pumping units, building integrated photovoltaic systems, domestic hot water systems heated by two 200 kW fuel cells (which also assist in building heating), and low water-use plumbing fixtures.

Four Times Square's energy consumption and footprint were modeled using DOE-2 building simulation models. DOE-2 was used to maximize the energy efficiency strategies employed in the design and construction of the building. The results are very instructive of how DOE-2 and the EEC market would be used together to execute the market system described in this paper. Data available post-occupancy for Four Times Square help demonstrate how the EEC system would function and behave, as outlined by this working example of an actual functioning building.

The total budget for Four Times Square was $170/sq ft, totaling $272 million dollars. The energy efficiency technology systems incorporated in this building accounted for approximately $5.1 million dollars of the overall construction budget, or just under 2% of the initial capital expenditure. This number does not include high efficiency window glazing incorporated in the building envelope budget line items, nor the building-integrated photovoltaic systems which would not be eligible for energy efficiency credits. Though high-efficiency glazing systems do significantly contribute to a building's energy efficiency performance, payback periods would not directly apply to building envelope, the cost of which is normally depreciated over the useful lifetime of the building.

Post-occupancy, 4 Times Square uses 40% less energy than the same building built to New York State Energy Code. Its annual electricity consumption is 20,841 MWh/year below that baseline and annual energy cost-savings are $1,760,000. At that rate of energy consumption, the building would generate 20,841 energy efficiency credits per year. If we assume that these credits would be rendered for a project duration of ten years, netting 208,410 EECs to the owner/operator and other stakeholders. At a hypothetical price of $15-20/EEC (based on a reasonable discount to current energy efficiency expenditures per MWh by the utility sector) on the environmental markets, those EECs would generate between $3.1-4.2 million dollars of additional income, in addition to the $17.6 million in ROI generated by annual cost savings below baseline. This creates an estimated pay-back period on the upfront capital investment in energy efficiency technologies incorporated into Four Times Square of 1-1.5 years, well below the minimum three year payback periods commonly cited by the Building Owner's and Managers Association as the threshold for making energy efficiency technology investments in buildings.

UNRESOLVED ISSUES

Unresolved issues for creating an energy efficiency market in California come down to legislative and regulatory initiatives required to create the basis for an energy efficiency market. California law must first be passed to create the legal underpinning for creating credits that can be used by covered entities to meet their obligations under the California RPS. Once this legal foundation has been set, regulatory agencies including the California Public Utilities Commission and the California Energy Commission must then agree upon the rules and regulations for the certification, verification and monitoring of building energy efficiency projects and their resulting credits. In addition to this legal foundation, a regulatory agency framework must be created to regulate an energy efficiency market. This framework would include rules-making by the CPUC and CEC for the conduct of the compliancy market, and the formation of a registry such as WREGIS (Western Renewable Energy Generation Information System) must be designated or created to serialize, track and retire energy efficiency credits created by building projects and used for RPS compliance.

Set-asides to prevent double-counting of emissions reductions in the capped utility sector is also a critical issue that must be resolved at the California Air Resources Board in conjunction with the CPUC and CEC. Metrics will need to be agreed that equate MWh saved in the energy efficiency system with GHG reductions achieved as a result of that demand mitigation. These metrics will, of course, depend on the type of fuel, or the mix of fuels involved and reduced by the energy efficiency savings.

Detailed legal ownership issues must also be addressed, especially in relation to ownership or even percentage of an EEC when government funds were used through utility rebate or loan programs to help pay for energy efficiency investments. This will create potentially complex formula that will have to be considered by the energy efficiency registry when verifying, certifying, and rewarding EECs to qualifying building projects.

Once the legal and regulatory framework are put in place, a robust, liquid, transparent and open trading market must be encouraged to foster the vast wave of energy efficiency investments in California's buildings that will ensue. This market will create the incentive for capital investment in energy efficiency in buildings, the certainty required to support the financing that will be needed to spark these construction projects, and a new class of green construction jobs that result from this huge surge of investment capital in energy efficiency.

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