

CO2toEE

Expanding Building Energy Efficiency Financing for Businesses, Cities, Real Estate Owners, Schools and Low Income Housing

“To reach the State’s [California’s] long-term goals, the energy sector must strive to achieve...much greater efficiencies from the existing building stock...”

- California Air Resources Board (2013)

“[California should] collaborate with the real estate and property management industries in crafting aggressive but practical solutions for achieving high penetration of efficiency upgrades to all existing buildings.”

- California Air Resources Board (2014)

Project Steering Committee:

- **Greg Kats** (Co-Chair) -- President of Capital E, Former Director of Financing for Energy Efficiency and Renewable Energy at the U.S. DOE
- **Donald Kennedy** (Co-Chair) -- President Emeritus of Stanford University, Former Editor in Chief of *Science*
- **Rex Hime** -- President & CEO, California Business Properties Association
- **Dan Kammen** -- Professor and Director, Renewable and Appropriate Energy Laboratory, University of California, Berkeley
- **Brenna Walraven** -- Managing Director at USAA Real Estate Company, Former Chair of BOMA International

Advisory Board:

- **Karin Corfee** – MD, Navigant Consulting
- **Anna Ferrera** – Executive Director, School Energy Coalition
- **Dirk Forrister** – President and CEO International Emissions Trading Association
- **Denis Hayes/Kathleen Rogers** – EarthDay
- **Dennis Murphy** –Chair of USGBC California
- **Nancy Pfund** – Managing Partner, DBL Investors
- **Art Rosenfeld** – former CEC Commissioner
- **Steve Westly** -- former California State Controller and Chief Financial Officer

Endorsements Include:

- ❖ Association of Corporate Real Estate Executives of Northern California
- ❖ ACRE of Southern California
- ❖ BOMA California
- ❖ California Business Properties Association
- ❖ California Downtown Association
- ❖ Commercial Real Estate Development Association
- ❖ Earth Day Network
- ❖ Institute of Real Estate Management

- ❖ International Council of Shopping Centers
- ❖ Johnson Controls Inc.
- ❖ National Electrical Manufacturers Association
- ❖ Retail Industry Leaders Association
- ❖ School Energy Coalition
- ❖ U.S. Green Building Council
- ❖ U.S. Green Building Council-California (all 8 chapters)

CO₂toEE

The Opportunity

The CO₂toEE coalition seeks to enable energy efficiency to participate in Greenhouse Gas Cap-and-Trade Programs. Allowing businesses, cities and real estate owners to get the value of the CO₂ reductions that occurs from their energy efficiency investments would drive much deeper CO₂ reductions cost-effectively.

California's own assessment of the state's climate change progress finds that "To reach the State's [California's] long-term goals, the energy sector must strive to achieve...much greater efficiencies from the existing building stock..." (P 83).¹ The Report also urges California to "collaborate with the real estate and property management industries in crafting aggressive but practical solutions for achieving high penetration of efficiency upgrades to all existing buildings" (P 43-44).² Exactly meeting this objective, the CO₂toEE initiative was co-developed by and is broadly endorsed by California's major real estate and property management groups. CO₂toEE would substantially increase funding for deep energy efficiency investments in California's buildings by providing a mechanism to allow buildings and building owners (including businesses, schools and cities) to participate in the state's Cap-and-Trade market.

Current carbon pricing has such a small impact on electricity/energy prices that it has no material impact on EE decisions. In contrast, CO₂toEE would achieve a roughly 10X larger impact by allocating ownership of CO₂ reductions that result from energy efficiency investments to the businesses, schools and cities that make these EE investment decisions.

Today, businesses, building owners, cities or schools investing in energy efficiency achieve two valuable objectives - cutting energy consumption/costs, and reducing CO₂ emissions. But under current Cap-and-Trade rules, these EE investors receive the financial value of only one of these benefits – lowered energy costs.

A cost-effective way to expand energy efficiency (EE) investment is to harness the Cap-and-Trade markets to provide businesses, schools and real estate owners the value of the CO₂ reductions that occur as a result of their EE investments. CO₂toEE is a market-based mechanism that would enable aggregators (managed under a Public Utilities Commission or Energy Commission contract) to efficiently document, aggregate, and sell CO₂ reductions in the Cap-and-Trade market on behalf of the businesses, schools, and real estate owners that invest in EE. This would allow businesses and building owners investing in electrical or natural gas efficiency to receive the value of the associated CO₂ reductions. The value of CO₂ would offset a significant part of the capital cost of EE investments, increasing the depth and volume of energy efficiency investments. By adding another financial incentive for investing in energy efficiency, CO₂toEE would expand and deepen the market for energy efficiency products and services in California.

¹ California Air Resources Board. (2013). *Climate Change Scoping Plan First Update*. Retrieved from http://www.arb.ca.gov/cc/scopingplan/2013_update/discussion_draft.pdf

² California Air Resources Board. (2014). *Proposed First Update to the Climate Change Scoping Plan: Building on the Framework*. Retrieved from http://www.arb.ca.gov/cc/scopingplan/2013_update/draft_proposed_first_update.pdf

CO₂toEE would provide a roughly 10X larger price signal and investment impact in motivating energy efficiency than the impact of carbon costs on energy prices.

It is worth noting that state funds generated from climate change reduction programs and intended for EE financing are politically uncertain. For example, New Jersey withdrew \$65 million of its climate change-linked funds intended for EE investments in order to help offset the state budget deficit. More recently, Governor Brown diverted CARB allowance sale proceeds. By awarding CO₂ value directly to EE investors and eliminating uncertainty of EE payments, CO₂toEE would make EE funding more secure and reliable - thereby increasing EE investment.

CO₂toEE

Current carbon pricing has negligible impact on electricity prices and on EE investments. In contrast, CO₂toEE would achieve a roughly 10X larger impact by shifting CO₂ ownership to EE investors. With CO₂toEE in place under California Energy Commission or Public Utility Commission supervision, qualified energy firms would review and aggregate energy efficiency investments in hundreds or thousands of buildings and then sell the associated CO₂ reductions into the Cap-and-Trade market. These revenues (minus a fee) would be returned to the building owners. By shifting ownership of CO₂ to EE investors, CO₂toEE would have ~10X larger impact in driving EE than status quo.¹

CO₂toEE would harness the Cap-and-Trade market by rewarding California's building owners, schools, cities and companies with the value of the CO₂ reductions that result from their energy efficiency investments. The level of energy efficiency investment depends on the financial payback required. Payback requirements for energy efficiency retrofits have been estimated by LBNL as about 3 years for commercial retrofits and about 7 years for institutional retrofits (these and other payback periods are illustrated in Chart 1). The assumed cost of commercial retrofits, illustrated in Appendix 1, represents a 4-year simple payback. Utility-funded retrofits could generally be expected to cost less than this while ESCO funding of institutional retrofits could be expected to cost more.

Importantly, CO₂toEE would provide funding up front – in contrast to energy savings which accrue over many years and are typically heavily discounted. The up-front payment for CO₂ would both enable deeper retrofits and allow projects to more easily secure debt financing. CO₂ payments accruing to businesses and schools at the time of investment reduce project financing needs/risk and enable debt financing. A sale in the Cap-and-Trade market of 8 years of CO₂ reductions from EE at a CO₂ price of \$15/ton would offset about 8% of the capital cost of a commercial building retrofit. If CO₂toEE enables one-third debt financing, the value of CO₂ to building owners and businesses would rise to about 12% of the capital cost of EE upgrades (See Table 1 and Appendix 1 below). At a CO₂ price of \$25/ton and 50% debt financing, the value of the CO₂ funding would equal about one quarter of the capital cost of the project.

Table 1

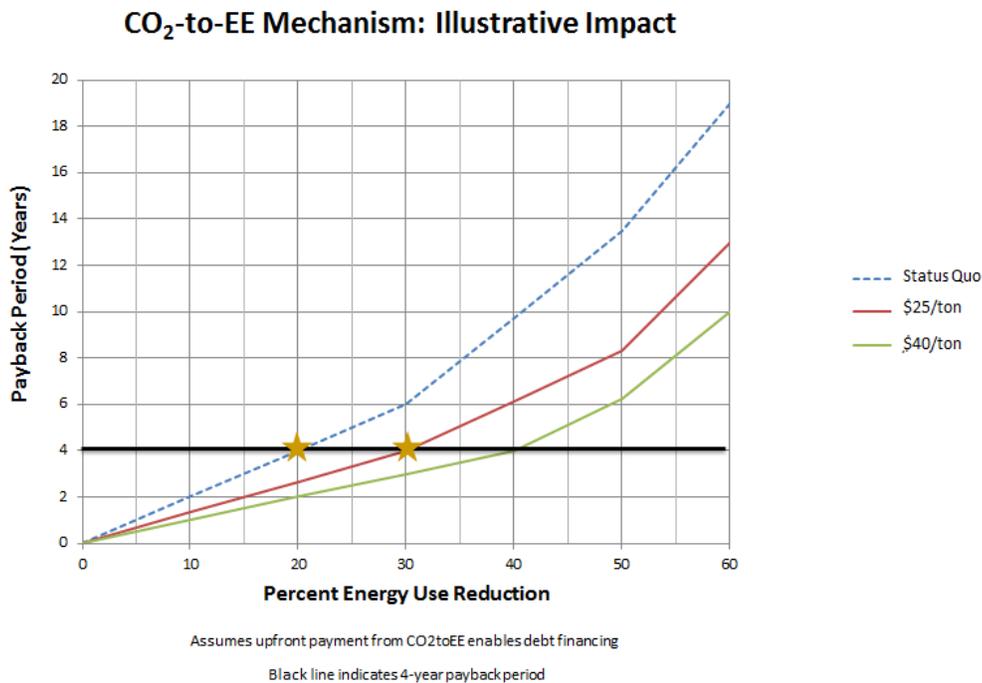
Debt Financing				
	Cost of CO ₂	\$15/ton	\$25/ton	\$40/ton
Equivalent to % of Capital Cost for EE Upgrade	0% debt financing	8	13	21
	33% debt financing	12	19	31
	50% debt financing	16	26	42
Assumed % energy savings achieved		20	30	40

As described in the Illustrative Impact chart below, with a 4-year payback requirement, a current commercial energy efficiency retrofit might achieve a 20% savings (first star). With a \$25/ton CO₂ value with CO₂toEE enabling debt financing, EE savings would increase to roughly 30% (2nd star). At a CO₂ value of \$40/ton enabling debt financing, EE savings could increase to roughly 40%. As the financial value of CO₂ rises, investors could make deeper EE investments to both achieve larger energy cost savings and to secure the associated CO₂ reduction value.

Illustrative Impact

The savings pictured in the Illustrative Impact chart below are estimates for commercial building upgrades. Other types of retrofits, such as public buildings and schools, have longer payback periods, are more likely to include deferred maintenance projects, and have higher cost of efficiency upgrades. This would result in lower impact from CO₂ value relative to the size of the retrofit investment. Regardless of the payback period or type of retrofit, adding the value of CO₂ would motivate substantially deeper energy efficiency retrofits.

CO₂toEE would reward EE retrofits more broadly/comprehensively and with greater efficiency than



many current, narrowly-targeted EE programs. By rewarding the CO₂ value of the EE reduction to the EE investor, CO₂toEE would result in roughly 10X larger price signal and impact than the carbon pricing in energy costs today. (The price of carbon would have to be very high in order to make a large enough change in retail energy prices to materially change retrofit paybacks.)

CO₂ prices in California have been relatively flat, in large part because of the recession-depressed energy consumption and demand for CO₂. As the economy rebounds, CO₂ costs are expected to rise, though future CO₂ prices are very uncertain. It is worth noting that the US Government recently increased their estimate of the social cost of carbon, essentially the government's estimate of how much carbon emissions harm the economy. Developed by 14 federal agencies, including the Treasury Department, the social cost of carbon was revised to \$43/ton in May 2013, up from \$26/ton calculated in 2010.

Note that while this document and supporting analysis draw on recent industry sources, energy efficiency and CO₂-intensity data is commonly years old, so findings are not precise. For a more complete documentation of data sources and assumptions see: [CO₂toEE website](#)

The CO₂ emissions intensity per kWh varies between Californian utilities (Los Angeles relies in part on relatively dirty electricity imports) which would create regional variations in upfront CO₂ payment from CO₂toEE.

CO₂toEE Implementation

This Energy Efficiency financing mechanism was designed to leverage California's Cap-and-Trade program to pay California's businesses, cities, real estate owners and schools for deep energy efficiency investments in their buildings. In this market-based program, building owners, schools and companies investing in energy efficiency would secure the value of the CO₂ reductions that result from their EE investments. Depending on market prices for CO₂, this mechanism is expected to provide from about 8% up to 40% of the capital cost of EE investments, and would be transacted by qualified market makers (managed under the California Energy Commission or the Public Utility Commission). Qualified PUC or CEC-supervised third parties would broker all transactions, so processing and documentation costs would be minimal for participating businesses, schools and real estate owners.

The Energy Service Company (ESCO) industry is about a 10 billion dollar a year industry in the US today. There is a large range of very experienced firms in the energy efficiency and energy aggregation industries that deploy rigorous EE measurement and verification techniques. Johnson Controls, for example, helped develop CO₂toEE and would like to serve as a CO₂ aggregator/broker.

An industry-standard measurement and verification (M&V) protocol (such as the IPMVP) is expected to be used to ensure project rigor and standardization. The program could be designed to ensure that energy savings and associated CO₂ reductions actually occur.

Additional Water, Equity, Health, and Employment Benefits

Deeper energy efficiency investments would also cut water use. A substantial portion of energy use in California buildings and businesses is involved in moving, heating and cooling water, and retrofitted buildings typically achieve water savings improvements comparable to energy savings. In addition, water plays a vital role in the generation and transmission of energy—thermal power plants account for 39% of

freshwater withdrawals. Given California's increasingly uncertain and limited water supply, achieving deeper direct and indirect water use savings in buildings and businesses would be an important benefit from adopting CO₂toEE.

Increased EE investments enabled by CO₂toEE would expand employment and help California's low income residents. Low income families tend to reside in inefficient, unhealthy homes. Similarly, low income students commonly attend energy inefficient, unhealthy schools. This worsens health problems (esp. respiratory) of low income and minority populations. In addition, low income families typically spend a significantly higher percentage of their income on energy than the average household. Expanded EE retrofits to low income housing would have a number of benefits including lower energy costs, improved occupant health, and enhanced equity.

By making EE investments more comprehensive and deeper, the CO₂toEE mechanism would drive significant employment benefits. Energy efficiency retrofits are labor intensive, and expanding EE investments would create good, distributed jobs. Lowered energy costs also mean higher disposable income and greater local spending, in turn driving secondary employment benefits. By lowering energy expenses, reducing energy imports and promoting employment, an expanded EE market would strengthen the economic competitiveness of California's businesses and communities.

With its leading role in venture-capital-funded innovation in clean energy and energy efficiency technology, California is ideally positioned to drive the innovation needed to steeply cut global warming. High efficiency lighting, ground sourced heat pumps, advanced building energy control software and a host of other VC-funded innovations have allowed California to keep its per-capita electricity consumption flat over the last 35 years during a time when houses were getting larger and a myriad of electricity consuming devices like computers became near-universal. But venture capital funding in energy efficiency innovation has recently plunged, in large part because businesses and building owners are not motivated to invest in the technologies and services that enable deep energy retrofits. CO₂toEE can help harness the power of the Cap-and-Trade market to enable California's innovation engine. Without continued investments in innovative energy efficiency technologies and services, California, the entire U.S., and the rest of the world would be handicapped in their long-term efforts to slow climate change.

Conclusion

Application of CO₂toEE in Cap-and-Trade Programs would reward businesses, real estate owners, cities and schools with the value of the CO₂ reductions that result from their energy efficiency investments. It would provide a permanent, substantial additional financing source for deepening energy efficiency investments, especially in the least efficient existing buildings – including low income housing and schools. This would greatly strengthen Greenhouse Gas Cap-and Trade Programs.

California's February 2014 ARB climate change Scoping Report notes that "California's Cap-and-Trade regulation is purposely designed to leverage the power of the market in pursuit of an environmental goal" and further that "the Cap-and-Trade program works in concert with many of the direct regulatory measures—providing an additional economic incentive to reduce emissions" (P 93-94).² By allowing energy efficiency improvements in buildings to participate in California's Cap-and-Trade market, CO₂toEE would reduce the overall societal costs of achieving the state's climate change objectives.

CO2toEE would harness market forces by shifting the value of CO₂ from a point of low or no leverage to a point of high leverage. This shift would deliver a substantial market-based expansion of EE funding and, critically, deepen building EE retrofits to help California achieve its climate change targets. Implementation of CO2toEE would result in roughly 10X larger price signal and impact than the current impact of carbon pricing on energy efficiency investments.

CO2toEE provides an efficient way to tap the large, but difficult-to-access, potential for deep building retrofits. By extending participation in Cap-and-Trade markets, CO2toEE would increase market liquidity and reduce overall societal costs of achieving the state's climate change goals. Secondary benefits would be large, including reduced water usage, expanded employment, heightened security, improved health, enhanced equity, and increased innovation and economic competitiveness.

Acknowledgements

Thank you to the Energy Foundation and Blue Moon Foundation for helping fund this initiative. Thank you also to the CEC, CPUC, ACEEE and the Alliance to Save Energy.

ⁱ California's February 2014 ARB climate change Scoping Report notes that California's "Cap-and-Trade program works in concert with many of the direct regulatory measures—providing an additional economic incentive to reduce emissions" (P 94).² That is, ARB intends that the Cap-and-Trade market-set carbon value be added to other incentives. The issue for ARB is not double incentives per se. ARB's concern is that CO2toEE would give building owners two partially redundant incentives based on the same carbon content: 1) very slightly higher energy prices (reflecting some cost of carbon) plus 2) proceeds from sale of CO₂ reductions achieved by EE investments. ARB's concern is that some of the carbon reduction that building owners or schools would own and sell under CO2toEE is already reflected in the cost of energy, and specifically that a portion of the carbon content would therefore be "double counted".

There are several straightforward ways to address this "double counting" issue. For example, when ARB grants allowances to building owners (e.g. businesses, schools, low income) for their deep EE investments, ARB could net out a portion of CO₂ to avoid double counting. ARB would grant allowances for EE energy/CO₂ savings that exclude the small carbon component that would otherwise be double counted. In this scenario, instead of getting allowances for 100% of the associated carbon in their EE reductions, building owners might get allowances for 90%, which they would then sell on the Cap-and-Trade market through qualified aggregators under CEC or PUC management.

CO₂ToEE

Appendix I – Calculation of CO₂ Pricing Impact on Capital Cost of Commercial EE Retrofits in California

Calculation of CO ₂ Impact of Commercial EE Retrofits						
	CO ₂ emitted per kWh in CA, metric tons ¹		0.0003		0.0003	0.0003
Elec.	Average electricity consumption of buildings psf/year, kWh ²	x	14.1	x	14.1	x 14.1
	Average % electricity use reduction per EE retrofit ³	x	20%	x	30%	x 40%
	Avoided CO ₂ emitted psf/year, mt	=	0.0008	=	0.0013	= 0.0017
	CO ₂ emitted per 1000 cf Natural Gas, metric tons ⁴		0.0531	0	0.0531	0 0.0531
N. Gas	Average natural gas consumption of buildings, 1000 cf psf ⁵	x	0.0365	x	0.0365	x 0.0365
	Average % gas use reduction per EE per EE retrofit ³	x	20%	x	30%	x 40%
	Avoided CO ₂ emitted psf/year, mt	=	0.00039		0.00058	0.00078
	Price per ton of CO ₂ , \$		\$ 15.00		\$ 25.00	\$ 40.00
	sell-forward period, years	x	8	x	8	x 8
	payment received per ton of CO ₂ , \$	=	\$ 120.00	=	\$200.00	= \$320.00
	15% taken by aggregator	=	\$ 18.00	=	\$ 30.00	= \$ 48.00
	net payment received per ton of CO ₂ , \$	=	\$ 102.00	=	\$170.00	= \$272.00
	Total CO ₂ emitted psf/year, mt	x	0.0012	x	0.0019	x 0.0025
	CO ₂ payment psf, \$	=	\$ 0.13	=	\$ 0.31	= \$ 0.67
	Cost of EE upgrade psf before CO ₂ payment, \$ ⁶		\$ 1.60		\$ 2.40	\$ 3.20
	CO ₂ payment psf, \$	-	\$ 0.13	-	\$ 0.31	- \$ 0.67
	Cost of EE upgrade after CO ₂ payment psf, \$	=	\$1.47	=	\$2.09	= \$2.53
	CO ₂ value as % total cost of upgrade		8%		13%	21%
	CO ₂ value as % net cost of upgrade		9%		15%	27%

¹EIA State Electricity Profiles, 2008

²EIA 2003 Commercial Buildings Elec. Profiles (2012 version not yet released)

³ Analysis of US ESCO Public and Private Sector Projects, Larsen, LBNL, 2010 (average 20% commercial retrofit)

⁴EIA Carbon Dioxide Emissions Coefficients, 2013

⁵Technical Report to California Energy Outlook 2000

⁶ Assumes simple 4-year payback