

Recommendations for Purchasing Carbon Offsets

Submitted by

Kristin Brainerd
Christa Chavez
Autumn Petros-Good
Rongxin Yin

CalCAP Graduate Seminar
Spring 2011

Executive Summary

The University of California, Berkeley (UCB) has committed to reducing absolute greenhouse gas (GHG) emissions to 1990 levels by 2014, which is 6 years earlier than required by California law and UC policy. The University has indicated that purchasing renewable energy certificates and/or carbon offsets may be necessary to meet this goal. In addition, carbon offsets will most likely be part of a future strategy to achieve climate neutrality. Therefore, this report is being written to aid UCB in understanding carbon offsets in order to be prepared to make an informed decision if and when the time comes to purchase them.

The report looks at carbon offset protocols recognized under the cap-and-trade program being designed by the California Air Resources Board (ARB) pursuant to AB 32, the Global Warming Solutions Act. While UCB is not currently subject to the cap-and-trade program, the report recommends looking at ARB's approach to offsets in the event that the campus is ever subject to the program, as well as for understanding ARB's views on what protocols are most likely to result in offsets that are real, permanent, quantifiable, verifiable, enforceable, and additional - as required by AB 32. The report will provide a summary of current negotiations between the University of California Office of the President and ARB regarding the possibility of an alternate compliance method for the university with respect to the cap-and-trade program outside the standard program.

The report also summarizes the requirements of the American College & University President's Climate Commitment (ACUPCC) Voluntary Carbon Offset Protocol, which UCB has already committed to following. The summarization of this protocol was included to compare and contrast what UCB has committed to versus what other protocols exist.

In addition, the report provides analyses of proposed projects that UCB might consider to offset carbon. Projects were identified during the CalCAP Seminar through talks with various campus affiliates and students. These projects include a biogas plant, community weatherization projects, and ongoing UCB research projects. The analysis of suggested projects will include estimated costs and requirements, and carbon offset potential.

Finally, the report recommends that UCB should invest in a portfolio of offsets, such that a percentage of them comply with AB 32 protocols.

Table of Contents

I. Introduction

II. AB 32, the Global Warming Solutions Act

A. AB 32 & Cap and Trade

B. AB 32 Cap-and-Trade Proposed Regulations for Carbon Offsets

C. Recommendations

III. American College & University Presidents' Climate Commitment

IV. Potential Projects for UC Berkeley

A. Biogas plant

B. Community Weatherization Programs

C. Faculty Research Pool

V. Recommendations

I. Introduction

The University of California at Berkeley (UCB) has committed to reducing absolute greenhouse gas (GHG) emissions to 1990 levels by 2014, which is 6 years earlier than required by California law. The rest of the UC system is aiming for the year 2020 to reduce their emissions. In 1990, UCB emitted 164,000 metric tons of carbon dioxide equivalent (CO₂e). Under a business-as-usual scenario, the campus predicted that it would emit 209,000 metric tons of CO₂e in 2014. Therefore, the amount of carbon to be reduced by 2014 is 45,000 metric tons. The university has also committed to purchasing carbon offsets, if necessary, in order to meet the goal of 1990 levels by 2014. In addition, carbon offsets will be needed in order to eventually achieve climate neutrality. Therefore, this report is being written to aid UCB in understanding carbon offsets in order to be prepared to make an informed decision when the time comes to purchase carbon offsets.

According to the American College & University President's Climate Commitment (ACUPCC) Voluntary Carbon Offset Protocol,

“A carbon offset is a reduction or removal of CO₂e GHG emissions that is used to counterbalance or compensate for (“offset”) emissions from other activities; offset projects reducing GHG emissions outside of an entity's boundary generate credits that can be purchased by that entity to meet its own targets for reducing GHG emissions within its boundary. Generally, offsets fall into two categories: 1) emissions reductions or avoidance, such as replacing a diesel generator with solar panels, and 2) sequestration, or removing GHGs from the atmosphere, such as planting trees that will absorb CO₂ as they grow. There are many different types of projects that generate offsets in both categories, however different offset markets and offset standards only recognize certain project types as acceptable.”

AB 32, the Global Warming Solutions Act in California, also states that carbon offsets must be real, permanent, quantifiable, verifiable, enforceable, and additional. These same properties are what make carbon offsets risky when used for a cap and trade program. Additionality and permanence, for example, can be problematic. Additional means that the offset will reduce carbon that wouldn't have been reduced anyway without the existence of the carbon offset project. Proving additionality can be difficult because it involves many assumptions. Permanence can also be difficult to prove when sequestering carbon, whether in trees or underground. For instance, if the forest is eventually burned down, then the carbon in the trees will no longer be sequestered and the offset no longer exists. Though carbon offsets can be controversial and risky, this report attempts to provide a guide through current offset protocols and projects.

II. AB 32, the Global Warming Solutions Act

A. AB 32 & Cap and Trade

California Assembly Bill 32 (AB 32), the Global Warming Solutions Act, became law in 2006. It set the goal of reducing greenhouse gas (GHG) emissions to 1990 levels by 2020, and directed the Air Resources Board (ARB) to prepare a scoping plan to identify the best ways to reach that goal. The Board issued the Scoping Plan in December 2008. The plan includes a variety of measures for reducing emissions; an “essential component” of the plan is a cap-and-trade program for GHG emissions. (ARB, Scoping Plan, 2008, p. 31.)¹

On December 16, 2010, ARB approved regulations for the proposed cap-and-trade program.² (ARB, News Release: California Air Resources Board gives green light to California’s emissions trading program, December 16, 2010; <http://www.arb.ca.gov/newsrel/newsrelease.php?id=170>.) Under the cap-and-trade program, ARB will set the total amount of GHG emissions allowable for covered facilities, and will issue these as “allowances,” which will be denominated in metric tons of CO₂e. Covered facilities can trade these allowances to the extent that they have too many or too few for their operations. In addition, the program would allow covered entities to meet a certain amount of their emissions limit through the use of offsets - reductions in GHG emissions that occur outside of the cap.

It should be noted that UCB is not currently covered by the cap-and-trade program.³ Furthermore, the exact future of the program is somewhat unclear, due to a lawsuit alleging violations of the California Environmental Quality Act that is currently under appeal.⁴ As a result, ARB’s implementation of the cap-and-trade program is currently on hold.

¹ARB plans to connect the cap-and-trade program with the Western Climate Initiative (WCI) to create a regional market. The WCI currently consists of 11 partner jurisdictions that are working to collectively implement policies to reduce GHG emissions to 15% below 2005 levels by 2020; a key component of this is a regional cap-and-trade program. (Western Climate Initiative, Program Design; <http://www.westernclimateinitiative.org/designing-the-program>.)

²ARB passed Resolution 10-42, which, among other things, directed its Executive Director to proceed with finalizing the cap-and-trade regulations; thus, while the vote gives ARB’s approval to the regulations, the regulations themselves are not yet final.

³The cap-and-trade program is scheduled to phase in certain facilities, and U.C. Berkeley does not currently fall under any of the designated facilities. See Scoping Plan, p. 31; Proposed Regulation Order §§95811 and 95812.

⁴Association of Irrigated Residents et al. v. California Air Resources Board, Case No. CPF-09-509562. A decision by the Superior Court on March 17, 2011, found that ARB had violated by the California Environmental Quality Act (CEQA) by failing to adequately consider alternatives (such as a carbon tax) and improperly beginning implementation of the Scoping Plan before the CEQA process was complete.

It should also be noted that the University of California Office of the President (UCOP) has held meetings with ARB regarding the University's compliance with the cap-and-trade program. (While U.C. Berkeley is not covered by the cap-and-trade program's proposed rules, several U.C. campuses would be covered, and thus UCOP has become involved in coordinating how those campuses would comply.) UCOP was concerned about the lack of a price signal for campuses generating electricity (as generally exists for electricity generators who sell electricity), since the campuses do not individually charge faculty, students, and researchers for their consumption of electricity and gas. Due to this market failure, UCOP began negotiations with ARB for an alternate compliance program. The most current proposal would have ARB provide the University with all of its required allowance for the duration of the cap-and-trade program, and, in exchange, the University would invest the equivalent cost of free allowances in GHG abatement projects of its choosing. But again, as a result of the current lawsuit over the cap-and-trade program, these negotiations are on hold, and thus the final resolution is unclear.

Thus, while the direct relevance of ARB's guidelines for carbon offsets for U.C. Berkeley is clearly limited, a review of ARB's proposed regulations for offsets is still useful. AB 32 requires that any reductions of GHG emissions be real, permanent, quantifiable, verifiable, enforceable, and additional, and the cap-and-trade regulations reiterates these requirements. (Cal. Health & Safety Code §38562(d)(1) and (2); Proposed Regulation Order §95970.) Since it is agreed that these should be guiding elements for any carbon offset program, it is instructive to consider the protocols that ARB determined satisfied these requirements. It is also useful in the event that U.C. Berkeley ever becomes subject to the cap-and-trade program of AB 32.

B. AB 32 Cap-and-Trade Proposed Regulations for Carbon Offsets

The approved regulations take a two-pronged approach with respect to offsets - the Board approved four specific protocols for carbon offsets, and also set out a framework for approving additional offset programs in the future. To be issued credits, offset projects must 1) use a Board-approved protocol, 2) meet additionality requirements, 3) be located in an applicable jurisdiction, and 4) comply with all applicable laws and regulations at the national, state or provincial, and local levels. (ARB, Staff Report: Initial Statement of Reasons (ISOR), 2010, III-9.) In addition, the regulations limit the use of offsets to 8 percent of an entity's compliance obligation. (Proposed Regulation Order §95854.) Under the regulations, ARB plays the role of the credit-issuing body, while third parties can fulfill some of the offset requirements (such as quantification and verification), subject to ARB oversight. (ISOR, III-3.)

The four approved protocols are the U.S. Ozone Depleting Substances Protocol, the Livestock Manure (Digesters) Projects Protocol, the Urban Forest Projects Protocol,

and the U.S. Forest Projects Protocol. These four protocols are largely taken from existing protocols developed by the Climate Action Reserve (CAR) for use in the voluntary offsets market. (The staff report on the regulations notes that the, “Staff recognizes the extensive contributions that stakeholders and experts have made to the CAR protocols, including fashioning effective solutions to difficult problems. Accordingly, ARB is relying on this work to help support ARB’s offset quality objectives, as well as provide continuity and stability for offset projects both within California and other parts of the United States.” (ISOR, III-2.))

The details of these four protocols are set out in Parts II-V of the Staff Report on the cap-and-trade regulations; <http://www.arb.ca.gov/regact/2010/capandtrade10/capandtrade10.htm>. A summary is included here:

- **Urban Forest Projects Protocol:** This protocol covers urban tree-planting projects by municipalities, educational campuses, utilities, and partner organizations to sequester carbon. (ISOR, III-5.) A project is defined by a specific number of project tree sites, determined at the beginning of the project, that will be planted and maintained over the project lifetime. The amount of the offset credit is calculated by determining the Project Tree CO₂ sequestration (per the protocol) and deducting the GHG emissions from motor vehicles and other equipment related to tree planting, care and monitoring. (Staff Report, Part II, Compliance Offset Protocol for Urban Forest Projects.)
- **U.S. Forest Projects Protocol:** This protocol covers projects that increase sequestered carbon or avoid GHG emissions due to forest management activities in three project types: reforestation, improved forest management, and/or avoided conversion within the United States. (ISOR, III-5.) To address permanence concerns for this forest protocol, the regulations establish a Forest Buffer Account. This is basically a tool to compensate for any losses of offset credits due to, for example, disease or wildfire. Thus, a portion of all offset credits issued by ARB to offset projects under the U.S. Forest Projects Protocol must be placed into the Forest Buffer Account to cover these “unintentional reversals.” The amount is determined by a risk-rating, and the methodology is set out in the protocol. (ISOR, III-19.)
- **Livestock Manure (Digesters) Projects Protocol:** This protocol covers projects that capture and destroy methane from anaerobic manure treatment and/or storage facilities (i.e. biogas control systems) on dairy cattle and swine farms within the United States. (ISOR, III-5.) The protocol focuses on quantifying the change in methane emissions, but also accounts for effects on carbon dioxide emissions. The captured biogas can be “destroyed on-site or transported for off-site use (e.g. through gas distribution or transmission pipeline), or used to power vehicles.” Regardless of how the captured biogas is used, “the ultimate fate of the methane must be destruction.” (Staff Report,

Part IV, Compliance Offset Protocol for Livestock Manure (Digesters) Projects.)

- U.S. Ozone Depleting Substances (ODS) Projects Protocol⁵: This protocol covers projects that destroy ODS from refrigerant and foam-blowing agents sourced from and destroyed within the United States. The staff report notes that the production of ODS is being phased out through the Montreal Protocol, but there are still “significant banks” that will emit these gases in coming years unless they are destroyed.

In addition to these four protocols, the regulations set a framework for ARB’s review and adoption of additional offset projects and protocols in the future. For example, offset credits from linked programs, such as Western Climate Initiative (WCI) partner jurisdictions, would be eligible for review and inclusion in California’s cap-and-trade program. (ISOR, III-2.)

The regulations also establish a framework for accepting sector-based offset credits from developing countries. (ISOR, II-48.) The staff report notes that California has already been working with international partners on two major initiatives to develop sector-based offsetting programs. First, the Governors’ Climate and Forests Task Force (GCF), is a consortium of states and provinces that seeks to establish a market for offsets from reducing emissions from deforestation and forest degradation (REDD). Second, California is part of the International Carbon Action Partnership (ICAP), a consortium of states and countries pursuing the development of carbon markets. (ISOR, III-23.) ARB also notes that a Memorandum of Understanding has already been signed with Chiapas, Mexico, and Acre, Brazil, at the Governor’s Global Climate Summit 3 to establish these offset programs. (ARB, News Release: California Air Resources Board gives green light to California’s emissions trading program, December 16, 2010; <http://www.arb.ca.gov/newsrel/newsrelease.php?id=170>.)

The staff report notes that, “because sector-based offset crediting programs are new and evolving,” the regulations limit the amount of sector-based offset credits that may be used to meet compliance obligations to 20 percent of the overall offset limit during the first three-year compliance period (i.e. 1.6 percent total), and then 40 percent of the limit for the second and third compliance periods (i.e. 3.2 percent total). (Resolution 10-42, Attachment B, Staff’s Suggested Modifications to the Original Proposal.)

As noted above, all offset projects allowed under the cap-and-trade program must meet an “additionality” requirement. The regulations stipulate that, to be “additional,” GHG reductions must result from activities that: (1) are not required by or undertaken to comply with any federal, state or local law or ordinance, including any regulation,

⁵The ISOR notes that ARB has coordinated with its WCI partners to develop the offset program, and three of these proposed protocols have been reviewed a part of that effort. The U.S. Ozone Depleting Substances Projects Protocol has not been part of this review process to date, but the WCI Partner jurisdictions are currently reviewing it and assessing it relative to the WCI offset criteria recommendations. (ISOR, III-5 to III-6.)

consent order, and stipulated agreement or Memorandum of Understanding; (2) are not considered common practice or would not have occurred under a business-as-usual scenario; (3) were not commenced prior to January 1, 2007; and (4) exceed a project baseline calculated by a protocol for an offset project of that type. (ISOR, III-6 to III-7.)

In addition to these requirements, after a project uses an approved offset protocol to quantify its emissions reductions, it must continue to monitor, report, and verify its emissions reductions. (ISOR, III-1.)

C. Recommendations

ARB has taken a good approach in adopting offset protocols that have already been developed by CAR. This adds assurance that these offset programs have a greater likelihood of meeting AB 32's requirements that reductions be real, permanent, quantifiable, verifiable, enforceable, and additional, as they have already been used and tested and, presumably, had loop-holes or redundancies reduced or eliminated. It is also important to develop specific criteria, as ARB has, for additionality, since this can be a key failing of offsets. Continuing monitoring and verification requirements are also important. Particularly good is ARB's "forest buffer account" mechanism in the U.S. Forests Protocol, for helping to reduce the impact of unintentional reversals of offsets in that sector. Finally, ARB's limits on offsets - both overall and for developing countries in particular - are wise. While offsets can provide a useful tool for meeting GHG emission reduction requirements, they are also more susceptible than direct emissions reductions to being illusory - especially due to a lack of additionality or permanence. While safeguards can be included, as ARB has done, those risks still remain, and limiting the overall role of offsets helps ensure the on-going strength and veracity of any GHG emission reductions program.

III. American College & University Presidents' Climate Commitment

The ACUPCC⁶ is a high-visibility initiative of college and university presidents and chancellors to achieve the goal of greenhouse gas emission neutrality on their campuses through various activities and efforts.

The ACUPCC provides a common framework for managing carbon emissions on

⁶ American College & University Presidents' Climate Commitment (ACUPCC). <http://www.presidentsclimatecommitment.org/>

college and university campuses to achieve GHG neutrality. As other colleges and universities, UCB also participated in ACUPCC institutions to affirm its climate commitment for achieving reduction of GHG emission on campus. As indicated in the ACUPCC Voluntary Carbon Offset Protocol, UCB should first try to meet the self-imposed GHG emission reductions. If UCB cannot achieve GHG neutrality in a certain time period, then they should consider purchasing carbon offsets. From the perspective of the ACUPCC, it is not necessary to incorporate carbon offsets into each college or university's climate action plan, which means that UCB needs to evaluate the effect and the value of offsets in accordance with its own unique circumstances and goals. The ACUPCC institutions also go through each carbon offset investment option and compare those costs and risks between each other as follows⁷:

Offset Investment Options	Risk	Cost
Purchasing Credits – retail	Low	Varies
Purchasing Credits – wholesale	Varies	Varies
Investing in Projects	Varies	High
Developing Projects	High	High
Prompt Delivery	Low	High
Forward Delivery	Low	Low
Forward Crediting	Moderate	Varies

Base on the above table, the offset option of “Forward Delivery” would be the best way to offset carbon at low cost without taking too much risk. If taking the option of “Forward Delivery”, UCB needs to find an offset provider and sign an offset purchase contract to guarantee the offsets are delivered.

Another issue to be aware of is that UCB cannot purchase offsets which have already been used for reducing other institutions' climate change impact. The reason is to avoid the occurrence of double counting carbon offsets. On the other hand, UCB can resell offsets if the campus can meet its carbon emissions reduction through the internal efforts and activities

⁷ACUPCC. (2008) “Investing in Carbon Offsets: Guidelines for ACUPCC Institutions”, Accompanying document to The ACUPCC Voluntary Carbon Offsets Protocol. <http://www.presidentsclimatecommitment.org/resources/guidance-documents/offset-protocol>

without using pre-purchased offsets, or if the campus has some spare offsets when achieving the proposed GHG emission reductions.

ACUPCC also gives a brief introduction to the compatibility of other existing protocols with the ACUPCC Voluntary Carbon Offset Protocol. Since UCB has already signed the ACUPCC Carbon Offset Protocol, it is necessary for UCB to know what kind of existing offset standards are compatible with the ACUPCC Protocol. Among existing offset protocols, the Clean Development Mechanism (CDM) is most compatible with the ACUPCC Protocol. However, there is one major issue that differs between the ACUPCC Protocol and CDM: the allowance of avoided emissions projects. The ACUPCC Protocol indicates that the term “offset” refers to the reduction, removal, or avoidance of GHG emissions, therefore, avoidance projects are not recognized as offsets. UCB should be aware of this issue when purchasing offsets from third-parties because avoidance projects may be recognized as offsets under other protocols or standards.

In terms of compatibility with general project types such as energy efficiency projects and fuel switching projects, they are compatible with the ACUPCC Protocol in most cases. For most energy efficiency projects, what UCB should be aware of is establishing a baseline, maintaining efficiency over time, establishing clear ownership of the reductions, and the potential for double counting of offsets.

IV. Potential Projects for UC Berkeley

A. Biogas plant

Description: One potential source of offsets for UC Berkeley is investment in a plant that converts methane to electricity. The captured methane can come from a variety of sources, including both agricultural and landfill emissions. Offset benefits can come from two separate steps in the energy conversion process. First, methane that would have otherwise been emitted to the air from a manure storage lagoon or a landfill is flared to produce electricity, which means the methane is destroyed. Every ton of methane released is equivalent to 21 tons of carbon dioxide released, so destroying the methane reduces its greenhouse gas impact potential. Also, when the methane is being used for electricity generation, the electricity generated is renewable. If it is used in lieu of another fuel at an existing plant, this can also be counted as an offset. If a new plant is built, it is more difficult to count the emissions reductions from the electricity, because the electricity may not be fully replacing dirtier electricity. However, the electricity can often be counted as a REC, because methane from agricultural waste is a renewable fuel.⁸

Estimated Requirements and Costs:

In 2005, it was estimated that, if digesters were installed at all eligible livestock operations

⁸Biogas Energy Solutions. www.besch4.com. May 2011.

centers, California had the potential to reduce its emissions from agricultural methane by up to 6 MMT CO₂equivalent, while generating 188 MW of renewable power (about 1500 GWh/yr at full operating capacity).⁹ In 2014, UC Berkeley will require an estimated 45 kT CO₂e, or 0.75% of the available emissions reductions. The exact size of plant that would be required to generate this size of offset is variable, and depends on the sources of methane emissions that are being captured. Using an average value for kW/kT CO₂e averted, a plant that would provide enough emissions to satisfy UC Berkeley targets would need have a capacity of about 5 MW.¹⁰ Costs for such digesters vary widely, but similarly-sized digesters have cost on the order of \$1 million to install, and \$60,000/year to maintain.¹¹ With a retail electricity price of about \$0.10/kWh and a capacity factor of 85%, such a plant could expect to generate revenues of about \$3 million/year.¹²

Offset Potential: High. Methane capture and destruction is relatively risk-free as an offset protocol. Because it is guaranteed that the methane would otherwise have been released to the atmosphere, the total offset is easily calculated from the total amount of methane destroyed. The costs to operate the plant and the revenues it would obtain are variable and depend on market conditions.

B. Community Weatherization Programs

Description: Community weatherization projects have been used in the past as offsets by other universities, including Duke and the University of Florida, but are not currently in use at UC Berkeley. These types of projects do not presently fall under an AB 32 protocol; however, there are some benefits to investing in community weatherization even if UC Berkeley is required to purchase only offsets that fall under AB 32. Community weatherization projects include improvements to heating and cooling systems, weather-stripping and insulation, and energy efficiency in low-income local areas. These types of improvements reduce utility bills for residents by up to 20%, and can generate goodwill in the community as a result.¹³ Once the improvements have been completed, UC Berkeley can claim the subsequent residential greenhouse gas reductions as offsets if the university is not regulated under AB 32. Alternatively, if UC Berkeley does become regulated under AB 32 or another regulation

⁹E2 Dairy Energy Strategy: Reducing Greenhouse Gas Emissions from California's Dairy Operations. www.e2.org/jsp/controller?docId=14628. May 2011.

¹⁰EPA. Operational Aerobic Digesters, Stored by State: Dairy Projects. http://epa.gov/agstar/downloads/digesters_dairy.xls. May 2011.

¹¹Shih, Jih-Shyang Shih, Dallas Burtraw, Karen Palmer, and Juha Siikamäki. Ammonia and Methane from Livestock Operations: Valuation and Policy Options. Discussion Paper: Resources for the Future. RFF DP 06-11 March 2006.

¹²Shih, 2006.

¹³Ca.gov. Low Income Home Energy Assistance Program. <http://www.csd.ca.gov/Programs/Low%20Income%20Home%20Energy%20Assistance%20Program%20%28LIHEAP%29.aspx>. May 2011.

system, any energy efficiency improvements to residential buildings where students live can be used to reduce the university's total greenhouse gas emissions, since off-campus student housing is included in UC Berkeley's greenhouse gas accounting. Berkeley already implements a weatherization program for low-income Berkeley residents, so any additional weatherization improvements made by UC Berkeley will need to be made in addition to these. Possible solutions could include offering the program to all UC Berkeley students whose living quarters are not weatherized, and adding a moderate income bracket on top of the low-income bracket that is currently served.

Estimated Requirements and Costs:

In 2009, off-campus housing contributed 1,658 MWh to UC Berkeley's electricity use, and 109,466 MMBtu to UC Berkeley's natural gas use.¹⁴ Using the California electricity emissions factor of 0.279 kg CO₂/kWh in 2009 and a natural gas emissions factor of 52.78 kg CO₂/MMBtu, the total emissions from these sources are 0.462 kT CO₂e and 5.86 kT CO₂e, respectively. Based on these numbers, it is clear that any efficiency or weatherization improvements will not be able to achieve the full 45 kT CO₂e reduction on their own. If 50% of off-campus Berkeley student homes receive weatherization improvements that reduce their emissions by 20%, this project could save a total of 0.632 kT CO₂e. Using cost estimates from the UC Berkeley weatherization program and an estimated cost/therm of \$1.00, the weatherization program works out to cost \$189/T CO₂e, or \$120,000.¹⁵

Offset Potential: Moderate. Given that the off-campus housing component of UC Berkeley's GHG emissions is an estimate, it is difficult to assess the exact impact of weatherization on this number. Further, while performing weatherizations on living quarters where UC Berkeley students reside will ensure that the people who live in those quarters reap the weatherization benefits for as long as the improvements last, it is not clear that the residences will always involve Berkeley students. This makes the calculations difficult, because it is not clear whether residences on which weatherizations have been performed will continue to fall within UC Berkeley's GHG system boundaries year after year. As such, it is difficult to justify counting the weatherization offsets towards UC Berkeley's emissions profile.

C. Faculty Research Pool

Description: Many UC Berkeley faculty have research interests that align with UC's goals for emissions reduction, and some are already working on projects that are reducing emissions in California or abroad. Some examples include: building retrofit projects, cookstoves abroad, and demand response. These sorts of projects can be included in UC Berkeley's plan for offsets by

¹⁴Stoll, Kira. UC Berkeley 2009 Greenhouse Gas Emissions Inventory Report. CalCAP. http://sustainability.berkeley.edu/calcap/pages/inventory/docs/2009InventoryReport_0910.pdf. May 2011.

¹⁵LIHEAP-DOE Fact Sheet. CSD. [http://www.csd.ca.gov/Contractors/documents/Energy%20tab/LIHEAP-DOE%20Fact%20Sheet%20\(2008\).pdf](http://www.csd.ca.gov/Contractors/documents/Energy%20tab/LIHEAP-DOE%20Fact%20Sheet%20(2008).pdf). May 2011.

creating a faculty research pool for offsets. This can include a combination of events, facilities, funding, and infrastructure, all of which is tailored to support faculty networking, research, and collaboration on offset generation for the University.

Estimated Requirements and Costs:

Because this is an open-ended offset generation tool, the costs could be anywhere between \$10,000 and \$1,000,000. Publicity to faculty, including a website explaining the program and some networking events are essential. Other possibilities include a funding pool that accepts faculty research proposals and allots funds based on likelihood to produce valid offsets, as well as graduate student fellowships for work on offset projects.

Offset Potential: Low. Many of these projects can be engineered to comply with AB 32 offset guidelines, but some will never meet that threshold. Additionally, because these projects will be research-based, it is possible that some of them will be ineffective, and will not produce countable offsets. However, UC Berkeley's goals as a research institution in combination with the number of faculty already working on potential projects make this risk more appealing.

V. Recommendations

In conclusion, UCB should invest in a portfolio of offsets, such that a percentage of them comply with AB 32 protocols. UCB should invest in projects from the AB 32 compliant list and the voluntary-compliant list. The rest of the offsets could come from experimental projects, including UCB-run projects in other countries, community development projects, or projects that have not been explicitly verified. Just as it is advantageous to invest one's money in many different places, and not just the stock market, so it would also be less risky to invest in many different carbon offset projects. Ultimately, UCB must decide which projects best fit the needs and the mission of the University.