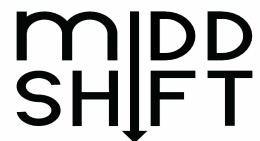


*The Carbon Neutrality Toolkit,
An Annotated Guide to:*

**A Proposal for Carbon Neutrality
at Middlebury College
(January 2007)**



CARBON NEUTRALITY TOOLKIT

Introduction

“No institutions in modern society are better equipped to catalyze the necessary transition to a sustainable world than universities. They have access to the leaders of tomorrow and the leaders of today. They have buying and investment power. They are widely respected. Consequentially what they do matters to the wider public.” ~David Orr, Author, *“The Last Refuge: Patriotism, Politics, and the Environment in an Age of Terror.”*

Welcome to the Carbon Neutrality Toolkit. Whether you’re just starting a carbon neutrality campaign or are well on your way to success and looking for a few tips, we hope that the following pages will be a useful resource. From the beginning, this document has been a collaborative effort. We want to start by acknowledging some of the groups and people who contributed the toolkit: first, all of the students in Middlebury’s Sunday Night Group who made our carbon neutrality campaign (MiddShift) work; second, the Sierra Student Coalition and the Campus Climate Challenge, whose enduring leadership inspired us to embark on this project; third, the nearly one hundred students who attended the Climate Neutrality Summit at Middlebury College on Jan 19-21, 2007 and contributed with their feedback and questions; and finally, the many professors, staff, and students who have helped us along the way.

Collaboration is an appropriate place to start this toolkit off. Teamwork may be important in all endeavors, but we think it’s especially well suited for finding the solutions to global warming on our campuses. Carbon neutrality is a complicated topic, but it’s complicated for a reason. As a wise person once said, when it comes to solving global warming, it’s not a silver bullet we’re looking for, but a whole bunch of silver buckshot. The more people you have, the more buckshot you can gather. The point of this toolkit is to show you some places to find your ammunition.

Here’s how this document works. Over the month of January 2007, a group of twelve Middlebury College students (your illustrious authors) compiled a bunch of previous research and new information into a Carbon Neutrality Proposal that went to our Board of Trustees. It was a hell of a process and we learned a lot. This document is based on the proposal we sent to the trustees, but with some helpful (we hope) annotations. Each section of this toolkit has a unique author, a member of our team, who worked hard and became somewhat of an authority in his or her focus. He/She will lead you through the process of compiling the section, using the Middlebury proposal as a base, and try and give some useful advice on how to avoid the pitfalls he/she fell into.

If you’re looking for a step-by-step, hold-your-hand, no-hard-work path to climate neutrality, tough luck, this ain’t it. But if you’re willing to do a little work yourselves, we think that this toolkit will give you some useful advice. On the next page is a list of other resources you should check out as you go forward. In the end, though, it’s up to you, so get yourself a team, get excited, and get started.

The Middshift Crew
(Billie, Caitlin, Claire, Clayton, David, Emily, Jamie, Jason, Kelly, May, Tizzy, Will,
and the Sunday Night Group)

Additional Resources

There is a wealth of resources on the internet to help you develop your carbon neutrality plan. This is just a short list of ones that we have found especially helpful. Don't limit yourself though - - get on Google and check out the latest news/info/tips from the growing community of schools and businesses (maybe even governments sometime?) that are working on becoming carbon neutral. Good luck!

The Campus Climate Challenge Resource Database:

The Challenge has pulled together some fantastic resources, from "The Challenge Toolkit 2.0" to sample policies from schools around the country. Check it out in the "resources" section of www.climatechallenge.org.

Clean Air – Cool Planet:

CACP not only has a badass **GHG Emissions Inventory Calculator** to help you get started calculating your emissions, they've also developed a "Climate Action Toolkit" to help you along the way of making important reductions. It's a brilliant resource, check it out at: http://www.cleanair-coolplanet.org/for_campuses.php

The National Association of Environmental Law Societies:

Dan Worth and NAELS are pros at helping any campus (you don't have to be a law school) work on going neutral. You can even find 185 page carbon neutrality proposals from the UC system - - light bedtime reading, anyone? Check out the latest accomplishments and resources at: www.naels.org.

The Sustainable Endowments Institute:

Sustainable-izing your endowment is something you won't hear much about in this document, but that's not because we don't care. In fact, the endowment is one of the most important places you can try and make change on campus. Just talk to Mark Orlowsky at SEI if you're not convinced or check out the organization's website to get a dose of endowment loving: www.endowmentsinstitute.org

It's Getting Hot in Here:

Yes, listening to the Nelly song will probably help you, but that's not what we're talking about. IGHIIH is the hippest, hottest youth climate blog on the internet. It's a great way to keep in touch with what's happening on campuses around the country and get new campaign ideas and tips. You'll also stay up to date with the latest climate news and opinions. Take off all your clothes at: www.itsgettinghotinhere.org

Last, but not least, remember that many of the greatest resources are already at your fingertips: the faculty, staff, and administrators on your campus. Maybe your environmental studies professor doesn't have all the tips, but maybe she knows someone who can help you out. Think outside the box and make friends with those who run the show on your campus. You'll learn more about insulated piping than you ever thought possible and maybe even find a new friend (just ask Billie from Middlebury about her *heating* and cooling section!)



**A Proposal for Carbon Neutrality
at Middlebury College**

January 2007
Middlebury College
Middlebury, Vermont

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This proposal outlines a plan to eliminate Middlebury College's net carbon emissions by 2016. This goal fulfills the College's mission, secures its reputation and leadership among peer institutions, rises to the challenge of global climate change, and is financially feasible.

The first section delineates the educational opportunities associated with carbon neutrality, which strongly reinforce the College's mission and build awareness for and experience with energy and climate issues. This section suggests incorporating student, faculty, and staff led projects to institutionalize carbon neutral behavior and using competition through grants as a means to create efficiency and facilitate this necessary change.

The following sections suggest several infrastructural projects to reduce Middlebury's carbon footprint resulting from heating and cooling, electricity, transportation, waste and purchasing, and architecture and planning. Although the previously approved biomass gasification system will reduce the College's heating and cooling footprint by half, this section suggests several other projects which will build on this momentum and continue to reduce carbon emissions.

This proposal also suggests a three-tiered strategy to offset the College's irreducible carbon emissions. This approach avoids the risk of bypassing the important stages of emissions reduction through both behavioral and infrastructural change and the fiscally irresponsible decision to invest money in offsets prior to completing on-site carbon reduction.

Following these recommendations, there is a preliminary analysis of the proposed projects featuring estimated costs, internal rates of return, carbon reductions, and costs related to offsets. This analysis is a starting point for further research into which projects are most cost effective in reducing the College's carbon footprint. According to our calculations, including the recent investment in the biomass gasification system, the goal of carbon neutrality is both an asset to our educational mission and within our financial grasp. For example, in addition to biomass, if the College were to invest in the reduction projects with a positive internal rate of return recommended in this document, the total net present value of the College's carbon reduction expenditures after a 20 year period would only be \$835,000 shy of the return on the value of the expenditures had they been invested in our endowment instead.

Following this section, there are several recommendations on how to finance carbon neutrality, which principally involves using the class of '07 gift, the Green Fund, to create a separate endowment for environmental initiatives.

The proposal concludes with a recommended timeline:

February 2007:

- Institutional commitment to achieving carbon neutrality by 2016
- Develop and implement plan for continued collaboration with MiddShift students

May 2007:

- Develop and approve funding strategy
- Approve recommended offset policy
- Prioritize recommendations delineated in this proposal. This will enable the Middlebury College community to utilize Summer 2007 to begin implementation.

Executive Summary



Project Index:

Project Index	Discount Rate: 9.00%		Timeframe: 20 yrs			
	Initial Capital Investment	Annual Cost/Savings	IRR	NPV over 20 yr timeframe	MTCDE Reduced	\$/MTCDE over timeframe
Employee Commuting/Parking Fee (High compliance)	\$0	\$14,700	Infinite	\$123,110	1260	\$98
Silver LEED cert. -- integrated design	\$0	\$36,188	Infinite	\$303,068	7435	Infinite
Employee Commuting/Parking Fee (Low compliance)	\$0	\$379,350	Infinite	\$3,176,985	970	\$3,275
Lighting Efficiency Measures	(\$3,369)	\$11,000	326.5%	\$89,032	5	\$18,626
Monitoring and Control Systems	(\$18,720)	\$18,000	96.2%	\$133,572	8	\$17,061
Landfill Gas to Energy Projects	(\$65,000)	\$19,000	29.1%	\$99,488	6250	\$16
Replacing steam pipes	(\$800,000)	\$122,316	14.2%	\$290,429	1022	\$284
New Biomass Gasification System	(\$11,000,000)	\$1,093,153	7.7%	(\$936,792)	15000	(\$62)
Silver LEED cert.-- no integrated design	(\$375,000)	\$36,188	7.3%	(\$40,969)	7435	(\$6)
Bright Card	\$0	(\$51,900)	N/A	N/A	9047	(\$6)
Native Energy Offsets (low price)	\$0	(\$138,858)	N/A	N/A	19380	(\$7)
Native Energy Offsets (high price)	\$0	(\$192,265)	N/A	N/A	19380	(\$10)
Waste Reduction Fund	\$0	(\$1,000)	N/A	N/A	82	(\$12)
All B20 burned in the college fleet	\$0	(\$1,125)	N/A	N/A	19	(\$60)
Purchasing policy for college fleet	\$0	(\$13,000)	N/A	N/A	80	(\$163)
B100 Biodiesel Blend to Replace #6 Oil	\$0	(\$3,837,011)	N/A	N/A	23370	(\$164)
B20 Biodiesel Blend to Replace #6 Oil	\$0	(\$3,020,781)	N/A	N/A	6496	(\$465)
Investment in Hydroelectricity downtown	(\$2,000,000)	\$0	N/A	(\$1,834,862)	880	(\$2,085)

Two weeks passed during Middlebury College's beloved winter term before any of us felt the crunch of snow beneath our feet. The snowless Vermont landscape could not have been a more appropriate backdrop for our research into carbon neutrality. We all experienced a taste of what it is we are working to prevent—the effects of climate change.

In May of 2006, the Sunday Night Group (SNG), Middlebury's student organization dedicated to climate change activism, decided to take on the challenge of making the College carbon neutral. After meeting with you in September, we began a carbon neutrality educational campaign—MiddShift—for Middlebury students and community members. Since then, over 300 students from SNG have built awareness and support for this campaign by screening “An Inconvenient Truth”, tabling at hockey games, and a door-to-door exchange of thousands of light bulbs. This January term, we have developed an internship with the Sierra Student Coalition to formally pursue carbon neutrality.

The eleven students who have participated in this internship have spent the month researching the many facets of pursuing carbon neutrality at the College. We have also hosted a conference for students across the Northeast who are working towards carbon neutrality at their own schools. From this conference and from our own findings, we will create a resource kit with fundamental information about carbon neutrality strategies for other schools.

The following report is our assessment of the steps Middlebury is already taking to achieve its carbon reduction goals, and the opportunities for further carbon reduction that would result in carbon neutrality within the decade. We believe that carbon neutrality is critical to the advancement of Middlebury College as a current leader in higher education. Finding solutions to climate change is the challenge of our time. By accepting our proposal, you, as a Trustee of Middlebury College, have the opportunity to lead the College towards a sustainable future.

Thank you for your time and consideration,

Kelly Blynn, '07
Environmental Studies/Geography
Beryn, PA

May Boeve, '06.5
Political Science
Sonoma, CA

Billie Borden, '09
Undeclared
Huletts Landing, NY

David Dolginow, '09
Geography
Leawood, KS

Tiziana Dominguez, '09
Economics
Ourense, Spain

Jamie Henn, '07
History
Cambridge, MA

Caitlin Littlefield, '07.5
Environmental Studies/Conservation Biology
Andover, MA

Will Martin, '07.5
International Studies/Economics
Englewood, CO

Claire Polfus, '08
Environmental Studies/Literature
Lake Tomahawk, WI

Clayton Reed, '08
Environmental Studies/Economics
Stowe, VT

Emily Wheeler, '07
Sociology/Anthropology
East Burke, VT

When the Trustees of Middlebury College approved the proposal for the Carbon Reduction Initiative in 2004, the College became one of the first educational institutions in the nation to respond to the threat of global climate change. With the decision to implement a biomass burner, the College will reduce its oil-related emissions by almost half—the most remarkable reduction thus far by any college in the Northeast. Now, in 2007, we are asking you to take the next step and approve carbon neutrality for the College by 2016. By adopting our proposal, this college will continue to lead peer institutions in the fight against climate change while paving the way for an economically vibrant and environmentally sustainable future.

What is Carbon Neutrality?

For an institution such as Middlebury College to achieve carbon neutrality, *it must effectively eliminate its net greenhouse gas emissions*. This is accomplished through using sustainable energy sources, conservation and efficiency measures and ultimately the purchase of carbon offsets for those ‘irreducible’ components of its carbon footprint (see the Offset section for a further explanation).

The World Research Institute (WRI) has developed a protocol with three scopes for the inventory of greenhouse gases for corporations. In this protocol, Scopes One and Two are necessary to carbon neutrality and Scope Three is optional, but recommended. Jason Kowalski ’07 followed this framework during an independent study to calculate the College’s carbon footprint, measured in metric tonnes of carbon dioxide equivalents (MTCDE). Because the College is an educational institution rather than a corporation, certain sectors of its emissions footprint did not correspond directly to the WRI model. For various reasons, student transportation and emissions released at Middlebury institutions outside of the main campus—such as the Monterey Institute and the C.V. Starr Middlebury Schools abroad—were not included in Kowalski’s 2005-2006 carbon inventory. Middlebury may consider including these emissions when calculating carbon footprints in the future.

Scope	Emissions Included
Scope 1- Direct Emissions	Heating and Cooling
	College Fleet
Scope 2- Imported Emissions	Purchased Electricity
Scope 3- Other Indirect Emissions	Outsourced Travel
	Waste Emissions
	Employee Commuting

Why Carbon Neutrality?

In October of 2006, the Stern Review on the Economics of Climate Change calculated that under a business-as-usual scenario, the overall costs and risks of climate change will be equivalent to losing at least 5% of global GDP each year, now and in perpetuity. According to NASA research, 2006 was the hottest year on record in the U.S. and the fifth hottest globally. Leading climate scientist, James Hansen projects that we have ten years to drastically reduce carbon emissions before climate change becomes irreversible. Building on Middlebury College’s existing commitment to significantly reduce carbon emissions, we now believe the College must set the precedent for campuses across the nation and pursue carbon neutrality within ten years.

Middlebury College is already known as a leader in environmental sustainability. The College runs a unique recycling and composting facility, implements high recovery building methods, utilizes sustainable forestry on college lands and includes biofuels in both heating and transportation. With the decision to implement a biomass burner, the College will reduce its oil-related emission by almost half—the most remarkable reduction thus far by any college in the Northeast.

In the four short months since student representatives presented the goal of carbon neutrality to the Board of Trustees the following events have taken place:

September 30, 2006 – Focus the Nation, a nationwide day of discussion aimed at global warming policy change, launches at Middlebury.

October 4-6, 2006 – Middlebury College students and staff attended the Association for the Advancement of Sustainability in Higher Education conference entitled “The Role of Higher Education in Creating a Sustainable World.”

October 23, 2006 – Middlebury College students featured in *Chronicle of Higher Education* for their efforts on behalf of sustainability.

October 30, 2006 – Middlebury College ski facility, as well as alpine and Nordic ski teams, become carbon neutral, garnering publicity in *U.S. News and World Report*, *The San Francisco Chronicle*, and many Vermont publications.

November 4, 2006 – Middlebury students and faculty organize “Save Your Vermont” as part of the International Day of Action on Climate Change, eliciting participation from 500 people at 30 locations throughout the state.

January, 2007 – Professor Jonathon Isham and visiting professor Eban Goodstein host winter-term class “Focus the Nation,” where forty Middlebury students participate in planning the national day of discussion on climate change in 2008.

January 19, 2007 – Students’ MiddShift initiative featured on ABCnews.com.

January 19-21, 2007 – Middlebury students host Carbon Neutrality Summit for over 85 students from 25 schools in the East.

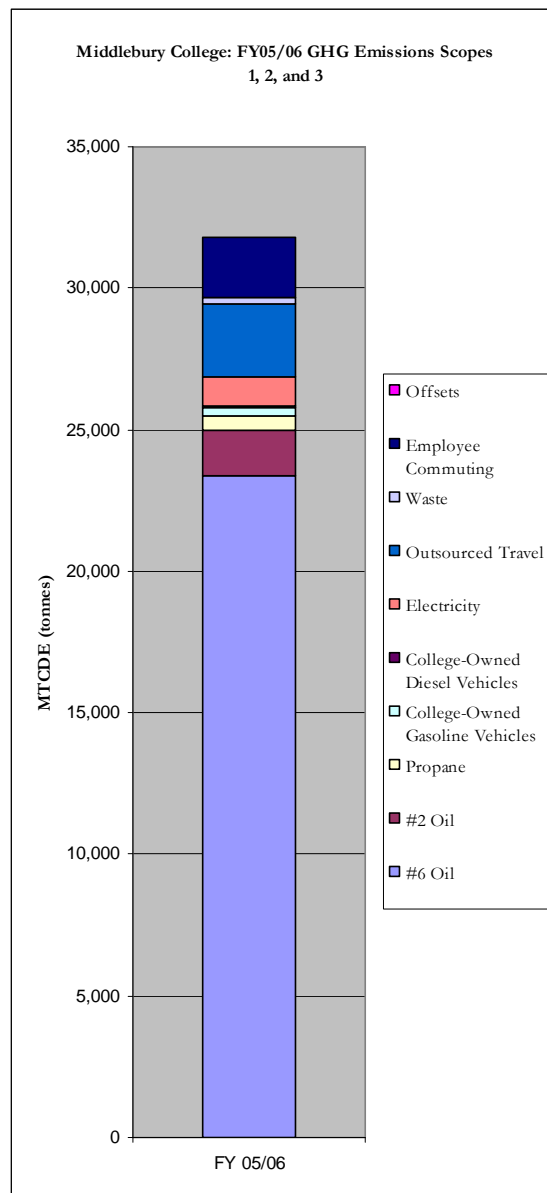
Middlebury College’s drive to create solutions to climate change is constantly reinforced by the strongest student climate change activist group in the country. We, as members of the Sunday Night Group, have organized and participated in local, statewide, national and international campaigns to fight climate change and have established ourselves as leaders in the climate change movement. We must rise to the challenge of our respective reputations and lead collegiate efforts to achieve carbon neutrality.

The movement for carbon reduction has spread to over 300 colleges and universities nationwide. Several have already adopted carbon neutrality goals, including the University of Florida and College of the Atlantic this fall. However, Middlebury College still can be one of the first institutions of higher education to adopt a comprehensive plan for *how* to achieve carbon neutrality. Middlebury’s reputation as a leader would help ensure that other institutions pursue similar goals and match our commitment. Joining leadership circles of compacts such as the Association for Advancement of Sustainability in Higher Education President’s Pledge would reinforce this endeavor.

Carbon Neutrality in Ten Years

The following document does not delineate one specific plan for carbon neutrality at Middlebury, but rather provides a variety of steps that we can take to achieve our goals. At this point in time, we cannot predict

the appropriate solutions for the entire carbon neutrality process. Climate change has reached a level of national importance and we can expect many changes that will influence the ways we may pursue carbon neutrality, including innovative technology, federal grants and subsidies, and national legislation on climate change. In the following proposal, we make strong suggestions for the steps that we believe should be taken to eliminate our carbon emissions over the next ten years. Please commit to carbon neutrality within ten years, knowing that this pursuit rests upon the collaborative efforts of the entire college community.



Making your GHG Inventory: Jason

A Greenhouse Gas inventory is a crucial piece of the carbon reduction equation. Without an inventory that has clearly defined boundaries and scopes, colleges will never be able to indulge in the kind of cross-institutional comparison that will end up really driving this process down the road. There is so much to say about this process, that in the end I'm just going to need to point to some additional reading to get you started. Here goes:

1. WRI (World Resource Institute):
<http://www.ghgprotocol.org/templates/GHG5/layout.asp?type=p&MenuId=ODg4&doOpen=1&ClickMenu=Corporate%20Standard>

These guys sort of started it all. After the IPCC got going, and the US refused to commit to Kyoto standards, many American businesses started voluntarily reporting their emissions. This standard allowed them to compete against each other on the same playing field

2. CCAR (California Climate Action Registry)
<http://www.climateregistry.org/PROTOCOLS/GRCP/>

This took the principles used in the WRI and made them a bit more specific. They also made a cool online tool (CARROT) that allows you to submit your emissions data to an on-line registry that will do a bunch of the number crunching for you (or a price). We borrowed some of the elements from this protocol, b/c this is the candidate for a cap and trade system.

3. EPA Climate Leaders
<http://www.epa.gov/stateply/>

In the end we used these protocols because we wanted a system that was transparent enough to be updated with factory-specific emissions factors and able to have all data in terms of BTUs. Plus the voluntary reporting protocol is one that we can join, with cool stipulations for annual inventories, inventory management plans (IMP), desktop audits, and technical assistance. We're not members yet. We've been too focused on the neutrality bit to get the third party certification. Midd essentially used all of their protocols, formulas, and methodology though. As an inventory made for the

corporate world, we added on quite a few extra pieces of our own.

4. CA-CP Clean Air-Cool Planet
http://www.cleanair-coolplanet.org/for_campuses.php

These guys are awesome. Jenn Schroeder is the contact you want here. She is very knowledgeable, and is a great resource to bounce your ideas off of. Basically these guys produced a toolkit w/ UNH in 2001 that has been updated every couple years to become more precise/inclusive. When we started to construct our own GHG MRS in May 2006, these guys were also working on a WRI compatible model. This model is now complete and is quite accurate. I highly recommend this protocol to any school that is doing an inventory for the first time or just including scopes 1 and 2.

The rest assumes you're somewhat familiar with the above documents:

One thing we've found helpful is to be very precise about your operational/control boundaries in the beginning (i.e. for this years calculations), but then list what you'd like to include in the future (capital construction, hotel stays, better employee commuting data). We adhered very strictly to the conservatism stipulated by the CCAR, but also used their liberal cap and trade style electricity methodology (where btus of fuel = btus of electricity consumed). In the end, financial boundaries make the most sense. We expanded our control boundaries to encompass employee commuting and all "necessary" student commuting (which for Middlebury is 0). This makes our footprint interesting given the student-led component of this project. Our trustees want to see a little "skin in the game" but it's tough to convince them of that when you don't include "student." That's been our biggest challenge, yet the soundness of our methodology has been our greatest strength. I would love to chat with you further. Good luck!

Jason "Peaches" Kowalski
jkowalsk@middlebury.edu

Pursuing carbon neutrality will create many unique and dynamic educational opportunities for students and faculty at Middlebury College. Carbon neutrality, as a campus-wide endeavor, will enhance the Middlebury education across the academic disciplines. By giving Middlebury students the opportunity to help design and implement carbon reduction projects, the College would connect the critical thinking intrinsic to the liberal arts curriculum with tangible solutions to climate change.

The following mission statement was adopted by the board of trustees in 2006,

We strive to engage students' capacity for rigorous analysis and independent thought within a wide range of disciplines and endeavors, and to cultivate the intellectual, creative, physical, ethical, and social qualities essential for leadership in a rapidly changing global community.

To adhere to this mission, Middlebury must recognize that climate change and energy challenges are becoming the most important issues of our time. The global community is in need of leaders who understand the scope of these problems. With carbon neutrality as a strong component of our education, Middlebury students will have the necessary skills and innovative solutions to address climate change. This project can extend across all disciplines: cost-benefit analyses of efficiency measures in economics, spatial feasibility studies in geography, explorations of the moral consequences of climate change in philosophy and more. By making climate education a focus of the institution, Middlebury will establish a unique identity as a leader in this growing field.

Each department at Middlebury can begin to undertake the development and continuation of climate curriculum. We are proposing four programs that would motivate professors and students to incorporate carbon neutrality into their studies. We recommend that these programs be implemented within the next academic year:

Faculty and Curriculum Development Program: This program would include a series of faculty seminars on carbon neutrality which would promote interdisciplinary thought, study and intellectual exchanges among faculty. The seminars would challenge faculty to consider how carbon neutrality initiatives may empower their scholarly work and increase the College's contributions to the state and the world.

Carbon Neutrality Innovations Fund: The Innovations Fund would provide grants of \$1,000 to \$4,000 to faculty

and staff to develop creative new programs for the carbon neutrality initiative. The fund would also offer Faculty Fellowships each year to faculty to support their course development and research. The Innovations Fund would be designed to keep the program vibrant and to shift the initiative to a higher level of impact each year.

Carbon Neutrality Undergraduate Research Program:

Talented, creative undergraduates would undertake entrepreneurial research projects focused on climate change and carbon neutrality. Research proposals would be competitively evaluated and funded to support summer fellowship or research during the academic year.

Community Partnership for Carbon Neutrality:

Through this program, the Alliance for Civic Engagement office and the Coordinator for Community Based Environmental Studies would support cooperation between community groups and Middlebury students through service learning and extracurricular service projects based on carbon reductions. Service projects are emphasized in the College's Strategic Plan and benefit the students, the community partners and the College's relationship with its neighbors.

In order to facilitate these programs, an online resource collaborative should be created for interested parties. With this resource, faculty could find information about developing climate curriculum, community partners could post project ideas that could benefit from student input and students could find out which courses and faculty members are already addressing climate change or get ideas for independent research projects.

To strengthen the institutionalization of carbon neutrality, the College should be mindful of the projects in hiring new professors. The educational benefits of carbon neutrality would be greatly enhanced by more professors with relevant experience. This is an exceptional opportunity to integrate solution-based curriculum into the classroom. By integrating carbon neutrality into the Middlebury education, the work of students and faculty will serve as accountability measures for this project.

The movement towards carbon neutrality is gathering momentum on campuses across the country. By making an early commitment, Middlebury will realize extensive benefits in attracting talent and preparing its students for the challenges that lie ahead.

The Inside Scoop: (Emily)

The Inside Scoop: (Emily)

Increasing educational opportunities is undoubtedly one of the strongest selling points of carbon neutrality. While the benefits of incorporating carbon neutrality into the curriculum are not quantifiable in terms of carbon emissions reductions or dollar savings, colleges, of all places, know that the returns on education are beyond carbon and dollar amounts. By offering and encouraging class work, independent studies, and group projects which address some aspect of carbon neutrality, colleges will give students the opportunity to better understand climate change, its effects on the world and future solutions. We have a vision that over the next ten years carbon neutrality will surface in classes across all departments, becoming part of thousands of students' college experience.

Regardless of where your school is in the process, institutionalizing climate education into the curriculum might serve as a starting point to the conversation about neutrality or solidify your college's commitment to achieving neutrality. The beauty of the educational opportunity is that schools will be giving their students both the opportunity and responsibility to partake in the process of achieving neutrality—which also shares the accountability between students, faculty and administrators, a truly collaborative effort, instead of putting all the onus on one person or group of people.

While our goal was to sell the idea of educational opportunities, we proposed three funded programs to foster more academic work that focuses on climate change and carbon neutrality which will offer monetary support for faculty and students to develop curriculum and design and implement projects. More than likely, programs and incentives like these already exist at your school to encourage this type of work. I would suggest you use the pre-existing programs as a model, especially in terms of funding, and then propose similar programs for carbon neutrality. In addition to the three that we requested, UNC has an incredible list of programs and funds geared toward entrepreneurship that can be tailored to each school as you move forward with carbon neutrality.

<http://www.kenaninstitute.unc.edu/centers/cei/?y=programs&t=Programs>

Educating faculty and encouraging faculty to develop curriculum will get at one of the biggest barriers in for this aspect of the project because, as we realized here, many faculty members are not ready at this point in time to talk about climate change or carbon neutrality. These are very new concepts, and while they are becoming more mainstream, the reality is that climate change is the issue of our generation. Often times, we as students will be more knowledgeable and concerned about cutting carbon emissions than our faculty. One request that we were very cautious in making was to consider how new faculty being hired could contribute to the carbon neutrality initiative. While hiring engaged faculty seemed obvious to us, we were advised not to ask for such a stringent commitment from the college.

My advice on how to sell this idea to your administration or board of trustees: find a paragraph or clause in your mission statement that can be applied to the relevancy of teaching students about climate change and the responsibility of the college or university to teach their students how to become the leaders of the future. I also strongly suggest that you have the ability to show students' commitment to this project (your job is half done if you are in fact proposing carbon neutrality) and that you have also thought of ways to maintain student-initiated involvement. Some ideas we came up with include getting involved in freshman orientation, outdoor orientation and school trips or activities that can somehow pertain to climate change, e.g. a ski trip. You might also want to talk about how offsetting the school's entire carbon footprint could be done tomorrow at a cost lower than they probably expect (Middlebury's would cost about \$300,000 annually with our current footprint, which may seem like a relatively small amount) but that the real point is to use carbon neutrality as a multi-faceted tool whereby we can actually reduce our emissions significantly and learn as much as possible in the process.

Feel free to get in touch! ~ Emily
eqwhee@middlebury.edu

Space heating and cooling, including domestic hot water heating, is responsible for about 80.2% of Middlebury College's carbon footprint (25,507 MTCDE). The college uses approximately 2,000,000 gallons of residual oil #6 per year, emitting CO₂ at a rate of 25.22 pounds per gallon combusted—that's 50,440,000 pounds of CO₂ per year—making it our largest greenhouse gas emitting activity. In addition to #6 oil, the annual burning of 150,000-175,000 gallons of B20 oil—20% biodiesel, 80% distillate oil #2—and other fuel sources like natural gas and propane make up the College's heating and cooling fuel portfolio. In pursuing carbon neutrality, we must tackle this primary component of our total emissions.

The College has already taken admirable steps towards reducing its heating and cooling footprint. The \$11 million biomass burner will reduce carbon emissions by nearly 12,500 tonnes per year, cutting the College's residual oil #6 use from 2 million to 1 million gallons. The College has made other significant improvements to the heating and cooling footprint by replacing virtually all of its distillate #2 oil use with B20; by lowering the set point for the heating systems from 70°F to 68°F; and by installing low-flow showerheads and valve setting in the residence halls. Nevertheless, there are still many ways to improve energy use on campus

Fuel Use

Biodiesel and #6 Oil: Replacing #6 oil with biodiesel reduces the amount of CO₂ emitted by 20.83 pounds per gallon. The Vermont Department of Buildings and General Services (BGS) conducted emissions testing of biodiesel blends with #6 oil in February 2006, and found that “biodiesel mixes readily with #6 fuel oil, ... [that] blends of biodiesel and #6 fuel oil burn without modification to either boiler or burner, ... [and that blends result in] easier measurement of fuel in tanks, easier routine cleaning of the burners and strainers, lower emissions, lower demand for imported oil, and reduction of fossil CO₂ emitted.”²⁵ Investigating the supply and testing the efficiency of biodiesel blends with #6 oil at the College could yield a cleaner energy option than straight #6 oil.

Biodiesel and #2 Oil: The College currently uses B20 in almost all buildings—use of pure #2 oil cannot be further reduced. The College can, however, design trials to test the effectiveness of increasing the biodiesel content in #2 oil blends. Last winter, the Vermont Biodiesel Association sponsored a trial comparing pure #2 oil, B5, B10 and B20 at different campus locations. We recommend a trial of

higher biodiesel contents to determine the maximum fossil fuel displacement by adopting this cleaner fuel source. Michael Moser, the Assistant Director of Facilities Services, Central Heating/Utilities has stated that he is excited to work with students as early as this spring to design trials for the two aforementioned projects.

Future Biomass Usage: If the biomass project successfully meets its projected portion of the college's energy needs, and both a feasible location and sufficient supply of biomass are available, then installing a second biomass burner to replace our remaining #6 oil use, or increasing the amount of biomass burned would significantly shrink the footprint. Students have also expressed interest in investigating the potential of an algae photobioreactor, which could create a biofuel source and displace fossil fuels.

Infrastructure and Building Envelopes

Pipe Replacement: Fuel is burned to create steam that passes through a turbine and then transferred to campus buildings through pipes, which leak about 35% of the energy. Increasing the rate at which the College is currently replacing these pipes would improve the efficiency of transferring steam, thereby wasting less energy.

Monitoring and Control Systems: Inefficiencies in building infrastructure lead to much wasted energy, too. Room temperature set at 68°F is monitored at the Service Building using a master control linked to sensors located in each building. The ability to fine-tune room temperature is impeded by the small quantity of sensors per building—Starr Hall has only four sensors to monitor the entire dormitory. Installing more sensors in each building, ideally one in each room as is planned for the Starr-Axinn project, would allow for closer monitoring of temperature and prevent unnecessary heating. Variable speed drives (VSD) would increase the amount of control over heat distribution while reducing the amount of electricity expended. These installations could occur while the buildings are in use.

Facilities Services is currently seeking a fast solution to the growing pressure for cooling systems from the Language Schools, especially residents of the upper floors of dormitories. Investing in a high quality, centrally controlled air-conditioning system would allow Facilities Services to regulate cooling related energy use in campus buildings.

Building Envelopes: The efficiency of a building is determined in part by the quality of its envelope, defined as that which mediates between exterior environmental conditions and interior environmental conditions, including insulation, windows, doors and seals.⁷ The Master Planners have conducted an energy audit through EarthTech, examining 40 buildings totaling about 1.75 million square feet of campus space in order to identify buildings that have insufficient envelopes and wasting energy. Using this audit as a diagnostic tool, the College can decrease the amount of wasted energy by targeting those buildings most in need of retrofitting.

Future Construction and Renovation: Energy efficiency and consequent emissions reduction are essential components of the initial design and planning phases of new construction and renovation projects. For instance, the College should assess the impact upon the carbon footprint of the estimated 250,000 square feet called for by the Master Planners and further discussed in the Architecture and Planning chapter. Lastly, each building renovation should concurrently include all necessary efficiency improvements.

The Inside Scoop: (Billie)

Heating and cooling will inevitably be responsible for a substantial portion of your college's carbon footprint—at Middlebury it accounts for 80.2% of our total emissions. Because of the magnitude of its impact, you will need to carefully consider this section when you draft your plan. Though heating and cooling is not as sexy as other components of carbon neutrality, researching the ways in which your college uses energy to create its interior climate can be very interesting. As you read the heating and cooling section of our proposal, it is important to remember that it pertains to Middlebury College's heating and cooling-related emissions. Colleges fulfill their heating and cooling needs in a variety of ways and may therefore need to address these processes differently than we have done here. That being said, my experiences with the research and drafting process for our carbon neutrality plan should be helpful to you when attempting the same feat.

I knew very little about heating and cooling processes at Middlebury when I chose this as my section of our proposal to research and write. I saw this project as an opportunity to gain a thorough understanding of a large portion of my college's energy use, and to suggest changes that would result in a significant reduction in carbon emissions. Not having a wealth of information with which to write my section, I outlined a research process asking three questions: where are we now, where are we going, and where do we need to go? I also compiled a list of important individuals, including the Energy and Engineering Manager, the Assistant Director of Facilities Services, Central Heating/Utilities, and a representative of Earth Tech, with whom I would need to meet to discuss the project and to receive their input.

In the "where are we now?" research phase, I wanted to learn about the College's heating and cooling processes, their efficiency, and the related emissions. A brief summary of these findings is included in the introduction to this section in the proposal. I also wanted to identify other important factors that affect the efficiency of these processes in order to reduce emissions by increasing energy efficiency and reducing energy displacement.

Architecture, more specifically the quality of building envelopes, is directly related to the amount of energy wasted by that building, and therefore to carbon emissions. Because there was already a section of the proposal devoted to architecture, I decided to emphasize its importance to heating and cooling in this section and leave the bulk of the architectural projects to their section. Some overlap between sections is helpful because it reinforces points, but too much of it becomes tedious for readers. Most of the information I needed was available on the College's website, but I met with Assistant Director of Facilities Service, Central Heating/Utilities Mike Moser to deepen my understanding of what I had read.

I pursued answers to the "where are we going?" question in order to verse myself in the reductions measures already underway at Middlebury and in approved projects that will further reduce our emissions. This step is important because it reduces the chances that you will repeat someone else's work. We spent a great deal of time communicating with various faculty and staff at the College in order to fully understand the context in which we were working because we did not want to miss the mark with our proposal. Though time intensive, this research helped me to identify the pertinent points to make in this section. I found much of this information on the College website as well, but learned more through meetings with faculty and staff.

The "where do we need to go?" question is the meat and potatoes of the document—these are the projects that we are suggesting to the Board of Trustees as a means by which to achieve carbon neutrality. I considered potential projects in terms of their impact on our carbon footprint primarily, and their additional benefits and costs secondarily. The ultimate goal of our proposal is carbon neutrality, which should therefore be the focus of all suggested projects regardless of other factors. After selecting the carbon-emitting activities that I thought could be reduced, I met with Mike Moser again and with Energy and Engineering Manager George McPhail and EarthTech representative Ray Portfilio to hear their thoughts on the topic. It is essential that the individuals whose jobs pertain to heating and cooling at the College and who will implement changes to these processes be involved

in the process of drafting the proposal. Their input strengthened this section of the proposal by lending their expertise and support for our project. I also researched projects at other institutions that might be applicable to Middlebury.

After spending about a month researching heating and cooling at Middlebury, I began the arduous process of compiling pages of information from numerous sources and individuals into a one-page document. I organized my project suggestions into the two categories of fuel sources and infrastructure and building envelopes, limiting each project to a brief paragraph. We decided to keep the proposal short in order to increase the likelihood that the trustees would read it. Though it was difficult to write so little about projects and ideas for which we had loads of information, the end result was practical for the purpose of selling the trustees on the idea.

I was fortunate to have the work of other students and the support of the individuals involved in heating and cooling at the College, but this will not be everyone's experience. A greenhouse gas inventory is essential to achieving carbon neutrality because it tells you what exactly you are trying to neutralize. We had that thanks to Jason Kowalski (Peaches). Another potential barrier is resistance from college staff who might not want to go through the hassle of changing fuel sources and altering heating and cooling processes. Carbon neutrality by any means other than buying offsets alone will mean time, effort, and money, which will be deterrents for some individuals. For this reason, it is essential that you meet with the appropriate people to discuss your project and its importance in order to gain their support. Aside from the obvious environmental benefit of neutralizing your college's carbon emissions, carbon neutrality presents numerous additional benefits like educational opportunities and marketing image that will make it appealing to a wider range of people.

Good luck! Contact me with any questions you might have: bborden@middlebury.edu

Electricity at the College accounts for 3.2% of our carbon footprint (1,032 MTCDE). This small percentage is due to the fact that most power in Vermont is derived from the hydroelectric generation of Hydro-Quebec and the nuclear generation of Vermont Yankee Nuclear Power Corporation. The College is generating 15-25% of its electricity through cogeneration at the campus heating plant.

While electricity currently comprises a small percentage of our carbon footprint, the future is uncertain. Vermont Yankee is set to decommission in 2012. Vermont's contract with Hydro-Quebec ends the same year; if the state renews the contract, the cost of power is likely to rise. In pursuing carbon neutrality and seeking the most cost-effective options the College must be prepared for upcoming changes in electricity sources.

Lighting Systems: The College has already made great strides in electrical efficiency. For example, most light bulbs on campus are energy-saving compact fluorescents. The student-run CFL Exchange Program launched in 2005 has replaced 2,300 incandescent bulbs with CFLs in dormitories. Each semester, a competition called the Inter-Commons Initiative to Consume Less Energy (ICICLE) encourages students to reduce their electricity use.

Major electricity renovations are not currently cost-effective. However, lighting accounts for 30-50% a building's carbon footprint. The best plan to further electrical efficiency entails updating lighting systems during future building retrofitting. Occupancy sensors, for example, could save energy in hallways and spaces that do not see constant traffic. Ultimately, however, electricity-related energy savings are largely contingent upon individual behavior. Educating college community members on the importance of shutting off lights and computers, for instance, can reduce wasted energy.

Hydroelectricity Downtown: Electricity production through a local hydroelectric project is now an option for the College. Where there were previously 1,000 dams for electricity in use during Vermont's industrial age, there are now only 106. Middlebury harbors one of these sites near the old mill on Otter Creek. The owner of the building, Dr. Anders Holm, has recently determined that installing a hydro plant at this location could yield one megawatt—enough to provide up to half of the College's electricity needs.

Vermont's complex permit application process has made it difficult for the project to get off the ground. However, Vermont H.70 is currently before the state legislature to streamline the permitting process for small

hydroelectric plants, reducing the fee from \$250,000-\$500,000 to just \$5,000. The College is in a unique position to aid in funding this clean electricity project.

Facing an upfront cost of \$4 million, Dr. Holm needs help launching this clean energy project. If the College were to become an equity partner, it would not only be receiving clean, locally-generated electricity, but it would also ensure a consistent electricity price for the duration of the contract. Central Vermont Public Service would only be willing to pay 8 cents per kWh for the power which does not make the project economically feasible. A price of 9.8 cents per kWh is what the College currently pays for power and could pay to make the project a viable one, meanwhile gaining the benefit of fuel diversification in a potentially volatile energy market.

A small-scale "run of the river" hydroelectric plant such as this does not carry with it much of the concerns regarding larger hydro plants. This plant would not change the flow of the main falls. Indeed, the infrastructure for turbine installation already exists. Furthermore, new turbine technology has filters and chutes to minimize harm to fish, and because of the modest use of water flow, the falls will continue to aerate the water, providing dissolved oxygen for aquatic life. Lastly, sophisticated monitor controls can change the water flow during dry months.

Future Electricity in Vermont: With the future of Vermont Yankee and Hydro-Quebec no longer certain, Vermont faces major electricity generation decisions. Without these plants, it is likely that a new coal power plant will be installed to meet the state's power needs. Coal power plants are a large operation requiring millions of tons of coal to be imported every year and ash to be exported, meanwhile emitting large amounts of carbon dioxide, sulfur dioxide and nitrogen dioxide, the main compounds responsible for acid rain.

The College is in a position to be a role model in keeping Vermont's energy portfolio clean. Future study on other sources of power such as solar and wind should also be conducted. Indeed, the College already boasts its own small 10-kW wind turbine. Currently, the government is subsidizing solar water heating systems. The coming years should also see a decrease in the cost of solar power. Feasibility studies would provide excellent opportunities for student-driven independent study.

Despite the small percentage of the carbon footprint that electricity currently comprises, the College must acknowledge impending changes in electricity sources and prices. As a long-lasting institution, the College should continue to look for ways to diversify its energy portfolio.

The Inside Scoop: (Clayton)

There are two things to consider when reducing your electricity emissions. The first is reduction and second is production. It helps to get a very good idea of where you are at before you begin. Where does your power come from? Middlebury was in a position to benefit from two major sources of electricity that were already carbon neutral (despite the other challenges and issues that come with nuclear and hydroelectric power). This may not be the case in your situation. So you have to make sure you have all the facts in front of you before you can make any decisions.

Reduction

Check to see if your college has recently completed an energy audit or if they are planning on doing so. This should give you a good idea of where your college is at and where it can go to be more efficient.

The biggest problem with reducing electricity use is that it is so dependent on individual behavior. If the students and staff on your campus do not turn off the lights in rooms when they leave them, then you need to educate them to do so. Make sure students know to switch their computers to power save mode when they are not using them. This is probably the hardest task. Technology like occupancy sensors can help you overcome some of this difficulty.

It is important that you stress the importance of installing new technology when buildings are being retrofitted. All bulbs on campus should be energy efficient. Come up with a plan to swap out students' old incandescent light bulbs for new halogen ones. This can be a student run organization. When buildings are being updated, push for new technologies to increase energy efficiency.

There are big savings to be made by saving energy. You should remember this when trying to convince anyone about your decision. Money talks and numbers about how much money can be saved are very important.

Production

Individual students can really take the next step in this area. Colleges love the idea of having students do research on projects that can save them money. It's free for them and great experience for you. Our biomass plant here at Middlebury is the result of a student's independent research project. One of the most important things I learned from our manager of facilities here at Middlebury is the importance of data and facts. If you can prove that solar panels, for example, are a good investment for your school, it can happen. However, decisions can not be made without data and facts. Talk to the facilities staff at your school and see what is possible.

Go Get Em!
Clayton,
cpaulreed@gmail.com

Transportation makes up 14.3% of the College's carbon footprint and includes college fleet use, employee commuting, and outsourced travel. Middlebury demonstrated a commitment to developing sustainable transportation options and reducing reliance on personal vehicles through its Strategic Plan of 2006. The College has taken the lead in purchasing fuel efficient vehicles and using biodiesel in its fleet. Transportation is a complicated sector; therefore, we follow the aforementioned World Resources Institute three scope model used in Jason Kowalski's emissions inventory.

Scope 1 – Direct Mobile Emissions: This scope includes emissions from all fuel burned in vehicles owned or controlled by the College. In FY 2005-2006, the college fleet emitted a total of 345 MTCDE from diesel and gasoline fuel consumption, accounting for 1.1% of the college footprint.

Purchasing Policy for College Fleet: Recent 'green' transportation purchases include a new Honda Civic Hybrid as a rental vehicle, an Escape Hybrid for Public Safety, and fuel efficient "mini-trucks" for intra-campus deliveries. While the college fleet accounts for a small percentage of total emissions, it is a highly visible component of our footprint, with Middlebury College written on our vans and trucks. As discussed in the Strategic Plan, a policy for purchasing the most fuel efficient vehicles will demonstrate the College's commitment to sustainable transportation to faculty, staff, students and the outside world. While hybrid and diesel vehicles still have higher initial costs than conventional vehicles, there are significant financial savings from less fuel use and fuel diversification.

More Biodiesel Use in the College Fleet: While the College has begun using biodiesel blends to reduce carbon emissions, such blends currently accounts for only 1.3% of all fuel burned in diesel vehicles. In FY 05-06, diesel vehicles burned 200 gallons of B5 and 500 gallons of B20. Facilities Services hopes to use B20 in all college vehicles as soon as possible, as long as warranties apply and biodiesel can be properly stored on-site.

We recommend supporting Facilities Services with the necessary funding and institutional backing to overcome costs and infrastructural challenges to achieve this goal of using B20 in all campus vehicles. As discussed under Heating and Cooling, we also recommend experimentation with higher blends of biodiesel (such as B50 or B100) through encouraging student research in collaboration with Facilities Services and our fuel distributor, Champlain Valley Heating and Plumbing.

Scope 3 – Indirect Emissions

Outsourced Travel: Outsourced travel includes emissions from fossil fuels combusted in vehicles not owned by the College, but whose services are directly solicited from College operations, such as air travel, car rentals and bus charters for Admissions, sports, College Advancement and conference travel. In FY 05-06, outsourced travel accounted for 6.8% of total college emissions. Several departments, sports teams and student organizations currently offset their travel but this accounts for minimal and is not well documented.

Substituting or significantly reducing emissions from outsourced travel is very difficult. As discussed further under the Offset chapter, we therefore recommend offsetting this sector by the next fiscal year.

Employee Commuting: Last year, college employees drove 4.5 million cumulative miles to work, accounting for 6.4% of the College's carbon footprint. The College currently supports the only public transportation in the area, Addison County Transit Resources (ACTR). Only 1% of the College's 1,500 employees use the ACTR shuttle on a regular basis. According to the Human Resources department, little is being done to facilitate ridesharing and use of clean transportation. An on-line survey conducted this year (20% response rate) demonstrates that 85% of Middlebury employees commute alone to work in personal cars, while 15% regularly commute by walking, biking, carpooling, or the ACTR shuttle.

Reducing emissions from personal travel is a significant challenge as it relates to individual behavior and requires a wide range of convenient and flexible strategies. As the Strategic Plan recommends the College to minimize its reliance on private vehicles, we suggest a comprehensive, flexible, and well-funded program that encourages employee commuting via walking, biking, carpooling, and the ACTR shuttle. Such a strategy not only reduces emissions but also eases local congestion, while improving town relations and providing cheaper and healthier commuting options.

Based on survey responses, a large majority of employees would leave their car at home if there were financial incentives (64%) or if alternative modes of transportation were more convenient (56%). We propose an array of strategies, including a ride-share program; financial incentives for not driving alone to work; free passes for shuttles to Rutland and Burlington; ZipCars or some car-sharing service for commuter's use; more affordable housing closer to the College; and better bike facilities.

Future Considerations – Student Travel: For a variety of reasons, emissions related to student travel are not currently in the greenhouse gas inventory. Because it is a highly visible source of emissions, the College should consider including parts of student travel in the future. This is also a significant educational opportunity. The College should consider such strategies as a student parking fee which could help finance other carbon reduction projects such as offering financial incentives to employee commuters (see Financing). Additionally, the College should work to improve student ride-sharing and increase access to public transportation.

Models to Consider: Comprehensive transportation strategies at other schools can serve as models for Middlebury College. For example, Cornell University raised parking fees, gave free public transport passes to anyone who does not use a parking pass, and integrated the school's transit system with that of the city, cutting emissions significantly and saving \$36 million. At Cornell, 36% of employees commute by means other than driving alone.

Stanford University offers a well-supported, flexible “Commute Club” that rewards club members with up to \$216 per year for not commuting alone. The program is open to employees and students and offers financial incentives coupled with free transit passes, a guaranteed ride home program for emergencies, rental cars, and easily accessible on-line references about a variety of alternative transportation.

The Tufts Climate Initiative aids departments in purchasing vehicles of zero or near-zero emissions and currently leases two electric vehicles for on-campus deliveries, as well as ZipCars for employee and student use.

Nearly all of Middlebury's peer schools charge parking fees for students and/or ban freshman cars. Parking fees range from \$25 at Bowdoin to \$135 at Wellesley. Vermont Law School will soon institute a parking fee and use the revenue to provide incentives for employees who decline a parking pass and commute via alternative transportation.

The Inside Scoop: (Kelly)

Researching and writing the transportation section of MiddShift's plan, I quickly learned that eliminating emissions from transportation is one of the more complicated aspects of becoming carbon neutral. Drawing a line around an institution's transportation footprint can be difficult because it involves many more sources and individual decision makers than something like heating and cooling. Because of this challenge, a holistic approach will be necessary to push your university to green its fleets, offset its associated travel, and take many other measures to reduce transportation emissions.

My first step was to determine what made up our transportation footprint. I ended up using Jason's greenhouse gas inventory definition of transportation emissions, which includes employee commuting, emissions from college-owned vehicles, and outsourced travel like airline travel, as I outlined in the document. For a while, I wrestled with the inclusion or exclusion of student travel, as it is a highly visible part of our footprint and something that people take as a signal of student commitment to the issue. In fact, we received a few questions about student driving and the potential for a student parking fee (which we do not yet have) during our meeting with the trustees. You'll have to come to a consensus amongst your group to figure out at your school where the line should be drawn between institutional responsibility and personal footprints. At Middlebury, this line has currently been defined by excluding student travel and claiming that student driving to go to town or hiking or skiing, is a personal issue. In the future, we hope to try to draw a line around some student travel that is directly related to College operations, such as each student's trip to and from home.

Ultimately, I worked from our existing greenhouse gas footprint, which includes college fleet use, employee commuting, and outsourced travel, and excludes student travel. With our college fleet, I started by looking at how much it emitted (not much!) and then figured out what we were already doing to reduce emissions (some biodiesel use). Using our greenhouse gas inventory and meeting with our head of facilities, I was able to figure out

what the current state of biodiesel and alternative vehicle use was on campus.

Employee commuting makes up a much larger percentage of our footprint, and I quickly found that there was little information about it, and little being done about it. In our footprint, the assumption had been made that each employee commutes alone each day. Because there was so little information, I did an on-line survey (using www.surveymonkey.com) to faculty and staff about how they commute to work and how they might respond to different initiatives, such as a financial incentive to carpool. I had a great response rate, interesting answers to some of the questions, and great anecdotal advice/evidence to support instituting some of the solutions laid out in our plan.

For outsourced travel, we pretty much just realized there wasn't much we could do about it. We aren't going to keep our sports teams from traveling to their games or to keep our faculty from going to conferences. This was the one area where we ultimately decided that immediate carbon offsets made sense, to show institutional commitment.

Going carbon neutral in the transportation sector requires a holistic and multi-pronged approach to chip away at all the little pieces. Your school's transportation footprint likely looks much different from ours, so you'll need to create your own catalog of strategies to reduce emissions. Here is a list of strategies to try compiled from a great session with students from many schools at the Carbon Neutrality Summit in January:

College Fleet
<ul style="list-style-type: none"> ▪ Create purchasing policy for college-owned vehicles ▪ Biodiesel of various blends in college-owned vehicles ▪ No-idling policy ▪ Encouraging slow driving (esp. for hybrids)
Employee Commuting
<ul style="list-style-type: none"> ▪ Well-supported, flexible 'alternative commuting' ▪ Free public transportation passes ▪ Financial incentives to leave car at home ▪ Encourage/allow telecommuting ▪ Available zip cars/ "guaranteed ride home" ▪ Locker rooms/showers/proper storage for bicyclists ▪ Availability of affordable faculty/staff housing near campus
Student Travel
<ul style="list-style-type: none"> ▪ Student parking fee ▪ Parking ban for freshman and sophomore cars ▪ Grassroots initiative to get students to calculate their own transportation footprint and offset it ▪ Use funds collected from student parking fee
Outsourced Travel
<ul style="list-style-type: none"> ▪ Offset emissions largely out of college's control (i.e. airline emissions) ASAP ▪ Encourage telecommuting and video conferencing ▪ Reduce short haul air travel

Resources:

Sources:

- AASHE President's Climate Commitment <http://www.aashe.org/presidentsclimatecommitment.php>.
- Chapter 5 of Middlebury's Strategic Plan: Campus, Infrastructure, and Environment http://www.middlebury.edu/administration/planning/final_plan/chapter_five.htm.
- Campus Fleet Emissions Reductions. <http://www.cleanair-coolplanet.org/toolkit/content/blogsection/36/94/>.
- U.S. EPA Fuel Economy- www.fueleconomy.gov
- U.S. EPA Commuter Choice- www.commuterchoice.gov
- Isham, et al. Carbon Neutrality at Middlebury College, February 2003 http://community.middlebury.edu/~cneutral/es010_report.pdf.
- Transportation Services at Emory University <http://www.epcs.emory.edu/alttransp/index.html>
- Stanford University's Commute Club http://transportation.stanford.edu/alt_transportation/Commute_Club.shtml.
- Tufts Climate Initiative. <http://www.tufts.edu/tie/tci/Transportation.htm>.
- Cornell Commuter and Parking Services. http://www.parking.cornell.edu/tms3_faculty.html.

People I talked to:

- Mike Moser, Assistant Director of Facilities Services at Middlebury College
- Tom Corbin, Assistant Treasurer and Director of Business Services at Middlebury College
- Drew Macan, Director of Human Resources at Middlebury College
- Jason Kowalski '07

Thanks for reading! Feel free to contact me with any questions-- Kelly Blynn, kmblynn@gmail.com

Solid waste accounts for 0.8% of the College's carbon footprint (244 MTCDE). Middlebury already neutralizes much of its waste-related emissions by processing 60% of its solid waste through its state-of-the-art composting and recycling facilities. The remaining 40% of waste is left to decompose in landfills, contributing to our carbon footprint through the methane and carbon dioxide generated during decomposition. Such emissions can be captured with readily available technology that the College should implement. Additionally, in a nation where each person creates about one million pounds of waste every year, it is essential to impress the values of waste reduction upon faculty, staff and students. In order to achieve these goals, we recommend the following policies and projects.

Environmentally Sound Purchasing Policy: As the purchasing departments at the College are decentralized, the College should create an online resource to guide individual departments towards environmentally sound purchasing options. The site would include numerous sustainable options for general products bought by the College, and direct links to suppliers. A student could easily undertake this, following the lead of similar projects at Harvard and Duke. The reusable and long-lasting attributes of sustainable products will compensate for their greater initial cost through reductions in landfill fees while reducing emissions.

Waste Reduction Fund: All members of the college community have a responsibility for their waste. Employee and student initiatives should continue to be promoted through a competitive fund modeled after the Environmental Council Grants or the Treehouse Fund. Prior student awareness campaigns have succeeded in diminishing wasteful behavior. One such campaign weighed each student's food waste as they left the dining hall. Director of Dining Services Matthew Biette observed a 'significant reduction' of food waste within a week of the event. MiddShift is working to repeat this initiative.

Melissa Beckwith, Supervisor of Waste Management, will soon launch a pilot waste reduction competition among staff. Future projects could include a waste reduction inter-dorm competition modeled on current energy reduction competitions, a mandatory teach-in at the recycling centre during Freshman Orientation, and the establishment of Eco-Reps in every dorm. Furthermore, the College needs adequate recycling signage across the campus to target areas where the recycling infrastructure is currently underutilized.

Landfill Gas to Energy Project: Unfortunately, the College cannot entirely eliminate its waste. Once waste leaves the College, it enters the landfill and emits methane, a potent greenhouse gas. Landfill Gas to Energy (LFGTE) projects sequester and combust this methane in order to produce electricity (which is then sold back into the grid) and co-generate thermal energy. Although a quarter of all Vermont landfills have LFGTE technology, out-of-district fees make it ineffective to utilize them.

The College should invest in LFGTE technology at a local landfill and negotiate for at least half of the carbon offsets and half of the electricity-related profits. Tom Badowski, Vice President of the Moretown landfill, plans to start an LFGTE project at his landfill in 2007 and would welcome Middlebury College as a partner in the project.

A student-generated cost-benefit analysis in 2003 determined the total cost of this project to be \$50,000 to \$80,000. Given a negotiation to obtain half of the offsets and half of the revenues, the project would pay for itself within 3.4 years and earn the College 6,250 tonnes of carbon offsets per year, at a price of \$2.50 per MTCDE. Since 2003, the landfill has grown substantially. In order to pursue this option, the current details of the project need to be discussed with the representatives of the landfill, and student independent study ought to reevaluate the economic feasibility of it.

Models from other schools can serve as an impetus for this process. In April 2004, Hudson Valley Community College invested in an \$8.5 million LFGTE project at a neighboring landfill which has a payback period of less than fifteen years and will continue to save the College money on electricity bills. Additionally, New York State funded \$2.5 million of the project and the College is no longer subjected to wavering price levels from the electric grid.

The Inside Scoop: (Tizzy)

Waste is not so much of numerical significance to carbon neutrality as it is of symbolic and educational significance. At Middlebury, waste currently represents only 0.8% of our inventory. Nationwide, this figure is 3.1%, and this includes landfill, wastewater treatment and human sewage emissions¹. With this percentage, waste is likely to take the backseat in carbon reductions. However, you should consider taking advantage of the obnoxious nature of solid waste pollution. Do you interact with all that carbon floating around? How about when you compost, recycle and reuse all that stuff? Some say that experience is the best teacher. If that is so, solid waste reduction requires behavioral change, and in that, it furthers the ethos of carbon neutrality.

If I were to start all over again, this is what I would do. First, I would spend some time getting familiar with the topic. 'Garbage Land' by Elizabeth Royte gives an entertaining overview of the topic. EPA's solid waste webpage² has plenty of case studies and up-to-date information on technological possibilities around the country. It also explains the link between climate change and solid waste, and offers lots of solutions and examples. For further information on the articles and books that were helpful to me, check the references at the end of our document.

Then, I would take a close look at the waste-related emissions of your college's greenhouse gas inventory. The model used to obtain these calculations will shape how upstream or downstream your college's waste stream adds to the footprint. You should concentrate your efforts on those processes that add to the footprint. I got bogged down by the quantity of the elements that add to our waste and the complexity of reducing them all. Luckily for you, carbon inventories can be quite exclusive; much of the solid waste that I was trying to deal with didn't even count towards our footprint. For example, the emissions associated with carting our trash to the landfill are counted in

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<http://www.epa.gov/climatechange/emissions/usinventoryreport.html>

² <http://epa.gov/climatechange/wywd/waste/index.html>

the footprint of the company that we employ to the task, not ours. And yet, the methane and carbon emissions from our land-filled waste count towards our footprint, not that of the landfill. Anything that gets recycled or composted is considered carbon-free. Sewage and waste water treatment emissions can count, or not. Save yourself some time and pour over the inventory.

Now that you have a clear idea of the problem areas, I would contact your institution's Waste Management Supervisor. Most likely, there will be such a staff member in your institution's Custodial Team. Not only will they give you the current details of the process and destination of your waste stream, but they are likely to be informed of the waste-management solutions particular to your region. For example, rummaging on the EPA website, I discovered that some nearby Vermont landfills possess the technology to capture landfill emissions. Given that all of Middlebury's waste-related emissions come from the landfill, I could have suggested that we neutralize our emissions by sending our waste there. The supervisor squelched the idea by informing me of prohibitive out-of-district land-filling fees. You should also keep in mind that waste-management is never pleasant. Waste-management staff can be more enthusiastic about the landfill than about diversion techniques such as recycling and composting, which require greater procedural complexity and closer contact to the waste. In any case, waste management professionals are guaranteed to save you time and give you good ideas.

Other professionals that may be helpful to you are the local landfill authorities, electric utilities, manufacturers of gas-turbine technology, your college's Purchasing Department (and if purchasing is decentralized, contact the staff in charge of purchasing the main items that end up in the landfill), and sustainability coordinator.

As a group, we determined that precedent, especially from other educational institutions, would be a strong prop for our recommendations. In any case, I recommend looking at other schools for inspiration. A comprehensive environmental purchasing policy as a waste reduction measure had not occurred to me until I snooped around

Harvard's website. I also came across many initiatives focused on achieving behavioral change from the college community. This is when it hit me that our carbon neutrality goal should be pursued through a whole-systems approach. Technological fixes such as a "Landfill Gas to Energy" (LFGTE) projects to capture carbon emissions at the landfill aren't enough. Carbon neutrality at a college can be a residential, social and academic experience. Integral to this is an awareness, concern and action towards the refuse created by our lifestyle.

I hope that this has been helpful and good luck!

Sincerely,

Tiziana "Tizzy" Dominguez, Middlebury 09'

PS: feel free to contact me with any questions or comments at tdomingu@middlebury.edu.

Future green building at the College presents a key opportunity to ensure long-term energy efficiency and financial savings in fuel expenditures as well as create a more productive and meaningful built environment for faculty, staff, students and community members. New buildings should not only embody the institution's values but also address the global imperative of reducing carbon emissions and safeguarding the natural environment.

Although maximizing energy efficiency has been a goal in recent building projects, no institutional standards have been followed to ensure an appropriate level of efficiency. Because efficiency measures are not properly prioritized, unforeseen budgetary constraints result in their exclusion. For example, the rising price of copper forced many efficiency measures, particularly regarding heating and cooling, to be cut from final construction of the Starr-Axinn project. Fortunately, the new Hillcrest Environmental Center has maintained higher efficiency measures because of the department's focus. However, environmental stewardship is not only a goal of the Environmental Studies program, but also of the College itself—a goal that building practices must reflect.

The College currently stands at a crossroads in terms of campus development. With a lull in future building plans and the drafting of a Master Plan by Michael Dennis & Associates, the College has a prime opportunity to set any new building on a greener course. Proposed goals such as the expansion of the arts facility as well as the completion of the Commons System—requiring roughly 250,000 new square feet—could easily expand the carbon footprint, but proper planning can avoid this issue.

Internal Efficiency Guidelines:

At a minimum, the College must commit to specific and strict efficiency guidelines for new buildings to which architects and engineers will be held accountable from the start of the planning process. These guidelines could be developed in the classroom in a joint student and faculty effort. Thus, efficiency measures will be incorporated into budget constraints from a project's inception. As the client, Middlebury must take a leadership role in monitoring and accountability, ensuring that such guidelines are continually prioritized. Furthermore, with detailed tracking of efficiency through energy modeling and post-compliance commissioning, the exact carbon footprint of each new building can be tracked and accounted for continuously.

By establishing such comprehensive guidelines, green buildings need not come at a premium cost. Furthermore, the College may opt to enter into an Energy Saving Performance Contract (as detailed under Finance), which

ensures such standards throughout the entire planning and building processes without initial capital costs.

LEED Standards: Energy efficiency is only one component of green building. The U.S. Green Building Council has established a point-based framework for the construction and certification of green buildings called the Leadership in Energy and Environmental Design (LEED), which has quickly become a national standard. By certifying future buildings through LEED, the College will not only ensure the green qualities of its buildings, but it also outfits itself with a powerful marketing tool to attract future students for whom sustainability and environmental stewardship is a major concern.

We recommend that Middlebury College commits to certifying all future buildings to a minimum Silver certification through LEED, as do other competitive schools such as Harvard, Duke and Emory as well as all University of California campuses. Although LEED certification does entail the additional costs of consulting and processing fees, we believe that the benefits such as increased human productivity within such buildings, admissions marketability and other collateral benefits of energy efficiency vastly outweigh these costs.

The Architecture Program: Green building—whether LEED certified or abiding by internally established guidelines—will be an important educational tool for students of the College's architecture program, particularly as the demand for LEED certified architects and engineers grows. Students can take an active, hands-on role in guideline development and building processes, thereby gaining valuable professional experience on campus. Student excitement for such work is demonstrated by a recently added Environmental Studies concentration: Architecture and the Environment. Adopting future green building standards clearly provides a host of benefits to the College, both within and beyond the classroom.

The Inside Scoop: (Will)

Building and Planning is an interesting and critical part of any carbon neutrality process because, as of the present, there are no emissions but at the same time it is one of the most pertinent because it is an exciting opportunity for your school to “get things right” the first time. It seems that you walk around any campus in America and you see some sort of construction. Expansion is a given. It is our job to make sure that that campus building is done in a conscious manner. When most of our college buildings were built there was an abundance of cheap fossil fuels to heat them and no knowledge of the true dangers of global warming. Buildings were nothing but machines for internal use and with some aesthetic touches. This has led to huge inefficiencies. In the U.S., buildings contribute to 48% of total emissions. With each new building we have an opportunity to do better, to minimize the future footprints of our campuses. Green building will be the future of development and institutions of higher education must take a leadership role for the rest of society to follow.

I have always been interested in building and architecture; however, when I chose to take on this section I quickly realized that I had much to learn. I started with the basics, asking the question: how do buildings work? Luckily I found a book entitled *How Buildings Work*. By gaining basic knowledge about the inner-workings of buildings I felt like I was better prepared to understand new efficiency technologies so from there I researched the way “green” buildings work by reviewing the exploding amount of literature on the subject. This allowed me to be caught up to speed on “what’s new” in the industry. All this preliminary research made me comfortable enough to start talking to professionals and have them actually respect me and listen to what I have to say. This background knowledge proved invaluable for asking the right questions when meeting with important people (For links and important articles I read, see the bibliography of the Architecture and Planning Section at the end of the MiddShift document).

Setting up the meetings with relevant buildings and grounds staff on campus was the next step but first I had to establish just who those important people

are. I didn’t know, yet I found the best way to find out was quite obvious... ask. Our internship group set up a meeting with all the key stakeholders that we had identified in the carbon neutrality process early on. At this meeting the writer of each section asked these important internal actors who they thought would be the best people to aim our questions at. For me, some of the more important answers were found with the following people: sustainability coordinator, facilities project manager, master planners, local architects, architecture professors, and town and regional planning commission members.

With a good list of people to contact I had to make sure that I was asking the right questions to get the most out of each meeting because often these people are extremely busy and not particularly interested in student movements. Some important things that I tried to get out of each meeting were: What measures have been taken in terms of the environment and energy efficiency in past construction and design? Does the school have established required standards, and if not, why not? Who are the major decision makers in the design process and how can they be convinced to change their practices if necessary? What is the hierarchy of decision makers in this process? How exactly does the design process occur? How informed are these decision makers about green building practices? If they are not choosing to pursue green building, why? Is it because they don’t know about it? What do they think about LEED certification?

After asking these questions to the given actors, I was able to understand the way the building system works at Middlebury, where the holes are, why they are there, and what can be done to fix them. For Middlebury I thought committing to a LEED silver certification would be the best possible option to ensure that all future buildings would be environmentally friendly because it minimized possible cost premiums that would scare away trustees by not committing to higher LEED standard while filling in the important gap of institutionalized standards. Middlebury has tried to create its own in-house standards for a while with little success.

The debate over LEED certification is one that you will have to decide for your school individually;

however, there are many benefits that are important outside of just energy efficiency that can be very useful in trying to convince your school to make such a commitment. LEED certification is without a doubt becoming the national standard in terms of green building. This means that the certification is a guarantee of quality that members of the community will be able to understand and recognize regardless of their background in architecture. It is already often in the news. As LEED has become such a readable icon it can easily be used for advertising campaign for funding or for prospective students. Also, as it is becoming the industry standard, having LEED certified buildings on campus is a huge asset for any architecture program that truly wishes to prepare its students for the future. Furthermore, there is considerable research that shows that productivity increases in green buildings.

These “additional” benefits are important, non-obvious aspects to remember convey to the board of trustees as they might not find savings through energy efficiency enticing enough. Also stress that green buildings need not come at price premium if integrated design is pursued (you’ll find this in the articles in the bibliography as well). The argument is simple. You can tell your trustees that green building not only costs nothing but actually save the college millions by making the school more productive, marketable, and efficient.

Of course it isn’t just that simple. I met some barriers during the process, mostly regarding LEED certification, mainly surrounding the cost of certification and the internal change that must occur. These complaints I believe were largely due to the fact that many of the important players have been doing their job their way for a long period of time, and they don’t want to change. This is understandable. However, you must be persistent with your logic and back yourself up with knowledge in order to change these minds. They will be convinced eventually but it is our role to make our schools proactive, not reactive. Good luck!

Will Martin
wmartin@middlebury.edu

No matter how many emission reduction measures an institution such as Middlebury College takes, carbon emissions are inevitable given the restraints of current technology. The voluntary offset market was thus created to enable individuals and institutions to decrease or fully neutralize emissions by investing in renewable energy and emissions reduction projects. By obtaining offsets in addition to pursuing energy efficiency and fuel reduction measures as detailed in the other chapters, the College can effectively negate its contribution to climate change while demonstrating its continued leadership in the arena of environmentally conscious education.

Various sectors of the College have already obtained offsets and achieved internal carbon neutrality, including the Snow Bowl, Middlebury Outdoor Orientation (MOO), the weekly ES Woodin Colloquium series and recent climate change-oriented conferences such as “What Works?” and “Focus the Nation.” Furthermore, families of over 30 first-year students opted to offset the students’ school year through the Environmental Affairs Office. At an institutional level, obtaining local offsets necessary to achieve carbon neutrality can not only meet the College’s educational goals, but can also directly benefit local communities.

Offset Policy: In light of the imminent threats of climate change and the need for renewable energy development, we recommend an offset policy with a three tiered commitment.

Tier 1 – ‘Irreducible’ Transportation Emissions

Deadline: FY 2007

This tier involves emissions from outsourced travel that the College cannot directly eliminate. If all outsourced travel was purchased through Bright Card (to be described fully below), 70% of the emissions would be automatically offset. The remaining emissions would cost an estimated \$4670-\$6470 to offset each year.

Tier 2 – ‘Reducible’ Transportation Emissions

Deadline: FY 2011

Emissions from sources such as the college fleet, employee commuting, and sports team travel can be reduced through clean fuel use, carpooling and use of fuel-efficient vehicles such as hybrids. Offsets to compensate for reducible emissions in 2011 would be obtained with the assumption that actual emission reductions could and ought to be pursued.

Tier 3 – Infrastructure Emissions

Deadline: FY 2016

By 2016 emission reductions for all aspects of the College infrastructure should be maximized. The offsets in

this category will therefore be minimal; when obtained, they will fully eliminate the College’s carbon footprint.

Obtaining Offsets: There are countless ways the College may pursue this offset strategy. The strongest options achieve not only the associated carbon reductions, but moreover, educational opportunities, local economic stimulation, and local fuel source diversification.

Working, for instance, with a retail offset provider such as *NativeEnergy*, of Charlotte, Vermont, the College would be the direct benefactor of a “cow-power” project that can generate both electricity and thermal energy by capturing and combusting methane, a potent greenhouse gas, from cow manure. Depending on the scope and scale of such a project, the price per ton of emissions reductions would range from \$6.50 - \$9.00. With such a purchase, the College would be the proximate cause of methane emissions reduction.

Community Partnerships: Other options for local offsets include, for instance, the installation of a biomass burner in Middlebury Union High School or the conversion of the Monument Farms fleet, which supplies the College’s milk, to biodiesel vehicles. Such offsetting partnerships between the College and local enterprises are mutually beneficial, providing educational opportunities through both project development and outreach in addition to stimulating the local economy and diversifying local fuel sources.

Bright Card: In addition to directly purchasing retail offsets, the College could obtain offsets through college credit card purchasing. Bright Planet, a company launched in a Middlebury classroom, will soon offer the Bright Card purchasing card. When used for procurement and expenses, this corporate credit card will direct 1% of the College’s purchases towards obtaining offsets on the College’s behalf. This is a drop-in replacement for existing purchasing cards, will be issued by a leading national financial institution, and will maintain all of the robust use and reporting capabilities provided by the current purchasing cards.

Using Bright Card for procurement—roughly 3% of 2007 budget expenditures—would yield a 25% reduction in the College’s current carbon footprint. While the actual card will not be available until late 2007, Bright Planet has the capability to immediately simulate the process by utilizing the returns from the ‘1% cash back’ program currently attached to the College’s credit card portfolio to purchase offsets. Ultimately, the offsets obtained in any of these strategies will be the critical step required to fully negate the College’s contribution to climate change.

The Inside Scoop: (Caitlin and Claire)

Given the constraints of today's technology, obtaining carbon offsets are a necessary component of achieving institutional carbon neutrality. However, they are also a highly debated aspect of global warming activism. Should we set a deadline to go carbon neutral and then only purchase offsets at the very end after all other fossil fuel displacement and energy conservation measures have been taken? Or should we go carbon neutral instantly by purchasing tons (literally) of offsets from the get-go and then work backwards with the financial incentive of decreasing costs each year? Or should we set a "reduce emissions by at least 10% per year over the next ten years" goal and thereby end up buying offsets incrementally?

Some of these questions were laid to rest after chatting with our faculty mentors. They pointed out that the absolute last thing the Trustees would want to do is buy all offsets up front—after all, how does writing a check (for a LOT of money) reflect the College's mission if there are no tangible effects on campus? So we knew not to push offsets from the start. And when we did propose to incorporate offsets into the overall strategy (again, they're necessary for complete carbon neutrality) they ought to be obtained in a way that best reflects the College's mission statement. Therefore, we researched the possibilities of local offsets--like farm methane digestion only a few miles from campus--and unique funding options, such as the corporate procurement card offered by Bright Planet, which directs 1% of purchases towards obtaining offsets. In checking out these options, we made contacts with representatives of offset companies like NativeEnergy (just north of Middlebury in Charlotte, VT) and Bright Planet (a company born in a Middlebury Environmental Economics class). We also talked to the College's Director of Business Services who oversees facilities and land management.

In the end, we decided to recommend a three-tiered ten year offset strategy. Tier 1 includes 'irreducible' transportation emissions, such as outsourced travel, and should be offset within a year. We chose to include offsets in the first year of the process toward carbon neutrality because we

wanted the school to demonstrate its commitment toward the goal. By investing in alternative energy, we can prove our role as leaders in the movement. Tier 2 includes 'reducible' transportation emissions, such as college fleet use, employee commuting and sports team travel, and should be offset within 5 years. We decided on an interim offset goal to facilitate the transformation of the college transportation fleet. Impending offsets would provide an incentive to quickly and efficiently lower transportation emissions. Finally, Tier 3 includes infrastructure emissions from electricity and heating and cooling and should be offset by the final carbon neutrality deadline of ten years. We saved these emissions until the end because infrastructure changes take longer than transportation changes and are also a larger section of the college's footprint.

To make the acquiring of offsets as smooth as possible, we recommended that the College use the Bright Planet card discussed above, and that local offsetting options be pursued through a partnership with an offset company like NativeEnergy. We decided that a partnership would be the most efficient use of the college's staff time since permitting and certification for offset projects is difficult to obtain.

The hardest challenge to overcome regarding offsets is to educate yourself, your allies and the Board of Trustees about the complex nature of carbon offsets. It is a difficult concept and often seems too distanced from college life to be a logical spending option. And many still think it's simply a form of buying indulgences or permissions to pollute. However, by tweaking the offset strategy and options to the goals of each school, offsets start to make more sense--and they had better because they're necessary for neutrality!

For more information on offsets, check out Clean Air – Cool Planet's Consumer Guide to Offset Providers at www.cleanair-coolplanet.org to ensure that any offsets you obtain are legit.

And for more information on our choices contact Claire Polfus (cpolfus@middlebury.edu) or Caitlin Littlefield (clittlef@middlebury.edu).

Cost Analysis



The table below provides a preliminary analysis of estimated costs, internal rates of return, carbon reductions, and costs related to offsets. The numbers are estimates based on data collected and analyzed by various faculty, staff and students who have completed relevant cost analysis research. It is important to note that some of these numbers could vary widely over the lifespan of this project, due to the unstable nature of the fossil fuel, energy and voluntary offset markets. Furthermore, other strategies such as educational programs have less financially quantifiable benefits. This table provides a starting point from which to conduct further research and prioritize these initiatives to become carbon neutral over the proposed ten year period. (See Appendix for all project costs and corresponding sources and assumptions.)

Discount Rate
9.00%
Timeframe
20 (yr)

Sector	Project	Initial Capital Investment	Annual Cost/Savings	IRR	NPV over 20 yr timeframe	MTCDE Reduced	\$/MTCDE over timeframe	Notes and Sources:
Education	Faculty and Curriculum Development Program	\$0	-\$20,000	N/A	N/A	N/A	N/A	Academic Outreach Endowment Grants offer up to \$4,000 per grant. We propose \$20,000, for up to five curriculum development grants per year. Source: Pete Ryan, Academic Outreach Endowment Grants.
	Carbon Neutrality Undergraduate Research	\$0	-\$6,000	N/A	N/A	N/A	N/A	Proposal to allot \$6,000 per year for undergraduate research grants for up to 4 large projects. Source: Senior Work Fund.
Heating and Cooling (78.7%)	New Biomass Gasification System	-\$11,000,000	\$1,093,153	7.7%	-\$936,792	15,000	-\$62	Assumptions: 20,200 tons wood chips/yr., 45% moisture content, \$35/ton. Assumed \$1.40/gal #6 oil. Sources: CRI Working Group; Ian Hough '07 and Jason Kowalski '07 2006, Biomass Decision Support Tool (DST); Mike Moser's FY05-06 Energy Report; Jason Kowalski '07, Middlebury College GHG Inventory for FY05-06 (JK GHG Inventory FY05-06).
	B20 Biodiesel Blend to Replace #6 Oil	\$0	-\$3,020,781	N/A	N/A	6,496	-\$465	Sources: Jason Kowalski '07, 2007. Fuel Mix Analysis.
	B100 Biodiesel Blend to Replace #6 Oil	\$0	-\$3,837,011	N/A	N/A	23,370	-\$164	Sources: Jason Kowalski '07, 2007. Fuel Mix Analysis.
	Replacing steam pipes	-\$800,000	\$122,316	14.2%	\$290,429	1,022	\$284	Assumptions (Jason Kowalski): 800 ft. of pipe replacement assumed to halve inefficiency of steam transport to BiHall. Sources: Mike Moser, Jason Kowalski '07, Hanley et al, 2003. Carbon Neutrality at Middlebury College.
	Monitoring and Control Systems	-\$18,720	\$18,000	96.2%	\$133,572	8	\$17,061	Source: Pepper, Jake et al. 2006. Environmental Economics consulting project with Lucid Designs; JK GHG Inventory FY05-06.
Electricity (3.2%)	Lighting Efficiency Measures	-\$3,369	\$10,158	302%	\$81,981	5	\$17,151	Source: Bobby Levine '08, 2006. CFL Lightbulb Exchange Program data; JK GHG Inventory FY05-06.
	Investment in Hydroelectricity downtown	-\$2,000,000	\$0	N/A	-\$1,834,862	880	-\$2,085	No projected savings at this time, but benefit of a stable future energy price, and a diversified, local electricity portfolio. Source: Dr. Anders Holm and Clayton Reed '08; JK GHG Inventory FY05-06.

Cost Analysis



Transportation (14.3%)	All B20 burned in the college fleet	\$0	-\$1,125	N/A	N/A	19	-\$60	Assumption: Cost whole diesel fleet on B20 with est. cost of \$0.15 more per gal of B20. Source: Mike Moser; JK GHG Inventory FY05-06; Kelly Blynn '07.
	Purchasing policy for college fleet	\$0	-\$13,000	N/A	N/A	80	-\$163	Assumption: Example based on 13 veh, 10,000 gal diesel/year and 2.6 new 15 passenger vans per yr. in past 6 yrs. \$5,000 premium for diesel over gasoline vans. Assumed 20% reduction in MTCDEs from B20. Sources: Skip Brush, 2006, Vehicle Inventory; Tom Corbin; JK GHG Inventory FY05-06.
	Employee Commuting Incentive and Parking Fee (High compliance)	\$0	\$379,350	Infinity	\$3,176,985	970	\$3,275	Assumption: \$75 parking fee with \$350 rebate for employees who leave personal cars at home. Assumed 65% participation in incentive program, based on employee commuting survey data. Sources: Kelly Blynn '07, 2007, Employee Commuting Survey; JK GHG Inventory FY05-06
	Employee Commuting Incentive and Parking Fee (Low compliance)	\$0	\$14,700	Infinity	\$123,110	1260	\$98	Assumption: Same as above, but 20% participation rate in incentive program as lower bound. Sources: Kelly Blynn '07, 2007, Employee Commuting Survey; JK GHG Inventory FY05-06.
Waste (3.9%)	Waste Reduction Fund	\$0	-\$1,000	N/A	N/A	82	-\$12	Assumption: Decreases waste by 10%, Allot \$1,000/year similar to Tree House Fund. Sources: Dominguez, Tiziana '09; David S. Stone '74 Tree House Fund; JK GHG Inventory FY05-06.
	Landfill Gas to Energy Projects	-\$65,000	\$19,000	29.1%	\$99,488	6250	\$16	Source: Tiziana Dominguez, '09. Hanley et al. 2003. Carbon Neutrality at Middlebury College.
Architecture	Silver LEED certifications in new buildings	-\$375,000	\$36,188	7.3%	-\$40,969	7435	-\$6	Assumption: Based on \$5/ton reduction for total money spent on project. Current projections of 125,000 sq ft of new building in 10 yrs. from master planners. Source: Kats, Greg, et al. 2003. "The Cost and Financial Benefits of Green Buildings".
	Silver LEED certifications in new buildings (integrated design)	\$0	\$36,188	Infinity	\$723,760	7435	\$97	
Offsets	Retail offsets (low price)	\$0	-\$138,858	N/A	N/A	19,380	-\$7	Represents the cost of offsets after biomass boiler has gone on-line. Source: personal communication with retail offset provider.
	Retail offsets (high price)	\$0	-\$192,265	N/A	N/A	19,380	-\$10	Ibid.
	Bright Card	\$0	-\$51,900	N/A	N/A	9047	-\$6	Source: Jake Whitcomb '05, Bright Planet. Carbon reduction estimate based on a \$173,000,000 budget, of which 3% is spent on Bright Card purchasing cards. The estimated cost for implementing Bright Card is based on the yearly-accrued opportunity cost of replacing the current 1% cash-back purchasing cards with Bright Cards.

N/A=does not apply (nonnumeric savings and benefits). Offset price assumed to be \$6.50-\$9/short ton.

Committing to carbon neutrality is an institutional change that entails considering the environmental externalities of each action the College takes. The financial strategy should facilitate this shift in behavior. With a slightly different and creative approach to financing, Middlebury College can continue to build our reputation as one of the nation's most environmentally conscious and eventually carbon neutral campuses.

Green Fund: This year the senior class is raising money for a Green Fund. We endorse the idea of including this fund as part of the upcoming capital campaign and then using it to pay for most of the campus' environmental programs and initiatives. Directing a percentage of this fundraising effort toward the environment, including carbon neutrality, could draw new donors and eventually free up money in other areas of the College's budget. This approach is also preferable because it formally institutionalizes environmental behavior and carbon neutrality, specifically. It is also a powerful statement to other institutions and to future students that Middlebury is committing a percentage of its largest capital campaign to environmental initiatives. Furthermore, we would like to collaborate with the Advisory Committee for Socially Responsible Investment to ensure that the Green Fund reflects socially responsible investment decisions.

Comprehensive Fee: Although incorporating a new cost into the Comprehensive Fee reflects a difficult decision based on competition to use the funds elsewhere and to make the College affordable, we suggest reallocating or increasing the Comprehensive Fee in order to direct appropriate funding toward projects related to carbon neutrality. This measure is important because of its immediacy; several carbon neutrality research initiatives could begin as early as this summer, for instance. We recommend amending this amount as more cost analysis research is available and eventually incorporating it directly into the Green Fund.

Bright Card: This credit card will also help institutionalize carbon neutral behavior by obtaining offsets with each College purchase. Although this card would eliminate the current cash return, incorporating it allows the College to receive a cheaper offset policy and spend less employee time developing the offset projects, while supporting the entrepreneurship of Middlebury alumni.

Miscellaneous Fees: Becoming carbon neutral involves engaging the entire College community. The administration could encourage students to utilize

environmentally friendly transportation with financial incentives such as a parking fee with a discount for using the ride board or driving a fuel-efficient vehicle. Moreover, the New Haven Municipal Government earmark income derived from parking for public transportation. In a similar manner, income from Middlebury's parking tickets could be directed toward environmental projects or offsets related to carbon neutrality. Lastly, the College could initiate several voluntary fees. For instance, when inviting alumni to Middlebury events such as Homecoming, the College could offer the option of offsetting their travel with a small fee. The names of participating alumni could then be published in the Middlebury Magazine. Such fees create awareness for carbon neutrality, while also generating capital to fund green projects.

Creative Financing: There are several less conventional methods to finance carbon neutrality. As discussed under Offsets and as suggested by the National Association of College and University Business Officers, the College could fund a project within the local community—for instance, a biomass burner at a local school—and then apply the resulting offsets toward the campus' carbon footprint. A coalition of colleges pursuing carbon neutrality could apply this model among themselves, too.

Revolving Loan: Harvard University uses its Green Campus Loan Fund of \$12 million to encourage efficiency measures through a revolving loan. To receive the loan, a department must submit a project proposal with a payback plan of 5 years or less. It is a competitive process, which forces the departments to make efficiency measures a priority. Harvard reports that there is an average Return on Investment of 27.9%, suggesting a strong correlation between fiscal and environmental responsibility. This model may not be appropriate for Middlebury College as many spending projects are highly centralized; however, it demonstrates the viability of using competition to encourage behavioral change.

Government Subsidies: There are several state subsidies currently available for a variety of environmentally efficient measures. For instance, Efficiency Vermont, an independent non-profit organization under contract to the Vermont Public Service Board, provides homes and businesses with technical and financial assistance for energy saving projects. Additionally, Governor Douglas' Commission on Climate Change is currently meeting to develop a climate change policy for Vermont. Although in its nascent stages, there is a proposal to include subsidies

for green construction and other such measures. Senator Bernie Sanders is also planning to modify the Higher Education Fund to include funding for campus sustainability and carbon reduction projects. Middlebury College should monitor this policy's development and look to capitalize on funding for future building projects. Given the new climate in Washington D.C., it is also possible that more comprehensive federal subsidies will become available within the next few years.

Performance Contracts: Energy Saving Performance Contracts (ESPC) would allow Middlebury College to

pursue energy efficiency projects without the initial capital costs. The agreement occurs between the College and an Energy Services Company (ESCO). The ESCO does an energy audit, designs and constructs a project by our standards, organizes the financing, and guarantees that the savings will pay off the project in less than 25 years. Savings from that point forward belong to the College. This option may or may not be feasible depending on the project and the amount of money that could alternatively be made through investment of the saved initial capital.

The Inside Scoop: (Dave)

Including a section on cost analysis and how to finance carbon neutrality is a wonderful way to offer important information to your college's administration. For a moment, imagine your college as a business no different than Wal-Mart or the cozy café on the corner. For this business, there is an excel spreadsheet that contains the annual budget and where the money comes from to support that budget. Becoming carbon neutral will require additional costs and line items in that spreadsheet. Therefore, providing figures to show the viability of your projects in addition to demonstrating why your carbon neutrality is central to your college's mission and image will create a grounded and convincing argument.

To begin, I tried to read as much as possible about financing green initiatives, whether it was efficiency measures in green buildings or green endowments or state and federal subsidies. The financing section of the MiddShift document could provide a nice starting point for learning such information.

Secondly, I researched our college's financial situation and approach. I found info on current and upcoming projects, including new financial aid options, increasing faculty/staff salaries, building more dorms and dining halls, inviting more prestigious speakers, and more. Middlebury has a strategic plan entitled "Knowledge Without Boundaries," which is a document that contains much of this information and many further contacts. Having knowledge of other projects will give you a basis to understand what carbon neutrality costs are competing against. Demonstrating either how carbon neutrality will help make the college more money (see the "Green Fund" under Financing) or why it deserves money that is probably earmarked for other initiatives is the key to your document.

After reading, I contacted several important administrators. We had an initial meeting that included our Executive Vice President/Treasurer and the Dean of Environmental Affairs, each of whom gave priceless insight into financing (mostly about the green fund and how to approach cost analysis). We also met with several members of the Treasurer's staff to view and understand the

college's budget and where the money comes from (comprehensive fee (tuition), endowment, annual gifts, and some auxiliary funds). We also met with the Vice President for College Advancement, essentially the person in charge of fundraising. He gave insight into how the Green Fund might attract new donors and thus be attractive to the Board. He helped us understand the importance of solid numbers and concise but informative writing, as the Trustees are likely to be very busy people. With this information, I was able to write up the financing page rather quickly.

The next and critical step was cost analysis. To do this, find an Economics major (perhaps with a focus in environmental studies) to calculate the various figures found in the table on the cost analysis page and executive summary. These figures will help provide the Board with some of the necessary information to decide whether or not carbon neutrality is appropriate for your college. Internal rates of return that are greater than the return that your College assumes on your endowment suggest the project would be financially beneficial, although there are less quantifiable elements to everything. Qualify your numbers with sources and assumptions but develop numbers.

Some potential barriers: Convince your group that it is important to develop numbers from the first day forward, even if they require assumptions. An idea without figures is an undeveloped idea. If you cannot develop figures, explain why (chances are you'll realize that you can, especially if you have an econ geek on your team). We did the cost analysis with little time remaining before the document was due which limited us to some degree.

Feel free to contact me with any questions or comments.

Good luck!

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In the Spring of 2006, the Middlebury Board of Trustees included the following in its mission statement for the College: "The College's Vermont location offers an inspirational setting for learning and reflection, reinforcing our commitment to integrating environmental stewardship into both our curriculum and our practices on campus."

This has certainly been true for the eleven of us who have researched and written this proposal. In our short time at the College, we have witnessed the rapid change that climate change has caused; at Professor John Elder's sugar-bush, for example, where syrup runs later each year or at Breadloaf, where the first snow fell in late January. Middlebury's beloved broomball is now known only to juniors and seniors.

Here at the College, we not only see the stakes of climate change, but also the possibilities for a sustainable and enriching community. Middlebury's resources can be counted beyond the material: our talent, creativity and commitment make this College and community uniquely prepared to engage this challenge.

In conclusion, we request that the following steps be taken:

February 2007:

- Institutional commitment to achieving carbon neutrality by 2016
- Develop and implement plan for continued collaboration with MiddShift students

May 2007:

- Develop and approve funding strategy
- Approve recommended offset policy
- Prioritize recommendations delineated in this proposal. This will enable the Middlebury College community to utilize Summer 2007 to begin implementation.

We thank you for your commitment to environmental stewardship and carbon reduction thus far, and for helping to inspire a new generation of conscientious leaders, on campus and beyond. Bill McKibben, Middlebury Scholar in Residence, is right in calling Vermont's Champlain Valley "America's most hopeful landscape." By adopting a comprehensive plan for carbon neutrality by 2016, Middlebury College will honor its place within our community, local and global.

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You've finally made it to the end of our Carbon Neutrality Proposal! Below are some final thoughts we wanted to share with you. First, about our meeting with the Middlebury Board of Trustees. Second, a short section on "looking forward" and a bit of a conclusion to this mixed up, crazy process. You've been a great audience this far, stick with us.

Meeting with the Trustees

Finally, the day came to present our proposal to the Middlebury College Board of Trustees. After a month of hard work on our toolkit, weeks and weeks of campaigning and preparation, it was a D-day for carbon neutrality. Boards of Trustees vary from campus to campus and you'll have to do your own research on the best strategy for working with (against) your board. Trustees have the reputation of being old, stodgy, pipe-smoking, conservative, money-making, con-artists; one of our trustees is serving eight to twenty-three years for illegally appropriating \$400 million from his company. This may hold true in some cases, but you'll likely be surprised how open your trustees are to carbon neutrality: it's all over the news, it's great publicity for the college, and many trustees realize it's simply the right moral choice in the face of a planetary crisis.

Being open to neutrality and committing to it are two different things. At the time of writing this toolkit, we are still waiting to hear back from our trustees on their decision. Most likely, they'll want to form yet another committee to look into the issue. Our advice is: be very clear about your demands. Lost in the feel good atmosphere and distracted by the nice paintings on the walls, we didn't do as good a job as we could have of pressuring for an immediate decision. Do your best to set up your meeting with the trustees with the expectation that you want a strong commitment.

We found that during the meeting, we really benefited from having a big team of people. That way, each person could be an expert in their area and answer questions on their topic. It's always good to only have a few people do most of the talking, but bringing a crew of committed students only helps your case.

In conclusion, good luck with your presentation. Make friends with your trustees if you can, definitely make friends with your college president's secretary (ours is awesome), and don't get psyched out. Trustees may have more money than you, but they're still people – and besides, you heard what happened to our richest trustee: maybe he'll be working on making his cell carbon neutral.

Looking forward

"When I hear people start talking about their 'issues' I start looking for the door . . . I want to hear about peoples' solutions." ~ Van Jones, *Ella Baker Center*

Let's face it: a lot of student activism on campus ends up being just talk, talk, talk and not too much walk. Here at Middlebury, we found that working on carbon neutrality and other hand-on emissions reduction projects was a great way to re-energize our campus and get tons of students involved. Our "get-shit-done" motto has attracted hundreds of students to our group and the numbers at weekly meetings often top 50 people.

That said, when working on a carbon neutrality campaign, it can be easy to lose the big picture. As you're getting to the end of this toolkit, take a minute to step back and assess why you are doing this. Is it just because double-paned windows and CFL's turn you on? Or is it something deeper. It will be up to you and your campus to determine the values that are driving your carbon neutrality campaign, but we really encourage you to take the time to do a little soul searching and then integrate it into your plan. Carbon neutrality is a great opportunity for student activists like us to help frame the global warming issue in a way that promotes the values we care about and make this movement about more than just neat technology and efficiency projects.

From January 19-21, around eighty students from schools across the Northeast and beyond gathered at Middlebury for a Climate Neutrality Summit. The summit was a great chance to make new friends, share skills, and talk about some of the principles guiding our work on carbon neutrality. Sadly, we ran out of time to jointly draft a "Carbon Neutrality Statement," but we did compile enough personal statements to see that there is a wealth of ideas

and motivations out there. As we continue to build this movement, constantly sharing, refining, and updating these principles should be a priority. There is no one reason for pursuing carbon neutrality, but many.

Looking forward here at Middlebury, one of our priorities for the future is expanding our thinking on how carbon neutrality can be a solution for more than reducing green-house gas emissions. Activist and leader, Van Jones, recently swung through campus to talk about a vision he has for our country: a green economy strong enough to lift people out of poverty. That's something we hadn't originally thought about: could carbon neutrality at Middlebury help build new jobs in our region? Could we incorporate a "green-jobs training program" for local youth into our carbon neutrality plan?

As you've seen from reading this document, we don't have all the answers. We're counting on you to help develop this vision and movement as we go forward.

Global warming is the challenge of our generation; let's start making the solution a reality.

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