



Norwalk Community College Climate Action Plan



Images on Cover

Top row (left to right)

- NCC's new LEED Gold Science, Health and Wellness Building
- "Blue Marble" composite image of Earth, released by NASA in 2005
- NCC Phi Theta Kappa members engaged in their biannual "River Clean-up." From left to right are students Diego Aguilar, Melissa Bucciarelli (the female leaning over), an unidentified student and Christian Mendoza.

Middle row (left to right)

- The HASTA club takes part in the Third Annual NCC Earth Day event on April 21, 2010. From left to right are members Emilie Jean-Marie, Ifania Monpreville and Elodie M. Manigat-Medor (partially obscured). The Student World Assembly, NCC Chapter (SWA-NCC) has organized annual Earth Day events since 2008.
- Installation of high efficiency "Air Foil" light fixtures in the East Atrium. The new fixtures replaced existing track lighting in several areas of the East and West campuses. The project was coordinated by NCC Committee for Active and Responsible Environmental Sustainability (NCC CARES), NCC's Building and Maintenance department, and Connecticut Light and Power.
- Culinary Arts students harvesting herbs from the college's organic garden, which is supervised by biology Professor Jonathan McMenamin-Balano.

Bottom row (left to right)

- SWA-NCC President Jake Savona attaching new signage to recycling bins that were purchased by NCC CARES.
- Students from NCC's Building Efficiency and Sustainable Technology (BEST) program placing solar panel on roof. BEST is a certificate program that prepares students for new "green-collar" jobs in sustainable building, energy efficiency auditing and renewable energy.
- NCC President David Levinson signs the American College and Presidents Climate Commitment on April 22, 2009. Standing directly behind President Levinson is former Student Government President Bepin Mgushi.

CLIMATE ACTION PLAN

Norwalk Community College

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April 2012

I.

STATEMENT FROM PRESIDENT LEVINSON

Connecticut has been a leader in the green movement as one of the first states to develop a climate change action plan, and to create an energy vision calling for 20% of all energy produced or consumed in the state to come from renewable sources by 2020. An integral part of reaching these energy goals is education developing a workforce that creates the knowledge and skills necessary to support an emerging green economy. It is NCC's commitment to carefully manage our campus growth while expanding our role in promoting environmental responsibility. In support of this initiative, we have developed NCC CARES (Committee for Active and Responsible Environmental Sustainability). To name but only a few efforts already in place at NCC, this committee initiated the use of environmentally friendly materials in the cafeteria and offices, established recycling protocols for the college, surveyed student and staff commuting patterns and coordinated bus routes with state and local transit districts, and developed a permaculture facility based on organic farming principles which provides our Culinary Arts program with produce and herbs. It was seeing the results of this group's commitment that encouraged me to sign the American College and University President's Climate Commitment (ACUPCC) in 2010, and to later create this Climate Action Plan, which is a plan that includes climate neutrality and sustainability as part of a curriculum and an integral educational experience for our students. NCC can not only serve our community by becoming climate neutral, but also by inspiring and educating others to pursue environmental sustainability.



David L. Levinson, Ph.D.
President, Norwalk Community College

II. CAP AUTHORS AND CONTRIBUTORS

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In addition to the contributors above, more than 35 NCC faculty, staff and students submitted over 85 suggestions, amendments and comments through a wiki established on the college's website. The wiki was open for public comments from January 24-March 7, 2012. Those suggestions were then incorporated into the final draft of this CAP.

III. EXECUTIVE SUMMARY

Norwalk Community College takes climate change and environmental sustainability seriously. In developing this Climate Action Plan (CAP), we have focused on two overarching goals: 1) to integrate concepts of sustainability throughout our college's curriculum, and 2) to become a climate-neutral college by the year 2025. These are bold and far-reaching goals, but we feel they are commensurate with the daunting environmental challenges that face our community, our nation, and our planet.

In order to achieve these broad goals, we have established 26 discrete outcomes as well as 59 specific strategies to be employed. Additionally, we have created metrics to measure each outcome, and most outcomes also include benchmarks and interim targets. The 26 outcomes fall into seven basic areas:

- Conservation and Efficiency
- Food and Food Service
- Commuting
- On-Site Power Generation
- Purchasing
- Education
- Equity and Governance

The creation of this CAP has been a collective endeavor of the college's faculty, staff, and students. The college's committee on sustainability—the Committee for Active and Responsible Environmental Sustainability (CARES)—began drafting the plan in September 2011. After completing the initial draft, the plan was presented to college's faculty and staff at its annual convocation in January 2012 and to the NCC Student Government in early February of that year. From the end of January through the first week in March 2012, the NCC community was invited to provide feedback to the initial draft of the CAP through a wiki established on the college's website. The response was overwhelmingly positive: more than 35 individuals submitted over 85 suggestions, amendments, and comments to the CAP. These amendments were then incorporated into this final draft.

Finally, it is important to recognize that this Climate Action Plan is a living document. As time passes, we expect each outcome to become more fully defined and developed. And while we are not unaware that fiscal restraints beyond our control may, at times, impede the expeditious implementation of some of the strategies enumerated in this plan, we are firmly committed to achieving environmental sustainability at the college and will work vigorously to achieve that goal.

IV. ABOUT THE COLLEGE

Norwalk Community College (NCC) was the first two-year college established in the state of Connecticut. Founded in 1961, NCC was originally two colleges: Norwalk State Technical College and Norwalk Community College. The two colleges merged in 1992 to become the second largest of the 12 Connecticut community colleges.

The campus has three buildings located on Richards Avenue. On the East Campus, there are classrooms, a library with 60,000 items, a language laboratory, and a theater. The West Campus is home to the William H. Schwab Center for Information Technology, classrooms, and the recently completed Science, Health and Wellness building, which houses science and nursing labs and a Wellness Center.



Enrolling nearly 15,000 students, the college offers associate degree, certificate, and continuing education programs in a variety of fields.

NCC's extensive involvement with the communities it serves has made it the only community college in Connecticut to earn a place on the Carnegie Foundation for Teaching's 2010 Community Engagement classification.

NCC is one of 30 Achieving the Dream Leader Colleges nationwide, a distinction honoring outstanding student success initiatives; one of 15 community college nationwide to receive major funding from the Bill and Melinda Gates Foundation for developmental education initiatives; and a member college of the United Nations Academic Impact.

- Founding Date: 1961
- Total number of students (credit, non-credit, lifetime learners): 15,000
- Accreditation/licenses: New England Association of Schools and Colleges, Connecticut Board of Governors for Higher Education Technology Accreditation
- Degrees: Associate, Certificate
- Programs: Distance learning, part-time, summer studies
- Percent international: 25 (over 50 countries represented)
- Sports facilities: Fitness center
- Student-to-faculty ratio: 18:1



Vision Statement

Norwalk Community College is the educational center of the community, providing opportunities for intellectual inquiry, open dialogue, multicultural awareness, and lifelong learning. Recognizing the diverse needs of its students, the college strives to provide an environment in which they are empowered to achieve their highest potential.

NCC's Mission

Norwalk Community College is the southwestern Fairfield County leader and partner in the academic, economic, and cultural lives of our communities, providing comprehensive, accessible, innovative, and affordable learning opportunities to diverse populations. To realize this distinctive mission, NCC:

- Provides a broad range of credit and non-credit liberal arts, sciences, career, technical, associate degree and certification programs leading to transfer, employment, and lifelong learning.
- Supports economic development through partnerships with labor, business, industry, government, and our communities, providing workforce development, business development, and technology transfer.
- Promotes learner success and inclusion through a stimulating, nurturing learning environment, high quality instruction, support services, and co-curricular activities.
- Builds community through the sponsorship of intellectual, cultural, social, and recreational events and activities.
- Engages students and community members to become active and responsible leaders in their communities.



Accreditation

Norwalk Community College is accredited by the New England Association of Schools and Colleges (NEASC) and the Connecticut Board of Regents for Higher Education. In addition, many individual programs are accredited by national professional associations including the Legal Assistant, Nursing, Respiratory Care, and Engineering Technology Curricula. Most credits earned at NCC are transferable to four-year colleges and universities.

College Goals

Academic Excellence: Create a competency based learning environment that fulfills the college's vision by providing opportunities for intellectual inquiry, open dialogue, multicultural awareness, and life-long learning.

Student Centered Experience: Create and nurture an environment, which supports students in the achievement of their educational and life goals.

Strong Community Partnerships: Collaborate with external constituencies to establish effective working partnerships in the interest of adding value to the communities we serve as well as enhancing NCC's programmatic endeavors.

Institutional Advancement: Develop a structure within the college that makes all decision making transparent, data driven, participatory, and based on a one-college approach. Identify, attract and obtain the funding and other resources needed for the College to achieve our long-range goals.



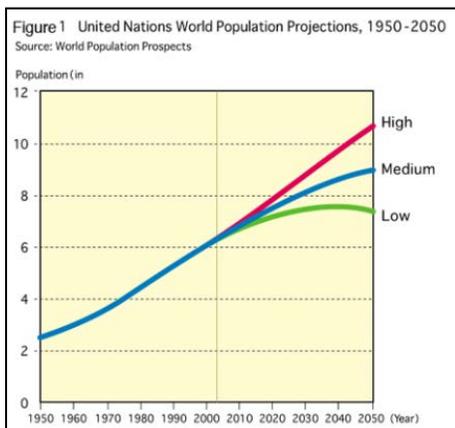
SUSTAINABILITY AT NCC: A BACKGROUND NARRATIVE

Introduction

In 1987, the United Nations' Brundtland Commission released a report that addressed environmental sustainability and the public policy changes needed to achieve that objective. Perhaps the most remembered quote from the publication was its succinct yet resonating definition of sustainability: "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs." Norwalk Community College is firmly committed to sustainability and sustainable development. As an institution of higher learning, NCC strives to create learning experiences for its students that will not only develop their knowledge, abilities, and critical thinking skills, but also enhance their awareness of the global challenges that confront us. It has been asserted that environmental sustainability may well be the defining global challenge of this century. With this in mind, NCC is determined to set an example for other institutions in our community and state by becoming carbon neutral by the year 2025; in addition, NCC is working to prepare those individuals who will take leadership roles in the struggle for a sustainable planet. Before reviewing specific actions that the college has undertaken and will undertake in the future to meet these goals, it is worthwhile to briefly summarize some of the principal environmental concerns confronting the world as it enters the 21st century as well as the advantages that can accrue to institutions that pursue climate neutrality.

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."
--Brundtland Commission

Causes for Environmental Concern

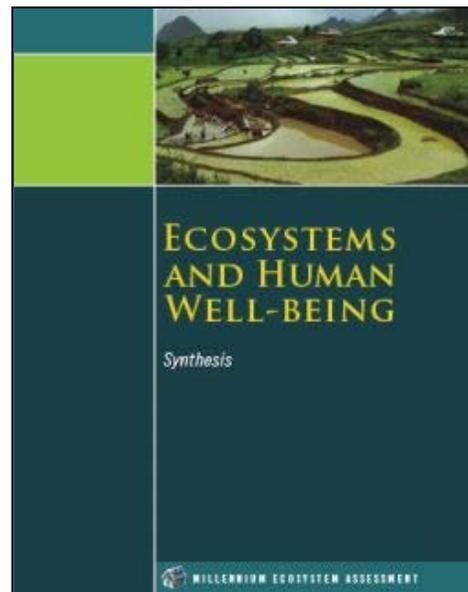


Recently, the total world population passed 7 billion, and UN projections are that by the middle of this century there will be approximately 9 billion global citizens. Consumption per capita has also increased, particularly in the countries with the most developed economies. In fact, writer Dinesh D'Souza has stated that the United States "is well on its way to creating the first mass affluent class in world history." This is also true for most of Western Europe, Japan, and a number of other developed nations around the world. There are also a number of countries that hope to reach this same level of affluence in the near

future, such as the “BRICS” countries: Brazil, Russia, India, China, and South Africa. The combination of a rising global population and increased levels of consumption is creating a strain on the world’s finite natural resources. Author Annie Leonard asserts that if everyone in the world consumed at the same rate as Americans do, we would need three to five planets just to meet the demand for natural resources.

Another reason for concern is the state of the earth’s ecosystems. An ecosystem is the dynamic interaction of all living things—plants, animals, and microorganisms—and non-living things and how they all affect each other and the environment. Humans are entirely dependent on ecosystem services for their well being. These ecosystem services are provided to us essentially free of charge by nature and range from provisional services (food, water, timber, fuel) to regulating services (climate regulation, flood prevention, water purification, disease regulation) to cultural services (aesthetic, recreational, spiritual) to supporting services (nutrient recycling, soil formation). From 2001-05, 1,300 scientists took part in the Millennium Ecosystem Assessment at the behest of the United Nations. The assessment concluded that approximately 60% of the world’s ecosystem services are being degraded or used unsustainably. In fact, the report stated that over the past 50 years, humans have changed ecosystems more rapidly and extensively than at any other comparable period of time in human history.

A third reason for concern is global climate change. In 2007 the Intergovernmental Panel on Climate Change stated that “Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level.” Furthermore, this warming is directly related to human activity: “The understanding of anthropogenic warming and cooling influences of climate change has improved since TAR [IPCC’s Third Assessment Report, 2001], leading to very high confidence that the global average net effect of human activities since 1750 has been one of warming...” In addition, prestigious national scientific bodies across the globe have endorsed the science of climate change and are advocating action. A joint statement by the science academies of the G8 countries, plus Brazil, China, India, Mexico, and South Africa stated, “Climate change and sustainable energy supply are crucial challenges for the future of humanity. It is essential that world leaders agree on the emission reductions needed to combat negative consequences of anthropogenic climate change...”



Public policies that addressed environmental sustainability would not only serve to mitigate the worst aspects of these ecological concerns, but they would also make sense economically. The construction and maintenance of buildings are responsible for almost half of all greenhouse gas

emissions globally. In a comprehensive study by the New Building Institute, buildings designed to meet specific environmental standards (LEED certified) used 33% less energy than buildings that were not designed in such a manner. Furthermore, buildings that met the highest standards of environmental efficiency (LEED Gold and Platinum) consumed 50% less energy. At NCC, a 50% reduction of energy usage would have translated into an energy savings of nearly \$700,000 for the fiscal year 2009.

For all of the reasons stated above, NCC believes that bold action is needed to address the environmental challenges facing our community and our planet. The following section briefly summarizes how our college has begun to meet these formidable challenges.

Beginning Steps of Sustainability at NCC

In 2005, NCC President David Levinson signed the Talloires Declaration, which stated that institutions of higher learning would become world leaders in developing, creating, supporting, and maintaining sustainability. NCC is among the 168 college and universities in the United States (436 worldwide) to have signed the declaration, and it is one of only 12 community colleges to have done so. A year later, the college commissioned an energy efficiency audit by the Institute of Sustainable Energy at Eastern Connecticut State University (ISE-ECSU). As well as examining the college's overall energy usage, the report provided a thorough lighting study that included recommendations for efficiency upgrades. NCC also created the Building Efficiency & Sustainable Technology (BEST) Certificate Program, which prepares students for employment in the field of sustainable building, building performance, and energy consumption auditing.

Also during this period, a number of NCC staff and faculty had begun to find ways to make the college greener. For example, when the college had solid waste to dispose of, such as furniture or computers, the Director of Grounds and Maintenance made inquiries to see if he could recycle those items at other area institutions. The college's electrician systematically replaced less efficient lighting fixtures with more efficient counterparts as recommended by the ISE-ECSU study. In addition, a number of faculty members began to address the concepts of sustainability and global climate change in their curricula. Two faculty members began to teach an environmental science course that had not been offered by the college for many years, and other faculty members integrated concepts of sustainability into their courses as well. An instructor who teaches Freshman Seminar used environmental sustainability as the theme for that course. Another professor used Elizabeth Kolbert's *Field Notes from a Catastrophe: Man, Nature and Climate Change* as the principal text for his high-level ESL course. Still another professor showed the environmental documentary "The 11th Hour" each semester to his students. Yet despite these individual efforts, the college did not yet have an institutional body to formally address issues of environmental sustainability or to coordinate the actions of various faculty and staff members as well as students on campus. This would change in 2008, and the impetus for the change came from NCC's own student body.

NCC Students Demand a Change to “Business as Usual”



New York Times, August 17, 2009

In the fall of 2007, NCC students learned that a proposed \$35 million Science, Health, and Wellness building to be constructed on campus would not meet even the lowest of Leadership of Energy and Environmental Design (LEED) certifications. The LEED rating system, which was developed by the U.S. Green Building Council (USGBC) in 2000, is a widely accepted standard that recognizes if a building meets certain environmental and energy-saving thresholds. LEED has four designations—Platinum, Gold, Silver, and Certified—that reflect the level of environmental sustainability incorporated into the building design. During the spring semester of 2008, a student organization called the Student World Assembly (SWA)-NCC Chapter spearheaded a drive to make the Science, Health, and Wellness building LEED certified. Within ten days, over 500 students, faculty, staff, and community members had signed a petition urging Connecticut’s Department of

Public Works to redesign the building. The students, with the help of President Levinson, arranged a “town hall” meeting with the project manager and the architects of the proposed building. The students also began a letter writing campaign to state officials and to the local media. Two months later, a New York Times reporter visited the college and interviewed several NCC students about the growing green movement on campus. His report, published on August 17th, 2009 in the newspaper’s Sunday edition, was entitled, “Challenging a College to Redesign a Building.” Shortly after the article appeared, NCC President Levinson was informed by the state of Connecticut that additional funds would be made available to ensure that the Science, Health, and Wellness building would become LEED certified. In April 2009, Dean of Administration Rose Ellis announced that the Science, Health, and Wellness would not only become LEED certified, but had achieved USGBC’s second highest rating possible, LEED Gold.

Faculty, Staff, and Students Create NCC CARES

While NCC students and others at the college were engaged in this effort to get the building redesigned, Dean Ellis suggested forming a standing committee to address all environmental and sustainability issues at the college. Distance Learning Director Lois Aime and Director of Library Services Linda Lerman helped to create this committee—later to be named the NCC Committee for Active and Responsible Environmental Sustainability (NCC CARES). The committee’s first meeting was held on June 16, 2008. Over the past four years, NCC CARES has taken on a number of initiatives aimed at greening the college. Some examples of those initiatives are the following:

- Surveyed staff and students on their commuting patterns and negotiated with the Norwalk Transit District to add a shuttle bus service that now runs between NCC and the

Norwalk MetroNorth Train station during peak commuting hours. The shuttle makes limited stops and supplements the regular bus service to the college.

- Completed a detailed greenhouse gas audit and negotiated an agreement with the college’s utility company, Connecticut Light and Power (CL & P), whereby CL & P would provide rebates for the installation more efficient lighting systems. Additionally, rebates were to be made available to the college to install a new energy management system in its East Campus building.
- Created a permaculture facility under the leadership of biology Professor Jonathan McMenemy-Balano to develop organic farming principles and to supply NCC’s Culinary Arts program with herbs and produce.
- Supported SWA-NCC and Student Government members in their negotiations with cafeteria services to ban the use of polystyrene containers at the college and to obtain a discounted price for customers who use reusable coffee/tea mugs.



Logo for NCC CARES, created John Alvord, Chair of the Art, Architecture and Design department

Furthermore, NCC student clubs have become involved as well in projects and events aimed at greening the college and raising awareness of environmental sustainability:

- Since 2008, SWA-NCC, with the active involvement of the Student Government, Student Activities, Phi Theta Kappa, HASTA Club, and others, has organized annual Earth Week events. Keynote talks by internationally-recognized environmental leaders have been a highlight of the week, and speakers have included Christiana Figueres, current Executive Secretary of the U.N. Framework Convention on Climate Change; Ana Lappé, best-selling author of *Diet for a Hot Planet*; and L. Hunter Lovins, a Time magazine’s “Hero of the Planet.”



President David Levinson signs the American College and University Presidents Climate Commitment

- The NCC Chapter of Phi Theta Kappa (PTK) has held a biennial “Norwalk River Clean-Up” for several years.
- SWA-NCC, Student Government, and PTK members have led NCC’s participation in the national RecycleMania competition since 2010.

In addition to accomplishing the initiatives enumerated above and many others, NCC CARES made an important decision in early 2009 that would help to guide and coordinate the college’s actions regarding sustainability: the committee voted unanimously to adopt a resolution

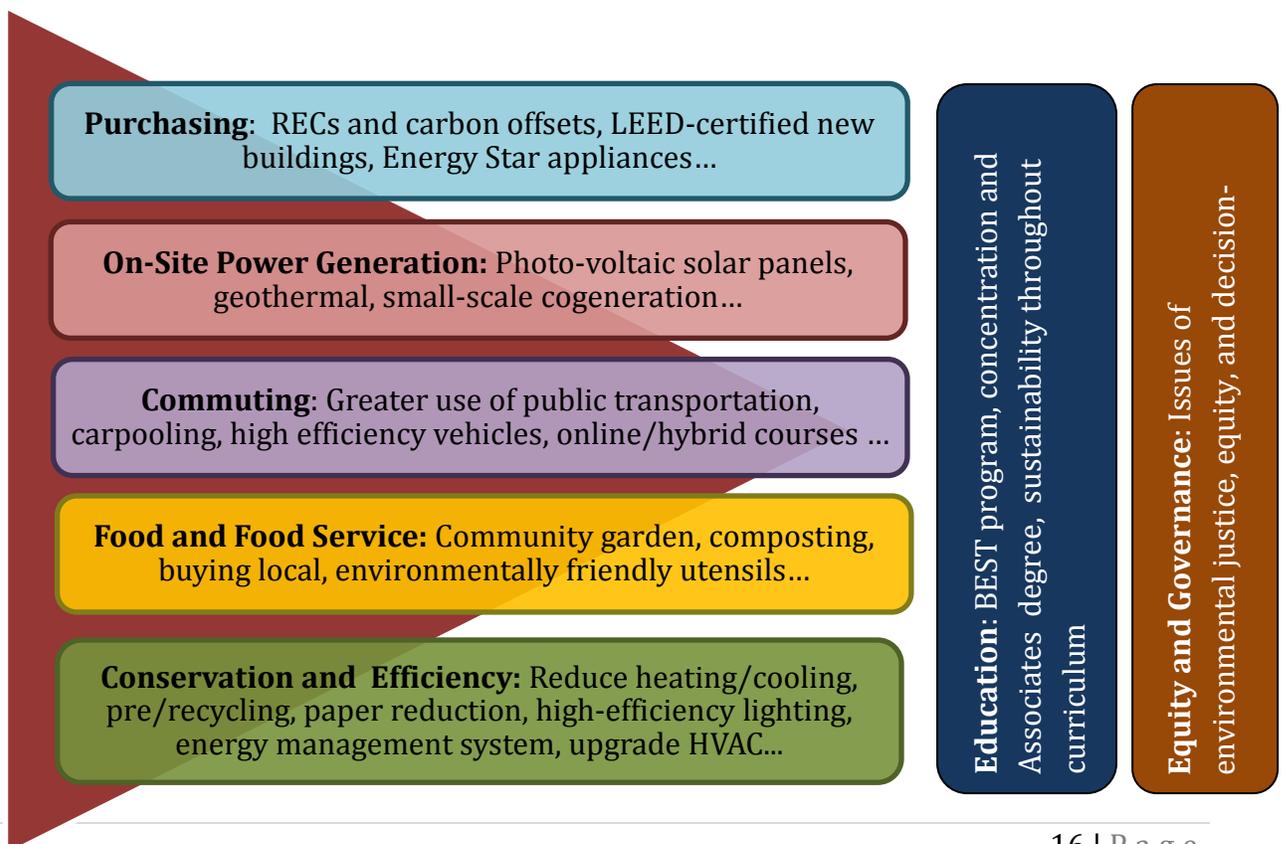
urging the college president to sign the American College and University Presidents Climate Commitment (ACUPCC). The commitment challenges its member institutions to become climate neutral—defined as emitting no net greenhouse gases—and to integrate concepts of environmental sustainability into their curricula. The resolution was then brought before the College Senate, where it was overwhelmingly approved. NCC President Levinson fully

supported the resolution and signed the ACUPCC letter of commitment on April 22, 2009, Earth Day.

VI. CLIMATE ACTION PLAN

NCC's Climate Action Plan has been divided into seven areas that are identified in the diagram below. The five areas that are placed horizontally relate, broadly speaking, to buildings and behaviors. More specifically, they detail how to make buildings—and the products and items found in them—more energy efficient and environmentally friendly. The horizontal items also relate to student, faculty, and staff behaviors: how we travel back-and-forth from our homes to the college, what we do with leftover containers and food scraps, how we use photocopy machines and printers, etc. These five items are placed in a rough order of priority from most urgent (bottom of diagram) to longer range (top). The items that are placed vertically on the right of the diagram focus on two other important issues—education and equity. These are areas that the college will begin addressing immediately and will continue to address over time.

The NCC Climate Action Plan that follows contains 26 outcomes and 59 strategies to achieve those outcomes. In addition, for each outcome there are metrics designed to measure whether the college has attained the stated objective. The overall goal of NCC is to become climate neutral—defined as emitting no net greenhouse gases—by the year 2025.





Conservation and Efficiency

OUTCOME #1: Increase awareness of energy and resource conservation, waste management, and recycling on campus.

Strategy

- 1) Increase visibility of recycle bins—both paper and plastic/cans.
- 2) Increase recycling awareness through campaigns and promotions by students and NCC CARES committee.
- 3) Develop website to support recycling.
- 4) Introduce through curriculum changes, specifically in College Forum and Freshman Seminar, but in other courses as well.
- 5) Introduce in orientation sessions for students, faculty, and staff.
- 6) Develop campaigns that promote recycling through competitions, etc.

Measurable Results

- 1) The amount of recycled materials will have increased 5% by 2014 (two-year goal), 15% by 2017 (five-year year goal), and 25% by 2022 (ten-year goal).
- 2) Students will collect data on the amount of materials being recycled during the annual RecycleMania competition.

OUTCOME #2: Decrease paper, water, and energy usage.

Strategy

- 1) Make duplex printing the default setting for applicable printers.
- 2) Get faculty to use Blackboard to upload hand-outs and syllabi instead of printing multiple copies.
- 3) Have faculty and staff use online programs, such as Google Docs, SharePoint, etc. to share documents and forms.
- 4) Create one faculty services area on campus that would accept requests for services via email.
- 5) Install 'low-flow' faucets and flushometers, and waterless urinals in all bathrooms, laboratories, and kitchens on campus.
- 6) Investigate the possibility of installing composting toilets.
- 7) Institute a "behavioral change" campaign to eliminate the use of space heaters, cut 'phantom loads' overnight and when not needed (i.e.: turning off power strips), and other energy conservation actions; coordination and troubleshooting with IT to reduce the hours that computers must be left on for night-time virus scanning and updates.



NCC student involvement in RecycleMania 2012 marked their third straight year of participation.

Measurable Results

- 1) The amount of purchased paper will have decreased 5% by 2014, 15% by 2017, and 25% by 2022.

- 2) The amount of water used will have decreased 5% by 2014, 15% by 2017, and 25% by 2022.
- 3) All office printers will have been set to default duplex printing by 2014.
- 4) Workshops will have been given to faculty and staff to demonstrate the use of Blackboard and other online programs.
- 5) A faculty services area will have been established to accept requests via email by 2014.
- 6) Low-flow faucets and flushometers will have been installed in all bathrooms, laboratories, and kitchens on campus by 2014.
- 7) Waterless urinals will replace traditional urinals by 2022.

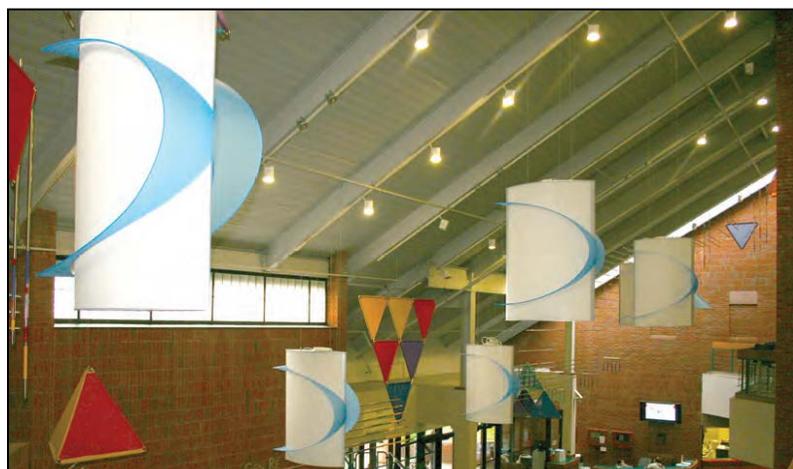
OUTCOME #3: Increase energy efficiency throughout the campus.

Strategy

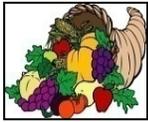
- 1) Install energy management systems on both East and West Campus.
- 2) Swap out lighting fixtures for more energy efficient lighting.
- 3) Install occupant sensors in rooms and various locations on campus to reduce lighting/heating/air-conditioning when unoccupied.
- 4) Install more efficient boilers on West Campus.
- 5) Install more efficient LED exterior lighting (parking lots and sidewalks).
- 6) Install energy “watt-misers” on campus vending machines.
- 7) Purchase only energy-star equipment (also see Purchasing section of CAP).
- 8) Troubleshoot existing programming to achieve 100% shut-down of computers in lab rooms.
- 9) Turn off all lights on the campus at night, except outside lighting.

Measurable Results

- 1) A new energy management system will have been installed on East Campus by 2014.
- 2) A new energy management system will have been installed on West Campus by 2017.
- 3) All incandescent bulbs and less efficient fluorescent lighting will have been replaced with either compact fluorescent lights (CFLs), more efficient fluorescent lighting, or light-emitting diodes (LEDs) by 2014.
- 4) The college will have installed more efficient boilers on West Campus by 2017 (see On-Site Power Generation section of CAP).
- 5) Vendors will have installed “watt-misers” on all campus vending machines by 2014.



Recently installed high-efficiency lighting in East Campus Atrium will replace existing track lighting.



Food and Food Service

OUTCOME #4: Continue to develop organic farming principles and a Permaculture Facility for NCC students and Norwalk residents to use.

Strategy

Provide necessary resources for the continuation and expansion of farming sites.

Measurable Results

Garden will continue to provide Culinary Arts program with fresh vegetables and herbs.

OUTCOME #5: Continue to develop composting program.

Strategy

- 1) Provide necessary resources for the continuation and expansion of composting program.
- 2) Partner with cafeteria services to enhance composting program.

Measurable Results

The amount of compostable matter will have increased 5% by 2014, 15% by 2017, and 25% by 2022.

OUTCOME #6: Increase purchasing of local, organic, Fair Trade, and sustainably harvested foods.

Strategy

- 1) Partner with cafeteria services to make available to students more local, organic, Fair Trade, and sustainably harvested foods.
- 2) Investigate the possibility of creating an organic buying club or co-op here on campus.
- 3) Investigate the possibility of creating a Farmer's Market on campus.

Measurable Results

The amount of local, organic, Fair Trade, and sustainably harvested foods will have increased 5% by 2014, 15% by 2017, and 25% by 2022.



Culinary Arts students harvest herbs from the NCC organic garden



Commuting

OUTCOME #7: Increase use of bicycles for commuting to campus.

Strategy

- 1) Implement a public relations campaign to encourage students, faculty, and staff who live near campus to use bicycles to commute to campus.
- 2) Increase number of bike racks and enhance security for bicycles in racks.
- 3) Create a bike co-op for repairing and buying/selling used bikes.
- 4) Offer bicycle safety workshops for NCC students and the general public.
- 5) Negotiate with City of Norwalk to increase number of bike paths around NCC.
- 6) Implement a free or low-cost public-transport bicycle program (à la Paris' Velib).
- 7) Open lockers rooms and showers in the Wellness Center at 7:00 a.m. so cycling commuters can freshen up upon arrival at campus.
- 8) Integrate concepts of bicycling into NCC courses, such as engineering and physics.

Measurable Results

- 1) Bike ridership will have increased 10% by 2014, 20% by 2017, and 35% by 2022. Data will be based on trips to campus and gathered in a biennial survey of commuting habits.
- 2) The number of bike racks on campus will have been doubled by 2014.
- 3) A subcommittee to research the feasibility of a free or low-cost public-transport bicycle program at NCC will have presented its findings to CARES by 2014.
- 4) A bike co-op will have been established on campus by 2017.

OUTCOME #8: Increase number of student, faculty, and staff using public transportation.

Strategy

- 1) Implement a public relations campaign to encourage students, faculty, and staff to use public transportation to commute to campus.
- 2) Negotiate with City of Norwalk for better coordination between bus/shuttle service and MetroNorth trains.
- 3) Provide a free or low-cost bus pass to students, faculty, and staff.



Measurable Results

- 1) Bus/train ridership will have increased at the college 10% by 2014, 25% by 2017, and 35% by 2022. Data will be based on commuting miles and gathered in a biennial survey of commuting habits.
- 2) The college will have begun negotiations with the City of Norwalk by 2012 to improve the bus/train coordination and to create a student bus pass system.

NCC has partnered with CT Dept. of Transportation ride-sharing program, NuRide

OUTCOME #9: Increase ride sharing/car pooling by students, faculty, and staff.

Strategies

- 1) Implement a public relations campaign to encourage students, faculty, and staff to use ride sharing services to commute to campus.
- 2) Implement a ride sharing program through the Connecticut Department of Transportation's NuRide program.
- 3) Create special parking spaces for ride-sharing vehicles near the front entrances of college buildings.

Measurable Results

- 1) Ride sharing will have increased at the college 10% by 2014, 20% by 2017, and 35% by 2022. Data will be based on commuting miles and gathered in a biennial survey of commuting habits.
- 2) Special parking spaces for ride-sharing vehicles will have been designated by 2014.

OUTCOME #10: Increase use of hybrid, electric, and other high-efficiency vehicles for commuting to campus.

Strategies

- 1) Create special parking spaces for high-efficiency vehicles near the front entrances of college buildings.
- 2) Install charging stations for electrical vehicles.

Measurable Results

- 1) The number of high-efficiency vehicles used for commuting to campus will have increased 10% by 2014, 20% by 2017, and 35% by 2022. Data will be based on commuting miles and gathered in a biennial survey of commuting habits.
- 2) Special parking spaces for high-efficiency vehicles will have been designated by 2014.
- 3) The college will have installed two electrical charging stations by 2017 and five stations by 2022.



On-Site Power Generation

OUTCOME #11: Reduce electrical consumption from the grid by two-thirds.

Strategies

- 1) Install two 75kW co-generation systems of heating and power (CHP) by 2017.
- 2) Install 309,992 sq. ft of photo-voltaic solar panels by 2022.
- 3) Investigate the possibility of installing wind turbines.
- 4) Enhance energy feedback of the existing Green Cardio Machines in the Wellness Center.

Measurable Results

- 1) Two 75kW CHP systems will have reduced the college's annual CO₂ emissions 1,114 metric tons by 2017.
- 2) Photo-voltaic solar panels will be producing 3,739,279 kW-h of electricity for the college annually by 2022.
- 3) Greenhouse gas emission reductions will be documented in the biennial Cool Air/Clean Planet GHG inventory.

OUTCOME #12: Reduce energy consumption for heating and cooling by one-third.

Strategies

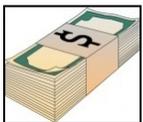
- 1) Install two Tecogen CHP 75 kW modules (American DG) by 2017.
- 2) Install geothermal heat pump system (standing well columns) by 2022.

Measurable Results

- 1) Due to installations of the geothermal heat pump and CHP systems, CO₂ emissions related to heating and cooling systems will have been reduced 33% by 2017.
- 2) Greenhouse gas emission reductions will be documented in the biennial Cool Air/Clean Planet GHG inventory.



Artist rendering of NCC's new Science, Health and Wellness building. Completed in 2011, the building received a LEED Gold designation.



Purchasing

OUTCOME #13: Any new construction will meet a high level of environmental sustainability.

Strategies

Require all new buildings meet Leadership in Energy and Environmental Design (LEED) Silver level or better.

Measurable Results

The U.S. Green Building Council will certify all new buildings on campus. (NCC's newest building, the Health, Science and Wellness Center, is LEED Silver or better.)

OUTCOME #14: Environmentally friendly appliances.

Strategies

Purchase only appliances that carry the Energy Star label.

Measurable Results

All new appliances purchased at NCC have been Energy Star since 2009.

OUTCOME #15: Environmentally friendly computers and paper with high recycled content.

Strategies

- 1) Purchase computers which are Electronic Product Environmental Assessment Tool (EPEAT) Silver or higher.
- 2) Purchase paper for printers and photocopiers that is made with 100% recycled content.

Measurable Results

All computers purchased beginning in 2014 will be EPEAT Silver or higher unless cost, availability, or other factors influence decision. All paper purchased beginning in 2014 will be made with 100% recycled content.

OUTCOME #16: Support the development of renewable energy sources for electricity.

Strategies

At least 10% of purchased electricity will be generated by renewable energy sources.

Measurable Results

NCC will have become an EPA GreenPower Partner by 2014.

OUTCOME #17: Purchase necessary offsets to achieve climate neutrality.

Strategies

After all strategies to reduce greenhouse gas emissions have been taken, offsets will be purchased in order to obtain climate neutrality, which is defined as emitting no net greenhouse gases.

Measurable Results

NCC will have become climate neutral by 2025.



Curriculum

The outcomes of curricular development as it relates to environmental sustainability and global climate change are threefold: 1) provide a basic environmental “literacy” to *all* students, 2) provide an understanding of how concepts of sustainability relate to students’ specific majors or areas of study, and 3) provide the necessary skills and knowledge to those students who will be in the forefront of addressing the environmental challenges of the 21st century.

OUTCOME #18: Continue to strengthen the Building Efficiency & Sustainable Technology (BEST) Certificate Program.

Strategies

- 1) Provide necessary resources for the continuation of the original BEST program and the launch of new BEST certificate and degree programs.
- 2) Add courses and utilize existing courses to create certificates in Small Business Energy Auditing, Energy Efficient Construction, and Energy Management.

Measurable Results

- 1) Enrollment in the BEST Certificate Program will have increased 3% by 2014, 5% by 2017, and 10% by 2022.
- 2) Certificates granted in the BEST Certificate Program will have increased 3% by 2014, 5% by 2017, and 10% by 2025.



Students in NCC's BEST program visit construction site.

OUTCOME #19: Develop a module for College Forum and Freshman Seminar courses that will introduce concepts of environmental sustainability, “Deep Ecology,” and NCC’s efforts towards sustainability and climate neutrality.

Strategies

Create a lesson plan and develop materials for a module (one class period) on environmental sustainability.

Measurable Results

All College Forum and Freshman Seminar courses will contain a learning module on environmental sustainability by 2014.

OUTCOME #20: Integrate concepts of sustainability and climate change into curricula across all disciplines.

Strategies

- 1) Develop a system to designate courses that devote a specified amount of class time to environmental sustainability and/or global climate change.
- 2) “Tag” courses which meet this minimum threshold of sustainability content in the college catalog and course schedule.
- 3) Encourage faculty members to design courses that meet these criteria.

Measurable Results

The college will have designated 20 course sections as containing environmental sustainability and/or global climate change content by 2017 and 40 sections by 2025.

OUTCOME #21: Offer environmental sustainability concentrations within existing Associate of Arts/Science degree programs.

Strategies

Develop the requirements to fulfill a concentration in environmental sustainability within various departments.

Measurable Results

Three departments will be offering concentrations in environmental sustainability by 2017 and five departments by 2025.

OUTCOME #22: Offer an Associate of Arts/Science degree program in Environmental Sustainability.

Strategies

Develop the requirements for an Associate of Arts/Science degree program in environmental sustainability.

Measurable Results

The program will have begun matriculating students by 2017.



Equity and Governance

While some may question whether a climate action plan is the appropriate venue to address issues of equity and fairness, many in the environmental movement assert that environmental sustainability can never be achieved without addressing directly issues of poverty and economic justice. The Brundtland Report, in addition to helping to define sustainability (see p. 4), states that sustainable development “requires meeting the basic needs of all and extending to all the opportunity to fulfill the aspirations of a better life.”

OUTCOME #23: Provide economic support to low-income students.

Strategies

Continue to provide grants and scholarships to academically-eligible, low-income students.

Measurable Results

- 1) Through the NCC Foundation, grants and scholarships will continue to be awarded to eligible students (NCC Foundation provided \$9.8 million in financial aid and scholarships in the fiscal year 2011.)
- 2) LEAP Scholarships, which aid NCC graduates transferring to four-year institutions, will continue to be awarded by the NCC Foundation.



Foundation events, such as the 2009 Le Bal d'Ecole, have raised funds to support numerous scholarships for low-income NCC students.

OUTCOME #24: Provide support programs for under-represented groups.

Strategies

Continue to provide free tutoring, counseling, and other services to under-represented groups.

Measurable Results

Enrollment and retention of under-represented groups will increase.

OUTCOME #25: Ensure the lowest-paid college employees, as well as workers employed by private contractors to work at the college, do not receive substandard compensation nor be exposed to unhealthy substances in the execution of their labor.

Strategies

Evaluate wages and working conditions of employees who work both for the college and companies that contract their services to the college.

Measurable Results

- 1) Compensation to workers at the college will be commensurate with the prevailing wages of that job type or classification for this area.
- 2) Employees will not be exposed to unhealthy substances in their work at the college.

OUTCOME #26: Establish a protocol to actualize the previous 25 outcomes and integrate sustainability into the decision-making process of the college.

Strategies

NCC CARES will oversee the implementation of the 26 outcomes. Additionally, the committee will be consulted whenever there is an administrative issue that relates to sustainability.

Measurable Results

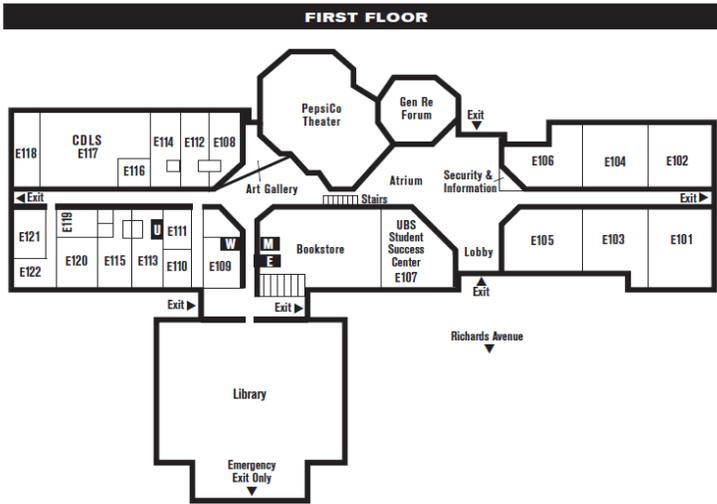
This climate action plan will be fully implemented by 2025.



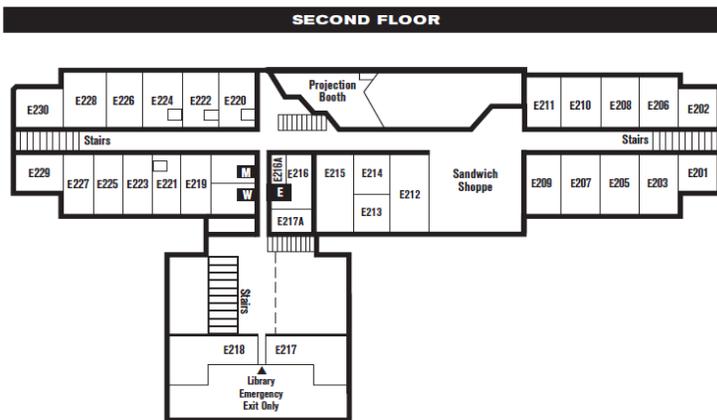
Past NCC Earth Day speakers. These speaking events were organized by NCC's Student World Assembly. (Top left) author Anna Lappé; (wearing scarf) (above) Christians Figueres, Executive Secretary UN Framework Convention on Climate Change; (lower left) author and environmentalist L. Hunter Lovins.

APPENDIX A
College Floor Plan and
Google Map

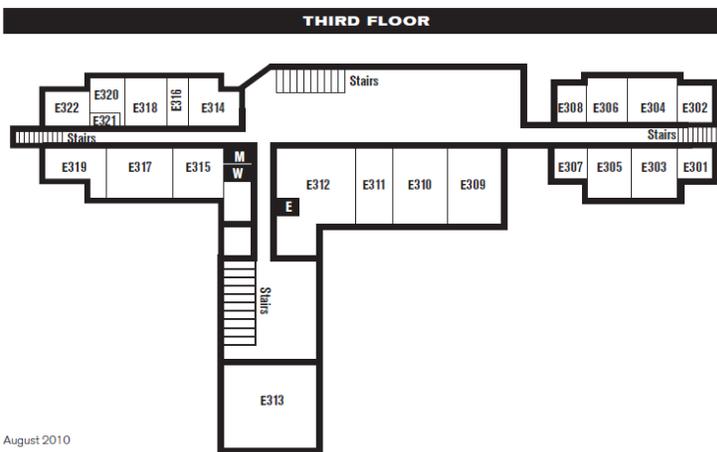
NCC East Campus



Room #	Sign Name	Room #	Sign Name
E101	Accounts Payable/ Purchasing	E116	Early Childhood Faculty Office
E102	Registrar/Records	E117	Child Development Lab School
E103	Business Office	E118	Classroom
E104	Counseling Center	E119	Child Development Lab School Teacher Offices
E105	Financial Aid Services	E120	Motor Development Lab
E106	Admissions	E121	Faculty Offices
E107	UBS Student Success Center	E122	Classroom
E108	Art Classroom		Art Gallery
E109	Dark Room		Atrium
E110	TV Computer Classroom		Bookstore
E111	Faculty Office		Child Development Lab School
E112	Art Classroom		Gen Re Forum
E113	TV Studio & Control Room		Library
E114	Classroom/Faculty Office		Lobby
E115	Computer Classroom Voice Newspaper/ Faculty Offices		PepsiCo Theater
		U	Unisex Restroom/ Baby Changing Station

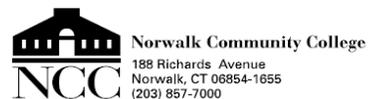


Room #	Sign Name	Room #	Sign Name
E201	Computer Classroom	E216A	Community & Government Relations
E202	ELS Non-Credit Office/International Services	E217	Classroom
E203	Computer Classroom	E217A	Phi Theta Kappa/ Student World Assembly Offices
E205	Computer Classroom	E218	Classroom
E206	ESL Faculty Offices	E219	Classroom
E207	Computer Classroom	E220	Classroom/ Faculty Office
E208	ESL Language Lab	E221	Classroom / Faculty Offices
E209	Computer Classroom	E222	Classroom / Faculty Office
E210	Computer Classroom	E223	Classroom
E211	Testing Center	E224	Language Tech. Lab/Faculty Office
E212	Founders Conference Room	E225	Classroom
E213	Classroom	E226	Classroom
E214	Events, Campus & Community Relations	E227	Classroom
E215	Dean of Students	E228	Classroom
E216	Dean of College Advancement	E229	Classroom
		E230	Classroom
			Projection Booth/ Faculty Office
			Sandwich Shoppe



Room #	Sign Name	Room #	Sign Name
E301	Nursing & Allied Health Simulation Lab	E312	Dean of Administration/ Dean of Institutional Effectiveness
E302	Faculty Offices	E313	Media Services
E303	Nursing Laboratory 1	E314	Faculty Services/ Mailroom
E304	Nursing Counseling & Tutoring Center	E315	Department of Institutional Effectiveness Office
E305	Faculty Offices	E316	Adjunct Faculty Office
E306	Nursing & Allied Health Office	E317	Faculty Offices
E307	Faculty Offices	E318	Nursing Laboratory 2
E308	Faculty Offices	E319 &	Information
E309	President's Conference Room	E321	Technology Services
E310	President	E320	Public Relations
E311	NCC Foundation	E322	Faculty Offices

August 2010

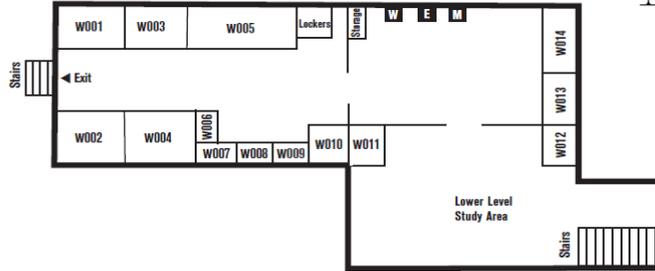


NCC West Campus

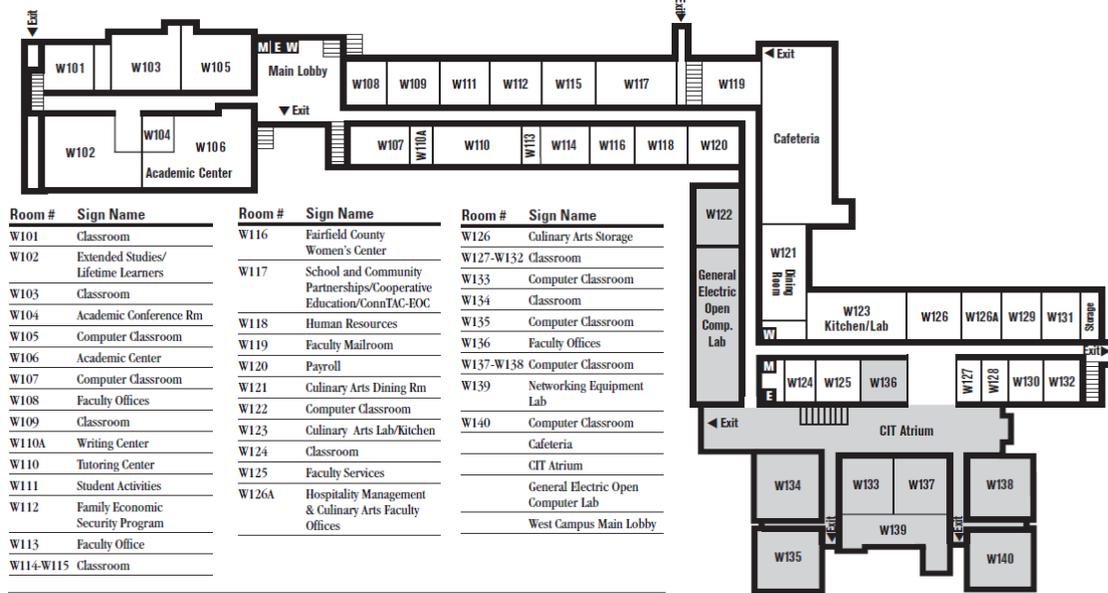


LOWER LEVEL

Room #	Sign Name
W001	Computer Repair
W002	Computer Classroom
W003	Physical Therapist Assistant Lab
W004	Studio 1
W005	Wellness Center
W006	Faculty Office
W007	Faculty Office
W008	Faculty Office
W009	Faculty Office
W010	Studio 2
W011-W014	Faculty Office
Lower Level Study Area	



FIRST FLOOR

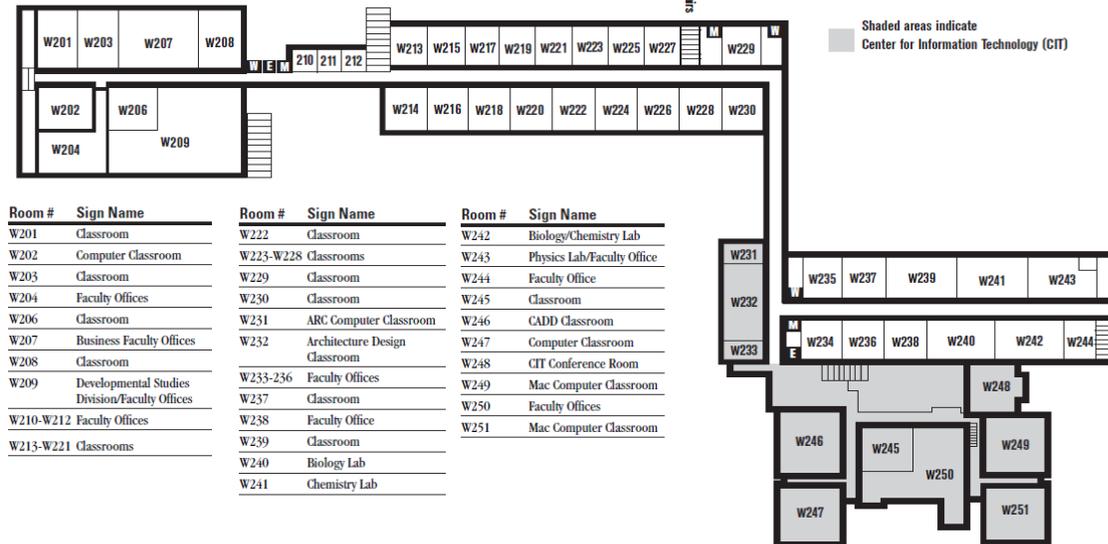


Room #	Sign Name
W101	Classroom
W102	Extended Studies/Lifetime Learners
W103	Classroom
W104	Academic Conference Rm
W105	Computer Classroom
W106	Academic Center
W107	Computer Classroom
W108	Faculty Offices
W109	Classroom
W110A	Writing Center
W110	Tutoring Center
W111	Student Activities
W112	Family Economic Security Program
W113	Faculty Office
W114-W115	Classroom

Room #	Sign Name
W116	Fairfield County Women's Center
W117	School and Community Partnerships/Cooperative Education/ConnTAC-EOC
W118	Human Resources
W119	Faculty Mailroom
W120	Payroll
W121	Culinary Arts Dining Rm
W122	Computer Classroom
W123	Culinary Arts Lab/Kitchen
W124	Classroom
W125	Faculty Services
W126A	Hospitality Management & Culinary Arts Faculty Offices

Room #	Sign Name
W126	Culinary Arts Storage
W127-W132	Classroom
W133	Computer Classroom
W134	Classroom
W135	Computer Classroom
W136	Faculty Offices
W137-W138	Computer Classroom
W139	Networking Equipment Lab
W140	Computer Classroom
Cafeteria	
CIT Atrium	
General Electric Open Computer Lab	
West Campus Main Lobby	

SECOND FLOOR



Room #	Sign Name
W201	Classroom
W202	Computer Classroom
W203	Classroom
W204	Faculty Offices
W206	Classroom
W207	Business Faculty Offices
W208	Classroom
W209	Developmental Studies Division/Faculty Offices
W210-W212	Faculty Offices
W213-W221	Classrooms

Room #	Sign Name
W222	Classroom
W223-W228	Classrooms
W229	Classroom
W230	Classroom
W231	ARC Computer Classroom
W232	Architecture Design Classroom
W233-236	Faculty Offices
W237	Classroom
W238	Faculty Office
W239	Classroom
W240	Biology Lab
W241	Chemistry Lab

Room #	Sign Name
W242	Biology/Chemistry Lab
W243	Physics Lab/Faculty Office
W244	Faculty Office
W245	Classroom
W246	CADD Classroom
W247	Computer Classroom
W248	CIT Conference Room
W249	Mac Computer Classroom
W250	Faculty Offices
W251	Mac Computer Classroom

Shaded areas indicate
Center for Information Technology (CIT)



Google Maps: Aerial View of College

APPENDIX B

Greenhouse Gas Inventory/Report

GHG Report for Norwalk Community College

[Home](#) / GHG Report

Submitted on September 15, 2010; last updated on October 8, 2010

Summary Statistics

Making fair comparisons between higher education institutions is always challenging due to the rich diversity of higher education. The unverified nature of the information in this database and unavailability of unbiased normalization metrics means such comparisons are even more difficult. Users should therefore approach direct institution to institution comparisons with caution and recognize that all comparisons between institutions are inherently biased.

	Total	Per Full-Time Enrollment	Per 1000 Square Feet	% Offset
Gross emissions (Scopes 1 + 2)	3,609 metric tons of CO ₂ e	1.3 metric tons of CO ₂ e	24.6 metric tons of CO ₂ e	0%
Gross emissions (Scopes 1 + 2 + 3)	3,780 metric tons of CO ₂ e	1.4 metric tons of CO ₂ e	25.8 metric tons of CO ₂ e	0%
Net emissions	3,780 metric tons of CO ₂ e	1.4 metric tons of CO ₂ e	25.8 metric tons of CO ₂ e	N/A

Emissions Inventory Methodology and Boundaries

Start date of the 12-month period covered in this report

July 1, 2008

Consolidation methodology used to determine organizational boundaries

No information provided

If any institution-owned, leased, or operated buildings or other holdings that should fall within the organizational boundaries are omitted, briefly explain why. No.

Emissions calculation tool used

Clean Air-Cool Planet

Please describe why this tool was selected.

No information provided

Please describe the source(s) of the emissions coefficients used.

No information provided

Which version of IPCC's list of global warming potentials did you use?

No information provided

Who primarily conducted this emissions inventory?

sustainability committee

Please describe the process of conducting the inventory.

No information provided

Please describe any emissions sources that were classified as *de minimis* and explain how a determination of the significance of these emissions was made.

No information provided

Please describe any data limitations related to this submission and any major assumptions made in response to these limitations.

No information provided

Emissions Data

Emissions from the following sources (in metric tons of CO₂e)

Scope 1 Emissions

Stationary Combustion	0.0 metric tons of CO ₂ e
Mobile Combustion	12.1 metric tons of CO ₂ e
Process Emissions	0.0 metric tons of CO ₂ e
Fugitive Emissions	506.6 metric tons of CO ₂ e
Total Scope 1 emissions	518.7 metric tons of CO₂e

Scope 2 Emissions

Purchased Electricity	3,090.5 metric tons of CO ₂ e
Purchased Heating	0.0 metric tons of CO ₂ e
Purchased Cooling	0.0 metric tons of CO ₂ e
Purchased Steam	0.0 metric tons of CO ₂ e
Total Scope 2 emissions	3,090.5 metric tons of CO₂e

Scope 3 Emissions

Commuting	0.0 metric tons of CO ₂ e
Air Travel	116.5 metric tons of CO ₂ e
Solid Waste	54.2 metric tons of CO ₂ e
Total Scope 3 emissions	170.7 metric tons of CO₂e

Biogenic Emissions

Biogenic Emissions from Stationary Combustion *No information provided*

Biogenic Emissions from Mobile Combustion *No information provided*

Mitigation Data

Carbon Offsets

Carbon offsets purchased *No information provided*

Offset verification program(s) *No information provided*

Description of offsets purchased (including vendor, project source, etc.)

No information provided

Renewable Energy Certificates (RECs)

Total RECs purchased 0

Percent of total electricity consumption mitigated through the purchase of RECs 0

Emissions reductions due to the purchase of RECs 0

REC verification program(s) *No information provided*

Description of RECs purchased (including vendor, project source, etc.)

No information provided

Sequestration and Carbon Storage

Sequestration due to land owned by the institution *No information provided*

Description of how sequestration was calculated

No information provided

Carbon storage due to composting *No information provided*

Normalization and Contextual Data

Building Space

Gross square feet of building space	146,598.0 sq ft
Net assignable square feet of laboratory space	<i>No information provided</i>
Net assignable square feet of health care space	<i>No information provided</i>
Net assignable square feet of residential space	0

Population

Total Student Enrollment (FTE)	2709.0
Residential Students	0
Full-time Commuter Students	2709.0
Part-time Commuter Students	<i>No information provided</i>
Non-Credit Students	<i>No information provided</i>
Full-time Faculty	104
Part-time Faculty	<i>No information provided</i>
Full-time Staff	154
Part-time Staff	<i>No information provided</i>

Other Contextual Data

Endowment Size	<i>No information provided</i>
Heating Degree Days	<i>No information provided</i>
Cooling Degree Days	<i>No information provided</i>

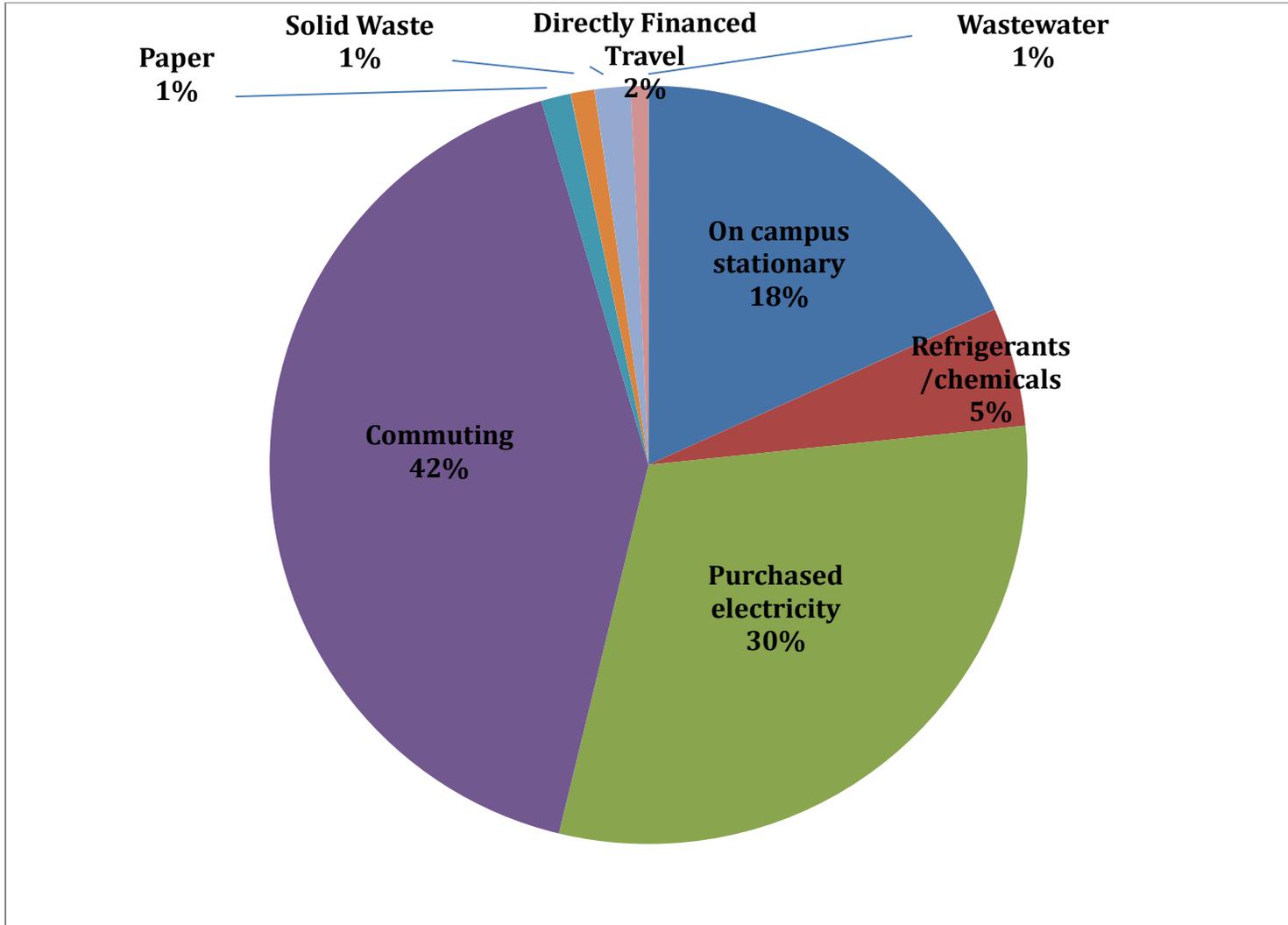
Please describe any circumstances specific to your institution that provide context for understanding your greenhouse gas emissions this year.

No information provided

Supporting Documentation

Completed inventory narrative *No information provided*

Completed inventory calculator *No information provided*



Norwalk Community College GHG Emissions by Sector

APPENDIX C

Energy Efficiency Study, 2007
(Executive Summary)

completed by the
Institute for Sustainable Energy at
Eastern Connecticut State University

Executive Summary

Norwalk Community College has been undergoing significant expansion since 1960. In nearly 50 years the gross square footage of the East and West campus facilities has increased over 60% to 280,000 square foot. Student enrollment today exceeds 5000 students.

Norwalk CC, like all Connecticut institutions, has also experienced dramatic increases in energy cost over the past six academic years. In the 2000 – 2001 academic year all energy purchases added up to \$430,000. During the 2005 – 2006 academic year that cost escalated to over \$900,000. Today, energy bills at the college exceed \$1,000,000.

The administration and maintenance staff at Norwalk CC has demonstrated a commitment to developing more efficient operations at the campus. Reducing energy use through energy efficiency, improved building automation and control, and building operation and maintenance practices is a means of reducing expenditures; especially considering the average cost of all energy sources has risen dramatically in the last six years. The doubling of energy costs at the college was accompanied by only a 22% increase in overall energy consumption. As the price of energy continues to rise, opportunities for energy efficiency improvements will represent an increasingly effective method of cutting costs. Based on campus trends for the last six fiscal years, Norwich CC is currently using more electricity than it has in any of the past years of the study. This may be in part due to the introduction of more electrically powered equipment, such as computers and printers. In order to stabilize energy costs, further energy efficiency improvements are needed to offset the introduction of this new electric load. For heating the facility, Facility Maintenance has significantly reduced the consumption of heating oil and natural gas. They are also holding steady on the college's contribution to climate change through installing more efficient equipment improved maintenance procedures and switching much of their heating to cleaner natural gas. This study includes a carbon footprint revealing the amount of CO₂ from fossil fuel has been reduced.

For this report, the Institute completed a **detailed facility profile** and **carbon footprint**, performed **Energy Star Benchmarking** on both facilities, and conducted an **in-depth lighting study of the East Campus**. We also performed a cursory walkthrough of the heating and cooling systems in both buildings and the lighting in the West Campus. The Institute recommends moving ahead quickly on the lighting retrofit of the East Campus and performing a more in-depth analysis of the issues related to heating, cooling and building automation on both campuses.

APPENDIX D

On-Site Power Generation Study

by

*Radu Tarta
Swagata Sharma
Fernando Febres*

Does CHP make sense for NCC?

The next step is to plot the true cost of electricity, summer on-peak, winter on-peak and off-peak, along with your current gas cost on the Graphs shown in Figure 3. This is done by drawing horizontal lines across the graph for each of the electric costs and a vertical line in for the natural gas cost. The results for our Example are as shown in Figure 4.

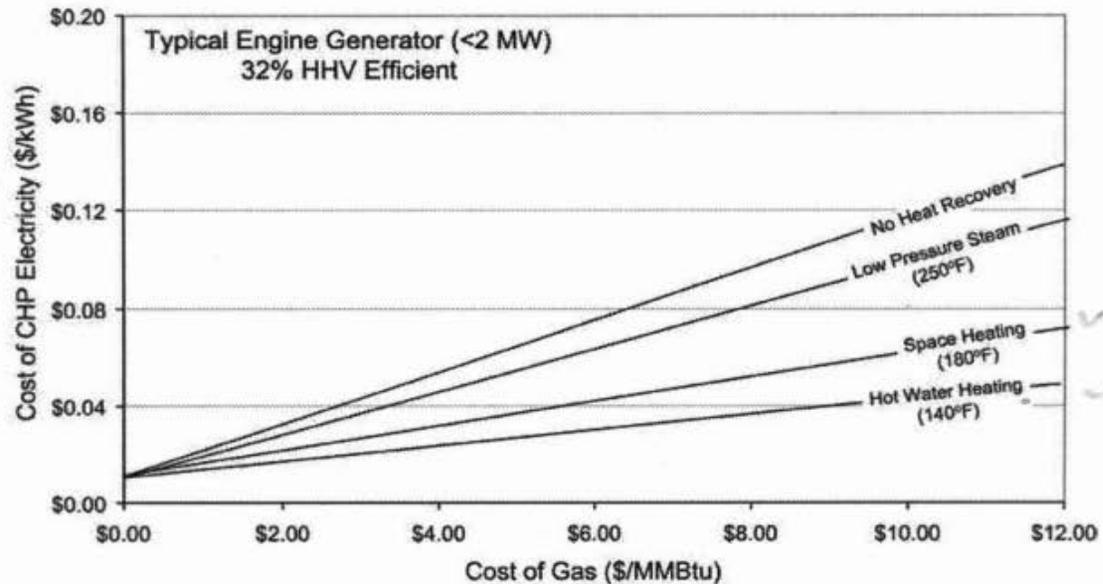


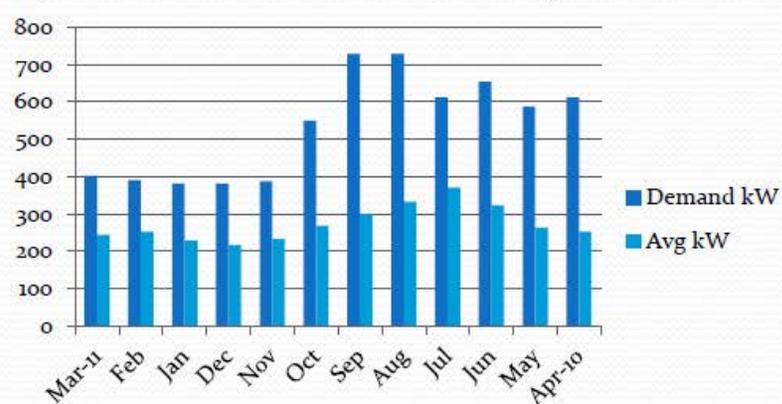
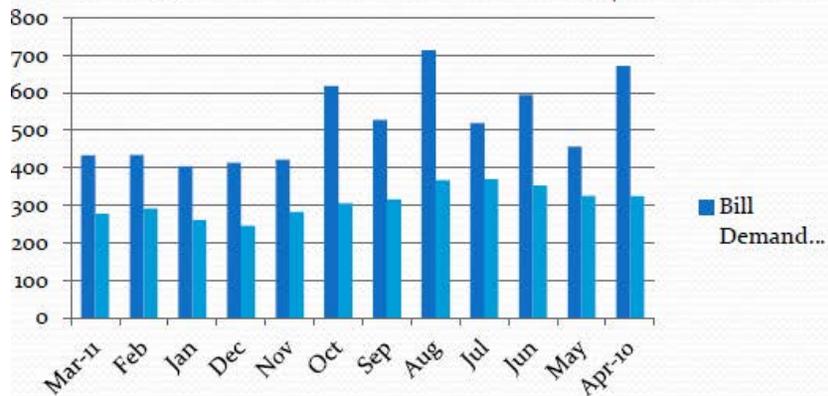
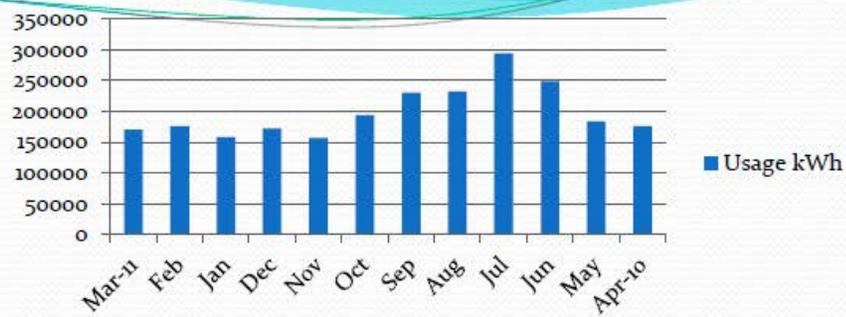
Figure 3: Cost of Electricity Graphs for Engines

Chart assumes an engine heat rate of 10,660 Btu./kWh and a maintenance allocation of \$0.011/kWh for engines of under 2 MW. Larger engine often have lower maintenance allocations. Engines are not recommended for high pressure steam applications (>15 psig). A separate chart is supplied at the back for gas turbines.

Usage kWh West Campus



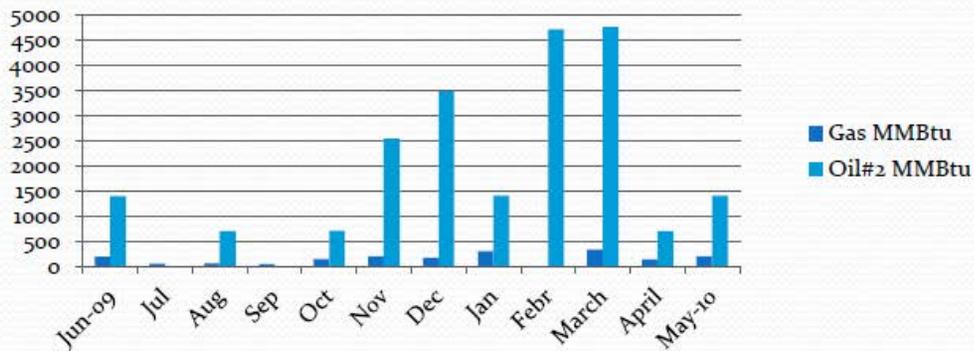
Usage kWh East Campus



Electric 15.83 kWh/sf

Electric 17.96 kWh/sf

Heating 20.74 kWh/sf



10/25/2011

Reciprocating ICE - An example



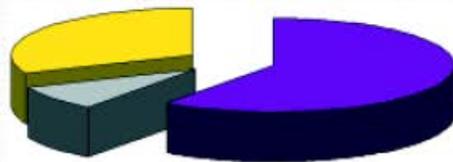
75 kW

TECOGEN®
Cogeneration
CM-60/75 Specs

Electrical Output (kW) 60 75
 Thermal Output 440,000 Btu/hr 490,000 Btu/hr
 Gas Input 760 scfh 900 scfh
 Efficiency
 @ LHV of 905 BTU/scf 93.7% 91.6%
 @ HHV of 1020 BTU/scf 83.1% 81.3%
 Required Gas Pressure 4-14"wc
 Hot Water Flow 22 gpm
 Maximum Water Temperature 230°F
 Electrical Service 208V or 460V, 3PH, 3-wire
 Emissions Option Can meet air quality standards as stringent as Southern California's
 Acoustic Level 70 dBa @ 20'
 Dimensions 6'10"L x 3'8"W x 3'10"H
 Weight 3,000 lbs
 Note:
 Above performance data is valid up to 100°F ambient temperature

Electricity
 31.4%

Hot Water
 60.1%



Losses
 8.5%



Turnkey Cost Savings Analysis (Estimate)
East Bldg Norwalk CC

Yearly Savings	
\$ 49,636	

Electricity kWh Breakdown		Yearly Savings
CUSTOMER Base Electricity per Kwh - Utility	\$0.1425	
Cogeneration installed (KW)	75	
Annual Electricity Produced (KWH)	390,000	
What you would have been charged from Utility	\$ 55,575	\$ 55,575

Electric kW Demand		Yearly Savings
CUSTOMER Demand Price	\$ 17.00	
Demand Savings KW (average per month)	30	
What you would have been charged from Utility	\$ 6,120	\$ 6,120

Thermal Breakdown		Yearly Savings
CUSTOMER Gas Price (1M BTU) - Utility	\$ 13.00	
Annual Thermal Offset (Therms)	36,771	
What you would have been charged from Utility	\$47,803	\$ 47,803

Operating Costs		Yearly Cost
CUSTOMER Gas Price (1M BTU) - Utility	\$ 10.40	
Natural Gas Consumption (Therms per Hour per 75 kW)	9.1	
Maintenance Rate (per hour per 75kW)	\$ 2.00	
Projected Run Hours	5,200	
Total Operating Costs	\$59,882	\$ (59,862)

Totals		Yearly Savings
TOTAL NET ANNUAL SAVINGS		\$ 49,636



Turnkey Cost Savings Analysis (Estimate)
West Norwalk CC

Yearly Savings	
\$ 67,497	

Electricity kWh Breakdown		Yearly Savings
CUSTOMER Base Electricity per Kwh - Utility	\$0.1425	
Cogeneration installed (KW)	75	
Annual Electricity Produced (KWH)	390,000	
What you would have been charged from Utility	\$ 55,575	\$ 55,575

Electric kW Demand		Yearly Savings
CUSTOMER Demand Price	\$ 17.00	
Demand Savings KW (average per month)	30	
What you would have been charged from Utility	\$ 6,120	\$ 6,120

Thermal Breakdown		Yearly Savings
CUSTOMER Gas Price (1M BTU) - Utility (Oil Equiv)	\$ 17.88	
Annual Thermal Offset (Therms)	38,771	
What you would have been charged from Utility	\$65,883	\$ 65,663

Operating Costs		Yearly Cost
CUSTOMER Gas Price (1M BTU) - Utility	\$ 10.40	
Natural Gas Consumption (Therms per Hour per 75 kW)	9.1	
Maintenance Rate (per hour per 75kW)	\$ 2.00	
Projected Run Hours	5,200	
Total Operating Costs	\$59,882	\$ (59,862)

Totals		Yearly Savings
TOTAL NET ANNUAL SAVINGS		\$ 67,497

Rough analysis using Tecogen CHP 75 kW (American DG)

	1 Unit 75kW CHP			2 Units 75kW CHP		
	Savings \$	Offset %	Reduction CO2 tons/year	Savings \$	Offset %	Reduction CO2 tons/year
East Campus	\$ 49,000.00	21% Electric 41% Thermal	247	\$ 88,000.00	37% Electric 71% Thermal	557
West Campus	\$ 67,000.00	17% Electric 18% Thermal	247	\$ 134,000.00	34% Electric 36% Thermal	557
Total	\$ 116,000.00		494	\$ 222,000.00		1114
Total Savings %	9.4%			17.9%		
First Cost to Install	\$ 600,000			\$ 1,200,000		
Simple Payback	5.2			5.4		

	kWh	Cost
Annual usage West	2691359	\$ 457,525
Annual usage East	2388959	\$ 420,014
Total	5080318	\$ 877,539
Total heating		\$ 360,000
Total cost energy/year		\$ 1,237,539

This CO2 reduction is equivalent to 84 cars (1 unit) or 184 (2 units) cars off the road

•Annual emissions analysis using EPA CHP Partnership calculator

Cost Savings analysis West Campus 200kW UTC Fuel Cell

Electricity kWh		Savings \$/year
Actual price per kWh	0.1425	
Cogen installed kW	200	
Production kWh/year	1,040,000	
Cost from Utility	\$ 148,200	\$ 148,200

Thermal Mbtu		
Gas Price \$/Mbtu	13	
Annual thermal offset Mbtu	4082	
Cost from Utility	\$ 53,066	\$ 53,066

Operating Costs		
Gas Price \$/Mbtu	13	
Natural Gas consumption Mbtu/h	1.6	
Maintenance rate \$/h	4	
Run hours	5200	
Total operating cost \$/year	\$ 128,960	\$ 128,960

Net Annual Savings	\$ 72,306
Incentives of \$2.5/W up to 200kW	\$ 500,000
Initial cost based on \$8,000/kW installed	\$ 1,600,000
Net Initial Cost	\$ 1,100,000
Simple payback (Years)	15

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Compare CHP alternatives for West Campus

System West Campus	Energy consumption		Energy offset %		CO2 Emissions (tons/year)		Gas	Payback
	Electric (kWh/year)	Thermal MMBtu/year	Electric	Thermal	Actual	Saved	CCF/h	Years
Actual	2,691,359	14,723			1966	0		
Scheme 1 two 75 kW Reciprocating ICE units	390,000	2,288	14%	16%	216	1751	7.6	5.2
Scheme 2 : one 200 kW Fuel Cell	1,040,000	2,470	39%	17%	454	1512	16	15
Scheme 3 : one 400 kW Fuel Cell	2,080,000	7,992	77%	54%	1021	945	36	

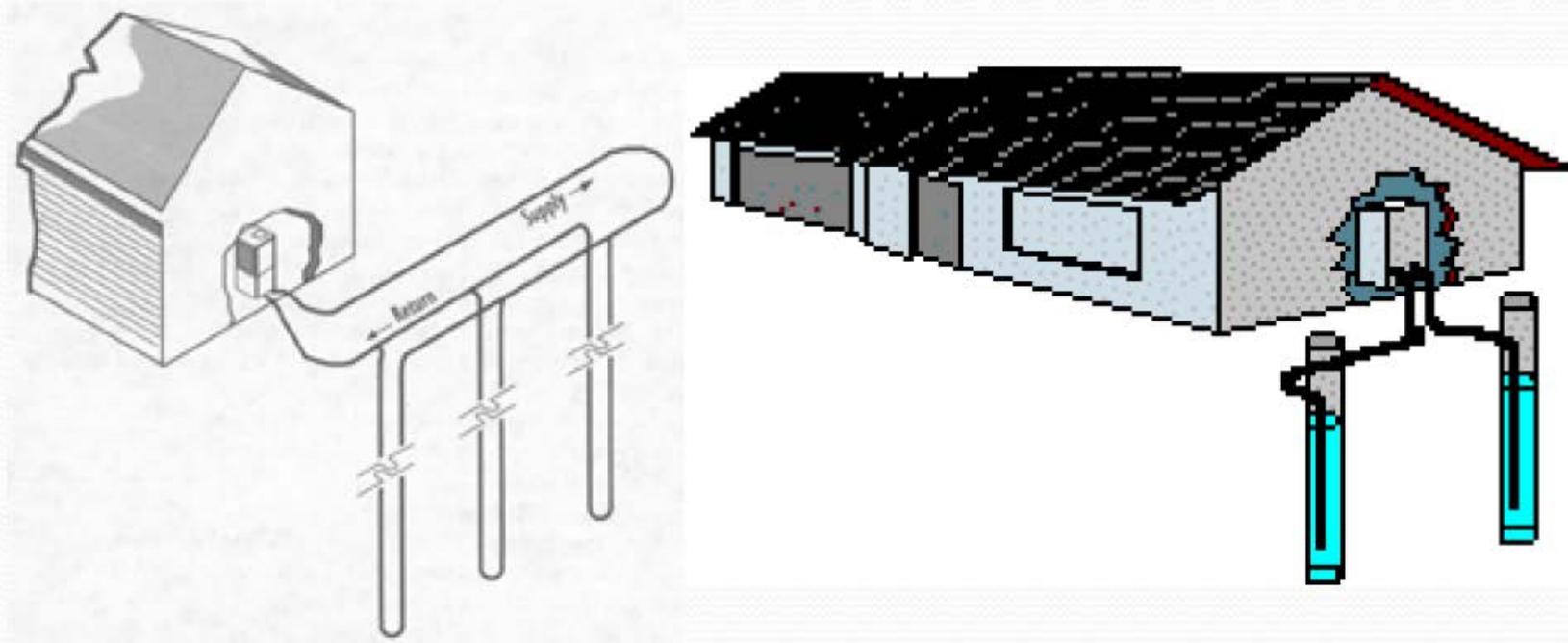
CHP Yearly hours	5,200	Oil	139,000 Btu/gal
Thermal 75 kW Tecogen	0.440 MBtu/h	Boilers	3831000 Btu/h
Thermal 200 kW UTC	0.475 MBtu/h	Nr. Boilers	4
Thermal 400 kW UTC	1.537 MBtu/h	Gallons/year	105919 Gal
		Boilers effic	84%
		Delta T (Heat)	58F

CO2 factor lb/kWh Connecticut	0.73
CO2 factor oil#2 lb/gal	22.29
CO2 factor Natural gas lb/CCF	12

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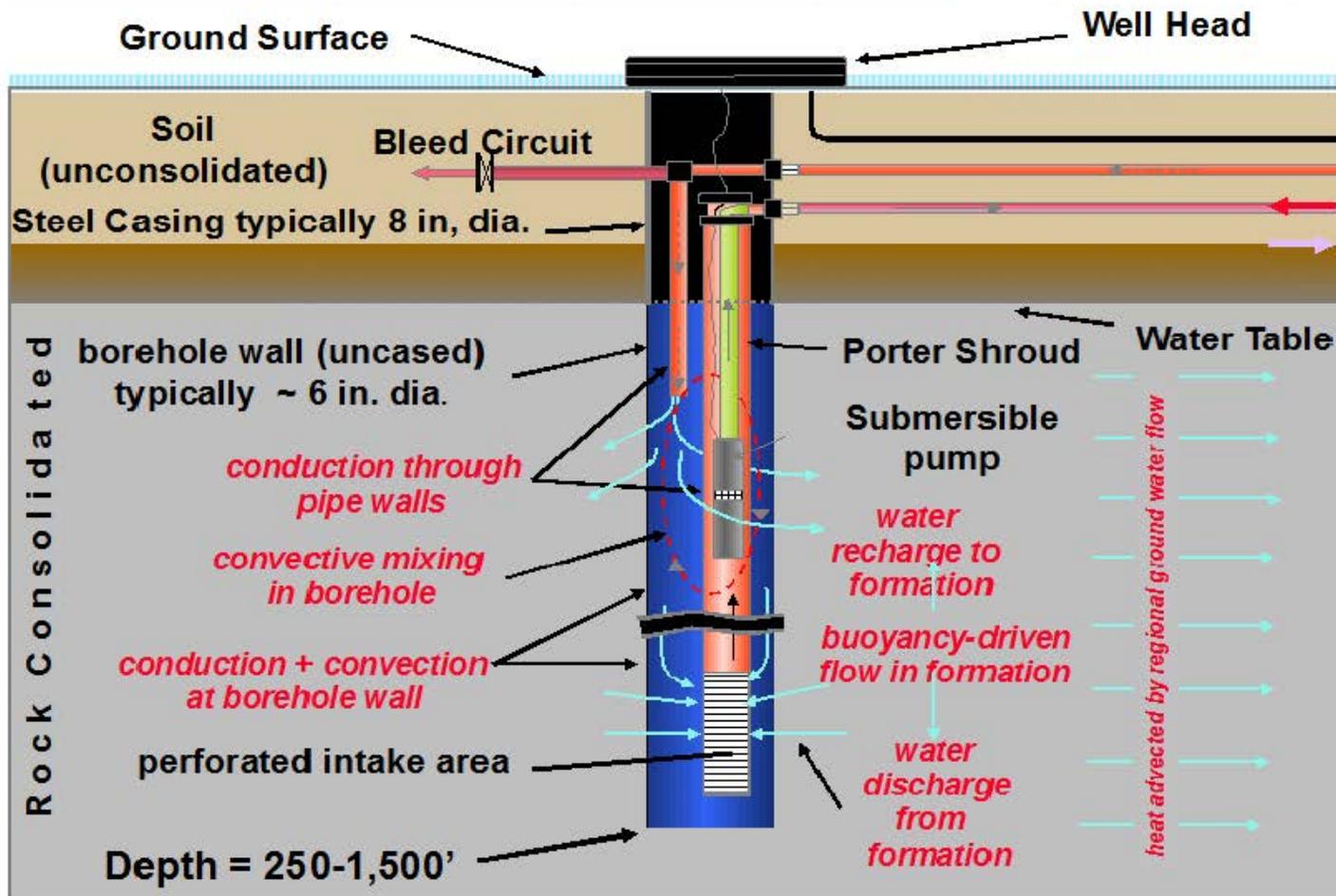
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Standing Column Well Systems



•Source: <http://www.hvackcmo.com>

CROSS -SECTION OF STANDING COLUMN WELL



Source:
<http://www.akfgroup.com>

Geo-exchange design for East Campus – Data and Formulas

Cooling		
Q =	4,386,000	BTU
Delta T	39	° F

Heating		
Q =	3,863,830	BTU
Delta T	58	° F

Heating Value of Fuels (C)		
C oil	139,000	BTU/Gal
C elec	1,000	W/KW
C elec	3,414	Btu/KW
Degree Days		
Cooling	3,550	
Heating	5,300	

Utility Cost of Fuels	
Oil (\$/Gal)	\$2.40
Elec (\$/KWh)	\$0.18

Heating Efficiency (COP)	
Oil Boiler	0.84
Geothermal Heat Pump	4

Cooling Efficiency (EER)	
DX Split System	10
Geothermal Heat Pump	16

Fuel Consumption (F)

$$F = \frac{24 \times DD \times Q}{\Delta T \times C \times \text{Eff}}$$

EER's as per minimum requirements of International Energy Code, 2003

Results :

Fuel for heating now= 72,574 Gal #2 Oil/year

Electricity for Cooling now = 958,172kWh/year

Electricity for future Geo-exchange heating and cooling = 1,219,375 kWh/year

East Campus Geo-exchange benefits

	Heating			Cooling			Total Annual Energy Cost	Annual Energy Cost Savings	Annual Electric Energy use kWh/year	Annual Total CO2 emissions tons/year
	Fuel Consumption			Fuel Consumption						
	F	Units	Cost	F	Units	Cost				
Scheme 1										
Existing Split System & Oil-fired Boilers	72,574	Gal	\$174,178	958,172	KWH	\$172,471	\$346,649	---	958,172	1,053
Scheme 2										
Geothermal Heat Pump System	620,517	KWH	\$111,693	598,858	KWH	\$107,794	\$219,487	\$127,162	1,219,375	405

East Campus Geo-exchange benefits

LIFE CYCLE COST ANALYSIS				
NCC - Geothermal Heat Pump system Study				
Project Name: Geothermal Heat Pump Feasibility Study		Future Overhaul Period:	10	1.480244285
Oil-fired Boiler & DX Split System Vs. Geothermal System		Real Discount Rate:	4%	17.29
Analysis Period: 30 years		Energy Escalation Rate:	6%	13.76
	Cost Elements	Baseline : Oil-fired HW Boiler & DX Split System	Alternate: Geothermal Heat Pump System	Baseline vs Alternate
a.	Construction cost, (See Note 2) \$	\$ 300,000	\$ 1,700,000	\$ 1,400,000
c.	Available Utility Rebates (See Note 1):	\$ 36,000	\$ 623,000	\$ 587,000
	(1) SUBTOTAL First Costs	\$ 264,000	\$ 1,077,000	\$ 813,000
g.	Annual Energy Cost \$/year	\$ 346,649	\$ 219,487	\$ (127,162)
h.	PW Annual Energy Costs	\$ 4,771,570	\$ 3,021,207	\$ (1,750,363)
i.	Annual Maintenance & service cost	\$ 20,000	\$ 19,500	\$ (500)
j.	PW Maintenance & service cost	\$ 345,841	\$ 268,414	\$ (77,426)
	(2) SUBTOTAL Annual Cost (h+j)	\$ 5,117,411	\$ 3,289,622	\$ (1,827,790)
k.	PW Future major overhaul	\$ 150,000	\$ 50,000	\$ (100,000)
l.	Future Value Major Overhaul (See Note 3):	\$ 222,037	\$ 74,012	\$ (148,024)
	(3) SUBTOTAL Future Replacements	\$ 222,037	\$ 50,000	\$ (172,037)
	Simple Payback, years			5.2
	TOTAL LIFE CYCLE COST, PW (1+2+3)	\$ 5,603,448	\$ 4,416,622	\$ (1,186,826)

Notes:

- Available utility rebates includes \$1,750/ton geothermal or \$100/ton efficient 1AC
- 2Initial Baseline construction cost is for replacement of 6 chillers
- 3Future major overhaul cost is for replacement of 2 oil fired boilers

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Solar PV potential at NCC

Solar PV potential for Norwalk Community College

Campus	Location	Surface area (sf)	Capacity (kW)	Production (kWh/year)
West Campus	Parking lots	164000	2296	2755200
West Campus	Flat roof	4000	56	67200
East Campus	Parking lots	52000	728	873600
East Campus	Library S roof	3200	44.8	53760
Total		223200	3124.8	3749760

Energy produced at 14 w/sf (20% efficient PV)
 Production 1200 kWh/Year/kW (Fairfield County CT)

	Total production kWh/year	Total consumption kWh/year	% offset
West Campus	2822400	2691359	105%
East Campus	927360	2388959	39%
Total	3749760	5080318	74%

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Solar PV potential at NCC

Solar Rating:	Good 4.48 kWh/sq-m/day
Solar System Capacity Required:	3,099.92 kW of peak power (DC watts)
Area Needed:	309,992 sq-ft
Equivalent Annual Production:	3,739,279 kWh electricity

ESTIMATED SYSTEM COST

This is only an estimate based upon many assumptions. Installation costs can vary considerably. detailed cost estimate.

Assumed Installation Gross Cost:	\$24,799,360
"Gross Cost" is the cost <u>before</u> any rebates, incentives, tax credits, etc. are applied. See the	assuming \$8 per watt DC

FINANCIAL INCENTIVES

Financial incentives shown are totals across all years. So, if an incentive spans multiple years then the value shown is the total of all years.

CCEF - ARRA Commercial Solar PV Program (>50 kW. actual incentive varies)	\$ 800,000
Federal Tax Credit (30% of Gross Cost at Installation)	\$ 7,439,808
Modified Accelerated Cost Recovery System (MACRS) Depreciation (5 yr)	YES
ESTIMATED NET COST:	\$ 16,559,552
Cash & Loan Amounts:	\$ 16,559,552 Cash \$ 0 Borrowed
Loan Monthly Payment (6.5% apr, 30 years):	\$ 0

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<http://www.solar-estimate.org/>

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Solar PV potential at NCC

SAVINGS & BENEFITS

First-year Utility Savings:

The utility offers Tiered rates and/or TOU metering. Therefore, the electricity savings you realize may exceed the annual electricity needs of the building.

\$822,641 to \$2,138,866

Average Monthly Utility Savings:

over 25-year expected life of system

\$115,064 to \$299,167

Average Annual Utility Savings:

over 25-year expected life of system

\$1,380,773 to \$3,590,010

25-year Utility Savings:

\$34,519,323 to \$89,750,239

Levelized Cost of your Solar Energy:

\$16,559,552 cost / 93,481,975 kWh electricity replaced by solar

\$0.18 per kWh

Utility savings shown above do not take income tax effects into account (they are "Post-Tax").

Appreciation (Increase) in Property Value:

\$16,452,814 to \$42,777,316

Return on Investment (ROI):

63% - 299%

Internal Rate of Return (IRR):

5.3% - 18.5%

Net Present Value (NPV):

\$351,071 - \$19,720,689

Profitability Index:

1.0 - 2.2

Greenhouse Gas (CO₂) Saved:

over 25-year system life

76,655 tons

153,310,000 auto miles

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<http://www.solar-estimate.org/>

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Reducing NCC commuting CO₂ emissions - Electric car charging stations

PEV model	Battery type/capacity	Charging Level I			Charging Level II		
		Hours	Power	up to %	Hours	Power	up to %
Chevy Volt	Li-Ion 16kWh	8	1.44kW(12A)	25-90	3.5	3.3kW(15A)	90
	(10.4kWh usable)	11	.96 kW (8A)	25-90			
Nissan Leaf	Li-Ion 34kWh	14	1.8kW(15A)	25-95	8	3.3kW(15A)	95
					4	6.6kW(30A)	95
Tesla Roadster	Li-Ion 53kWh	30	1.8kW(15A)	25-100	5	9.6kW(40A)	100
					3.5	16.8kW(70A)	100
CODA	Li-FE-PO4 34kWh	20	1.3kW(11A)	25-100	under 6	6.6kW(30A)	100
Think City	Sodium Zebra				7	3.6kW (230V/16A)	0-80
					4	3.6kW (230V/16A)	80-100
	Li-Ion				8	3.6kW (230V/16A)	0-100
Smart for Two	Li-Ion 16.5 kWh	12	1.44kW(12A)	0-100	4	240V	20-80
		9	1.92kW(16A)	0-100	8	240V	0-100
Toyota Prius	Li-Ion 5.2kWh	3	1.92kW(16A)	25-95			
Ford Focus BEV	Liquid cooled Li-Ion	12	1.92kW(16A)	0-100	3.5	6.6kW(30A)	0-100
	23kWh						
Honda-Fit EV	Li-Ion	12	1.8kW(15A)	0-100	6	3.3kW(15A)	0-100
Mini E-BMW	Li-Ion 35kWh	20	1.44kW(12A)	0-100	3.5	11.52kW(48A)	0-100
Average	16kWh	8	1.8kW(15A)	0-100	6	3.3kW(15A)	0-100

Summary

Energy needs	Energy needs NCC now		NCC Alternative Energy Solutions								Total Offset %	CO2 Reductions Tons/year	
	Quantity	Units	Solar PV East & West		Geothermal East		CHP West Campus Scheme 2 (200kW UTC)						
			kWh/year	Offset %	MMBtu/year	Offset % **	kWh/year	Offset %	MMBtu/year	Offset %			
Electric	5,080,318	kWh/year	3,749,760	70%				1,040,000	19%			90%	1797
Heating	24,810	MMBtu/year			10,087	41%				2,470	10%	51%	1526
Cooling	7,537	MMBtu/year			3,277	43%						43%	
Payback		Years	18		5.2		15				Total	3323	

* The future electricity needed will increase to 5,341,818 kWh/year due to geothermal fuel migration from oil to electricity

**Geothermal will offset 100% of East campus heating and cooling needs. Offsets in the above table are related to total NC needs

*** <http://www.epia.org/solar-pv/environmental-impact.html> Solar PV CO2 emissions 82 Tons/year 0.022 kg CO2/kWh

Solar PV CO2 reductions 1162 Tons/year

Total CO2 emissions 2010 on and off campus	7609	tons	****
Total CO2 reductions on and off campus	3323	tons	
Offset CO2 after Alternative Energy Measures	44%		

**** Clean Air-Cool Planet, Campus Carbon Calculator

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Conclusion

- Alternative Energy Solutions are viable options to reduce NCC's environmental impacts and pursue steps toward energy independence
- There is enough solar and ground potential to achieve carbon neutrality
- Smart financial approach will ensure that the proposed measures can be realized to maximize the returns
- A strong will and determination is need to pursue these goals to see the NCC project come to life