BALL STATE UNIVERSITY

Leveraging the Voluntary Carbon Market

To Invest in Deeper Carbon Reduction

Robert J. Koester, AIA LEED AP Professor of Architecture
Director,
Academy for Sustainability *and*
Center for Energy Research/Education/Service (CERES)

Chair,
Council on the Environment
University Liaison for CLC, IGCN, STARS, USGBC

Objectives

1.) the preparation of the university's **Verified Carbon Standard (VCS)** project application, including the estimated short and long term emissions reductions;

2) the use of the **Sustainability Indicator Management and Analysis Platform (SIMAP)** to determine the campus-wide greenhouse gas reductions as reported to Second Nature (SN) – the secretariat for the nationwide Climate Leadership Commitment (CLC);

3.) the **annual verification process** including internal tracking and quality assurance of the reported metrics;

4.) the **third-party sign-off** on VCS project verification reports; and

5.) the SN management of this work under the rubric of the **Carbon Credit Purchasing Program (C2P2)** by which it brokers credit registrations and transaction procedures in the VCM..

6) The presentation concludes with a review of the emerging **social cost of carbon,** a metric now used by institutions to shape their emission reduction strategies.

The Founding Members of the Presidents Climate Commitment Leadership Circle

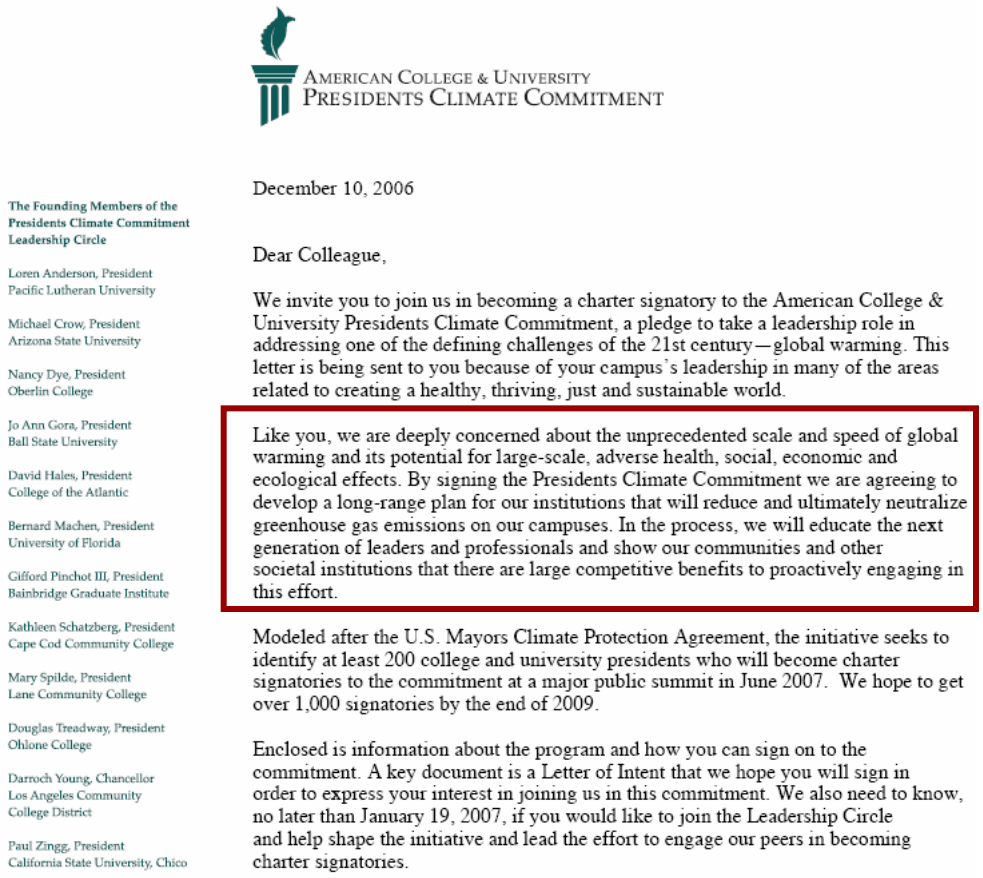
Loren Anderson, President
Pacific Lutheran University

Michael Crow, President
Arizona State University

Nancy Dye, President
Oberlin College

Jo Ann Gora, President
Ball State University

David Hales, President
College of the Atlantic



The Founding Members of the Presidents Climate Commitment Leadership Circle

Loren Anderson, President
Pacific Lutheran University

Michael Crow, President
Arizona State University

Nancy Dye, President
Oberlin College

Jo Ann Gora, President
Ball State University

David Hales, President
College of the Atlantic

Bernard Machen, President
University of Florida

Gifford Pinchot III, President
Bainbridge Graduate Institute

Kathleen Schatzberg, President
Cape Cod Community College

Mary Spilde, President
Lane Community College

Douglas Treadway, President
Ohlone College

Darroch Young, Chancellor
Los Angeles Community College District

Paul Zingg, President
California State University, Chico

AMERICAN COLLEGE & UNIVERSITY PRESIDENTS CLIMATE COMMITMENT

December 10, 2006

Dear Colleague,

We invite you to join us in becoming a charter signatory to the American College & University Presidents Climate Commitment, a pledge to take a leadership role in addressing one of the defining challenges of the 21st century—global warming. This letter is being sent to you because of your campus's leadership in many of the areas related to creating a healthy, thriving, just and sustainable world.

Like you, we are deeply concerned about the unprecedented scale and speed of global warming and its potential for large-scale, adverse health, social, economic and ecological effects. By signing the Presidents Climate Commitment we are agreeing to develop a long-range plan for our institutions that will reduce and ultimately neutralize greenhouse gas emissions on our campuses. In the process, we will educate the next generation of leaders and professionals and show our communities and other societal institutions that there are large competitive benefits to proactively engaging in this effort.

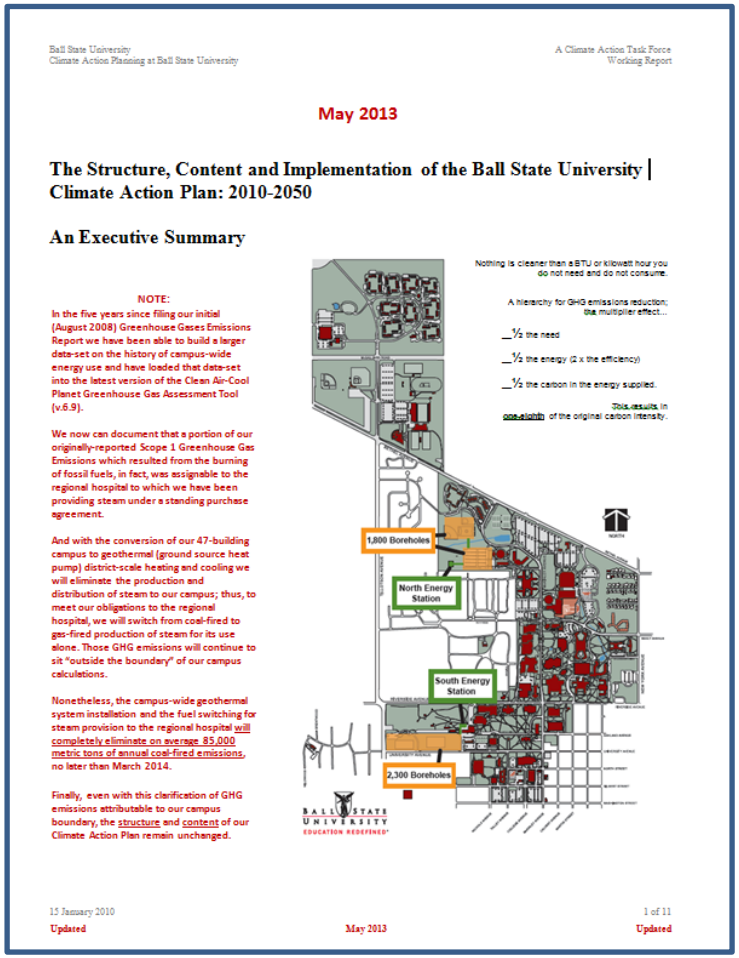
Modeled after the U.S. Mayors Climate Protection Agreement, the initiative seeks to identify at least 200 college and university presidents who will become charter signatories to the commitment at a major public summit in June 2007. We hope to get over 1,000 signatories by the end of 2009.

Enclosed is information about the program and how you can sign on to the commitment. A key document is a Letter of Intent that we hope you will sign in order to express your interest in joining us in this commitment. We also need to know, no later than January 19, 2007, if you would like to join the Leadership Circle and help shape the initiative and lead the effort to engage our peers in becoming charter signatories.

Climate Action Plan

…in nine steps

1. Transparent Monitoring and Reporting
2. **Energy Conservation: Geothermal District H&C**
3. Energy Conservation: Information Technology
4. Energy Conservation: Transportation
5. Energy Conservation: Buildings
6. Energy Conservation: Policies
7. Electrical: On-Site Solar-Photovoltaic (PV) Production
8. Electrical: Off-Site Wind-Energy Production
9. Electrical: Off-Site PV Production



Ball State University
Climate Action Planning at Ball State University

A Climate Action Task Force
Working Report

May 2013

The Structure, Content and Implementation of the Ball State University Climate Action Plan: 2010-2050

An Executive Summary

NOTE:
In the five years since filing our initial (August 2008) Greenhouse Gases Emissions Report we have been able to build a larger data-set on the history of campus-wide energy use and have loaded that data-set into the latest version of the Clean Air-Cool Planet Greenhouse Gas Assessment Tool (v.6.9).

We now can document that a portion of our originally-reported Scope 1 Greenhouse Gas Emissions which resulted from the burning of fossil fuels, in fact, was assignable to the regional hospital to which we have been providing steam under a standing purchase agreement.

And with the conversion of our 47-building campus to geothermal (ground source heat pump) district-scale heating and cooling we will eliminate the production and distribution of steam to our campus; thus, to meet our obligations to the regional hospital, we will switch from coal-fired to gas-fired production of steam for its use alone. Those GHG emissions will continue to sit "outside the boundary" of our campus calculations.

Nonetheless, the campus-wide geothermal system installation and the fuel switching for steam provision to the regional hospital will completely eliminate on average 85,000 metric tons of annual coal-fired emissions, no later than March 2014.

Finally, even with this clarification of GHG emissions attributable to our campus boundary, the structure and content of our Climate Action Plan remain unchanged.

Nothing is cleaner than a BTU or kilowatt hour you do not need and do not consume.

A hierarchy for GHG emissions reduction; the multiplier effect…

__½ the need

__½ the energy (2 x the efficiency)

__½ the carbon in the energy supplied.

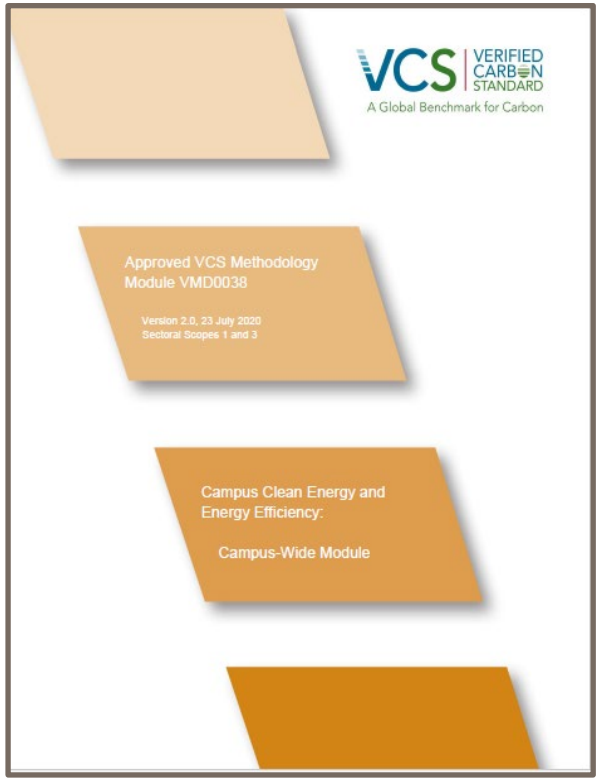
This results in one-eighth of the original carbon intensity.

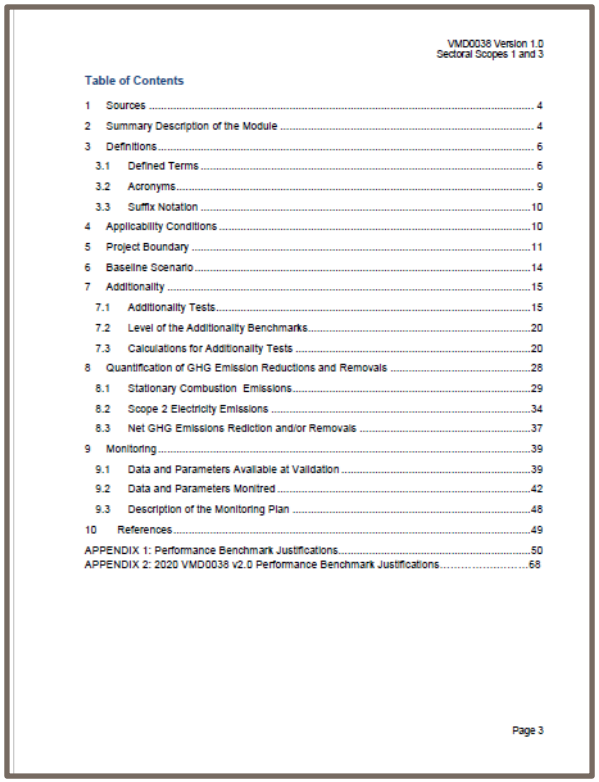
15 January 2010
Updated

May 2013

1 of 11
Updated

Carbon Accounting Methodology





Campus Clean Energy and Energy Efficiency: Campus Wide Module

VCS VERIFIED CARBON STANDARD — PROJECT DESCRIPTION: *VCS Version 3*

CAMPUS-WIDE CLEAN ENERGY & ENERGY EFFICIENCY: PROJECT DESCRIPTION DOCUMENT

BALL STATE UNIVERSITY

Document Prepared By
Center for Energy Research/Education/Service
CERES
Robert J. Koester AIA LEED AP
Director

Project Title	Ball State University Campus-Wide Clean Energy Efficiency Project: District-Scale Geothermal (Closed-Loop, Ground-Source) Heat Pump Chiller Heating and Cooling System
Version	5
Date of Issue	14-October-2014
Prepared By	Center for Energy Research/Education/Service (CERES)
Contact	2000 University Avenue

VCS VERIFIED CARBON STANDARD — PROJECT DESCRIPTION: *VCS Version 3*

For this campus project:

Verified reductions are sought in: ☒ Stationary-1 combustion ☐ Scope 2 Electricity-based
(check which one applies; complete a second pdd template if both sources are project eligible)

The campus Carnegie class is: ☒ Doctoral ☐ Masters ☐ Baccalaureate ☐ Associates ☐ Specials

The required PBSc/PBEc is therefore: ☒ PBS_c ☐ PBE_c

Campus' average percent reduction/yr campus achieved: 18.75%

Based upon the following Project 1 testing year. 2012 FY
First year Additionality Eligibilty Period Selected 2010 FY

Applying weather adjusted testing	☐ Yes	☒ No
Applicability conditions (2.2) are met	☒ Yes	☐ No
Square foot variances apply during baseline period (i.e. Test 2 failed)	☐ Yes	☒ No

No single technology installation is typically relied upon when meeting the performance standard requirements for this methodology but rather a series of energy efficiency/clean energy measures, adopted campus-wide. Since this methodology requires that at least two kinds of EE measures be adopted to meet the PB performance tests (per module section 4), this campus' activities include:

Behavior Change Campaign/Communications	☒ Yes	☐ No
CoGen & Fuelswitch	☐ Yes	☒ No
Lighting Retrofits	☒ Yes	☐ No
On-Site Renewables	☐ Yes	☒ No
Boiler Retrofits/Central Heating/Cooling Upgrades	☒ Yes	☐ No
Building System Retro-Commissioning & Upgrades Including Automation	☒ Yes	☐ No
Weatherization Improvements	☒ Yes	☐ No
LEED Certification/Green Buildings	☒ Yes	☐ No
Innovative Strategies	☒ Yes	☐ No

DESCRIBE specifics of at least two the measures undertaken:

Behavior Change Campaign/Communications	☒ Yes	☐ No
CoGen & Fuelswitch	☐ Yes	☒ No
Lighting Retrofits	☒ Yes	☐ No
On-Site Renewables	☐ Yes	☒ No
Boiler Retrofits/Central Heating/Cooling Upgrades	☒ Yes	☐ No
Building System Retro-Commissioning & Upgrades Including Automation	☒ Yes	☐ No
Weatherization Improvements	☒ Yes	☐ No
LEED Certification/Green Buildings	☒ Yes	☐ No
Innovative Strategies	☒ Yes	☐ No

VCS VERIFIED CARBON STANDARD MONITORING REPORT: *VCS Version 3*

CAMPUS-WIDE CLEAN ENERGY & ENERGY EFFICIENCY MONITORING REPORT

BALL STATE UNIVERSITY

Document Prepared By:
Center for Energy research/Education/Service (CERES)

Project Title	Ball State University Campus-Wide Clean Energy Efficiency Project: District-Scale Geothermal (Closed-Loop, Ground-Source) Heat Pump Chiller Heating and Cooling System
Version	8
Report ID	BSU Monitoring Report
Date of Issue	23 April-2015
Project ID	1354
Monitoring Period	07-01-2011 to 12-31-2014
Prepared By	Robert J. Koester AIA LEED AP
Contact	2000 University Avenue AB 018 Muncie Indiana 47306-0170 765.285.1135 rkoester@bsu.edu www.bsu.edu/sustainability

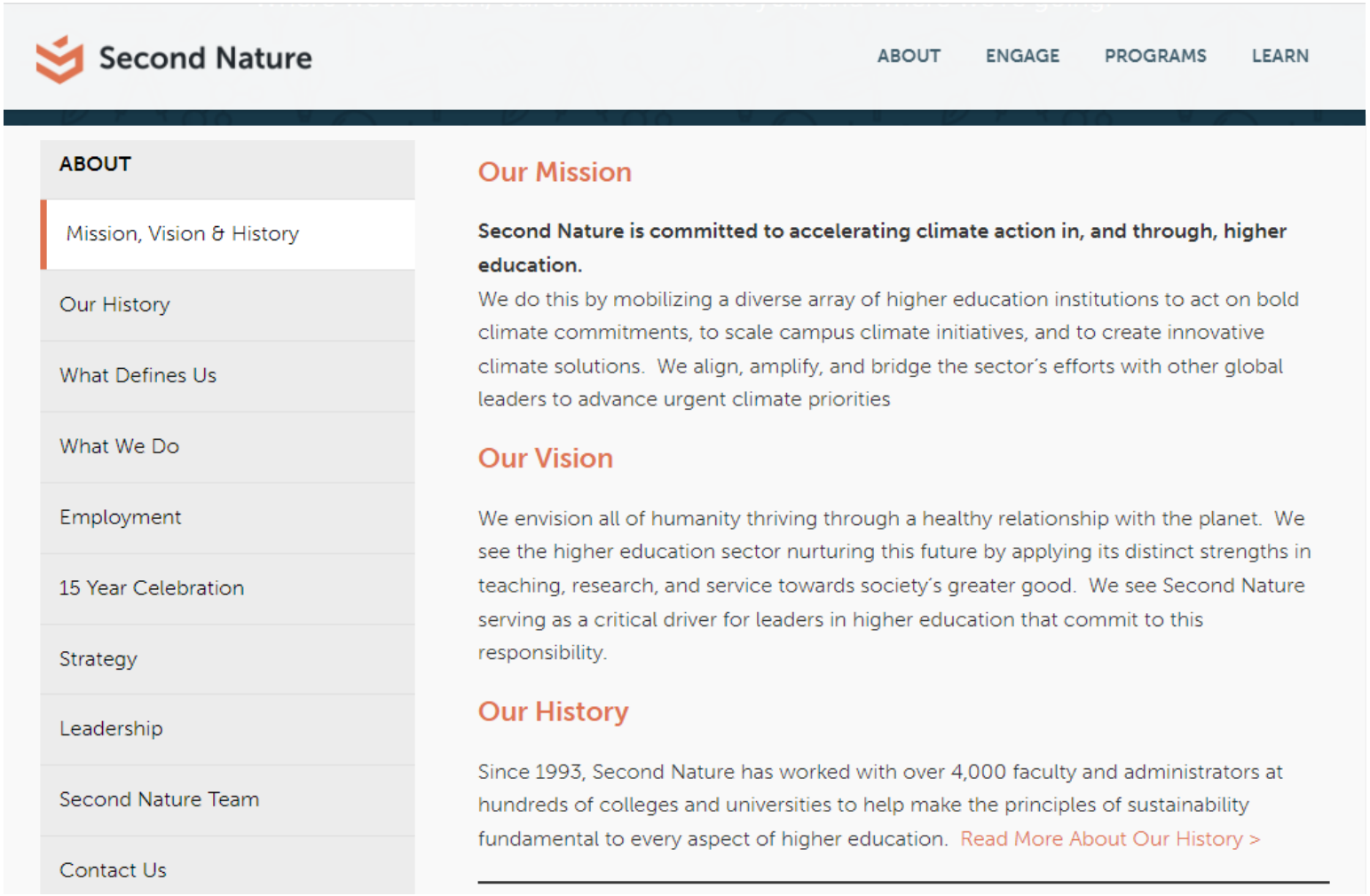
The following resources and tools are provided for campuses to use to help them to assess whether they want to pursue certification by VCS. The resources and tools are offered for assistance only and campus' use of the resources and tools is at its sole expense and discretion. Alternatively, campuses are free to develop their own tools to generate the necessary information to give to VCS for possible certification if they wish to do so. Use of these resources and tools does not guarantee certification by VCS. In addition, neither the use of these tools nor the successful certification by VCS will necessarily result in the purchase of credits by BEF or Chevrolet.

4.4 Net GHG Emission Reductions and Removals

For FY 2012, 2013, 2014, 2015 (as applicable) using the relevant CAPC generated results as described above:

For stationary 1 reductions:

Years	Baseline emissions or removals (tCO_2e) BE_y	Project emissions or removals (tCO_2e) PE_y	PE Adjustment emissions (tCO_2e) $PE\Delta_y$	Sq ft adjustment factor $SF\Delta_y$	Actual net GHG emission reductions or removals (tCO_2e) ER_y
Project Year 1	65,781	45,914	5,792	1	14,075
Project Year 2	64,926	30,503	11,345	1	23,078
Project Year 3	64,530	26,516	11,120	1	26,894
Project Year 4 [HALF YEAR]	31,845	10,655	4,751	1	16,439 and use actual #'s from this table Dec 2014
Project Year 5					
Project Year 6					
Project Year 7					
Project Year 8					
Project Year 9					
Project Year 10					
Total for this Monitoring Period (only)	227,082	113,588	33,008	N/A	80,486


Second Nature
ABOUT
ENGAGE
PROGRAMS
LEARN
ABOUT
Mission, Vision & History
Our History
What Defines Us
What We Do
Employment
15 Year Celebration
Strategy
Leadership
Second Nature Team
Contact Us
Our Mission
Second Nature is committed to accelerating climate action in, and through, higher education.
We do this by mobilizing a diverse array of higher education institutions to act on bold climate commitments, to scale campus climate initiatives, and to create innovative climate solutions. We align, amplify, and bridge the sector's efforts with other global leaders to advance urgent climate priorities
Our Vision
We envision all of humanity thriving through a healthy relationship with the planet. We see the higher education sector nurturing this future by applying its distinct strengths in teaching, research, and service towards society's greater good. We see Second Nature serving as a critical driver for leaders in higher education that commit to this responsibility.
Our History
Since 1993, Second Nature has worked with over 4,000 faculty and administrators at hundreds of colleges and universities to help make the principles of sustainability fundamental to every aspect of higher education. Read More About Our History >

2016

Climate Leadership Commitment

Challenge:
Contiguous to the founding of AASHE and the implementation of STARS, there was national interest in institutionalizing commitments by colleges and universities to become climate neutral.

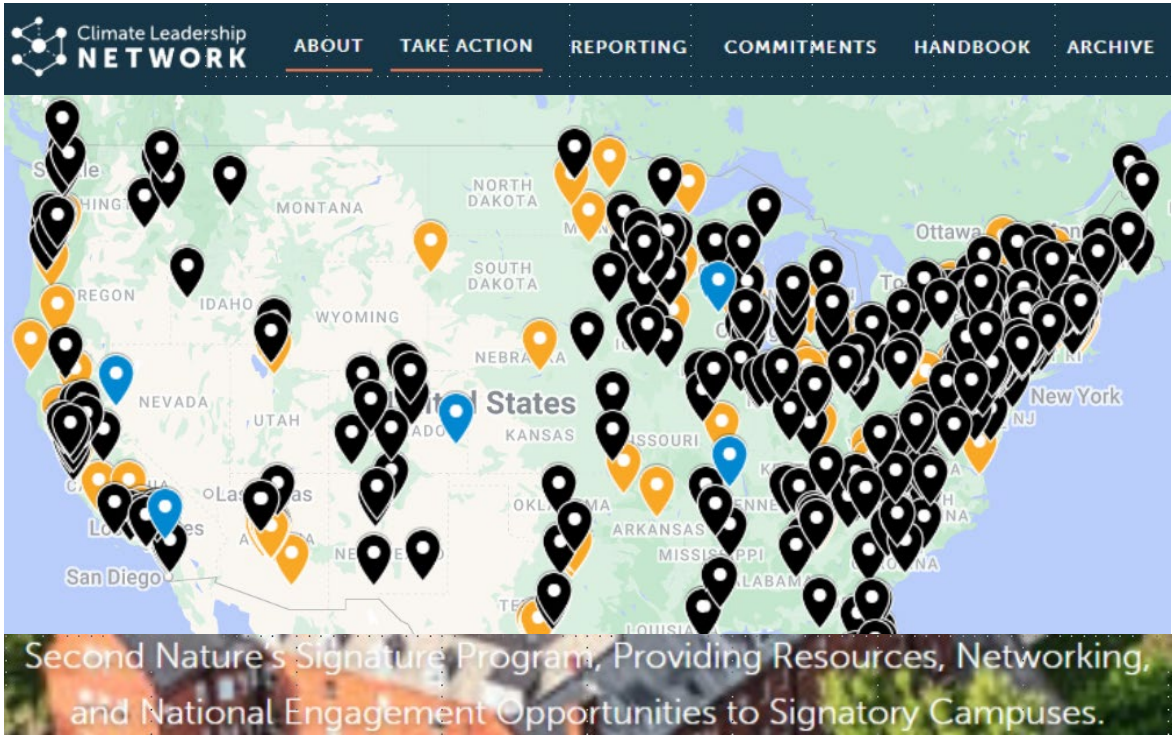
Role:
We participated in origination of the American Colleges and Universities Presidents' Climate Commitment (ACUPCC) in 2006; convincing Ball State University President Jo Ann Gora to become one of the first 12 signatories committed to becoming a climate neutral campus.

A cosigned letter from the 12 inaugural presidents and chancellors then was distributed nationally to 4076 colleges and universities; resulting in more than 800 institutional commitments, to date.

Impact:
Each has now inventoried greenhouse gas emissions and developed a climate action plan; setting a date for becoming climate neutral.

We prepared the greenhouse gas inventory and current 9-step climate action plan for Ball State University.

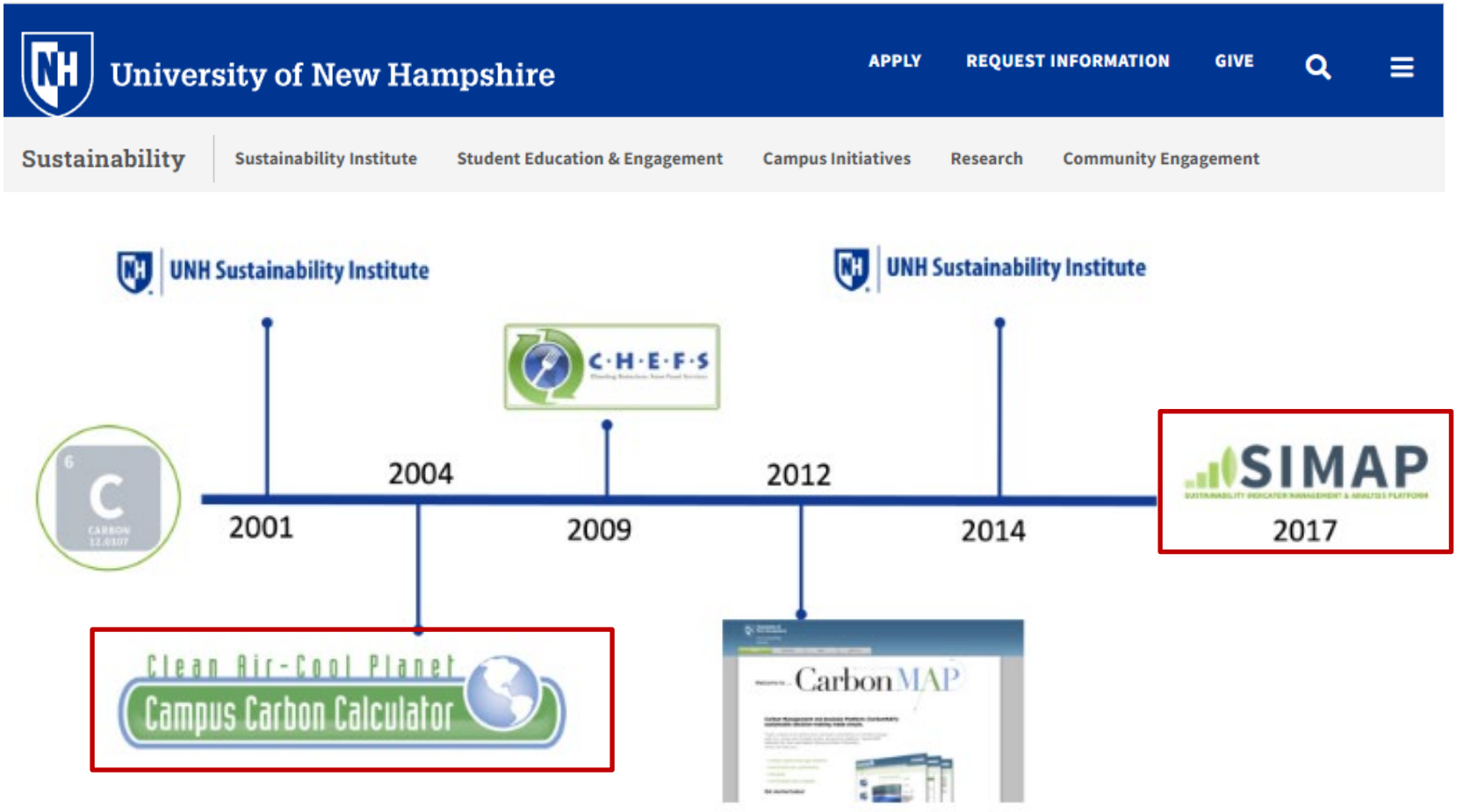
In 2016 on the 10th year anniversary of its creation, the ACUPCC was re-branded as the Climate Leadership Commitment (CLC)



at which time Ball State University embraced a commitment to work with the nearby Muncie community to conduct its greenhouse gas inventory, create a climate action plan and address climate resilience strategies for our Midwestern climate zone.

As of today, Ball state university has reduced its gross emissions by some 47% and has moved its target date for becoming climate neutral to align with Architecture 2030.

2011-2017


University of New Hampshire
APPLY
REQUEST INFORMATION
GIVE
Sustainability
Sustainability Institute
Student Education & Engagement
Campus Initiatives
Research
Community Engagement
UNH Sustainability Institute
UNH Sustainability Institute
C·H·E·F·S
2001
2004
2009
2012
2014
2017
SIMAP
Clean Air-Cool Planet
Campus Carbon Calculator
CarbonMAP

SIMAP

My account Log out

SUSTAINABILITY INDICATOR MANAGEMENT & ANALYSIS PLATFORM

HOME | 1. ACCOUNT | 2. DATA ENTRY | 3. RESULTS | REPORTS | DATA MGMT | ABOUT | RESOURCES | PUBLIC REPORTING

ABOUT

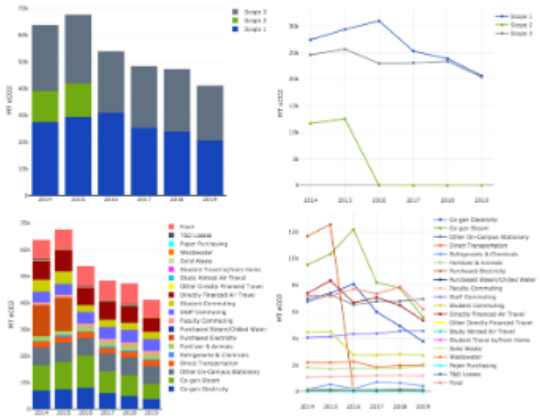
- About SIMAP
- Our Team
- SIMAP Programs
- UNH Sustainability Institute

About SIMAP

SIMAP® (Sustainability Indicator Management & Analysis Platform) is a carbon and nitrogen-accounting platform that offers campuses a simple, comprehensive, and affordable online tool to track, analyze, and improve campus-wide sustainability. The mission of SIMAP® is to help institutions, colleges and universities track their footprints so they can meet their sustainability goals as effectively and efficiently as possible.

Our proven algorithms are based on the standards in the Greenhouse Gas Protocol and nearly two decades of work supporting campus inventories with the Campus Carbon Calculator, CarbonMAP and Nitrogen Footprint Tool. SIMAP® helps users:

- Create a baseline
- Benchmark performance
- Create reports
- Set goals
- Analyze progress year over year
- Choose from two subscription tier options
- Access resources



2011-2022

ICARB 2023
Measuring Net Zero

SIMAP
SUSTAINABILITY INDICATOR MANAGEMENT & ANALYSIS PLATFORM

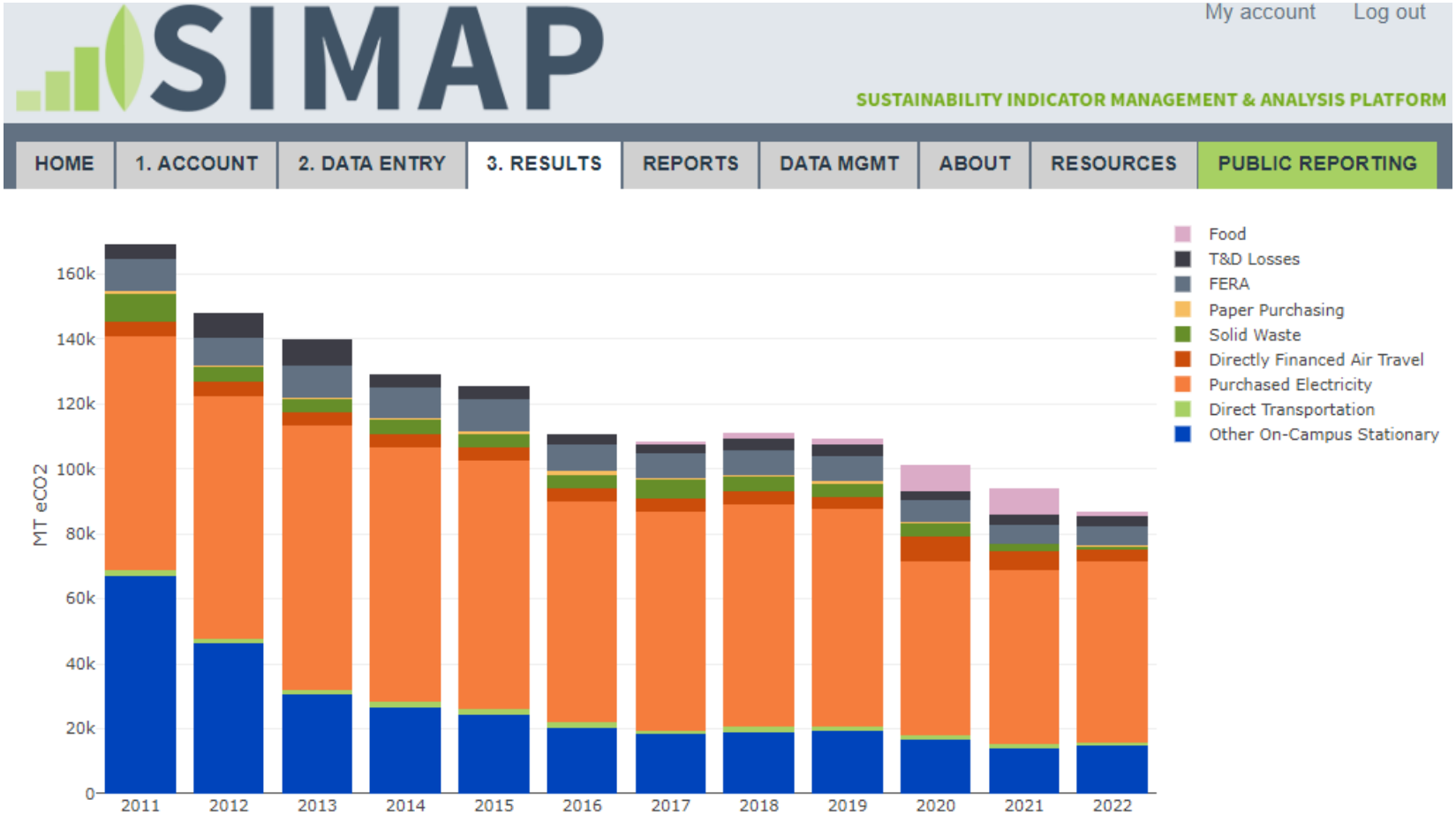
My account Log out

HOME | 1. ACCOUNT | 2. DATA ENTRY | 3. RESULTS | REPORTS | DATA MGMT | ABOUT | RESOURCES | PUBLIC REPORTING

Fiscal Year	Scope	Source	CO2 (kg)	CO2 (MTCDE)	CH4 (kg)	CH4 (MTCDE)	N2O (kg)	N2O (MTCDE)	GHG MTCDE
2011	1	Mobile Combustion	1,728,660	1,728.66	83	2.33	80	21.32	1,752.31
2011	1	Stationary Combustion	66,580,124	66,580.12	7,341	205.55	1,014	268.79	67,054.46
2011	2	Purchased Electricity	71,861,452	71,861.45	870	24.36	1,183	313.49	72,199.30
2011	3	Air Travel	4,542,921	4,542.92	0	0.00	52	13.72	4,556.64
2011	3	Purchased Goods and Services	399,567	399.57	0	0.00	0	0.00	399.57
2011	3	Waste Generated in Operations	0	0.00	310,496	8,693.89	0	0.00	8,693.89

Fiscal Year	Scope	Source	CO2 (kg)	CO2 (MTCDE)	CH4 (kg)	CH4 (MTCDE)	N2O (kg)	N2O (MTCDE)	GHG MTCDE
2022	1	Mobile Combustion	1,184,020	1,184.02	63	1.77	52	13.78	1,199.58
2022	1	Stationary Combustion	14,639,245	14,639.24	1,460	40.87	29	7.77	14,687.88
2022	2	Purchased Electricity	55,153,741	55,153.74	4,806	134.58	671	177.72	55,466.04
2022	3	Air Travel	3,895,485	3,895.49	0	0.00	45	11.95	3,907.43
2022	3	Purchased Goods and Services	92,368	92.37	0	0.00	0	0.00	92.37
2022	3	Waste Generated in Operations	0	0.00	33,622	941.43	0	0.00	941.43
2022	3	Food	1,317,150	1,317.15	0	0.00	0	0.00	1,317.15

2011-2022


SIMAP
My account
Log out
SUSTAINABILITY INDICATOR MANAGEMENT & ANALYSIS PLATFORM
HOME
1. ACCOUNT
2. DATA ENTRY
3. RESULTS
REPORTS
DATA MGMT
ABOUT
RESOURCES
PUBLIC REPORTING
MT eCO2
160k
140k
120k
100k
80k
60k
40k
20k
0
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
Food
T&D Losses
FERA
Paper Purchasing
Solid Waste
Directly Financed Air Travel
Purchased Electricity
Direct Transportation
Other On-Campus Stationary

2011-2022

ICARB 2023
Measuring Net Zero

Percent Change in Greenhouse Gas Emissions 2016 vs. Baseline 2008 and Emission Reduction Target Goals

	TOTAL SCOPE 1	TOTAL SCOPE 2	TOTAL SCOPE 3	TOTAL SCOPE 1 & 2	TOTAL SCOPE 1, 2, & 3	TOTAL NET
CHANGE IN EMISSIONS	↓ 67.44%	↓ 3.95%	↓ 22.51%	↓ 33.15%	↓ 32.09%	↓ 10.05%
PER 1,000 SQ. FT.	↓ 68.65%	↓ 7.52%	↓ 25.40%	↓ 35.64%	↓ 34.62%	↓ 13.40%
PER FULLTIME ENROLLMENT	↓ 67.65%	↓ 4.58%	↓ 23.02%	↓ 33.59%	↓ 32.54%	↓ 10.64%
EMISSION REDUCTION TARGETS					40% by 2020 50% by 2025 100% by 2030	

Institutional Information

SIGN DATE
Oct 5, 2015

PRESIDENT
Geoffrey S Mearns

IMPLEMENTATION LIAISON
Robert Koester

CLIMATE LEADERSHIP AWARD
2010

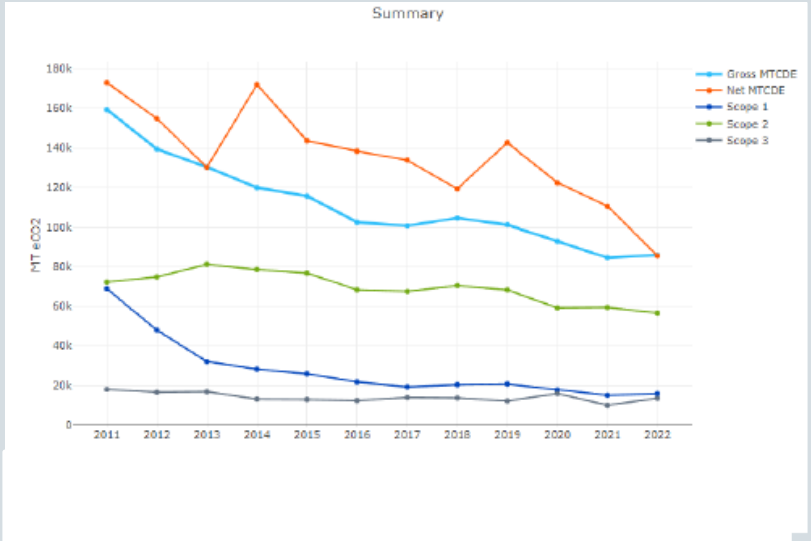
SUSTAINABILITY WEBSITE
Link

Membership – Ratings

STARS RATING
Gold

GRITS
Yes

Emissions over Time



Reports

INSTITUTIONAL PROFILE
View

CAMPUS/COMMUNITY STRUCTURE
View

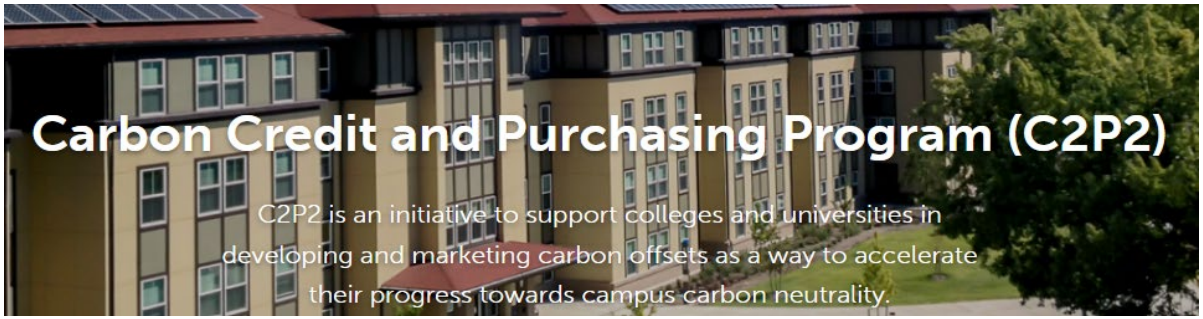
ANNUAL PROGRESS EVALUATION
20162017

RESILIENCE ASSESSMENT
View

CLIMATE ACTION PLAN
2010

GHG REPORTS
2015, 2014, 2013, 2012, 2011, 2008

2014-2022



Challenge:
Modifying operational practices to achieve a higher level of performance for most colleges and universities is hamstrung by limited funding.

Role:
Working in collaboration with Second nature in Boston, Bonneville Environmental Foundation (BEF) in Portland Oregon, Det Norske Veritas in Norway and the climate Neutral Business Network (CNBN) in Lake Oswego Oregon, we secured funding from the Chevrolet Climate Reduction Initiative created the protocol by which colleges and universities could monetize their carbon emissions reductions for transaction in the Voluntary Carbon Market with the goal of aggregating Carbon Capital for accelerating and deepening carbon reductions.

Impact:
Over the last 10 years, Ball State University has monetized its carbon reductions to generate some $1.7 million for a Green Revolving Fund, which is being used to support seven categories of additional intervention to enable Ball State to meet its Architecture 2030 target date for climate neutrality and demonstrate how best to use this carbon capital creation.

Working in collaboration with the Climate Neutral Business Network (CNBN) we prepared the methodology for the Campus Clean Energy and Efficiency (CCEE) protocol and worked with 11 other campuses as pilot participants in the use of this new methodology for monetizing carbon reductions.

This methodology was just recently revalidated for use for another 10 years by colleges and universities nationwide.

In addition, numerous webinars and conference presentation have been used to share the methodology and educate academic colleagues.

Footnote:

Remarkably, the funding from Chevrolet was used to purchase credits from participating universities which then were retired against the climate; i.e., Chevrolet did not use the value of the reduced emissions as credits against their corporate operations but made the investment to champion leadership in the auto industry with the introduction of the Chevy Volt as “the future” of transportation

Overview of C2P2

- Chevrolet Motor Division of General Motors with BEF and CNBN
  -Facilitated development of a “qualifying” performance methodology for colleges and universities to enter the carbon market

- 2013 Chevrolet Carbon Reduction Initiative funding
  - Pilot Voluntary Carbon Market (VCM) transactions for 3 years
  - C2P2 Program created to extend participation in VCM
  - Carbon reductions will remand to BSU at close of all programs
  - Thereupon available to meet BSU obligations to ACUPCC (now CLC)

- No government agencies involved
- Not subject to regulatory body approvals and fees

Overview of C2P2

Ten-year Window of Validation with Annual Verification of Credits

These transactions are processed on an annual cycle and at the close of project participation in the voluntary carbon market, the greenhouse gas reductions for future years, which now include those delivered as a result of the carbon capital, all remand to the university to qualify against the target setting of the Climate Leadership Commitment (CLC)[1].

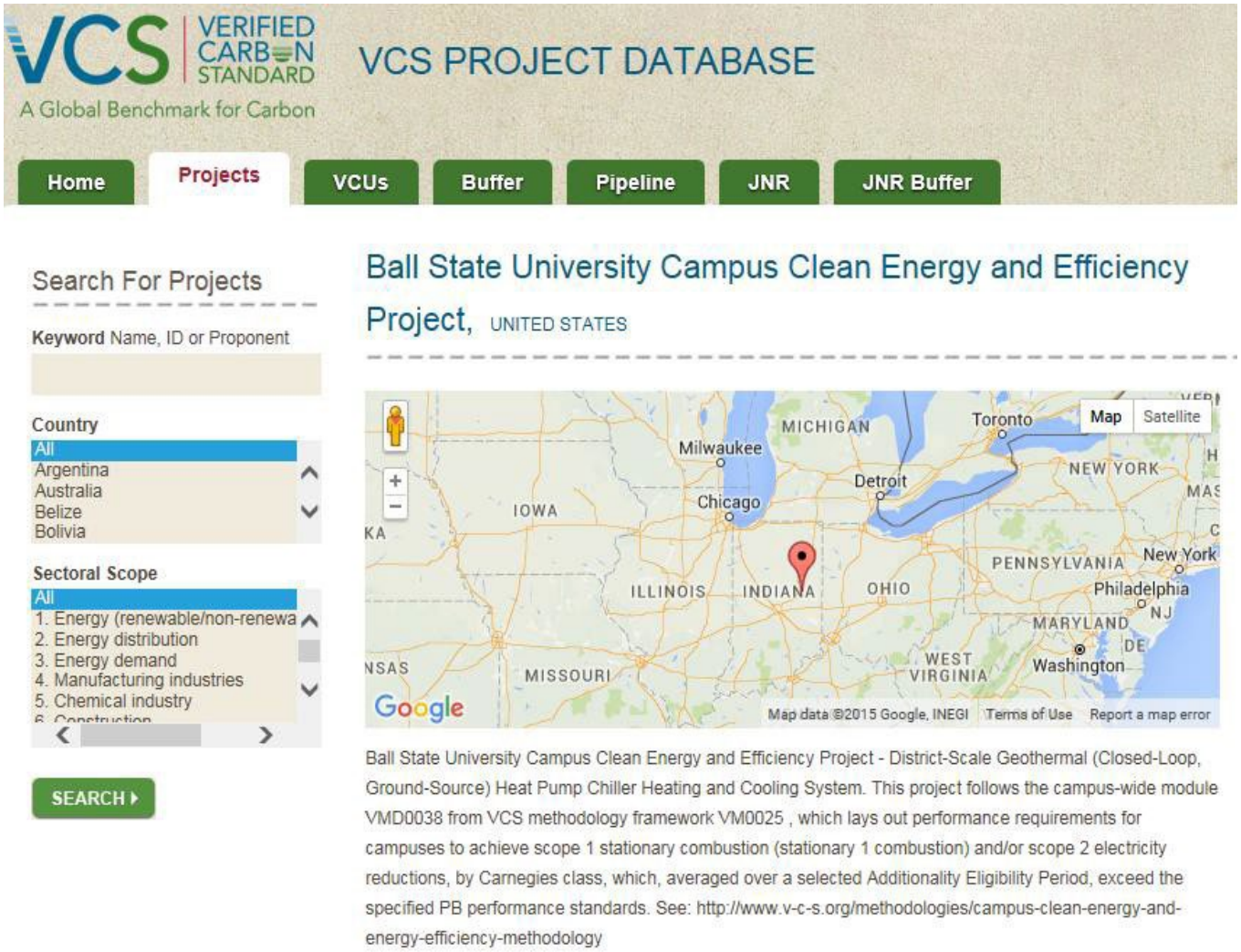
[1] Formerly the American College and University Presidents' Climate Commitment (ACUPCC)

Overview of C2P2

Campus-Wide Clean Energy And Efficiency (CCEE) Methodology

- "Qualifies" greenhouse gas reductions for Carbon Credit Market
- Uses VCS-certified reporting protocols
- Provides six layers of documentation/reporting
- Establishes baseline scenario
- Clarifies the certifiable 'additionality' of a GHG reduction effort
- Annotates any methodological deviations
- Quantifies actual performance of GHG emissions reductions
- Describes potential vectors of leakage
- Makes data and parameters available to validatation
- Reviews environmental impact

Overview of C2P2



ICARB 2023

Measuring Net Zero

_002_CY_2021_BSU_GasBurn + Steam on Gas + Hospital_Parsing

TOTAL STEAM PRODUCED (x 1000)

Month	5 Yr Ave. 1981-86	5 Yr Ave. 1986-91	5 Yr Ave. 1991-96	5 Yr Ave. 1996-01	2019-20	2020-21	2021-22
July	18,325.21	22,163.60	26,318.71	24,852.34	17,736.63	19,547.30	-
August	18,117.39	23,042.80	25,985.87	26,047.96	18,999.50	21,257.10	-
September	24,613.96	27,834.09	33,600.27	30,419.62	19,438.43	21,209.70	-
October	42,380.49	50,744.08	52,699.30	47,445.51	18,315.68	27,741.49	-
November	55,293.42	59,838.02	68,571.99	63,757.19	28,205.32	31,411.52	-
December	75,161.70	76,115.98	80,803.70	76,613.80	30,668.54	40,330.37	-
January	84,261.99	78,375.19	89,346.13	82,437.07	45,127.60	43,102.76	-
February	70,572.67	71,748.80	80,038.03	67,070.24	41,661.13	41,993.54	-
March	64,928.98	66,068.65	72,676.66	67,500.42	38,939.97	34,392.61	-
April	48,649.57	51,650.49	56,056.88	49,327.52	32,119.65	28,682.81	-
May	30,204.75	33,867.81	38,321.43	35,093.41	26,488.87	25,339.30	-
June	20,465.39	24,904.09	28,229.80	27,754.80	19,337.70	19,180.50	-
Total	552,977.52	586,353.60	652,648.75	598,119.88	337,039.02	192,691.52	-

192,691.52

CY_2021_total

HOSPITAL STEAM (x 1000)

Month	5 Year Ave. 1981-86	5 Year Ave. 1986-91	5 Year Ave. 1991-96	5 Year Ave. 1996-01	2019-20	2020-21	2021-22
July	4,432.50	4,712.11	5,928.96	6,631.52	7,924.61	8,458.44	-
August	4,817.06	5,046.17	5,903.37	6,277.20	7,729.15	8,856.19	-
September	5,306.84	5,319.36	6,674.55	6,545.21	6,974.85	8,674.66	-
October	7,374.72	7,642.08	8,647.26	8,622.96	5,292.93	9,460.36	-
November	8,851.02	8,752.08	10,019.74	10,789.52	11,550.76	10,211.92	-
December	12,063.10	10,996.61	11,554.03	12,276.77	12,510.37	12,962.40	-
January	13,475.48	10,991.64	13,128.14	12,321.54	12,972.60	13,632.01	-
February	11,507.48	9,965.37	11,699.02	10,182.28	12,090.29	13,192.04	-
March	10,817.10	8,845.01	10,894.80	10,457.20	11,330.13	11,213.33	-
April	8,328.54	7,308.36	8,937.76	8,432.43	9,046.00	9,827.25	-
May	6,368.18	6,256.00	7,911.53	7,532.49	8,091.93	9,561.63	-
June	4,970.10	4,907.59	6,521.15	6,865.37	7,859.99	8501.06	-
Total	98,312.12	90,742.38	107,820.30	106,934.50	113,443.61	65,927.32	-

65,927.32

CY_2021_total

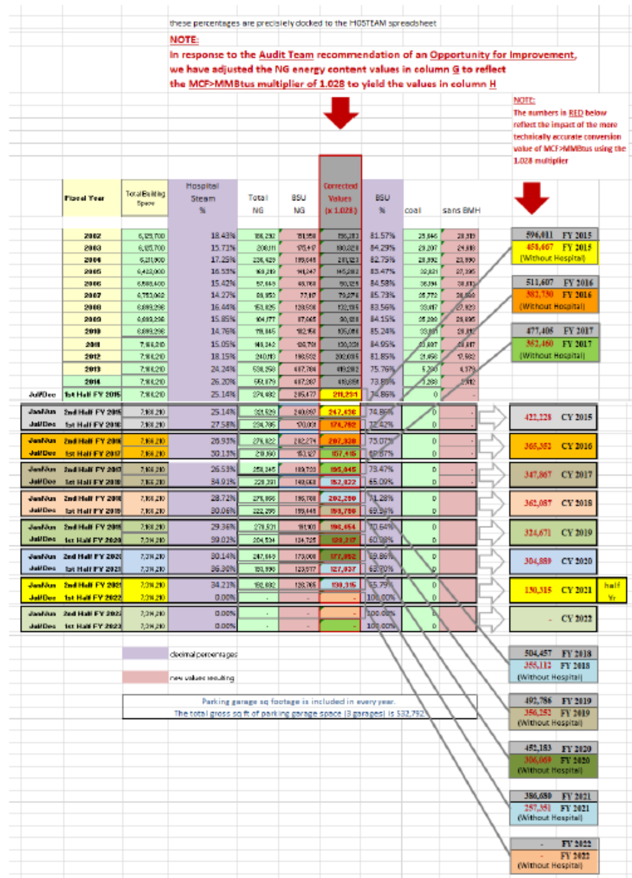
% OF HOSPITAL STEAM TO TOTAL STEAM

Month	5 Yr Ave. 1981-86	5 Yr Ave. 1986-91	5 Yr Ave. 1991-96	2019-20	2020-21	2021-22
July	24.19%	21.26%	22.53%	44.68%	43.27%	#DIV/0!
August	26.59%	21.90%	22.72%	40.68%	41.66%	#DIV/0!
September	21.56%	19.11%	19.86%	35.88%	40.90%	#DIV/0!
October	17.40%	15.06%	16.41%	28.90%	34.10%	#DIV/0!
November	16.01%	14.63%	14.61%	40.95%	32.51%	#DIV/0!
December	16.05%	14.45%	14.30%	41.02%	32.14%	#DIV/0!
January	15.99%	14.02%	14.69%	28.75%	31.63%	
February	16.31%	13.89%	14.62%	29.02%	31.41%	
March	16.66%	13.39%	14.99%	29.10%	32.60%	
April	17.12%	14.15%	15.94%	28.16%	34.26%	
May	21.08%	18.47%	20.65%	30.55%	37.73%	
June	24.29%	19.71%	23.10%	40.65%	44.32%	
Total	17.78%	15.48%	16.52%	33.66%	35.17%	#DIV/0!

#DIV/0! calculated (not averaged)

34.21% calculated (not averaged)

_003_CY 2021_BSU_Gasburn_Parsing by Steam Percentages_1.028



_005_CY_2021_BSU_Electrical_Main

MAIN METER

Monthly Kilowatt Hours Used

Facilities Planning and Management

FY	1989-90	1990-91	1991-92	2018-2019	2019-2020	2020-2021	2020-2021
July	6,801,600	6,702,400	7,649,280	12,305,472	11,961,799	9,968,562	0
August	6,406,400	6,753,600	6,923,040	12,269,895	10,111,551	10,340,322	0
September	7,401,600	8,169,600	8,572,320	14,553,083	11,690,333	10,819,918	0
October	6,595,200	7,099,200	7,246,800	11,378,921	9,560,131	9,204,913	0
November	5,921,600	6,446,400	7,137,600	10,947,542	9,397,067	9,275,708	0
December	5,144,000	5,803,200	6,997,680	13,190,040	10,830,542	10,193,642	0
January	4,851,200	5,390,400	5,534,640	10,796,003	10,309,305	11,402,890	
February	5,968,000	6,067,200	6,697,440	11,998,429	10,054,074	11,113,038	
March	5,250,800	6,081,600	6,420,960	9,745,121	9,043,039	8,923,407	
April	5,798,400	6,757,440	7,124,880	9,679,274	9,043,039	10,122,810	
May	5,836,800	6,774,240	6,798,960	8,833,153	8,521,786	8,775,256	
June	5,001,600	6,950,880	6,889,920	11,319,920	8,735,147	9,576,298	
TOTALS	70,987,200	78,996,160	83,993,520	137,016,853	119,257,813	119,716,764	0

*April 2019-2020 estimated by I&M
corrected 04.20.21 was 9,130,326
difference 87,287

59,913,699

(CY_2021_total)

59,603,065

55,700,390

115,509,455

(CY_2020_total)

005_CY_2021_BSU_Electrical_Main Page 1

_006_CY_2020_BSU_DESN_DESS_kWh

DESN

Month-Year	Electrical Usage FY_20 Usage (Kwh)	Demand (KVA Max.)	Month-Year	Electrical Usage FY_21 Usage (Kwh)	Demand (KVA Max.)	Month-Year	Electrical Usage FY_22 Usage (Kwh)	Demand (KVA Max.)
Jul-19	2,626,842	5,201	Jul-20	2,766,680	5,059	Jul-21	0	0
Aug-19	2,580,345	4,816	Aug-20	2,528,723	4,889	Aug-21	0	0
Sep-19	2,571,489	5,106	Sep-20	1,589,335	4,931	Sep-21	0	0
Oct-19	2,283,269	4,720	Oct-20	931,175	4,693	Oct-21	0	0
Nov-19	2,103,776	4,982	Nov-20	390,463	4,960	Nov-21	0	0
Dec-19	796,795	4,835	Dec-20	1,229,886	4,589	Dec-21	0	0
Jan-20	158,489	264	Jan-21	1,984,504	4,319	Jan-22		
Feb-20	141,402	257	Feb-21	2,142,961	4,804	Feb-22		
Mar-20	571,207	4,015	Mar-21	218,813	4,700	Mar-22		
Apr-20	2,107,567	3,965	Apr-21	125,175	254	Apr-22		
May-20	1,909,455	4,822	May-21	110,016	225	May-22		
Jun-20	2,354,390	5,045	Jun-21	777,440	4,655	Jun-22		
FY_Total	20,215,026	48,028	FY_Total	14,795,170	48,058	FY_Total	0	0

CY_20_Total: 16,078,772

CY_21_Total: 3,838,908

DESS

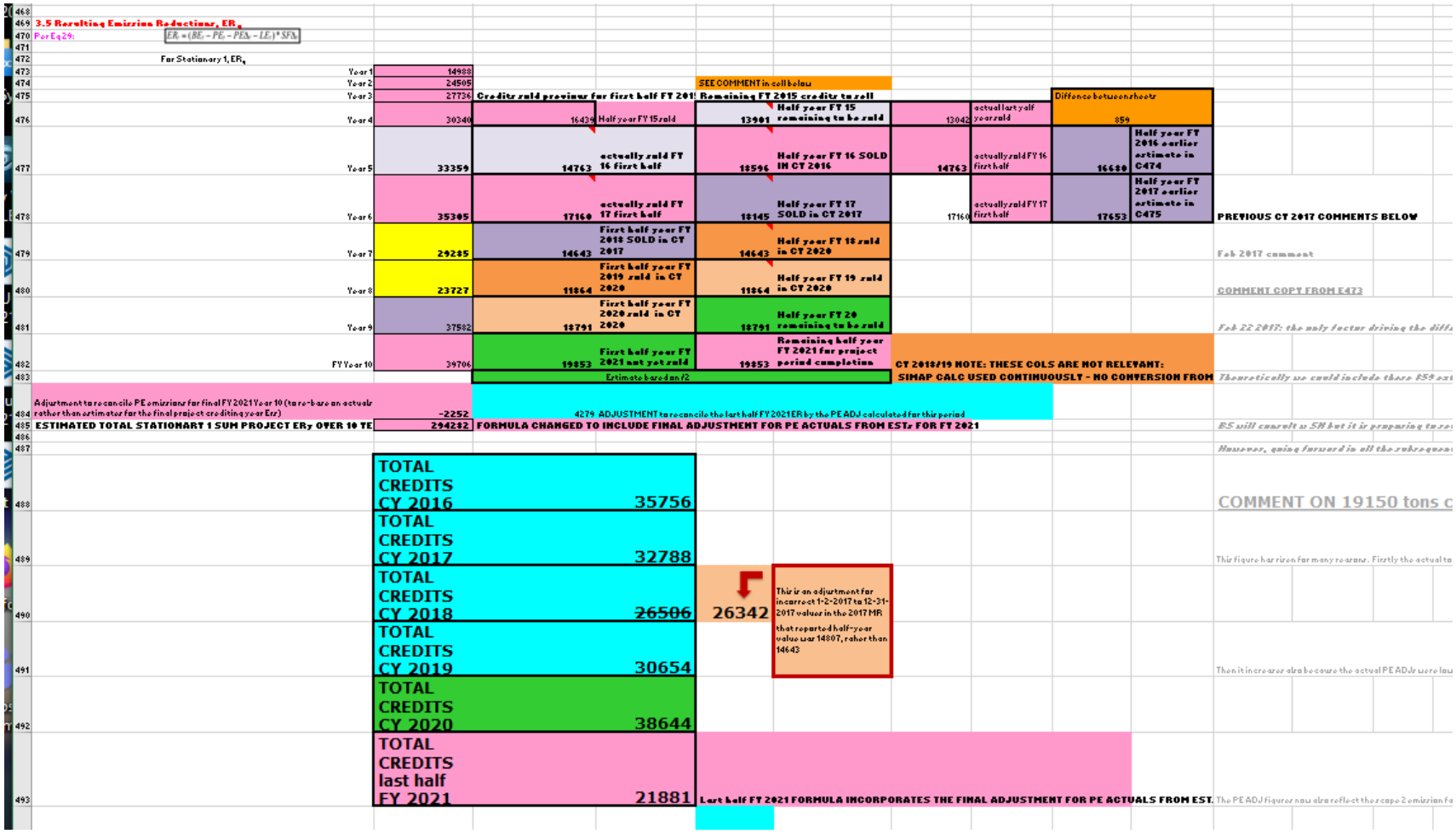
Month-Year	Electrical Usage FY_20 Usage (Kwh)	Demand (KVA Max.)	Month-Year	Electrical Usage FY_21 Usage (Kwh)	Demand (KVA Max.)	Month-Year	Electrical Usage FY_22 Usage (Kwh)	Demand (KVA Max.)
Jul-19	2,641,716	7,497	Jul-20	1,881,036	7,137	Jul-21	0	0
Aug-19	1,538,284	5,686	Aug-20	1,814,210	7,041	Aug-21	0	0
Sep-19	1,517,197	6,550	Sep-20	1,624,589	7,061	Sep-21	0	0
Oct-19	587,966	4,868	Oct-20	1,101,627	7,195	Oct-21	0	0
Nov-19	238,394	3,699	Nov-20	1,008,854	6,879	Nov-21	0	0
Dec-19	1,548,138	6,304	Dec-20	480,799	8,007	Dec-21	0	0
Jan-20	1,194,847	4,159	Jan-21	184,648	3,970	Jan-22		
Feb-20	637,649	7,157	Feb-21	650,322	6,589	Feb-22		
Mar-20	454,450	6,924	Mar-21	864,089	7,709	Mar-22		
Apr-20	999,597	6,329	Apr-21	1,152,666	6,786	Apr-22		
May-20	1,511,625	6,456	May-21	162,589	7,103	May-22		
Jun-20	1,640,256	7,084	Jun-21	735,370	7,311	Jun-22		
FY_Total	14,510,120	72,713	FY_Total	11,660,809	82,848	FY_Total	0	0

CY_20_Total: 14,349,550

CY_21_Total: 3,749,683

006_CY_2020_BSU_DESN_DESS_kWh

61	No single technology installation is typically relied upon when meeting the performance standard requirements for this methodology but rather a series of energy efficiency/clean energy measures, adapted campus-wide. Since this methodology requires that EE measures that the campus has adapted to meet the PB performance tests (per module section 4) this campus' activities include:						
62	TO qualify, at least two sections must apply						
63	**Re: 1.8 Description of Project Activity**					**RE: 1.2 APPLICABLE S**	DESCRIBE briefly steps taken:
64	Behavior Change Campaign/Communications:	1	Yes	BOX	No	3 Energy Demand	
65	CoGen & Fuel switch:	BOX	Yes	BOX	No	1 Energy Industries	
66	Lighting Retrofits:	1	Yes	BOX	No	3 Energy Demand	
67	On-Site Renewables:	BOX	Yes	BOX	No	1 Energy Industries	
68	Boiler Retrofits/Central Heating/Cooling Upgrades:	1	Yes	BOX	No	1 Energy Industries	
69	Building System Retro-Commissioning & Upgrades Including Automation:	1	Yes	BOX	No	1 Energy Industries	
70	Weatherization Improvements:	1	Yes	BOX	No	3 Energy Demand	
71	LEED Certification:	1	Yes	BOX	No	1 Energy Industries	
72	Green Building:	1	Yes	BOX	No	1 Energy Industries	
73	Innovative Strategies:	1	Yes	BOX	No	1 Energy Industries	
74							
75							
76	The first project baseline adopted is:	2007	First baseline year			Data enters once the baseline section is completed below: do not touch	
77							
78	Resulting in a baseline period of:	5	B	Number of years		Data enters once the baseline section is completed below: do not touch	
79							
80	Thus average baseline emissions BE selected -	66241	BE	Tons CO2/year		*For equations given in BE analysis below*	
81						Data enters once the baseline section is completed below: do not touch	
82	Adjusted for project year y to be	66241	BE_1	Tons CO2/year		*For equations given in BEy analysis below; BEy for all baseline years given completely below*	
83		65380	BE_2	Tons CO2/year		Data enters once the baseline section is completed below: do not touch	
84		64530	BE_3	Tons CO2/year			
85							
86	Project emissions for year y -	45960	PE_1	Tons CO2/year		*For year 1, per equations given in project emissions section below*	
87						Data enters once the project emissions section is completed below: do not touch	
88	Do applied EE technologies require PE adjustments?	1	Yes	BOX	No		
89							
90	If yes, the PE adjustment test is (from a) through f):	F				*Enter a) – f) from 6.2 corresponding to PE Adjustment tests applicable/selected*	
91						*The relevant tests are selected by completing the PE Adjustment section below; copy the answer of the test selec*	
92							
93	Resulting PE Adjustment PE_1:	5293	PE_1	Tons CO2/year		For year 1, per Equations outlined in the PE Adjustment section below; full set for all years found below	
94						Data enters once the adjustment section is completed below: do not touch	
95							
96	Thus, emission reductions comprise	14988	ER_1	Tons CO2/year		For year 1, per Equations outlined in the ER section below; Full set of ERy for all years found below	
97						Data enters once all other sections have been completed below: do not touch	
98							
99	Do campus sq footage variances during project period?	1	Yes	0	No	Data enters once PSQFT sections has been comp	
100	..That is SFy is not equal to 1 for same project year y?	Nothing changed from CY 2020 to last half FY 2021 so same test applies					
101							
102	**1.2: answer in PDD -- applicable sections noted above**						
103							
104	**1.3 Project Proponent**						
105	*Name:*	Robert J. Kaerter					
106	*Title/role:*	Professor and Director					
107	*Company/Institution Name:*	Ball State University					
108	*Address:*	2000 University Avenue	Muncie In 47306				
109	*Email:*	rkaerter@bsu.edu					
110	*Phone:*	765.285.1135					
111	**1.4: Answer in PDD**						
112							
113	**1.5/1.6 Project Start Date/Crediting Period**	Year	Month	Day			
114	Project start date:	2012	July	1	Year/Month/Day	Defaults to project year 1 start date: enter month/day only	
115							
116	Project end date:	2021	June	30	Year/Month/Day	Assumes full 10 year VCS project period to maximize project credits and reductions which campus then has option	
117							
118	Are GHG emissions reported on a fiscal or calendar year basis?	1	Fiscal	BOX	Calendar		
119							
120	Project crediting period:	10	Years			*NOTE: project crediting periods are typically 10 years for VCS*	
121	**1.7 Estimated Reductions**						
122							


3.5 Resulting Emissions Reductions, ER
Per Eq 29:
For Stationary 1, ER
Year 1 14988
Year 2 24505
Year 3 27736
Year 4 30340
Year 5 33359
Year 6 35305
Year 7 29285
Year 8 23727
Year 9 37582
FY Year 10 39706
SEE COMMENT in cell below
Credits sold previous for first half FY 201
Remaining FY 2015 credits to sell
16439 Half year FY 15 sold
13901 Half year FY 15 remaining to be sold
13042 actually sold FY 16 first half
Difference between sheets
859
14763 actually sold FY 16 first half
18596 Half year FY 16 SOLD IN CY 2016
16680 Half year FY 2016 earlier estimate in C474
17160 actually sold FY 17 first half
18145 Half year FY 17 SOLD in CY 2017
17160 actually sold FY 17 first half
17653 Half year FY 2017 earlier estimate in C475
14643 First half year FY 2018 SOLD in CY 2017
14643 Half year FY 18 sold in CY 2020
11864 First half year FY 2019 sold in CY 2020
11864 Half year FY 19 sold in CY 2020
18791 First half year FY 2020 sold in CY 2020
18791 Half year FY 20 remaining to be sold
19853 First half year FY 2021 not yet sold
19853 Remaining half year FY 2021 for project period completion
Estimate based on f2
CY 2018/19 NOTE: THESE COLS ARE NOT RELEVANT:
SIMAP CALC USED CONTINUOUSLY - NO CONVERSION FROM
Adjustment to re-concile PE emissions for final FY 2021 Year 10 (to re-base on actuals rather than estimates for the final project crediting year Err)
-2252
4279 ADJUSTMENT to re-concile the last half FY 2021 ER by the PE ADJ calculated for this period
ESTIMATED TOTAL STATIONART 1 SUM PROJECT ERs OVER 10 YE
294282
FORMULA CHANGED TO INCLUDE FINAL ADJUSTMENT FOR PE ACTUALS FROM ESTs FOR FY 2021
PREVIOUS CY 2017 COMMENTS BELOW
Feb 2017 comment
COMMENT COPY FROM E473
Feb 22 2017: the only factor driving the diffe
Theoretically we could include these 859 cre
BS will consult w SM but it is preparing to re
However, going forward in all the subsequen
TOTAL CREDITS CY 2016 35756
TOTAL CREDITS CY 2017 32788
TOTAL CREDITS CY 2018 26506
26342
This is an adjustment for incorrect 1-2-2017 to 12-31-2017 value in the 2017 MR that reported half-year value was 14807, rather than 14643
TOTAL CREDITS CY 2019 30654
TOTAL CREDITS CY 2020 38644
TOTAL CREDITS last half FY 2021 21881
Last half FY 2021 FORMULA INCORPORATES THE FINAL ADJUSTMENT FOR PE ACTUALS FROM EST
COMMENT ON 19150 tons c
This figure has risen for many reasons. Firstly the actual to
Then it increases also because the actual PE ADJ is more lau
The PE ADJ figures now also reflect the scope 2 emissions fa

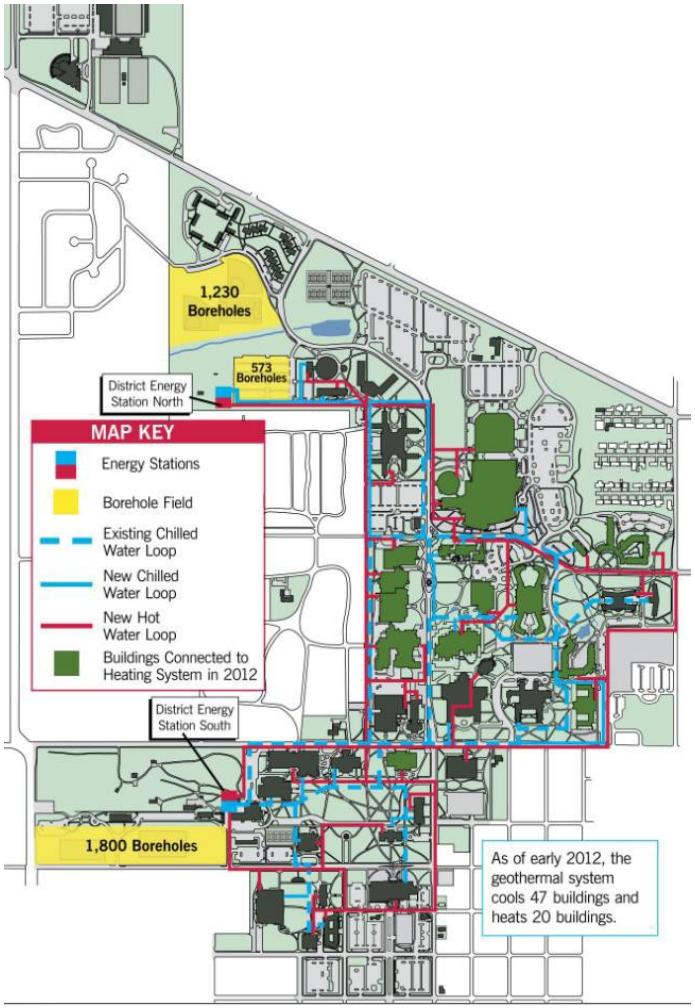
Opportunities at Hand

Initial creation, in 2011, of the **Clean Campus Energy Efficiency (CCEE)** program funded by Chevrolet in which BSU served as the pilot development institution (with 10 other universities from across the nation joining later).

Follow-up creation, in 2014, of the **Carbon Credit Purchasing Program (C2P2)** managed by Second Nature in Boston.

Since 2011 some $1.7 mil. in total

Opportunities at Hand



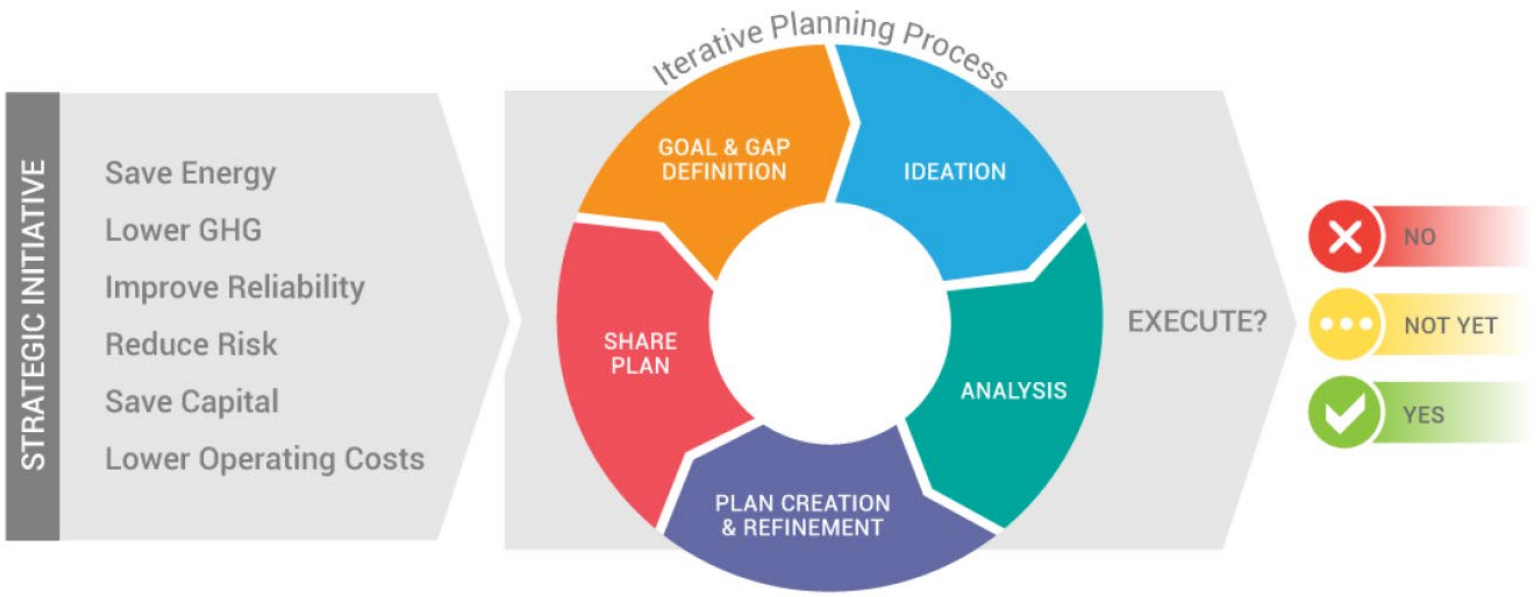
- 2 energy stations
- 3600 boreholes
- 47 buildings
- 5-7 year build out
- Total $ ~83 mil
- $2 mil Savings per Year
- ~ 8% ROI
  - [On Incremental $25 mil Cost]

- *Since 2014, $14 mil in savings*

Opportunities at Hand

- Carbon Capital
  - C2P2 Transactions on the VCM $ 1.7 mil
  - Operational Savings from Geothermal $ 14.0 mil
- Establish a Green Revolving Fund (GRF)
  - Accelerate Achievement of Carbon Neutrality
  - Avoid Costs of Delayed Decision Making
  - Avoid Risk of Future Carbon Taxation/Fees
- Use Green Investment Tracking System (GRITS)
  - Inform (Shared) Decisions
  - Publish Experiences

Where does BSU from here?

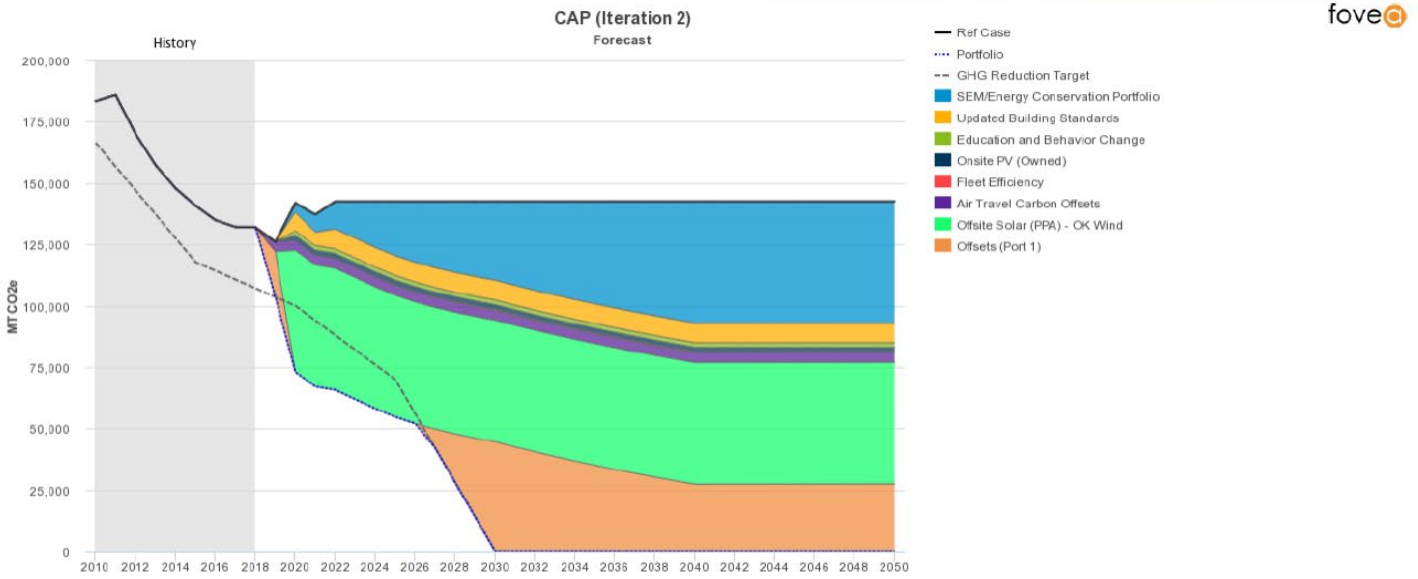


Most Important Goals

foveo

- Campus leadership support, funding sources identified, community education
- Carbon Offsets
- How to leverage funding to maximize benefits at mitigating impact of GHG
- Convincing plan for BSU carbon neutrality by 2030
- Providing guidance to help make recommendations to the President regarding possible energy savings.
- Re-think travel
- Creating a feasible carbon neutral plan
- Creating paths that save the university money BY reducing CO2 emissions
- Commitment to net positive design of new facilities and use of a green revolving fund to broaden involvement of the full academic community
- Time frame ...We have a strong team need support to get us moving

Portfolio Development



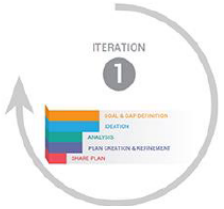
On-going investigation confirms a robust portfolio that can help Ball State get close to reaching the stated 2030 objective. The anchor elements are (1) conservation and efficiency (SEM) and (2) large scale renewable energy (LSRE) and (3) offsets after 2030.

Top Choices – Iteration 1 June 2017

foveA

Demand		Supply				Other		
People, Practices & Policies	Physical Systems & Technologies	Supply Efficiency	Substitute Fuel Sources	Campus/Building Level Renewables	Market / 3rd Party Purchases	Transportation	Waste Management	Offsets / Other
Green Building Standards	Campus-wide ECMs	Building Level CHP	Pipeline Quality Biogas	Onsite Solar: Rooftop PV	Green Power Purchases (RECs)	Avoided Travel	Waste Reduction	Land Management
Education & Behavior Change	Retro-commissioning	Central CHP	Biomass	Onsite Solar: Solar DHW	Landfill Gas	Business Travel	Waste Diversion	Air Travel Carbon Offsets
Student Engagement	Metering and Monitoring	Building Chilled Water Upgrades	Municipal Solid Waste	Onsite Solar: Parking Canopy	Renewable PPA (off-site)	Improved Commuting	Composting	Other Mission Linked Offsets
Space Planning & Management	Campus Vehicle Fleet	Central Chilled Water	Animal Waste to Energy	Building Integrated Wind		Intra-campus Connectivity		Market / 3rd Party Purchases
Grounds Management Policies / Practices	Zero-net Energy Buildings	Hot Water Heating	Used Oil	Ground Mount PV				
Procurement Policy (e.g. Energy Star)		Steam Line Upgrades	Wind					
Strategic Energy Management		Ground Source Heating/Cooling (Geoexchange)	Hydro					
Revolving Loan Fund		Energy Storage	Fleet Fuel Switch (NGV/EV/PHEV)					
			Modular Nuclear					

FRAME

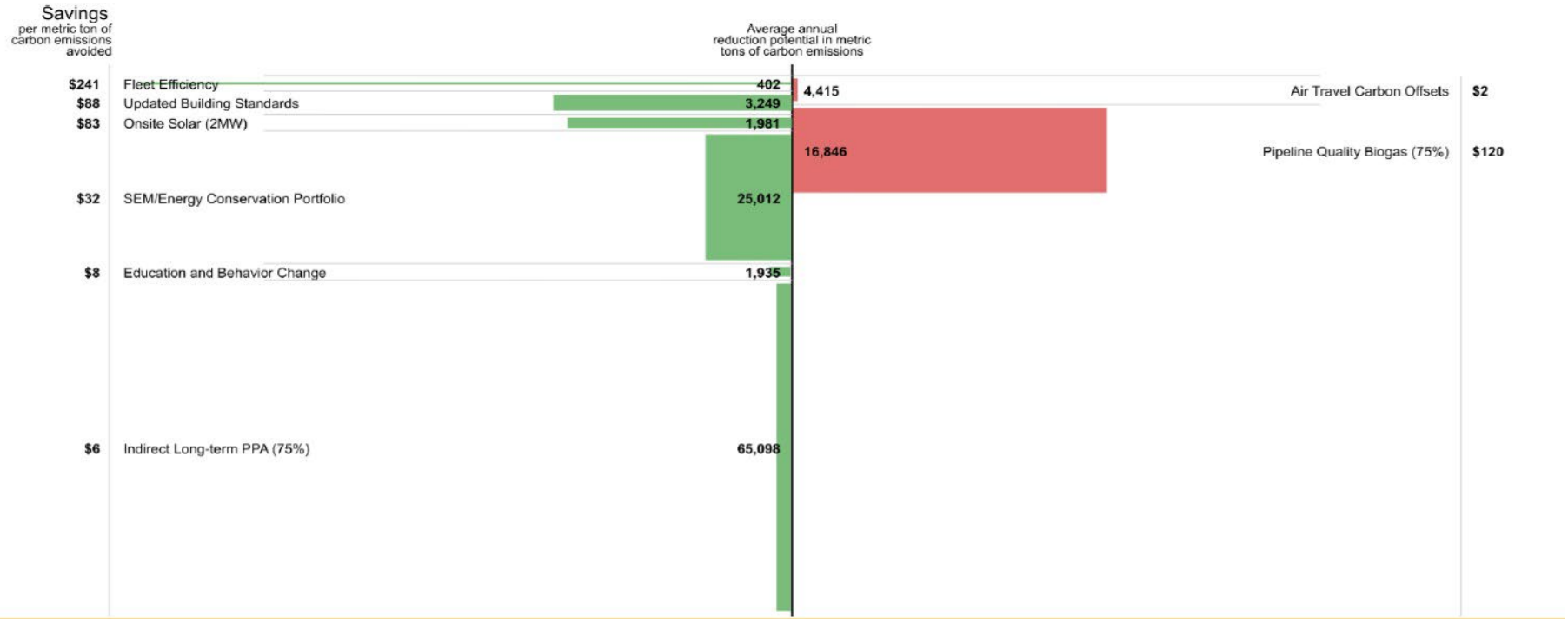


Preliminary List of Solutions Considered

foveA

Solutions Name	Description
Indirect Long-term PPA (75%)	Remote renewable energy project sized to produce 75% of projected 2020 purchased electricity at 6.5 cents/kWh with a 1% annual escalation.
Onsite Solar (2MW)	2MW onsite solar PV installation with a mix of ground mount and roof mount. Economics based on proposal received in 2016 by a higher education institution in Iowa.
SEM/Energy Conservation Portfolio	Energy conservation is implemented to save 25% of existing campus energy targeting average portfolio simple payback of 7 years or better.
Air Travel Carbon Offsets	Program to offset 100% of air travel emissions. Assumed purchase price is $2 per MTCO2e with an escalation of 0.5% per year.
Updated Building Standards	Target a 50% improvemnet over the ASHRAE 90.1 2013 for new construction.
Education and Behavior Change	Assumes that a program is implemented to reduce energy consumption on campus by 1.5% through behavior modification. Assumes a cost of $150K per year to run the program with a cost escalation of 2% per year.
Fleet Efficiency	Convert on-campus fleet to more fuel efficienct vehicles. Assumes the program is implemented over 10 years and has an average simple payback of 15 years.
Pipeline Quality Biogas (75%)	Assumes 75% of all projected natural gas is purchased as biogas (biomethane purchased through the interstate pipeline) at a price of $13 in 2025 per MMBTU and escalating at 1% per year thereafter. Biogas price based a 2013 study from the Gas Foundation.

Preliminary List of Solutions Considered



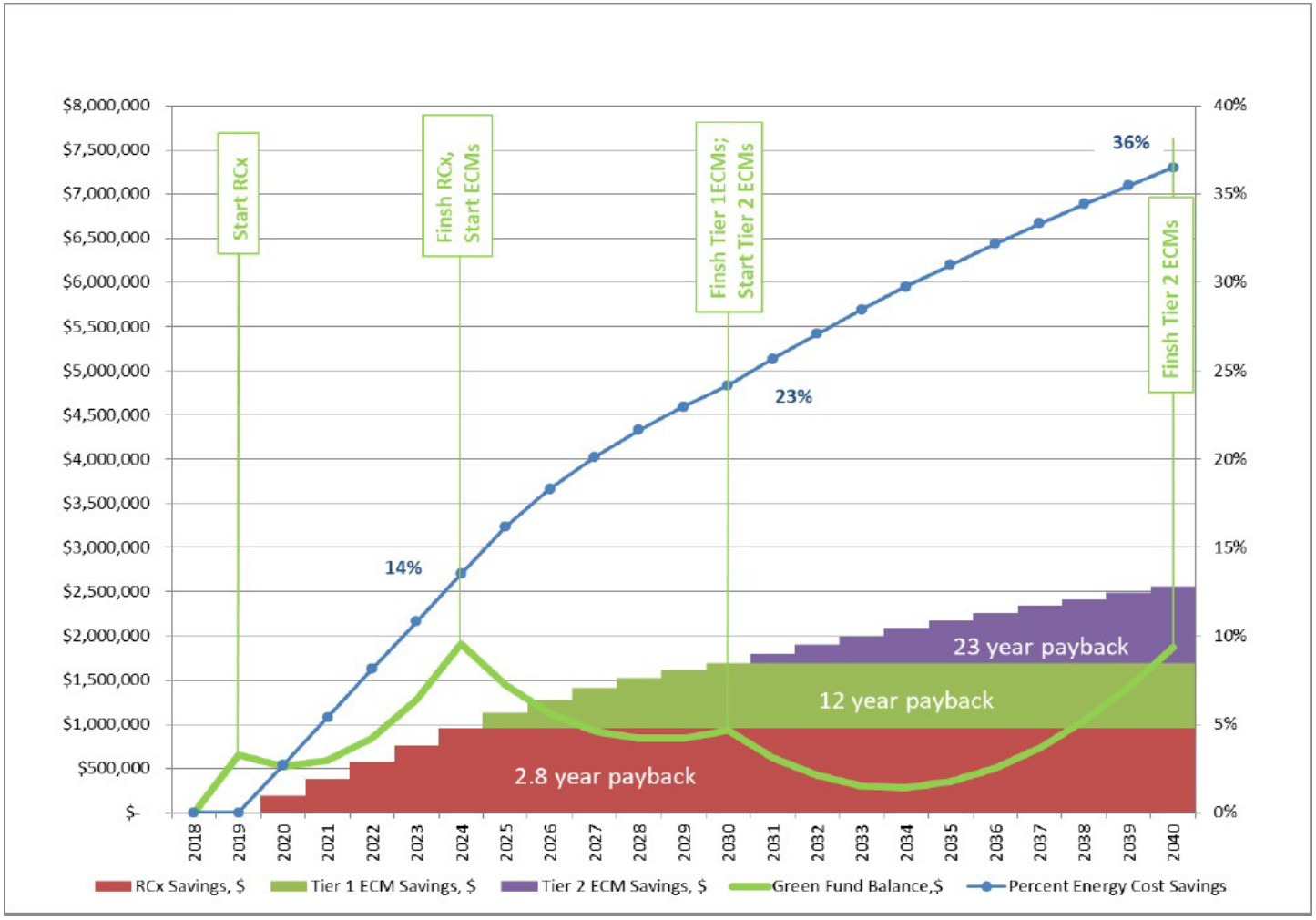
SEM – Next Steps

foveA

	Phase 1 (Years 1–5)	Phases 2 & 3 (Years 6- through 20)

Existing Buildings	OUTCOME: 10 to 15% reduction in energy use and emissions.
	• Establish energy savings sinking fund (revolving green fund) to reinvest energy cost savings and added efficiency (contract with management)
	• Transition operations culture to continuous commissioning
	• Start in year one with 2 to 4 pilot projects -- academic (classroom), academic (laboratory), student housing, medical center.
	• Example:
	  ○ 5+ buildings per year over a 5-year cycle (Year 1 through Year 5)
	  ○ $ 150 K to $ 200 K+ per year savings over a 5-year cycle (target total annual savings at end of five years of $ 1 million plus per year)
		OUTCOME: Incremental 15-25% reduction of energy use and emissions over 15 years (Years 6- through 20)
		• Following completion of ReCx/Tune-ups, invest
		• $ 1,000,000+ per year in prioritized energy retrofit projects on campus
		• Target annual incremental energy savings of $ 2 million to $ 3 million per year

New Buildings	New construction/green building policy
	OUTCOME: No increase in energy use or emissions, despite adding more building area to campus
	• Address as new buildings over the next 10 years
	• Example policy:
	  ○ No Net Gross in Campus Energy Footprint
	  ○ 80% reduction over average campus energy intensity (Architecture 2030 compliant) – EUI equals 25kBTU/SF-year
	  ○ Fund retrofit in existing campus buildings to make up for the remaining new building energy use footprint
	  ○ Targets an additional overall investment of $9 to $10/SF for both integrated efficiency ir new construction and existing building retrofit	


$8,000,000
$7,500,000
$7,000,000
$6,500,000
$6,000,000
$5,500,000
$5,000,000
$4,500,000
$4,000,000
$3,500,000
$3,000,000
$2,500,000
$2,000,000
$1,500,000
$1,000,000
$500,000
$-
40%
35%
30%
25%
20%
15%
10%
5%
0%
Start RCx
Finsh RCx, Start ECMs
Finsh Tier 1ECMs; Start Tier 2 ECMs
Finsh Tier 2 ECMs
14%
23%
36%
23 year payback
12 year payback
2.8 year payback
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
2032
2033
2034
2035
2036
2037
2038
2039
2040
RCx Savings, $
Tier 1 ECM Savings, $
Tier 2 ECM Savings, $
Green Fund Balance,$
Percent Energy Cost Savings

- All costs in 2018 dollars
- 11% electrical cost savings associated with RCx / Tune-ups
  - $4.428 million annual cost for electricity ($0.037/kWh)
  - 98% of total campus cost (all buildings over 20,000 SF)
- 22% thermal cost savings associated with RCx / Tune-ups
  - $1.884 million annual cost for thermal energy ($4.65/MMBtu)
  - 73% of thermal energy cost allocated to University
- Tier 1 Measures average 12 year payback
  - Lighting (LED, T5 fluorescent, comprehensive controls)
  - HVAC controls (retrofit of remaining pneumatic & legacy DDC)
  - Motor drive upgrades (variable frequency drives)
- Tier 2 Measures average 23 year payback
  - Upgrade of single pane windows
  - Building and piping insulation
  - Continued upgrade of (and to) heat pump technology

Lessons Learned

- Leveraging Carbon Credit Transactions
  - C2P2 seeds higher education transformation with a line of recurring funds
  - Enhancement of overall net reduction against CLC (ACUPCC) requirements

- Potential uses of funding
  - Establish Green Revolving Fund for (new) emissions reduction projects
  - Transition capital projects already underway to deeper levels of impact
  - Create sophisticated development/refinement of whole-system performance

  - Underwriting campus research and education
    - associated with geothermal installations in other venues

Footnote: SCC

The social cost of carbon (SCC) is an estimate, in dollars, of the economic damages that results from the impact of each additional ton of greenhouse gas (GHG) emissions.

This value can then be used to weigh the benefits of reduced consequences against the costs of cutting emissions.

The effects of climate change, include but are not limited to:

- drought,
- reduced agricultural yields,
- fires,
- severe weather (storms, hurricanes,
- hail, freezing, heat waves, flooding),
- sea level rise,
- coral bleaching,
- thawing permafrost,
- health impacts in cities due to heat.

Footnote: SCC

"In a nutshell, climate policy, and the determination of the SCC, is not merely about investing resources now for the benefit of future richer generations. It is also about altering present and future inequalities, protecting future populations against uncertain disasters jeopardizing their livelihood, and considering the consequences of population growth."

The Social Cost of Carbon: Valuing Inequality, Risk, and Population for Climate Policy

"Equity weighting enables fair comparison of monetary damages that accrue to regions with very different income levels. This is especially appropriate in the context of climate change where damages are likely to affect people with very diverse levels of wealth."

Anthoff (2004) Social Cost of Carbon - Equity Weighting

Footnote: SCC

Impactful considerations are:

- Assumptions about future emissions
- Discount rate
- Include air quality/water quality
- Timeline of impact
- Equity weighting

But current models don't account for "identifiable but hard to quantify":

- Ocean acidification
- Morbidity
- Impact on ecosystem services
- Migration
- Conflict
- Tipping points

Current SCC Pricing in Existing Carbon Markets

Carbon Offsets $2.-$100.

SCC Prices used by Peer Institutions:

Cornell	$ 40.
UCD	$ 60.
Smith	$ 70.
Swarthmore	$ 100.
Princeton	$ 268.

Internal Carbon Pricing is used by some 600 companies

Footnote: SCC

On February 26, 2021, the Biden administration announced and initial estimate of $ 51. per ton of carbon. But the cost is not a settled matter, and Biden's advisers are still studying the latest research to make a more comprehensive update.

Operational Carbon and Energy Assessment for New Construction (OCEAN) Tool.

Berkeley consultants have estimated the equity weighted SCC for the UC system to be approximately:

$246 *draft

Ellen Vaughan
Water & Climate Action Manager
Sustainability Office
UC Santa Cruz
elvaugha@ucsc.edu