Experiential student learning & LEED: An Arc case study from SUNY

October 19, 2020

Gautami Palanki

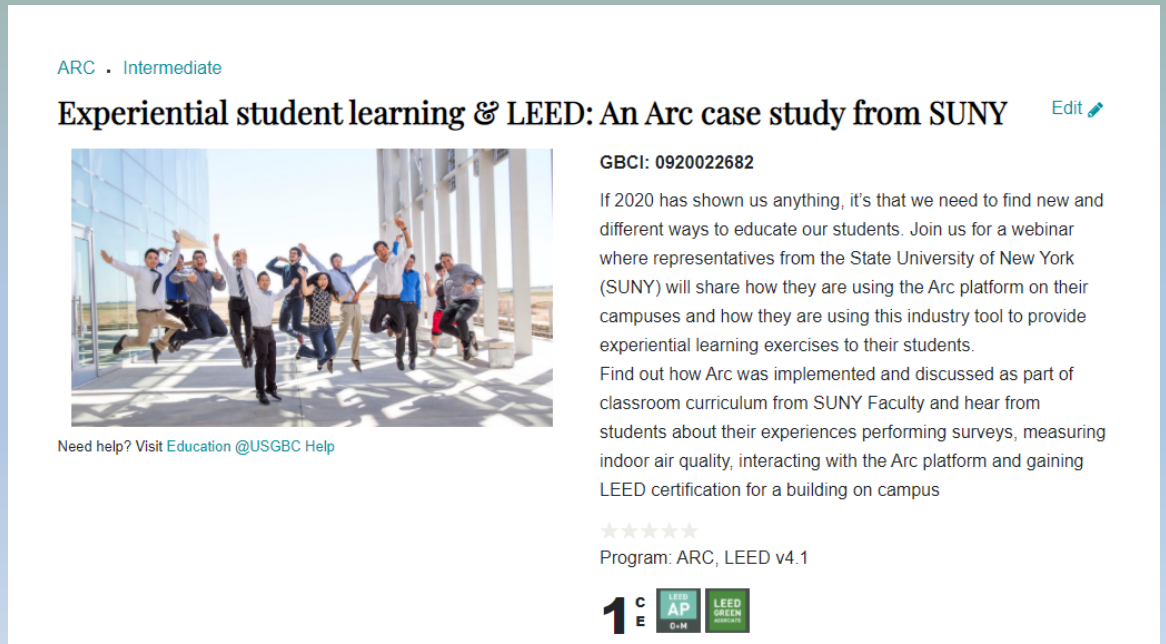
- **Q&A: Use the Chat Box for your questions today!**
- **Email: contact@arcskoru.com**
- **Twitter: @gautamipalanki and @arcskoru**

Continuing Education

- **Self Report 1 CE hour, with LEED AP O+M specialty**

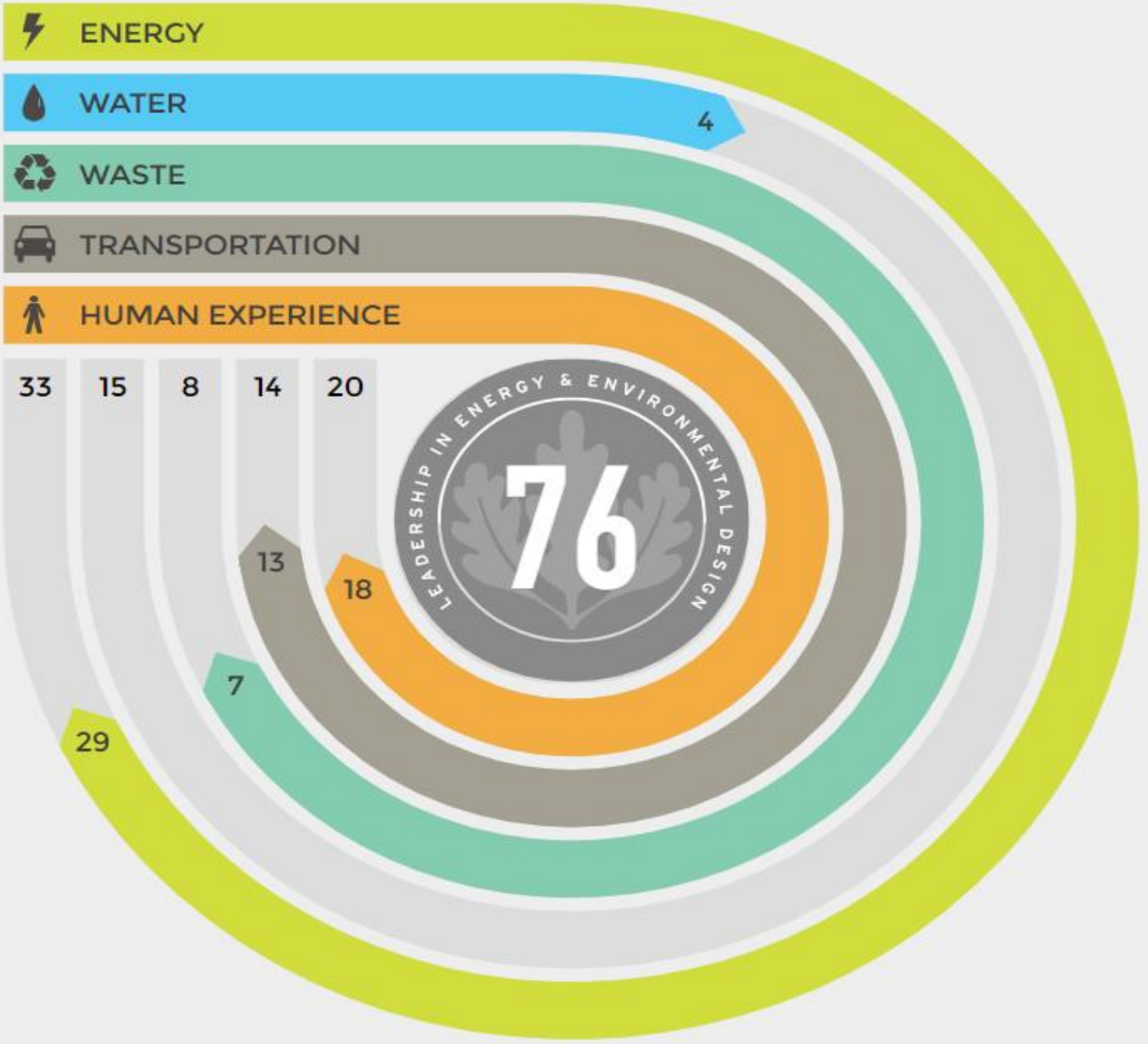
- **Experiential student learning & LEED: An Arc case study from SUNY**
- **Course ID: 0920022682**
- **Provider: GBCI**

- **Login into www.usgbc.org**
- **Account > Credentials > "Report CE hours"**



Experiential student learning & LEED: An Arc case study from SUNY

October 19, 2020


ENERGY
WATER
WASTE
TRANSPORTATION
HUMAN EXPERIENCE
33
15
8
14
20
4
29
7
13
18
LEADERSHIP IN ENERGY & ENVIRONMENTAL DESIGN
76

Arc Skoru Inc

- Arc is part of the USGBC and GBCI family of organizations.
- Arc is a technology platform to measure, analyze, and score the real-world performance of spaces, buildings, and places.

Leadership

Arc for All

Anyone, anywhere can use Arc.

www.arcskoru.com

Performance Certificates

Provides an incremental path to recognize performance in individual categories.

www.arcskoru.com/arc-performance-certificates

LEED Certification

Arc supports LEED v4.1 O+M and LEED Recertification.

www.arcskoru.com/arc-for-leed

Arc Re-Entry

Policies & Procedures

Occupant Observations

Indoor Air Quality

arc Re-Entry

www.arcskoru.com/re-entry

Resources

Arc
www.arcskoru.com
contact@arcskoru.com

LEED LAB
www.usgbc.org/education/leed-lab

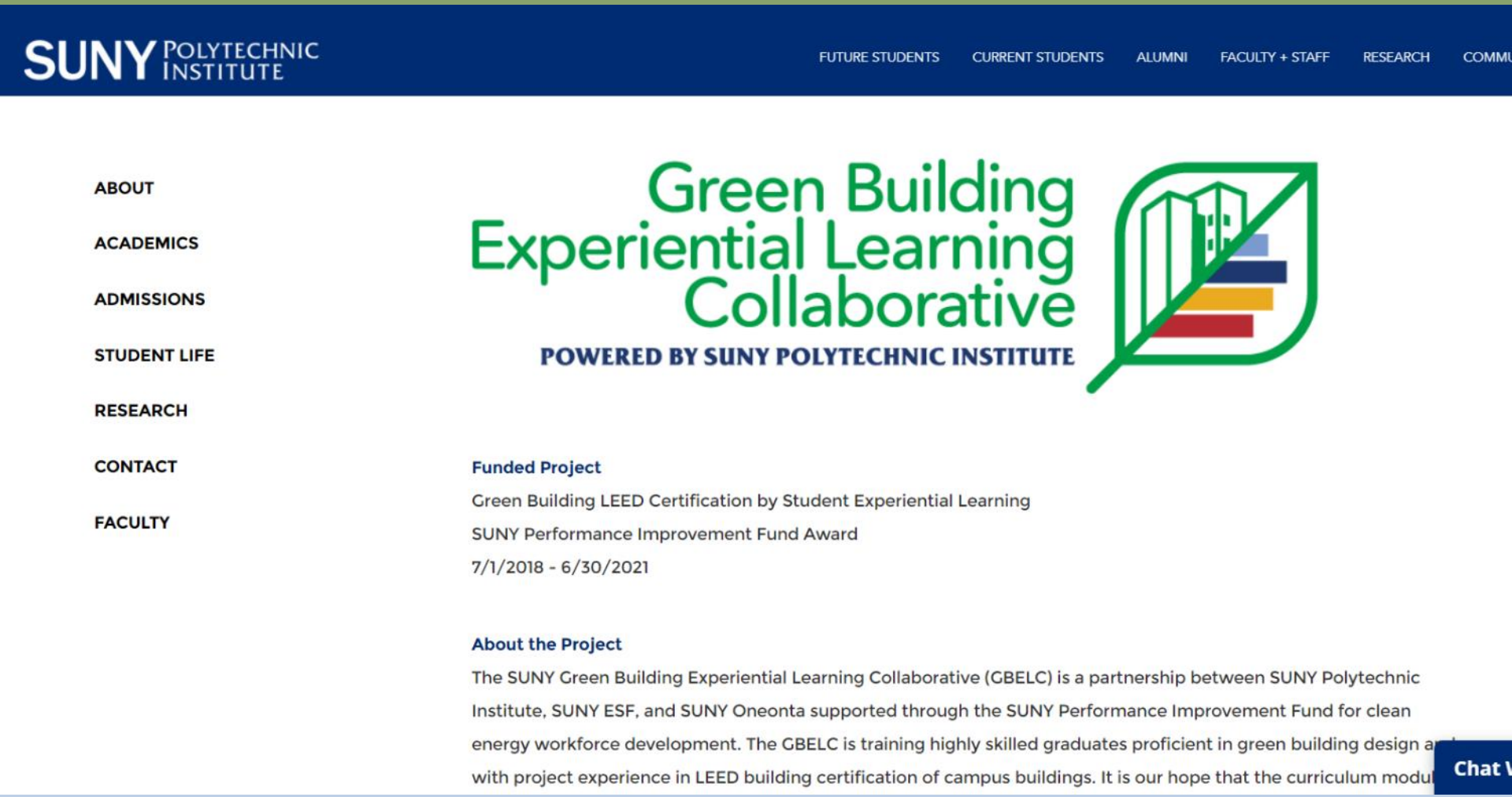
Incorporating Arc into the SUNY Green Building Experiential Learning Collaborative

Mark Bremer, PI
College of Arts & Sciences
mark.bremer@sunypoly.edu

Dr. Paul Crovella, Co-PI
Forest and Natural Resources Management
plcrovella@esf.edu

sunypoly.edu/gbelc

Incorporating Arc into the SUNY Green Building Experiential Learning Collaborative



sunypoly.edu/gbelc

Overview

- Project objectives
- Why it matters, why LEED?
- Course prep, development & delivery
- Incorporating Arc
- Results & feedback
- Lessons Learned
- Student experiences
- Acknowledgements
- Questions

Project Objectives

Make campuses into living laboratories

- Teach new experiential learning courses in which students certify existing campus green buildings

Develop NYS Workforce

- Students earn personal industry credentials (LEED GA)
- Develop capacity of faculty & staff accreditations (LEED AP)

Scale capabilities across SUNY

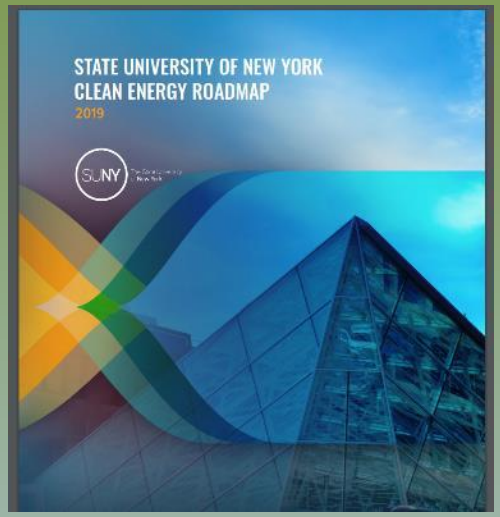
- Share expertise and best-practices with other campuses
- Increase in-house capacity for measuring air quality

Partners: ESF, Poly, Oneonta

SUNY by the numbers

- 64 Campuses
- 424,051 students
- 2,195,000 continuing ed.
- 91,180 staff
- 32,500 faculty
- >3,000 Vehicle fleet

Why it matters



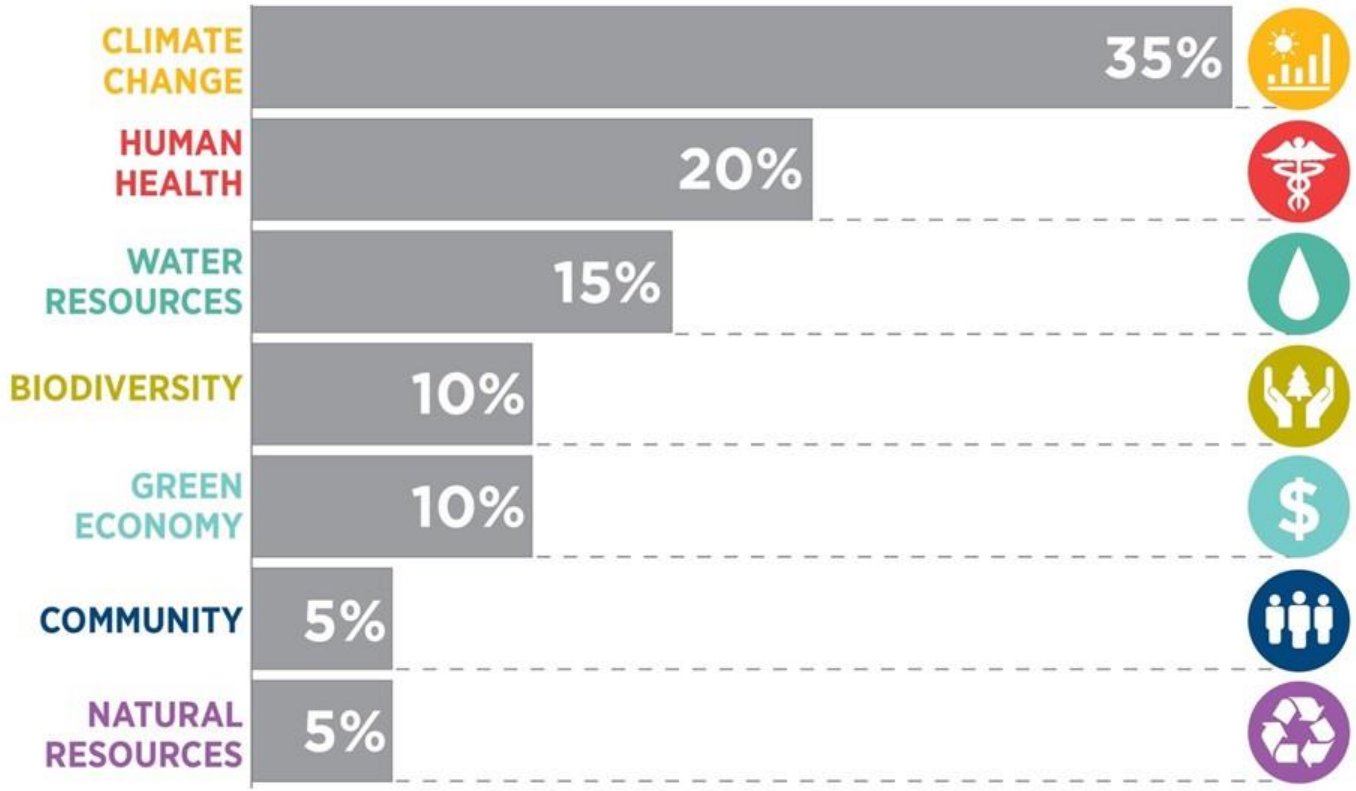
- NYS Reforming the Energy Vision
- SUNY Clean Energy Road Map
- Workforce development
- Experiential learning opportunities
- Building occupant health and well-being
- Environmental impact of buildings
- LEED Lab curriculum

Why LEED?

LEED v4

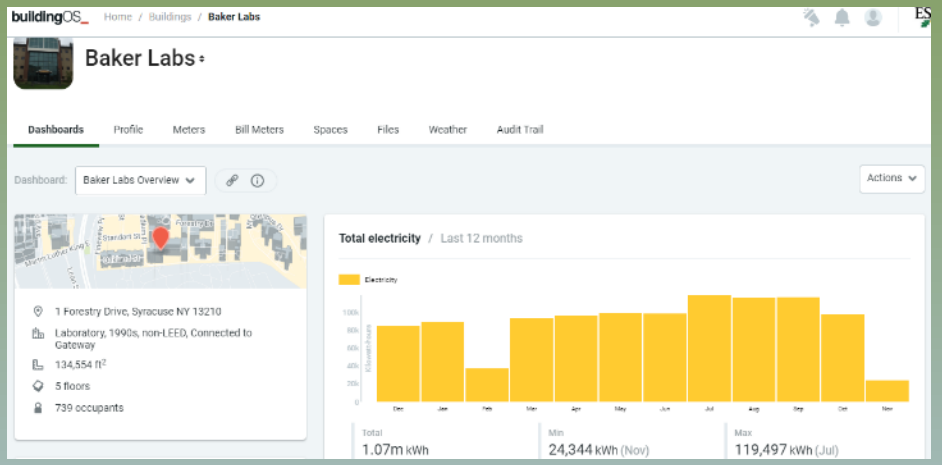
CERTIFIED	SILVER	GOLD	PLATINUM
40-49 points	50-59 points	60-79 points	80+ points

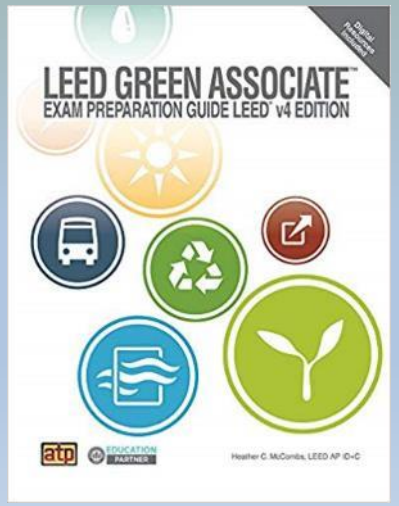
LEED SYSTEM GOALS



Advanced Preparation

- Arrange for access to Campus information
  - Meet with physical plant staff to discuss their collaboration
    - Students will need access to project documents (plans, and specifications if available)
    - Students will need access to energy/water use data (historical and current)
- Arrange for access to USGBC materials
  - Study bundles, exam registration
  - Set up USGBC accounts
  - LEED Online
  - ARC platform
  - LEED v4 Reference Guide





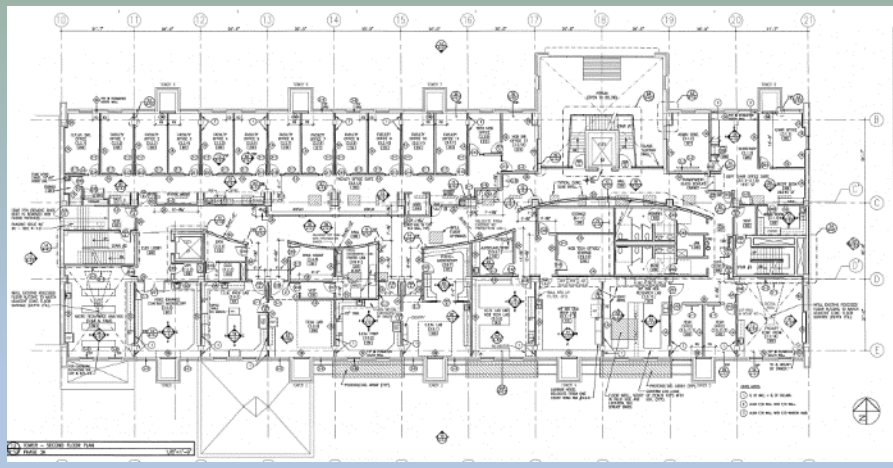
Course Development

- Followed existing USGBC LEED Lab model
- Engaged stakeholders for staff and faculty support
- Different approaches
- ESF – CME 496 experimental course, allowed as option for degree program requirement, co-taught
- Poly – CE/ME 448 & IDS 251 formally approved by campus curriculum committee as electives, co-taught
- Oneonta – courses for online delivery, hired new full-time visiting faculty

State University of New York
College of Environmental Science and Forestry

Course Delivery
CME 496 Principles of Green Buildings

- Orientation to the course and to the building –
- Delivery - Two times a week, 1 Lecture, 1 quiz/work/presentation session
- Topics covered in lecture did not necessarily align with work done for documentation
- Quizzes simulated LEED GA questions
- Students presented to classmates on progress, challenges



Weekly quiz	25%
Score on LEED GA	25%
Class Project/Participation – Instructor evaluation	25%
Class Project/Participation – Team members	25%

CE 448/ ME 448 Green Building Strategies

Fall 2019

EXISTING BUILDINGS OPERATIONS AND MAINTENANCE

LEED v4.1

EXPERIENTIAL LEARNING

20

LEED GREEN ASSOCIATE

12+2?

LEED AP O+M

+2

LOCATION AND TRANSPORTATION		14
Prerequisite	Transportation Performance	14
SUSTAINABLE SITES		**4**
Credit	Rainwater Management	1
Credit	Heat Island Reduction	1
Credit	Light Pollution Reduction	1
Credit	Site Management	1
WATER EFFICIENCY		**15**
Prerequisite	Water Performance	15
ENERGY AND ATMOSPHERE		**35**
Prerequisite	Energy Efficiency Best Management Practices	Required
Prerequisite	Fundamental Refrigerant Management	Required
Prerequisite	Energy Performance	33
Credit	Enhanced Refrigerant Management	1
Credit	Grid Harmonization	1

MATERIALS AND RESOURCES		9
Prerequisite	Purchasing Policy	Required
Prerequisite	Facility Maintenance and Renovations Policy	Required
Prerequisite	Waste Performance	8
Credit	Purchasing	1
INDOOR ENVIRONMENTAL QUALITY		**22**
Prerequisite	Minimum Indoor Air Quality	Required
Prerequisite	Environmental Tobacco Smoke Control	Required
Prerequisite	Green Cleaning Policy	Required
Prerequisite	Indoor Environmental Quality Performance	20
Credit	Green Cleaning	1
Credit	Integrated Pest Management	1
INNOVATION		**1**
Credit	Innovation	1
TOTAL		**100 Possible Points**

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Prerequisite	Transportation Performance	14
SUSTAINABLE SITES		**4**
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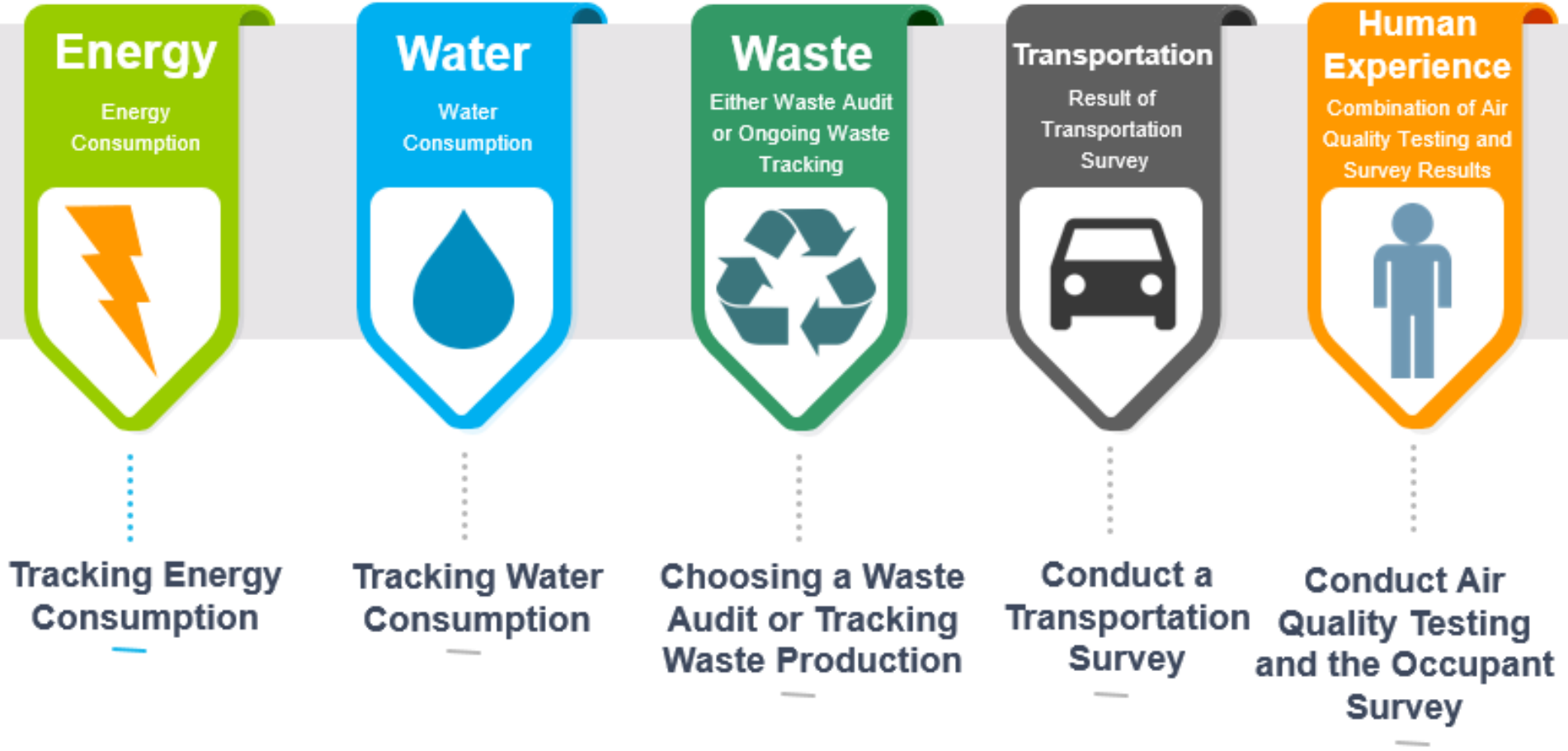
TOTAL		**100 Possible Points**

Tracking Performance in LEEDv4.1



SUNY Poly Wildcat Field House, New York, United States
1000121445

Upgrade my account

+ Add to Portfolio

Overview

Performance

Meters & Surveys

SUNY Poly Wildcat Field 79 / 100

ENERGY METER
Electric

All Changes Saved

Current Arc Scores

Table View

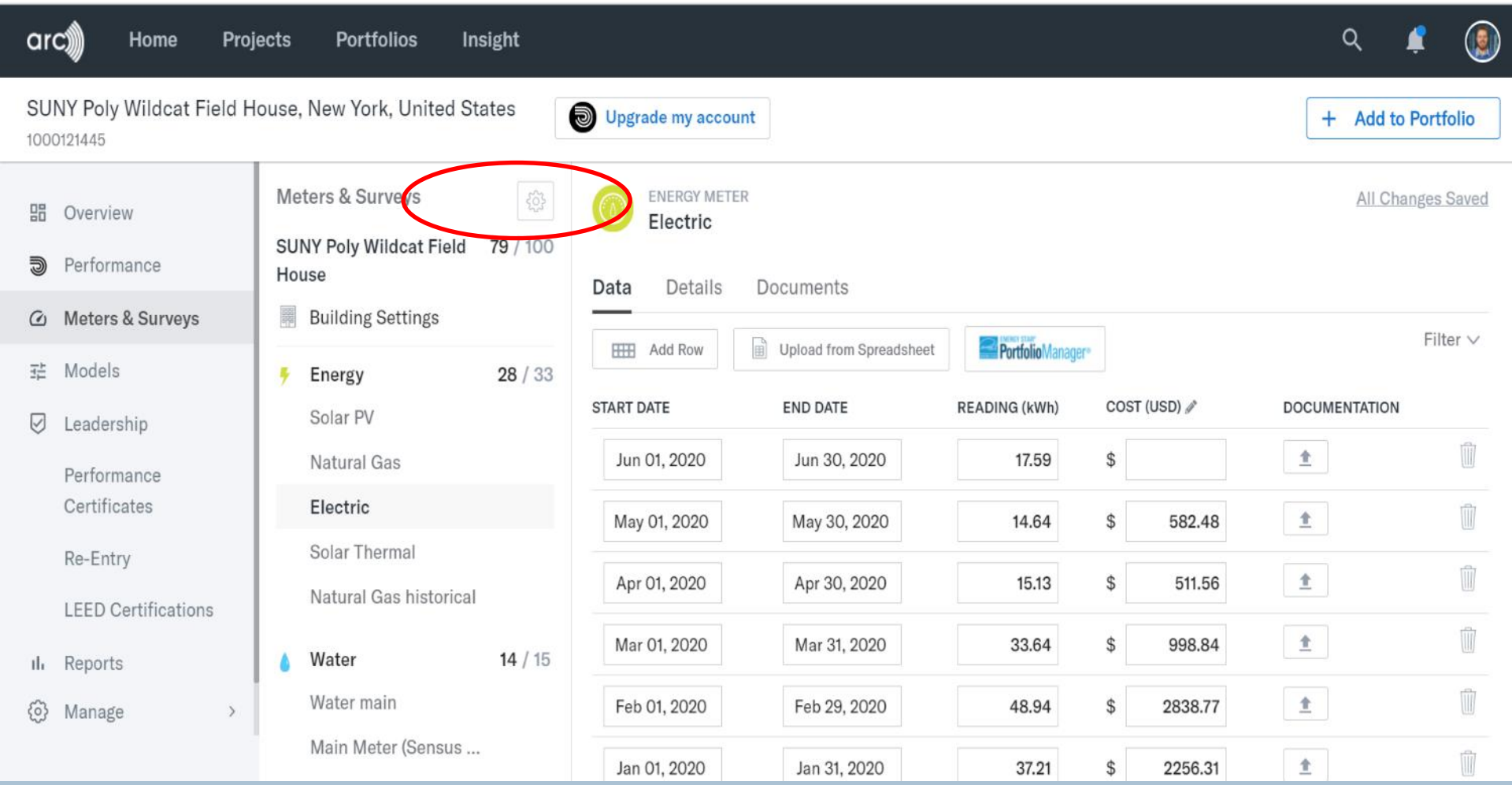
Energy	28/33
Water	14/15
Waste	8/8
Transportation	13/14
Human Experience	16/20

100 Seymour Rd SUNY Polytechnic Institute, NY, US

Current Arc Scores

Graphic

100 Seymour Rd SUNY Polytechnic Institute, NY, US


arc
Home
Projects
Portfolios
Insight
SUNY Poly Wildcat Field House, New York, United States
1000121445
Upgrade my account
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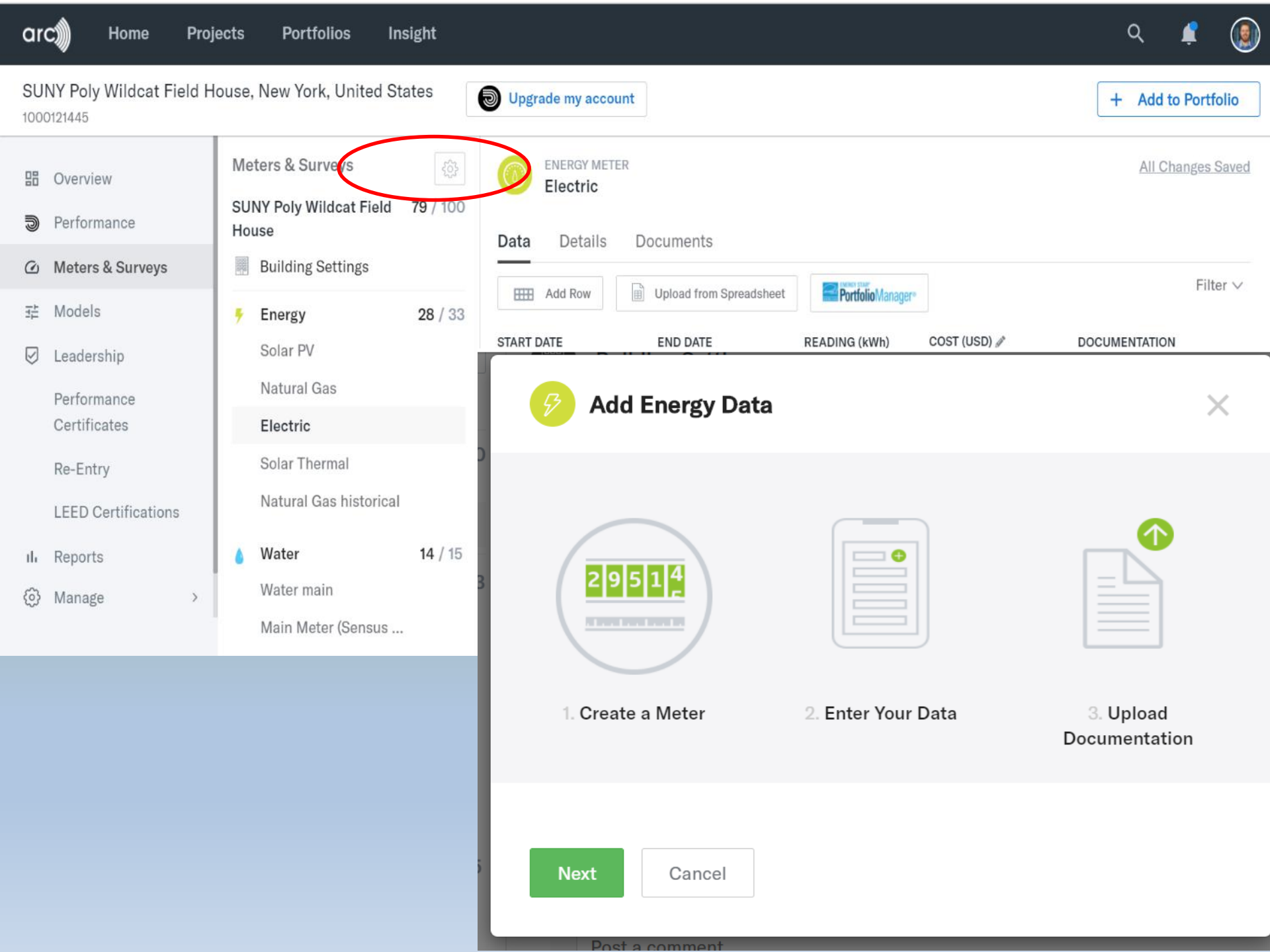
Overview
Performance
Meters & Surveys
Models
Leadership
Performance Certificates
Re-Entry
LEED Certifications
Reports
Manage
Meters & Surveys
SUNY Poly Wildcat Field House 79 / 100
Building Settings
Energy 28 / 33
Solar PV
Natural Gas
Electric
Solar Thermal
Natural Gas historical
Water 14 / 15
Water main
Main Meter (Sensus ...
ENERGY METER
Electric
All Changes Saved
Data
Details
Documents
Add Row
Upload from Spreadsheet
ENERGY STAR PortfolioManager
Filter
START DATE
END DATE
READING (kWh)
COST (USD)
DOCUMENTATION
Jun 01, 2020
Jun 30, 2020
17.59
$
May 01, 2020
May 30, 2020
14.64
$
582.48
Apr 01, 2020
Apr 30, 2020
15.13
$
511.56
Mar 01, 2020
Mar 31, 2020
33.64
$
998.84
Feb 01, 2020
Feb 29, 2020
48.94
$
2838.77
Jan 01, 2020
Jan 31, 2020
37.21
$
2256.31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SUNY Poly Wildcat Field House
79 / 100
Building Settings
Energy
28 / 33
Solar PV
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Electric
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Natural Gas historical
Water
14 / 15
Water main
Main Meter (Sensus ...
ENERGY METER
Electric
All Changes Saved
Data
Details
Documents
Add Row
Upload from Spreadsheet
PortfolioManager
Filter
START DATE
END DATE
READING (kWh)
COST (USD)
DOCUMENTATION
Add Energy Data
1. Create a Meter
2. Enter Your Data
3. Upload Documentation
Next
Cancel

Scope 1 and 2 emissions

Cumulative GHG emissions from Oct 14, 2019 to Oct 13, 2020

Scope 1 Scope 2

69.12 MTCO2e

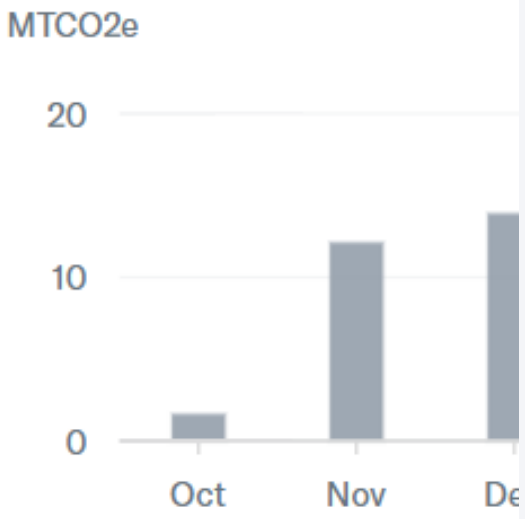
- Use Standard Emissions Factor of 0.37 lbs/kWh
- Use Custom Emissions Factor

Scope 1 and 2 emissions

Cumulative GHG emissions from Oct 14, 2019 to Oct 13, 2020

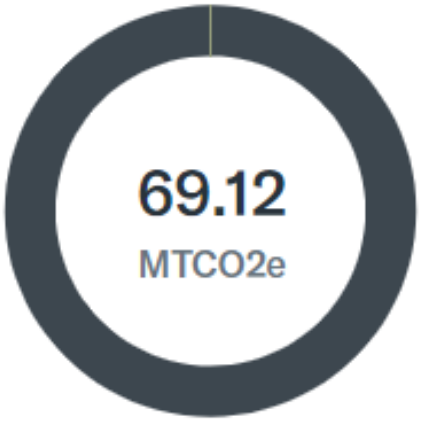
Scope 1 Scope 2

69.12 MTCO2e



GHG Emissions by source

GHG emissions sources from Oct 14, 2019 to Oct 13, 2020



Source (MTCO2e)

- Fuel
  69.09 (99.95%)
- Electricity
  0.0301 (0.04%)
- Transportation
  0.0062 (8.97e-3%)

arc Home Projects Portfolios Insight

Projects

Upgrade my account

+ Add a Project + Create a portfolio

- All 13
- Buildings 13
- Transit 0
- Parking 0
- Cities 0
- Communities 0
- Schools 0
- Certified 0

Showing: 10 of 13 Projects

ID	NAME	ADDRESS	TYPE	CERTIFICATION	SCORE
1000133616	SUNY Poly Cayan Li...	Utica, New York, Uni...	Building	Registered	60
8000003012	Hilltop Hall	Utica, New York, Uni...	Building	Sign agreement	0
8000003011	Oriskany Hall	Utica, New York, Uni...	Building	Registered	31
8000003010	Student Center	Utica, New York, Uni...	Building	Registered	34
8000003009	Mohawk Hall	Utica, New York, Uni...	Building	Registered	36
8000003008	Adirondack Hall	Utica, New York, Uni...	Building	Registered	37
8000003007	Cayan Library	Utica, New York, Uni...	Building	Registered	0
8000003006	Campus Center	Utica, New York, Uni...	Building	Registered	29

CE 448/ ME 448 Green Building Strategies

Fall 2020

EXISTING BUILDINGS OPERATIONS AND MAINTENANCE

LEED v4.1

EXPERIENTIAL LEARNING

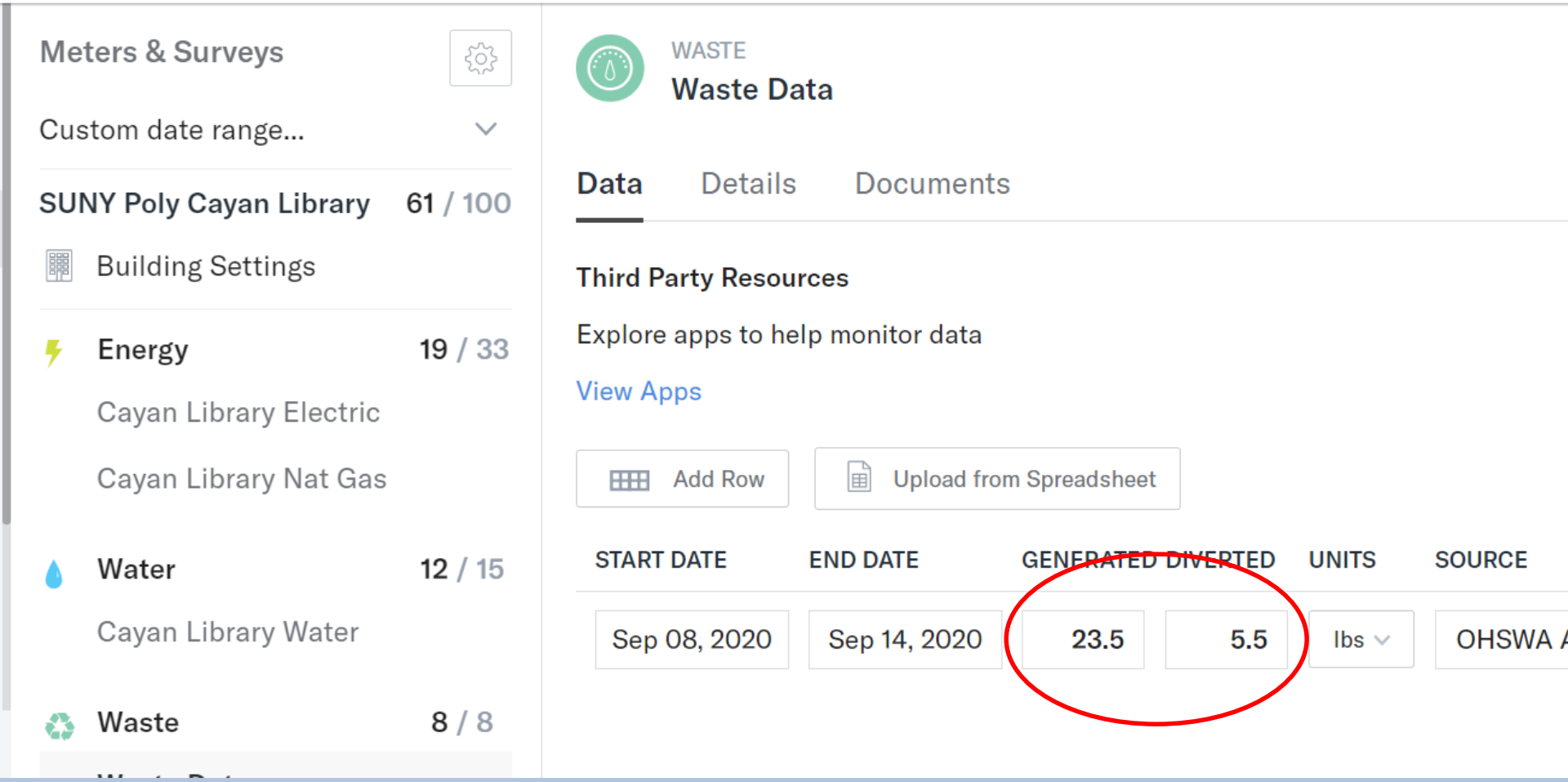
8

LEED GREEN ASSOCIATE

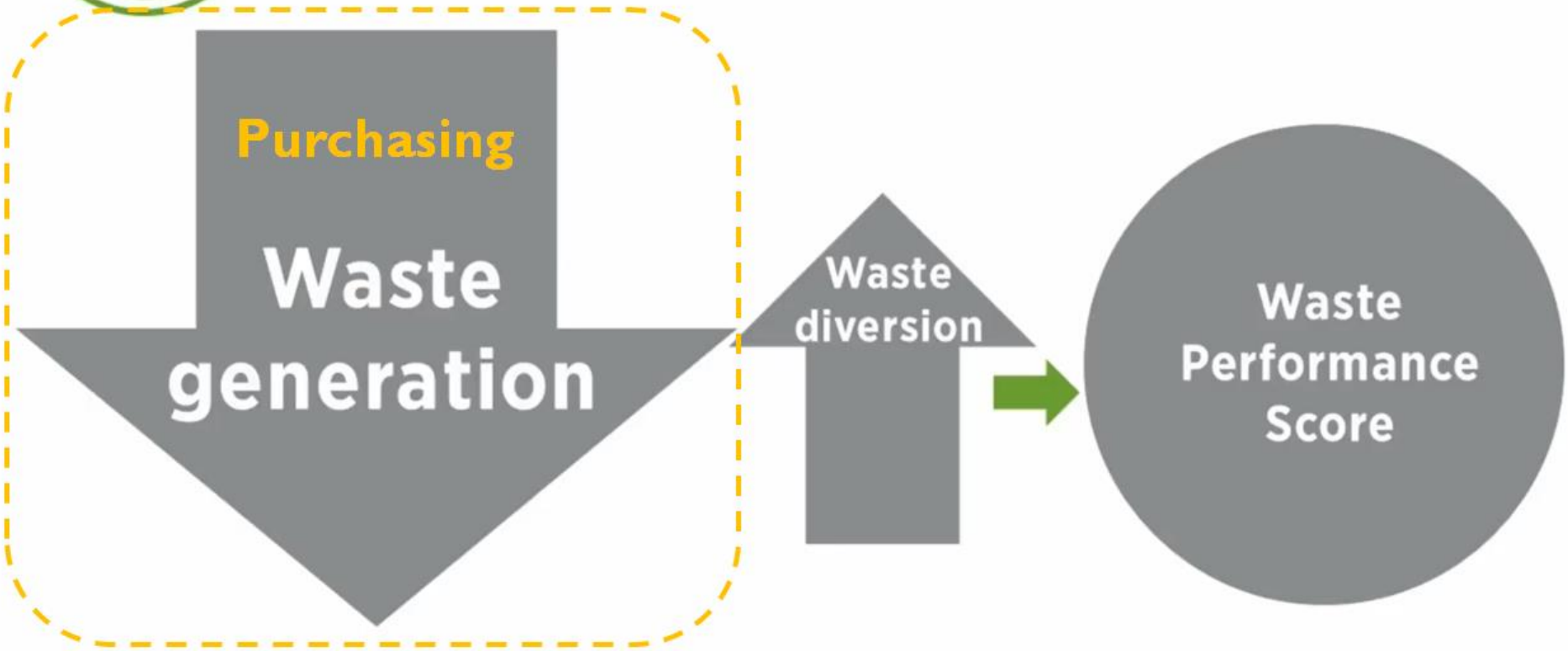
9?

LEED AP BD+C

1?


Meters & Surveys
Custom date range...
SUNY Poly Cayan Library 61 / 100
Building Settings
Energy 19 / 33
Cayan Library Electric
Cayan Library Nat Gas
Water 12 / 15
Cayan Library Water
Waste 8 / 8
WASTE
Waste Data
Data
Details
Documents
Third Party Resources
Explore apps to help monitor data
View Apps
Add Row
Upload from Spreadsheet
START DATE
END DATE
GENERATED
DIVERTED
UNITS
SOURCE
Sep 08, 2020
Sep 14, 2020
23.5
5.5
lbs
OHSWA

MATERIALS & RESOURCES



Suny Polytechnic Institute
Solid Waste & Recycling Review
September 2020

SUNY Polytechnic Institute

SUNY Poly

SOLID WASTE & RECYCLING REVIEW

SUMMARY & RECOMMENDATIONS

ONEIDA-HERKIMER SOLID WASTE AUTHORITY

recycleone
ONE AND DONE

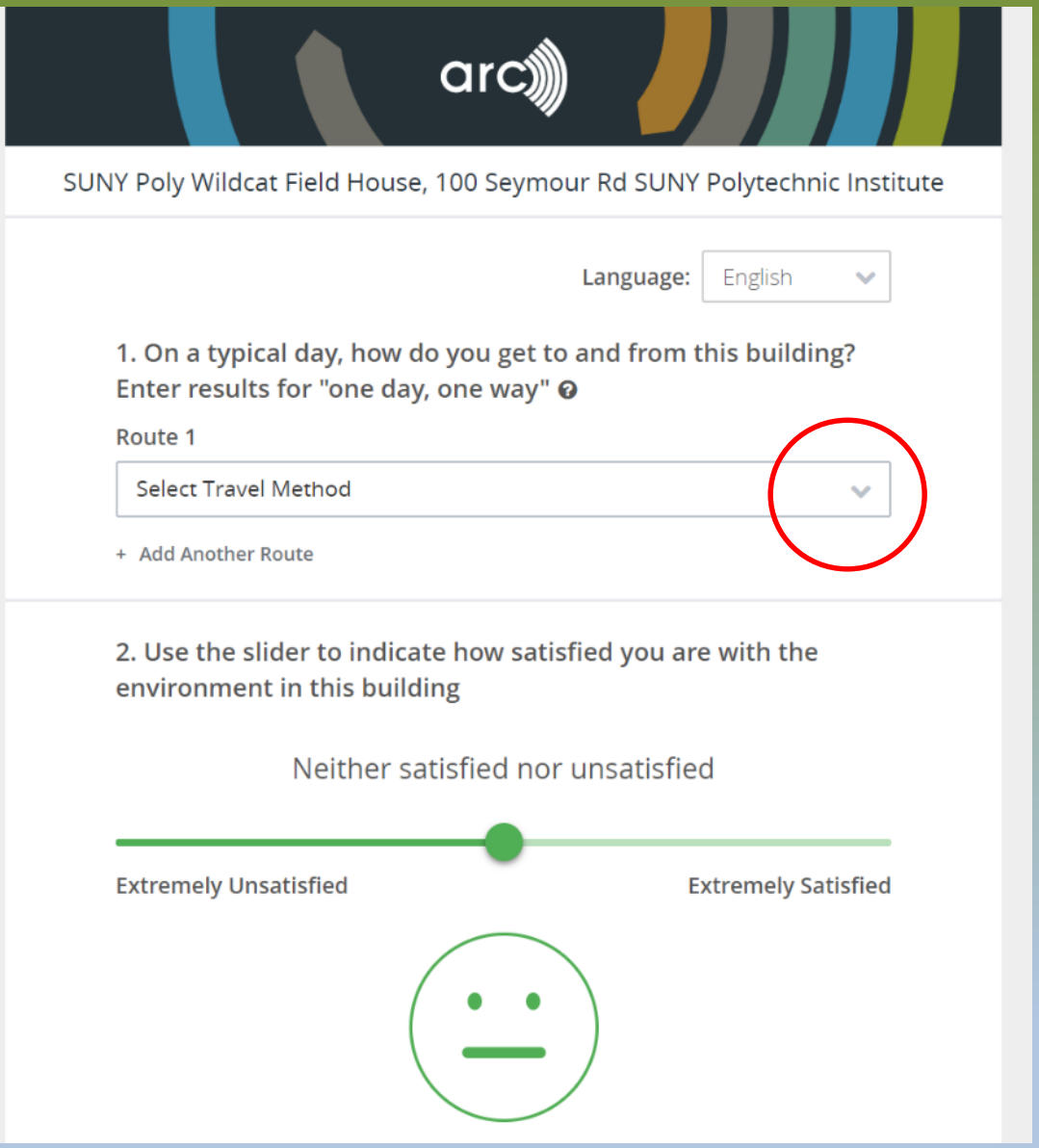
SUNY POLYTECHNIC INSTITUTE Informed Consent for Research Survey Fall 2020

Title of Study: Transportation and Occupant Satisfaction Survey for LEED O+M Certification of Cayan Library
Principal Investigators: Mark Bremer & Zhanjie Li

You are being invited to participate in a research study. Please take a few moments to read the explanations which follow to help you decide whether to participate or not.

Description of Study
This research study is being carried out in order to calculate performance scores in several green building certification categories. We are conducting this research in order to discover the commute patterns of building occupants and occupant satisfaction with the indoor environment. We would like to include you in the study because you work in (or visit) Cayan Library and are 18 or older. If you decide to take part, we will ask what mode(s) of transportation you take to get to and from the building. Additionally, we will ask about your level of satisfaction with the building's indoor environment. You can expect to spend about 3 minutes on the survey.

Risks and Discomforts
If you participate in this study, you will experience no more than minimal risks or discomforts. The survey is anonymous. If you choose to optionally give your name, your responses will be kept confidential.


arc
SUNY Poly Wildcat Field House, 100 Seymour Rd SUNY Polytechnic Institute
Language: English
1. On a typical day, how do you get to and from this building? Enter results for "one day, one way"
Route 1
Select Travel Method
+ Add Another Route
2. Use the slider to indicate how satisfied you are with the environment in this building
Neither satisfied nor unsatisfied
Extremely Unsatisfied
Extremely Satisfied

SUNY Poly Wildcat Field House, 100 Seymour Rd SUNY Poly

Language: Eng

1. On a typical day, how do you get to and from this b
Enter results for "one day, one way"

Route 1

Select Travel Method

+ Add Another Route

2. Use the slider to indicate how satisfied you are wit
environment in this building

Neither satisfied nor unsatisfied

Extremely Unsatisfied

Extrem

Route 1

Include any miles you travel to get to this building.

Travel Method	Distance In: Mile
Walk	
Bike	
Telecommute	
Bus	
Light rail (trolley, tram, streetcar)	
Rapid transit (subway, metro)	
Motorcycle or scooter	
Car solo	
Carpool 2-3 people	
Car: Alternate fuel	

Clear

SAVE CANCEL

TRANSPORTATION

Transportation Survey

Survey Responses

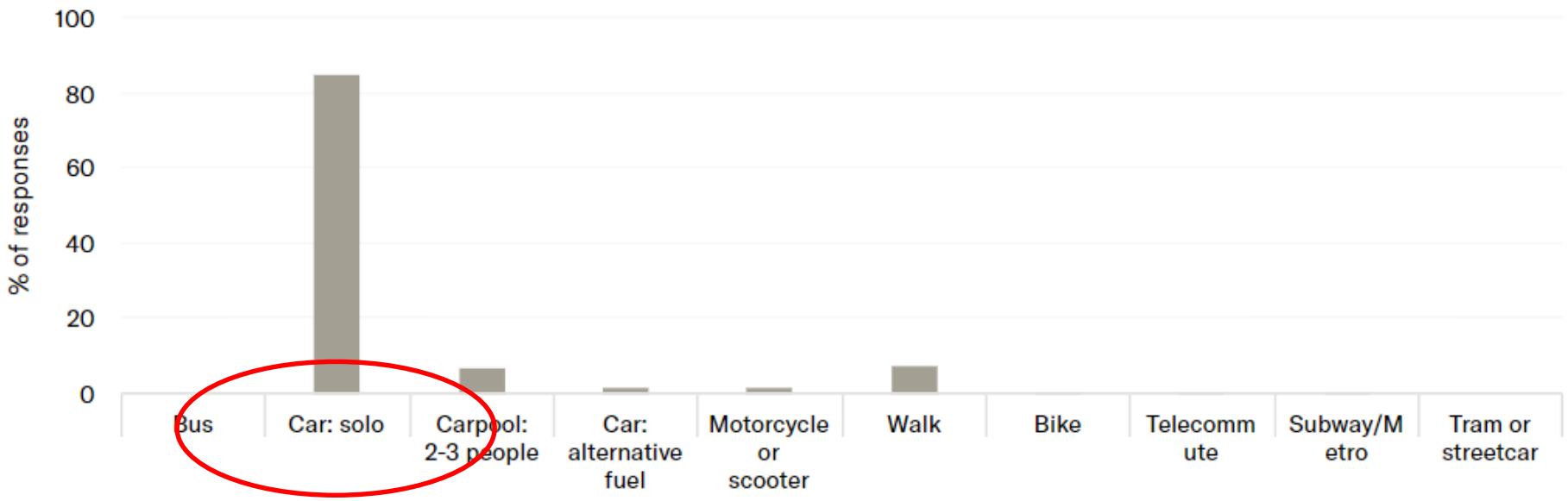
Survey Tools and Resources

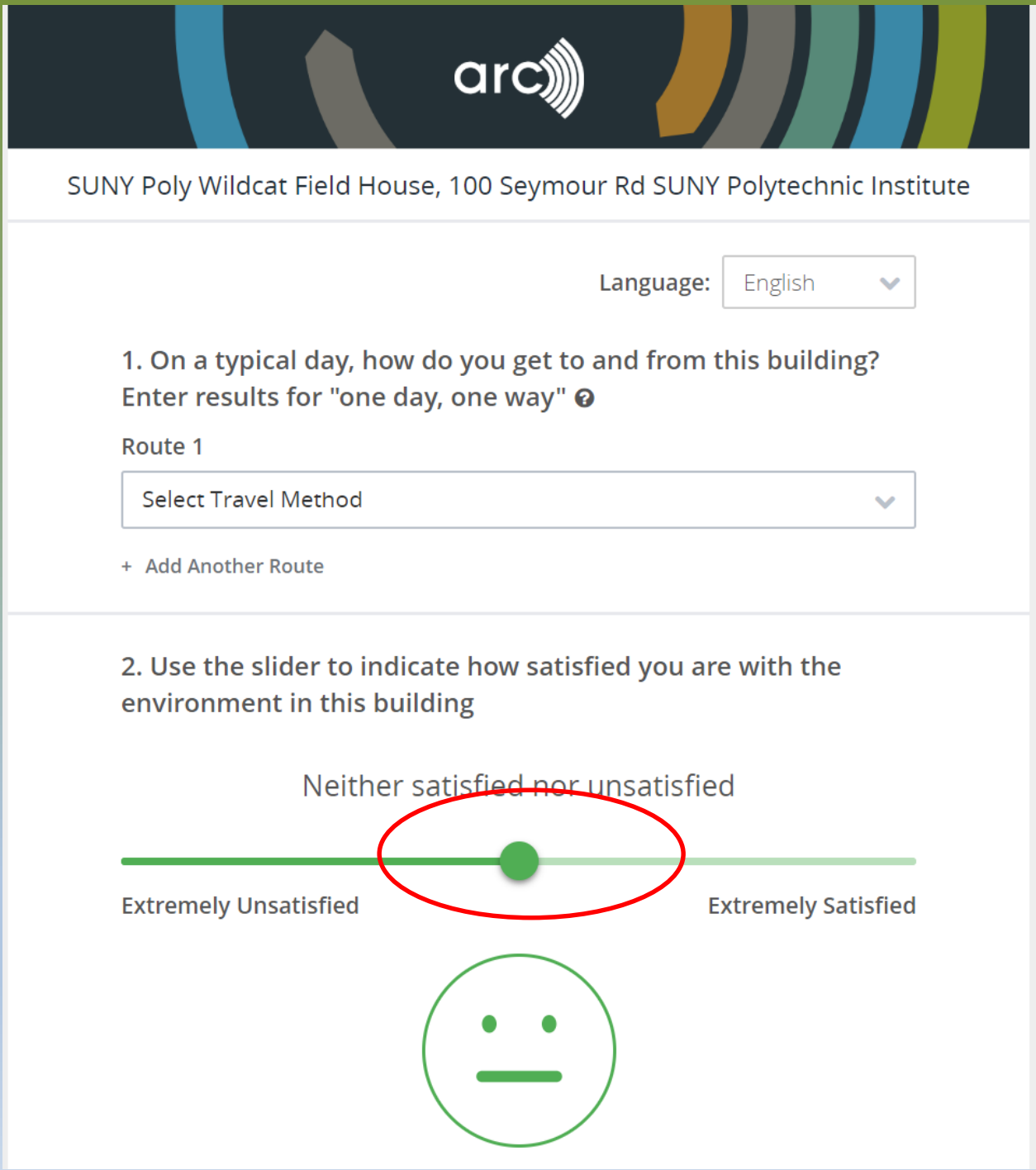
% OF PEOPLE RESPONDED

37.58 %

For your project, a response rate of **25.00%** will generate a score.

Popularity of Transport Modes

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Language: English
1. On a typical day, how do you get to and from this building? Enter results for "one day, one way"
Route 1
Select Travel Method
+ Add Another Route
2. Use the slider to indicate how satisfied you are with the environment in this building
Neither satisfied nor unsatisfied
Extremely Unsatisfied
Extremely Satisfied

2. Use the slider to indicate how satisfied you are with the environment in this building

Satisfied

Extremely Unsatisfied — Extremely Satisfied

3. We're glad to hear that. Please select the options below that significantly enhance your satisfaction:

- [ ] Thermal Comfort
- [ ] Sound
- [ ] Air Quality
- [ ] Cleanliness
- [ ] Light
- [ ] Privacy
- [ ] Views to Outdoors
- [ ] Daylight

Comments (Optional)

Location - eg. Lobby, 2nd Floor East, 50th Floor - Suite 500

Name (Optional)

Which type of occupant are you?

Regular Occupant

Submit

2. Use the slider to indicate how satisfied you are with the environment in this building

Unsatisfied

Extremely Unsatisfied

Extremely Satisfied

3. We're sorry to hear that. Please select the options below that significantly reduce your satisfaction:

- [ ] Dirty
- [ ] Cold
- [ ] Drafty
- [ ] Smelly
- [ ] Dark
- [ ] Bright
- [ ] Stuffy
- [ ] Glare
- [ ] Views to Outdoors
- [ ] Acoustics
- [ ] Privacy
- [ ] Sound
- [ ] Hot
- [ ] Humid

Comments (Optional)

Location - eg. Lobby, 2nd Floor East, 50th Floor - Suite 500

Name (Optional)

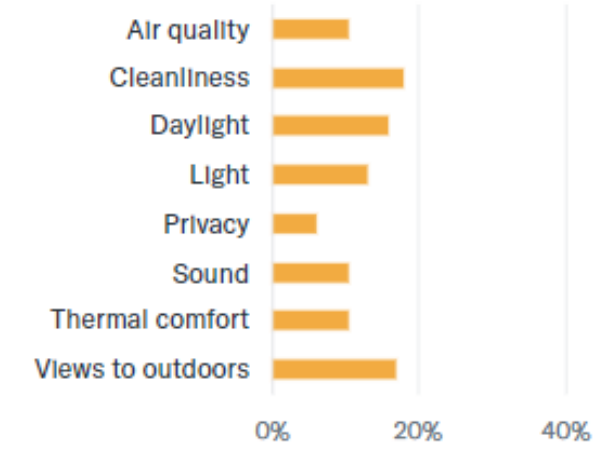
Which type of occupant are you?

Occupant satisfaction

Average occupant satisfaction from Oct 14, 2019 to Oct 13, 2020

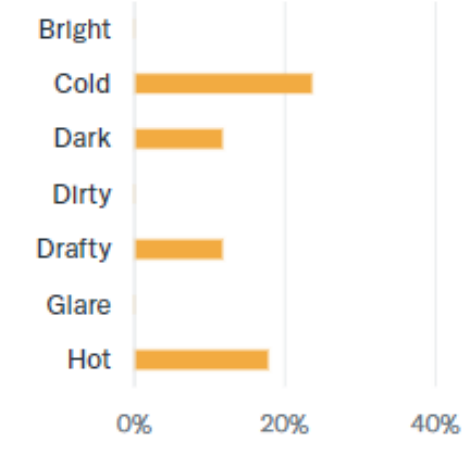
Satisfaction details

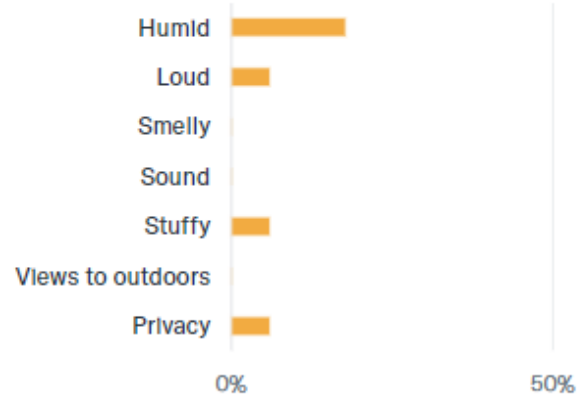
Oct 14, 2019 - Oct 13, 2020



Dissatisfaction details

Oct 14, 2019 - Oct 13, 2020





- Transportation 13 / 14
  - Transportation Survey
- Human Experience 16 / 20
  - Occupant Satisfaction Survey
  - Carbon Dioxide
  - Total Volatile Organic Compounds
  - PM2.5
  - Ozone
  - Carbon Monoxide
  - Acetaldehyde

START DATE	END DATE	READING (ppm)	SOURCE	DOCUMENTATION
Nov 13, 2019	Nov 13, 2019	520.6		

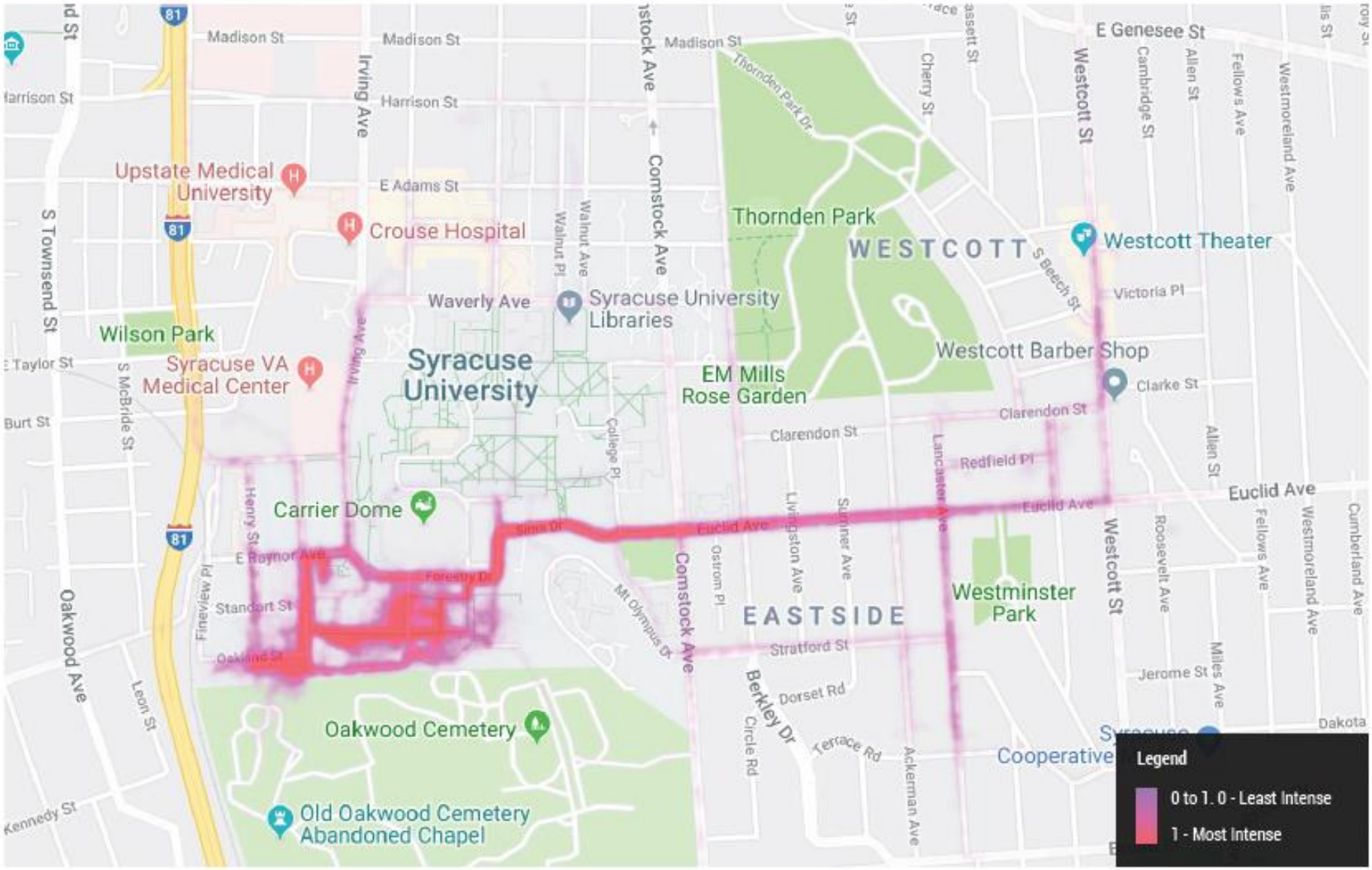
AZ-0001
AZ-0018


DOMESTIC COLD WATER
ROC

B-LINE ANALYTICS

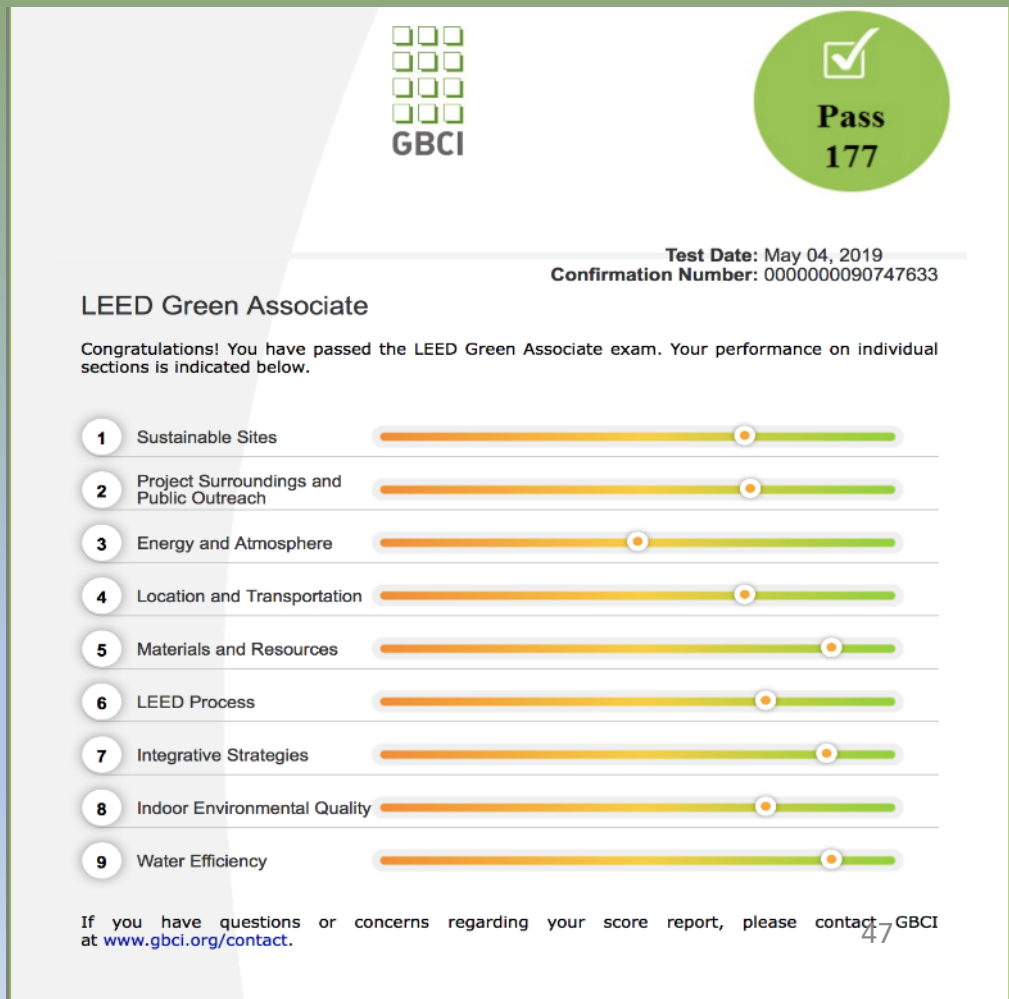
Generates better, cheaper mobility data in ***real time***

Map 1: All Modes of Transportation



Results and Student Feedback

- Key challenges:
  - Prerequisites
  - Policies
  - Project Management skills
- Student Performance
  - 25 out of 35 passed LEED GA
  - 1 out of 2 passed LEED AP (O+M)
- Feedback:
  - Course Organization
  - Group work
  - O+M vs. BD+C



GBCI

Pass
177

Test Date: May 04, 2019
Confirmation Number: 0000000090747633

LEED Green Associate

Congratulations! You have passed the LEED Green Associate exam. Your performance on individual sections is indicated below.

1	Sustainable Sites
2	Project Surroundings and Public Outreach
3	Energy and Atmosphere
4	Location and Transportation
5	Materials and Resources
6	LEED Process
7	Integrative Strategies
8	Indoor Environmental Quality
9	Water Efficiency

If you have questions or concerns regarding your score report, please contact GBCI at www.gbci.org/contact.

Lessons Learned

- Define objectives:
  - Green building knowledge
  - Credential – LEED Green Associate
  - Experiential – Project documentation
- Benefits
  - Memorable student experience and industry recognizable skills
  - Recognition for campus efforts
  - Partnerships to share educational load
- Challenges
  - Organizational structure of institution (e.g. policy implementation)
  - Organizational structure of USGBC
  - Student's working on projects need guidance in:
    - Communication with teammates and with professionals
    - Project management skills vs. typical linear educational assignments

Angie Persello, LEED Green Associate

Major: Civil Engineering Technology,
Old Dominion University

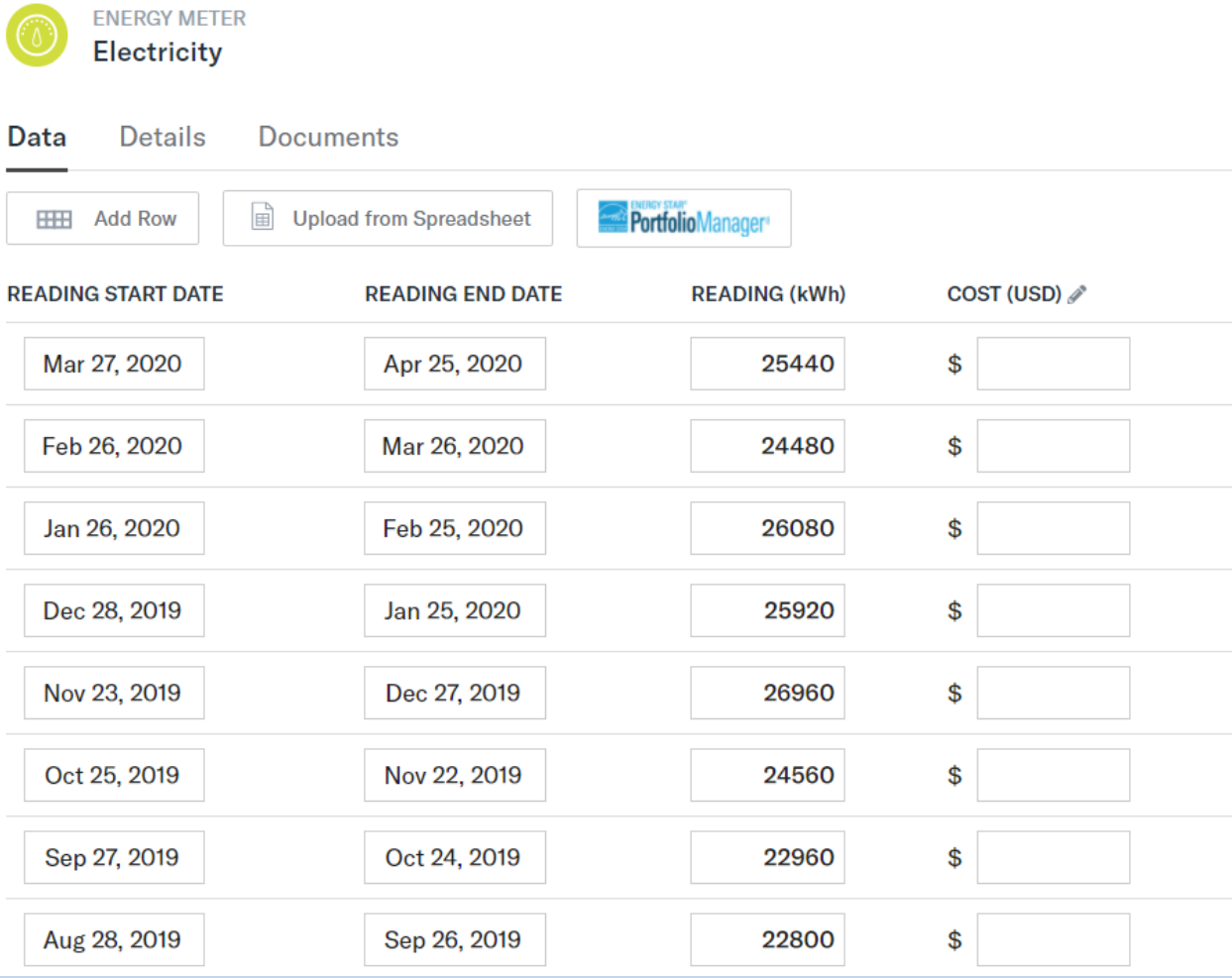
- Hands on LEED experience in Central New York
- Served as CME 496 Project & Communications Coordinator

ESF
State University of New York
College of Environmental Science and Forestry

Energy | Water | Waste | Transportation | Human Experience

Lesson Learned:
Data Collection & Analysis

Future Use:
Project Management
Document Organization



ENERGY METER
Electricity

Data | Details | Documents

Add Row | Upload from Spreadsheet | ENERGY STAR Portfolio Manager

READING START DATE	READING END DATE	READING (kWh)	COST (USD)
Mar 27, 2020	Apr 25, 2020	25440	$
Feb 26, 2020	Mar 26, 2020	24480	$
Jan 26, 2020	Feb 25, 2020	26080	$
Dec 28, 2019	Jan 25, 2020	25920	$
Nov 23, 2019	Dec 27, 2019	26960	$
Oct 25, 2019	Nov 22, 2019	24560	$
Sep 27, 2019	Oct 24, 2019	22960	$
Aug 28, 2019	Sep 26, 2019	22800	$

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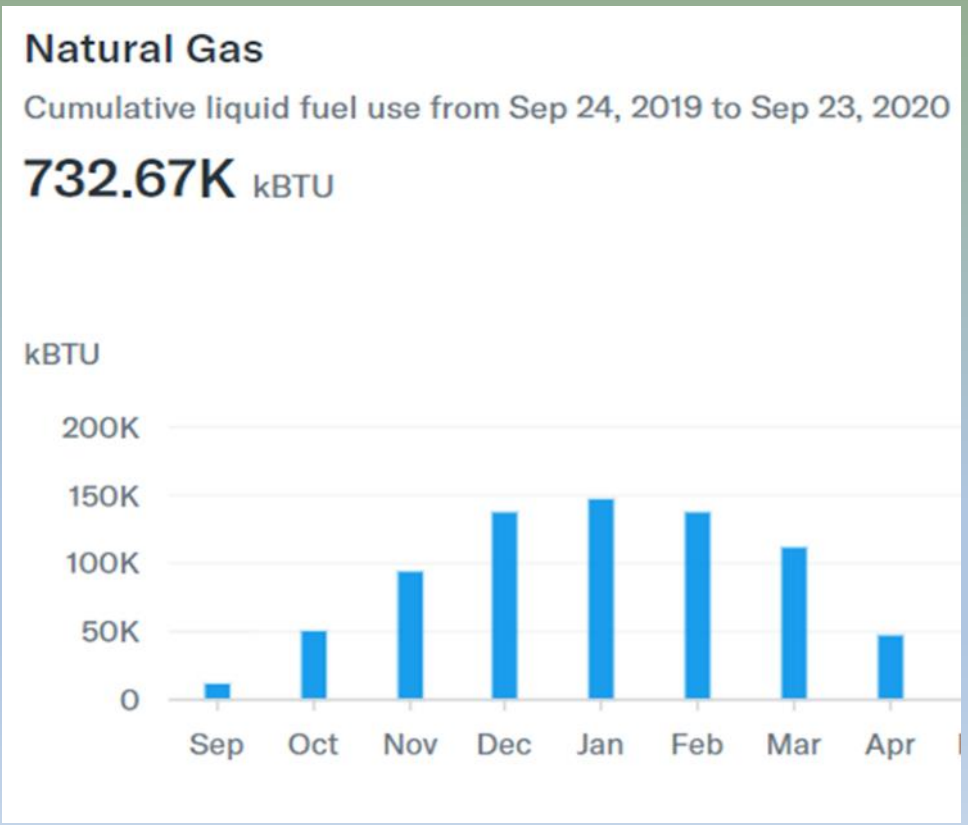
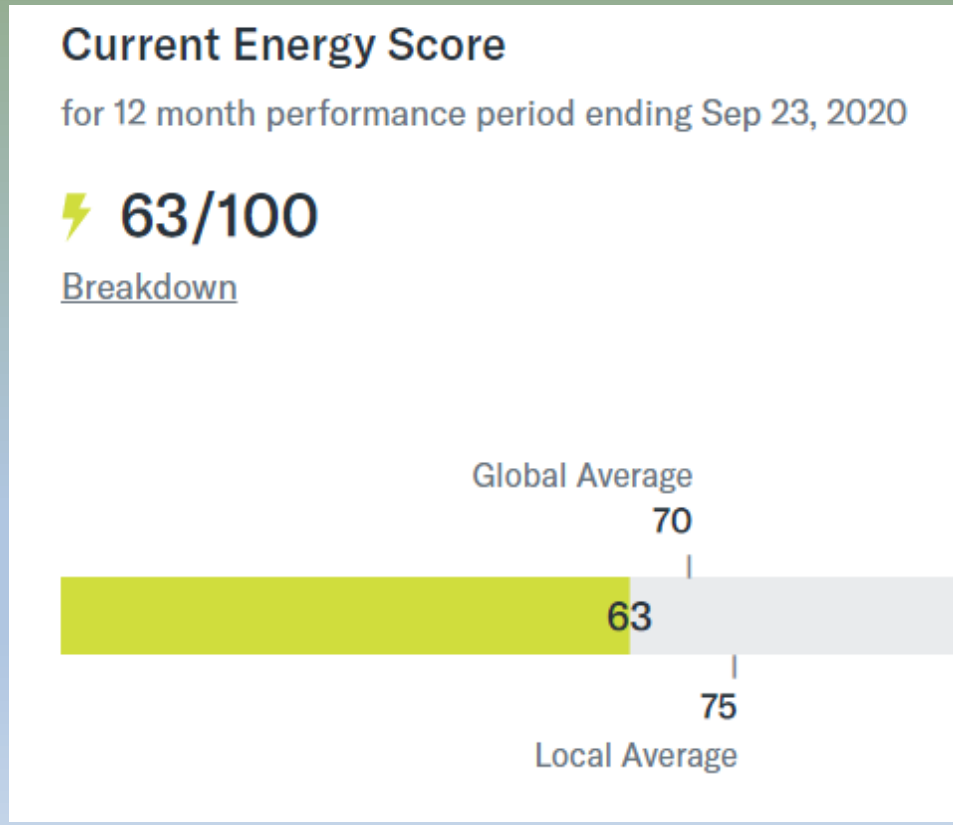
College of Environmental Science and Forestry

Lessons Learned:
Identifying Trends
Benchmarking

Future Use:
Recognizing Areas for Improvement





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Lesson Learned:
LEED Terminology

Future Use:
LEED Exams
Project Management

Add Occupancy

Effective date

Regular building occupants (daily average)

Days per week with visitors

Number of visitors each day

Duration of visit (in hours/day)

M’Kenzie Bradshaw, M+R Group Leader

Major: Mechanical Engineering

Graduation Date: May 2021

Material and Resource Group Leader

Career Interests:

- National Grid
- Mechanical Engineering workforce
- Different fields of Energy

Why I chose this course:

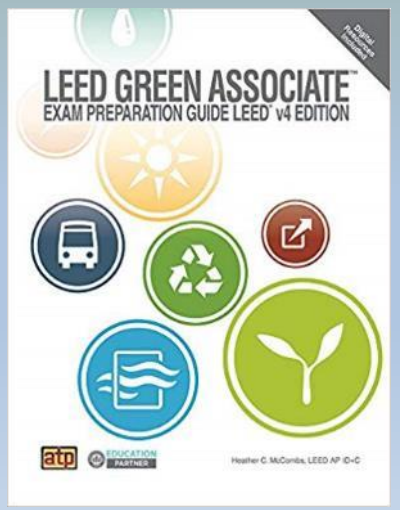
- Further knowledge on green buildings
- Opportunity to certify a Suny Poly building
- Being able to apply skills for future work
- Earn personal industry credentials(LEED GA)

What have I learned?

- In class lectures incorporating Arc

- Experience Using Arc
  - Waste Audit
  - Energy Data
  - Air Quality Measurements

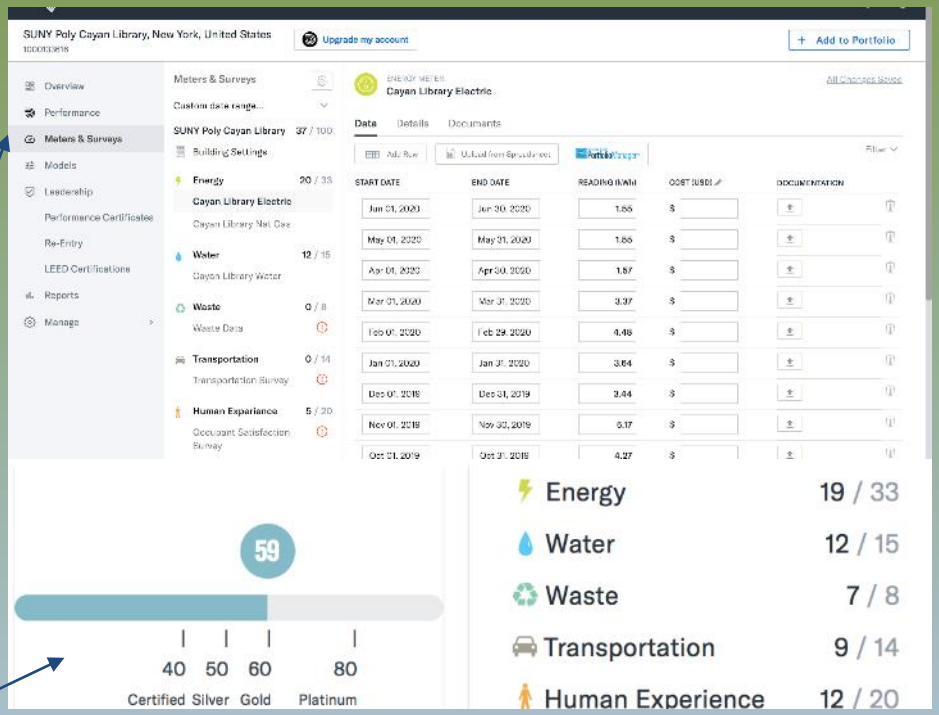
- Preparation of LEED GA Exam



Learning Arc

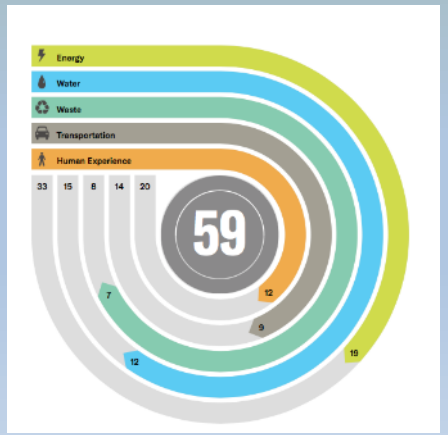
In class Virtual Tour of Arc:

- Can be used for LEED Certification
- Can determine readiness based off of inputted data
- Where the project was located and the different tools
- How data was inputted
- How arc scores the categories



Utilizing Arc Platform:

- Inputting Data in Meters & Surveys
- Analyzing performance scores of individual categories
- The Arc performance score with a different visual



With this being a virtual semester the Arc platform provided us a place to collaborate as a class and make this project successful!

Preparing for LEED GA Exam

Core Concepts Guide(USGBC)

- Explains green building fundamentals and sustainable systems thinking
- Strategies for 7 main categories

Exam Preparation Guide

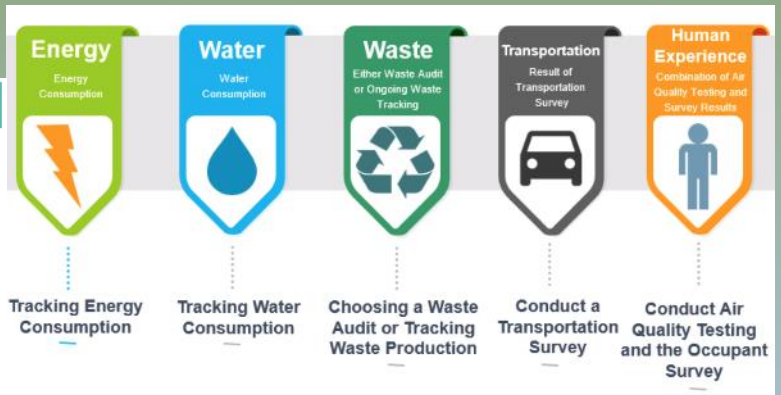
- Gain knowledge on key terms and definitions
- Completing practice questions and test
- Becoming familiar with the testing process
- Utilizing Digital: Quick Quizzes, Flash Cards, Practice Exams

How will I apply this to my future?

Importance of tracking building performance:

- Continue expanding green energy development
- Ensure building occupants are healthy & productive
- Reducing negative environmental effects

MATERIALS AND RESOURCES		9
Prerequisite	Purchasing Policy	Required
Prerequisite	Facility Maintenance and Renovations Policy	Required
Prerequisite	Waste Performance	8
Credit	Purchasing	1



Project Management

As the leader of M+R it was my job to:

- ensure prerequisites for category were completed.
- be the contact person for M+R group
- input waste data for waste audit into Arc

Green Building Experiential Learning Collaborative

→Share & Scale-up

- Lead with pilot projects at partner campuses
- Build course and certification project templates
- Share templates and best-practices with other campuses
- Develop a SUNY inter-campus Sustainable Buildings minor / micro-credential
- Expand use of indoor air quality testing as teaching tools
- Automate building performance monitoring

Acknowledgements

- SUNY Performance Improvement Fund

•Dr. Zhanjie Li, Assistant Professor, Civil Engineering
•Aaron LaFave, Energy Manager
•Kaila Aimino, Assistant Director of Residential Programming
•Eric Hotchkiss, Associate Director of Residential Housing
•Alvito DiStefano, Summer Intern

•Alex Poisson, PhD Candidate & Energy Coordinator
•Josh Arnold, Director of Energy Management & Utilities
•Patrick Whitford, Undergraduate Student

•Dr. Farzaneh Soflaei, Visiting Assistant Professor, Geography and Environmental Sustainability
•Rachel Kornhauser, Sustainability Coordinator
•Tracy Allen, Interim Dean, School of Sciences

Questions?

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mark.bremer@sunypoly.edu

Dr. Paul Crovella, Co-PI
Forest and Natural Resources Management
plcrovella@esf.edu

sunypoly.edu/gbelc

Experiential student learning & LEED: An Arc case study from SUNY

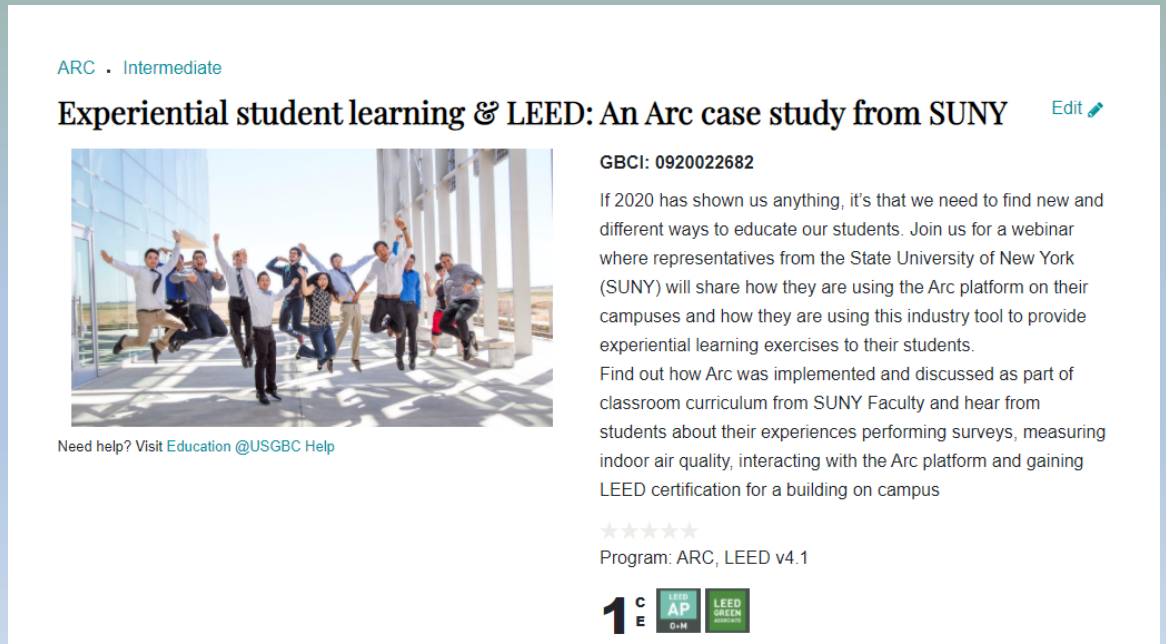
October 19, 2020

Continuing Education

- **Self Report 1 CE hour, with LEED AP O+M specialty**

- **Experiential student learning & LEED: An Arc case study from SUNY**
- **Course ID: 0920022682**
- **Provider: GBCI**

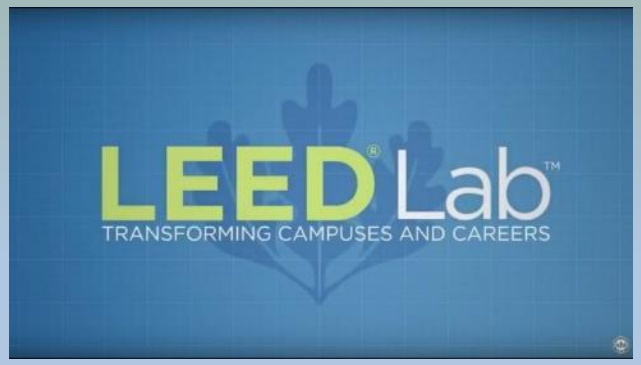
- **Login into www.usgbc.org**
- **Account > Credentials > "Report CE hours"**



Resources

www.arcskoru.com
contact@arcskoru.com

sunypoly.edu/gbelc



www.usgbc.org/education/leed-lab

Course Lessons

- Experimental/special topics course
- Curriculum committee course action (6+ months)
- Coordination with facilities staff and building occupants for measurement activities involving students
- IRB exemption application for survey
- Counting visitors for weighted occupancy calculation
- Cost per student $220 (education materials + LEED GA exam fee)
- Building registration fee $1200
- Building certification fee $0.038/sf

Admin Lessons

- Good communication among stakeholders
  - Copy relevant staff on communications
- Shared google doc for related emails, calls, and meeting minutes
- Adequate time for project coordination, course release and compensation
- Meet with staff early in the planning stages to review requirements
- Cost for staff accreditation $600 (education materials + LEED AP exam fee)
- Compensate staff for their time