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**New York  
Upstate Chapter**

# Learning Objectives

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## Beyond LEED® Design and Construction / - NYSGBC22 / 2011

Description: The main focus of the presentation will be on issues associated post occupancy with two LEED Platinum Certified buildings. Part one will focus on occupancy issues. The second phase will focus on challenges associated with upgrading existing buildings. The third portion will highlight green and sustainable opportunities beyond LEED.

Learning  
Units: 1

Credit  
Designations LU|HSW|SD

:

Learning  
Objective 1: Name three post occupancy considerations for architects and engineers.

Learning  
Objective 2: List facilities services skills necessary for successful LEED® buildings.

Learning  
Objective 3: Cite differences between energy models vs actual energy usage.

Learning  
Objective 4: Learn how to impact occupant behavior to affect change.



# **Beyond LEED Design and Construction**

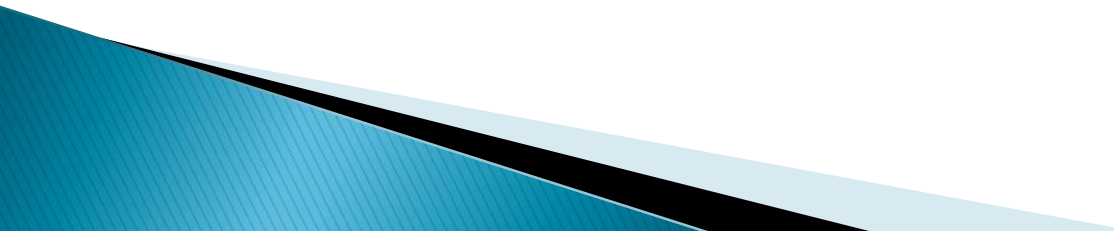
Ithaca College

Michelle Jones - Energy Manager LEED GA

**ITHACA**

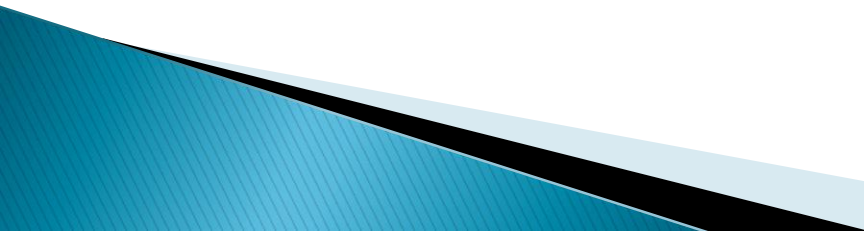
# Beyond LEED Design and Construction

## Ithaca College Introduction

- Founded 1892
  - Construction began on current site 1960
  - 100 Degree Programs across 5 Schools
  - Approximately 6000 students
  - Over 100 Buildings
  - 4 LEED Buildings
  - Annual Cost of Energy Approximately \$6M
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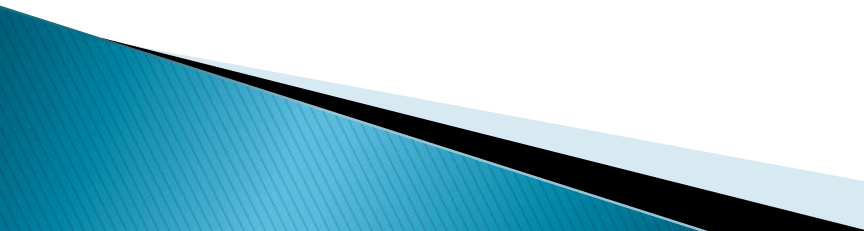
# Beyond LEED Design and Construction

## Objectives:

- Why LEED at Ithaca College
  - Ithaca College's LEED Buildings, their Features, Benefits and Challenges
  - Ithaca College's LEED Experience [Video]
  - Energy Model vs. Actual Usage
  - Behavioral Change Programs
  - Options Beyond LEED
  - Challenges to Upgrading Existing Buildings
  - Learning Objectives Conclusions and Recommendations
- 

# Beyond LEED Design and Construction

## Why LEED at Ithaca College

- American College and University President's Climate Commitment [2007]
  - Ithaca College's Climate Action Plan [2009]
  - Applicable to new construction, existing buildings, core and shell, interiors, and residential housing
  - Significant energy usage reductions
  - Options for cleaner energy solutions
  - Employer of choice, employee comfort, productivity
  - Integration of sustainability commitments with students, faculty, staff, campus visitors, and community
- 

# Beyond LEED Design and Construction

## Ithaca College's LEED Buildings

Dorothy D. and Roy H. Park  
Center for Business and  
Sustainable Enterprise [2008]  
LEED Platinum Certified

The Link Classrooms [2010]  
LEED Gold Certified

The Peggy Ryan Williams  
Center [2009]  
LEED Platinum Certified

The Athletics and  
Events Center [2011]  
LEED Registered [Silver]

# Beyond LEED Design and Construction

## ► Features

- LEED Platinum
- 38,800 sq'
- Vegetated rooftop gardens
- Daylight/occupancy sensors
- Building Automated Controls
- Rainwater capture/reuse
- 90% views
- Displacement ventilation
- Hydronic perimeter heating
- Low-flow water fixtures
- Shared central services
- EV charging station
- Exterior light shelves

Dorothy D. and Roy H. Park School of  
Business and Sustainable Enterprise



# Beyond LEED Design and Construction

## ▶ Benefits

- 66% light colored or shaded
- 25% reduction in storm water runoff
- 87% local construction materials
- 100% green cleaning
- 33% reduced energy usage
- 40+% water reduction
- Public transportation, bike racks, showers
- Views, natural lighting, air quality



Dorothy D. and Roy H. Park School of  
Business and Sustainable Enterprise

# Beyond LEED Design and Construction



## ► Challenges

- Glare/radiated heat to other buildings
- Thermal comfort
- Building automation- thermal set points
- Complexity of lighting
- Maintenance to rooftop gardens
- Aggregate metering
- Acoustics of open atrium
- Furniture placement in offices
- Location of EV charging station
- Occupant behaviors

Dorothy D. and Roy H. Park School of  
Business and Sustainable Enterprise

# Beyond LEED Design and Construction

## ► Features

- LEED Platinum
- 58,000 sq'
- 100% Electric
- Geothermal heating
- Vegetated rooftop
- Daylight/occupancy sensors
- Building Automated Controls
- Rainwater capture/reuse
- Porous Pavement
- Natural convection ventilation
- Low flow water fixtures
- Traction elevator
- Interior/exterior light shelves



The Peggy Ryan Williams Center

# Beyond LEED Design and Construction



## ▶ Benefits

- 6,000 sq' vegetated rooftop
- Thermal control/2 offices
- 90% recycled steel
- Over 85% water reduction
- 90% of all workspaces have views/natural lighting
- CO2 sensors ensure high air quality
- 37% Energy reduction\*
- System sub-metering
- Building orientation
- Over 50% of woodwork is FSC certified

The Peggy Ryan Williams Center

# Beyond LEED Design and Construction

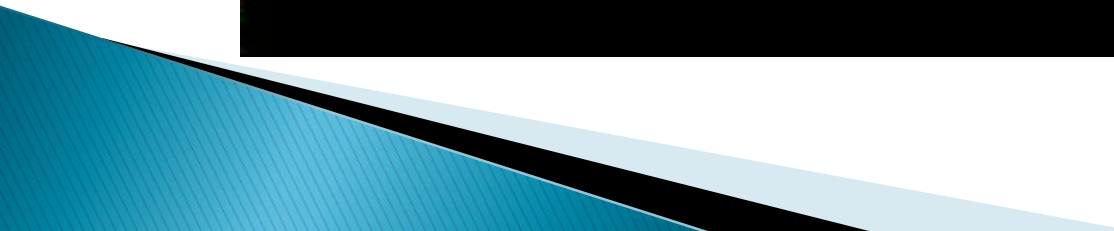
## ► Challenges

- Heat gain/heat loss
- 100% air movement
- Humidity control
- Integrated Project Design
- Regulating water pressure
- Dual-flush toilets
- Slow-grow grass
- Maintaining rooftop gardens
- Occupancy & visitor education/behaviors
- Commissioning
- Maintenance skills/data analysis



The Peggy Ryan Williams Center

# Beyond LEED Design and Construction



# Beyond LEED Design and Construction

## Model vs. Actual

- Peggy Ryan Williams Center energy model data vs. current energy usage
- System breakdown – Lighting, Plug Load, Mechanical Systems
- Campus building comparisons



Energy Model vs. Actual Usage

The Peggy Ryan Williams Center

# Beyond LEED Design and Construction

Jan	81,803 kWh	353kW	56,123kWh/142kW	56,723kWh/150kW
Feb	72,229 kWh	372kW	50,720kWh/126kW	46,158kWh/124kW
Mar	69,369kWh	326kW	48,841kWh	116kW
Apr	54,068kWh	299kW	43,199kWh	94kW
May	46,728kWh	202kW	31,911kWh	100kW
Jun	44,116kWh	143kW	31,596kWh	120kW
Jul	43,160kWh	143kW	41,525kWh	128kW
Aug	46,290kWh	140kW	42,314kWh	132kW
Sep	42,903kWh	220kW	38,318kWh	128kW
Oct	49,843kWh	273kW	39,093kWh	116kW
Nov	58,367kWh	306kW	42,577kWh	138kW
Dec	74,691kWh	377kW	55,238kWh	148kW

PRWC – Energy Model

2010 - 2011  
PRWC – Actual Usage

# Beyond LEED Design and Construction

## Model vs. Actual – Why Such a Difference?

- Assumption used to create the model
- ▶ Buffer
- ▶ Experience Level of Engineering Firm

## What Does the Data Tell Us?

- Significantly/consistently less usage than the model
- This building is a winter peaking building [compared to others that are summer peaking]
- There was a higher level of usage in January 2011 than 2010 [Why?]
- We want to ask more questions about the model

## What Other Questions Arise From the Data?

- What systems impact energy usage most?
  - When is the energy usage highest during specific periods [hour, day, month, season]
- 

# Beyond LEED Design and Construction

Sub System	kWh	%
Computer	7,508	13
Convenience	5,097	9
Emergency	74	.001
Lighting	4,596	8
Mechanical	273	.004
Geothermal	40,053	70

February 2011 Data



Peggy Ryan Williams Center  
Sub-metered Systems

PRWC  
Computer Outlet

# Beyond LEED Design and Construction

## Building Usage Comparison Chart

January 2010 – December 2010

\* Missing Data, numbers are higher than stated

Building	Yr Built	Sq Ft	kWh On	kWh Off	Total kWh	%	kWh/S q Ft	Peak kW	2	3	4	5
PRWC	2009	50,000	349,940	165,655	515,595	68/32	10.31	148 12/6	148 12/13	146 12/12	142 12/20	142 1/05
Park SOB	2007	34,007	197,808	143,807	341,615	58/42	6.83	85.5 4/08	84.2 4/06	80.6 4/16	79.9 8/31	79.1 9/24
Gannett Center	1965	86,529	672,675	521,021	1,193,696	56/44	13.80	201.2 4/01	200.8 3/09	200 3/11	198.4 10/06	197.6 4/2
Hill Center	1963	92,158	511,953	293,550	805,502	64/36	8.74	165.6 5/20	162 9/01	156 9/03	155.2 5/18	152 9/02
Dillingham Center*	1968	78,748	289,343	217,546	506,889	57/43	6.44	202 2/16	170 2/23	168 2/19	162 2/21	156 2/17
CHS*	1999	92,000	405,592	287,794	693,386	58/42	7.54	262 5/03	252 7/09	251 5/05	247 5/04	246 4/16
CNS	1991	125,000	1,233,859	1,107,832	2,341,691	53/47	18.73	560 8/03	558 8/05	554 8/30	550 4/08	548 7/08
Park Com	1988	81,762	836,014	789,155	1,625,159	51/49	19.88	404 8/05	378 9/21	364 9/14	364 9/23	364 9/27
Phillips Hall	1960	90,983	1,666,766	1,092,104	2,758,870	60/40	30.32	650 8/31	641 9/01	639 9/02	637 9/03	610 9/24
Whalon Center	62/99	141,753	1,007,571	780,454	1,788,025	56/44	12.61	566 8/02	543 8/05	498 9/14	488 9/02	487 8/30
Williams Hall*	1963	71,057	311,157	210,350	521,507	60/40	7.34	276 5/05	271 5/04	259 4/07	253 4/08	244 4/16
Smiddy Hall	1982	35,628	276,309	165,440	442,119	64/36	12.41	162.8 9/01	168.2 9/02	151.2 8/30	150.8 9/03	150.4 8/31

# Beyond LEED Design and Construction

## Behavioral Change

- ▶ Using data to reduce energy usage
- ▶ Behavioral Changes
  - Low involvement enhances power
  - Motivation drives change, social marketing influences it
  - Laws, policies and procedures go only so far



PRWC  
Behavioral Changes

PRWC  
Space Heater

# Beyond LEED Design and Construction

## Individual Office Audits

- ▶ Audited LEED Platinum Buildings
- ▶ >50% CPU's ON
- ▶ >90% Monitors ON
- ▶ >80% Associated Equipment
- ▶ Almost 100% of all copiers/network printers ON
- ▶ 30% of all offices had space heaters
- ▶ On average 14 pieces of equipment plugged in per office
- ▶ Space heaters, fish tanks, fans, desktop water fountains, neon signs
- ▶ Left letter asking occupants support



Behavioral Change

Targeting Faculty and Staff Behavior

# Beyond LEED Design and Construction

## Reasons Given for Leaving Them On

- Old myths
- Told to leave them on
- Don't remember to turn them off
- Not paying for the bill
- Left early
- Thought the outlet strip automatically turned off
- Didn't realize how much energy they use
- Thought sleep mode was enough

Behavioral Change



Targeting Student Behavior

# Beyond LEED Design and Construction

## Behavioral Change Action Plan

- Create short term/immediate goals
- Relate benefits to personal behaviors
- Motivate and reward
- Management ownership
- Green teams [Support Teams]
- Formal and informal research
- Target actions that have the highest probability of success
- Budget for change
- Tailor actions to target stakeholder groups
- Be persistent
- Involve as many as possible
- Get personal commitment to change
- Make it fun and interactive

# Beyond LEED Design and Construction

- ▶ Dashboards
- ▶ Websites
- ▶ Blog/Twitter
- ▶ Intercom
- ▶ Student projects
- ▶ White papers
- ▶ Print/Radio/TV Ads
- ▶ Developed curriculum
- ▶ Research
- ▶ Green/Sustainability teams
- ▶ Energy breaks
- ▶ Personal Networking



Data Sharing


The Peggy Ryan Williams Center

# Cleaner Energy; Greener Campus Through LEED

- ▶ Beyond LEED, options for cleaner energy and a greener campus in existing buildings
  - ▶ Re-commissioning/equipment upgrades
  - ▶ Centralized/satellite heating plant study
  - ▶ Heating/cooling recovery
  - ▶ Water treatment
  - ▶ Dining services Energy Star Program
  - ▶ Behavioral change studies
  - ▶ Solar domestic hot water
  - ▶ Solar PV
  - ▶ Small wind turbines
  - ▶ Fuel cells
  - ▶ Reduced travel, public transportation, car share programs
  - ▶ Accessible EV charging stations

# Beyond LEED Design and Construction

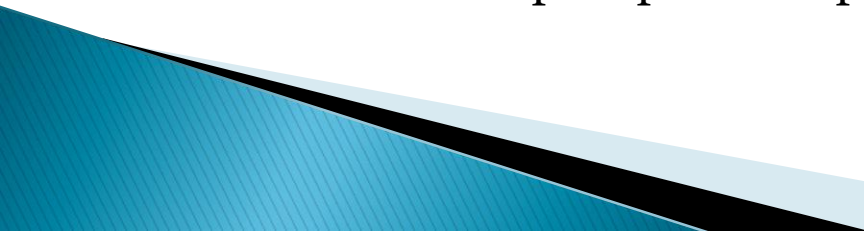
## Challenges to Upgrading Existing Buildings

- Cost/Capital allocations
  - Focus on O&M upgrades, not just capital improvements
  - Competing vendors
  - Multiple solutions
  - Space
  - Infrastructure
  - Equipment location within buildings
  - Time
  - Building codes and regulations
  - Remediation
  - Prioritizing benefit/payback
  - Relatively few LEED O&M professionals
  - Oversized systems
  - Investment Recovery
- 

# Beyond LEED Design and Construction

Learning Objectives - Conclusions and Recommendations

## **Considerations for Architects and Engineers**

- ▶ Ensure Integrated Project Team really happens
  - ▶ Create strict performance contracts for architects, engineers, construction company
  - ▶ Perform commissioning as systems come on-line
  - ▶ Schedule follow-up commissioning as building is occupied
  - ▶ Engage the campus community
  - ▶ Create a PR plan for students, faculty, staff and the public as part of construction schedule
  - ▶ Sub-meter systems
  - ▶ Ensure energy models are as accurate as possible
  - ▶ Create an O&M plan post occupancy
- 

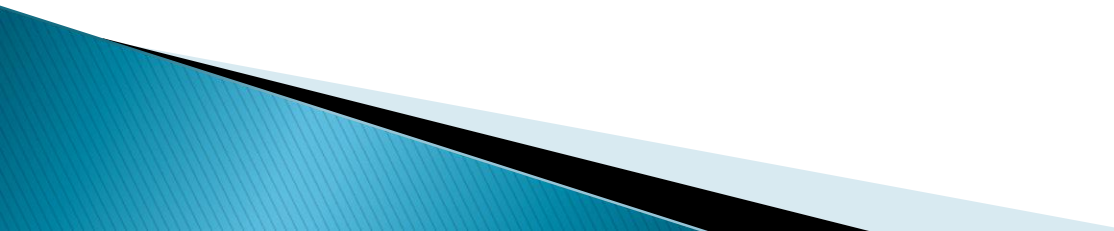
# Beyond LEED Design and Construction

## Facilities Services Skills for LEED

- ▶ Qualified in-house engineer /planner working with general contractor
- ▶ Train facilities staff – custodial, maintenance, grounds, transportation, project managers, energy manager, administrators
- ▶ Have a plan to address the initial occupancy work orders
- ▶ Educate occupants before frustration levels become detrimental
- ▶ Create instruction guides for occupants if necessary
- ▶ Label switches/special equipment in occupied spaces
- ▶ Dedicate the time to analyze data
- ▶ Consider training a LEED AP O&M
- ▶ Create a Strategic Operations Plan that includes O&M plan per building

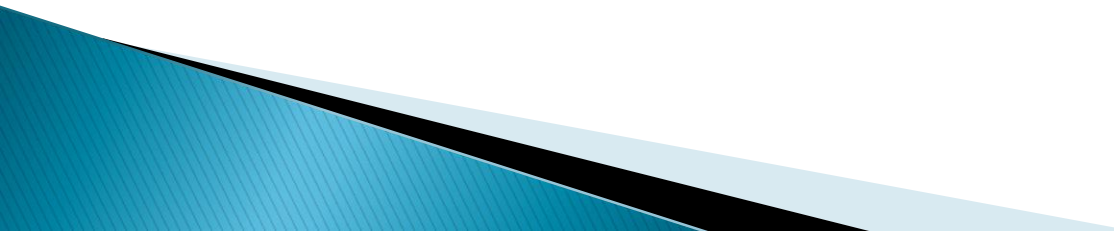
# Beyond LEED Design and Construction

## Energy Models vs. Actual Energy Usage

- ▶ Utilize additional resources to verify energy models
  - ▶ Require building system breakdowns in the energy model
  - ▶ Sub-meter where possible
  - ▶ Track data consistently
  - ▶ Provide feedback to architects/engineers/USGBC
  - ▶ Create meaningful reports
  - ▶ Benchmark
- 

# Beyond LEED Design and Construction

## How to Impact Occupants Behaviors to Affect Change

- ▶ Survey/audit occupants
  - ▶ Use feedback to improve future design/engineering/operations
  - ▶ Communicate data
  - ▶ Educate, motivate, influence, mandate
  - ▶ Ensure policies and procedures are appropriate for LEED buildings
  - ▶ Make big and small steps to conserve energy
- 

# Beyond LEED Design and Construction

Special Thanks to the 9<sup>th</sup>  
Annual New York State  
Green Building  
Conference

▶ Questions??

Thank you for your time!

This concludes The American Institute of  
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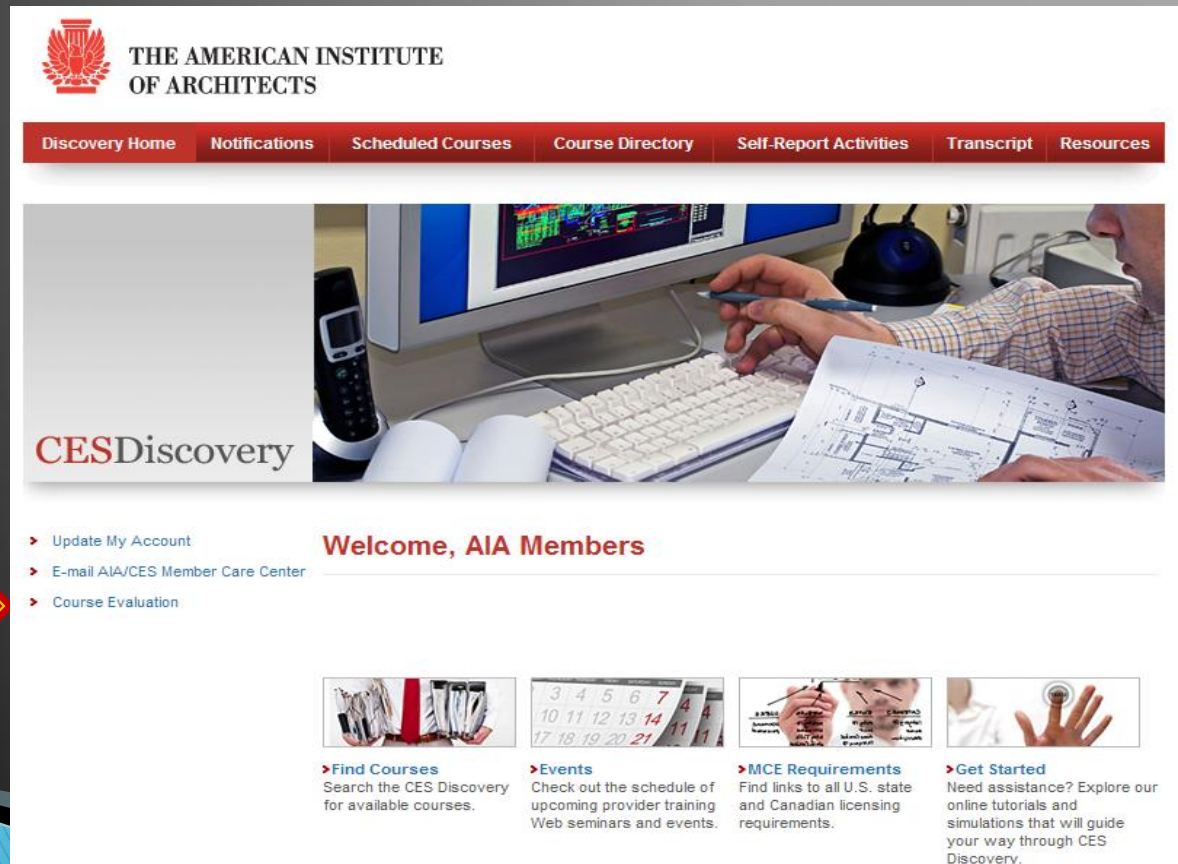
9<sup>th</sup> Annual New York State  
Green Building Conference



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