Project Management and becoming a Carbon Neutral Campus

Project Management Professional Development

2019 Nov 14

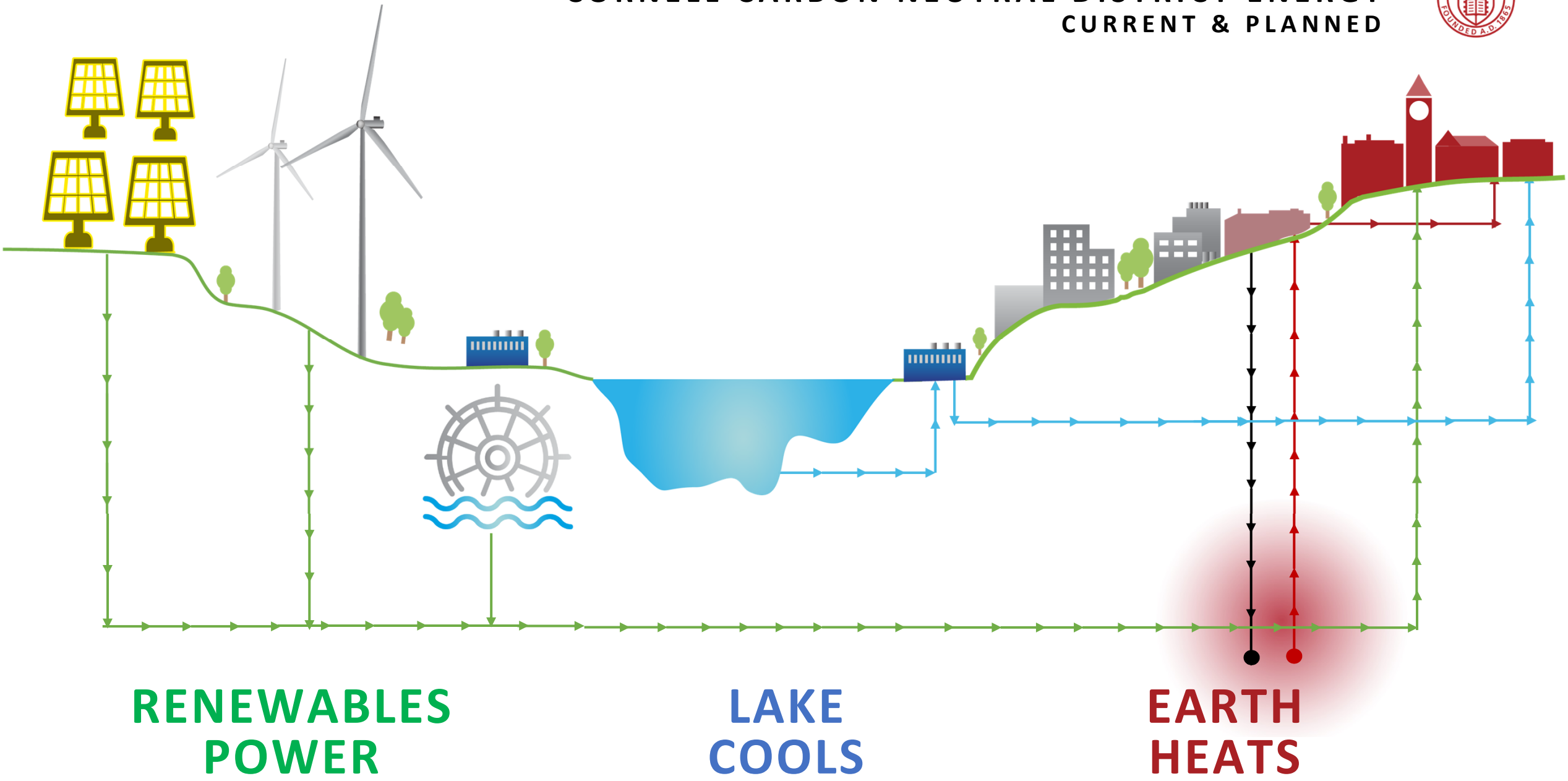
Quadruple Bottom Line

The sustainability framework at Cornell helps teams consider four questions for a project, solution, or change:

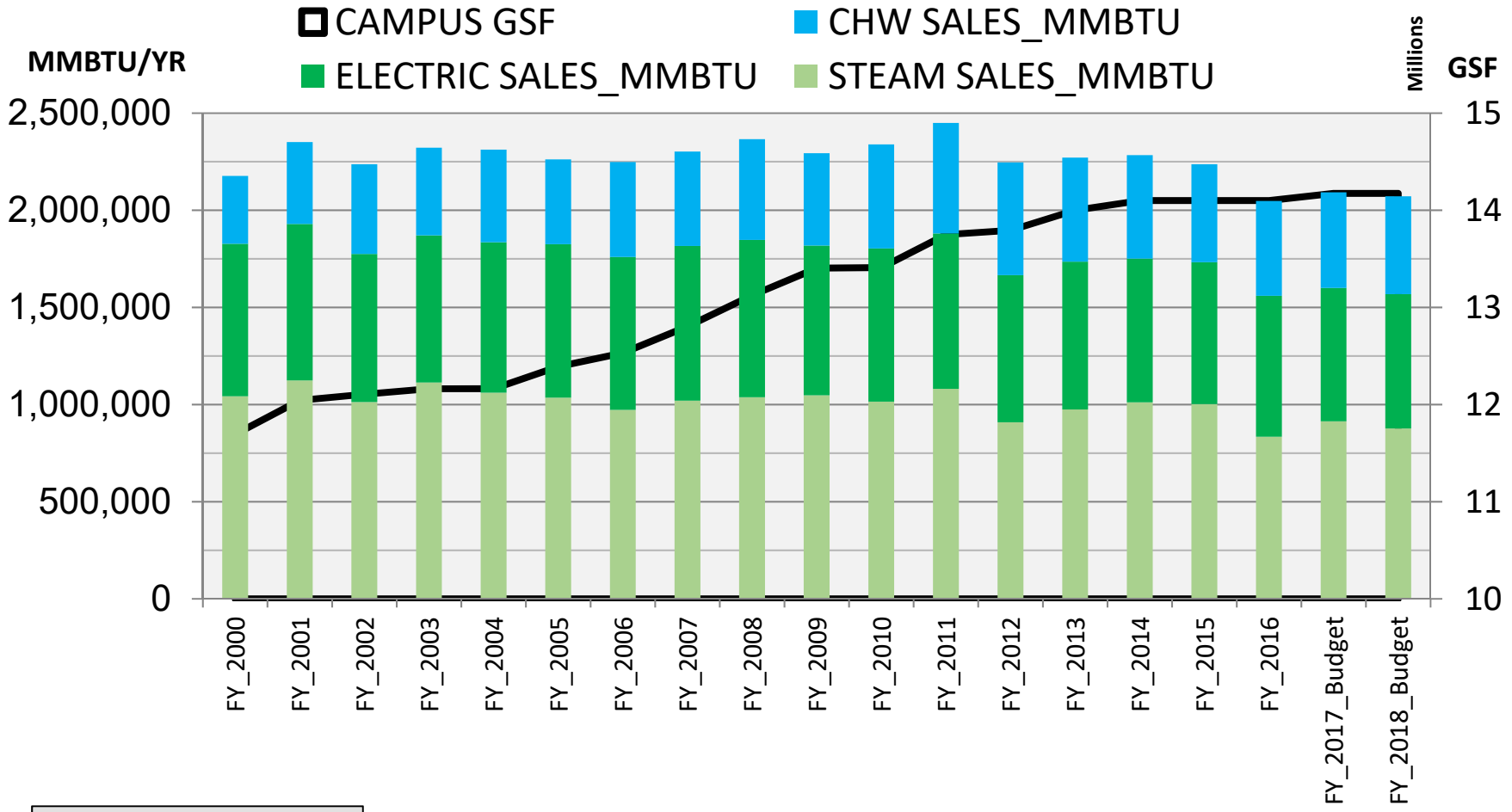
1. Does the solution meet the needs of **People** on campus, in the community and in the world?
2. Will the solution enhance overall **Prosperity** for the campus and our region?
3. Does the solution support a sustainable **Planet**?
4. Does the solution help Cornell fulfill its academic mission and **Purpose**?

CORNELL CARBON NEUTRAL DISTRICT ENERGY

CURRENT & PLANNED



Building Energy Sales: History 2000 - 2018



~186 kBtu/Sf-Yr

~146 kBtu/Sf-Yr

NYS Climate Leadership and Community Protection Act

New law enacted in 2019 with the target of reducing statewide greenhouse gas emissions below 1990 levels by 40% in 2030 and 85% in 2050.

- 2025 mandate – minimum of 6 GW or distributed solar (1.5 GW currently online)
- 2030 mandate – minimum of 3 GW energy storage (0.039 currently online)
- 2030 goal: 70% renewable electric energy
- 2035 mandate – minimum of 9 GW of offshore wind capacity (currently zero online)
- 2040 goal: 100% carbon free electricity (may include nuclear)
- 2050 goal: all sectors reduce statewide greenhouse gasses by 85%
- Building energy efficiency measures still under consideration, but may resemble NYC Local Law 97 of 2019 that sets limits on the amount of greenhouse gas emissions/SF for different types of buildings.

New York City

- Local Law 84 (2009)
  - Private buildings >25,000 sf and public buildings >10,000 sf must report their energy and water consumption each year for public disclosure.
- Local Law 85 (2009)
  - All renovations regardless of size must meet most current energy code.
- Executive Order 26 (2017)
  - NYC will commit to the principles of the Paris Climate Agreement.
- Local Law 92 and 94 (2019)
  - All new buildings and those undergoing major roof renovations must cover the roof surface with either solar panels or green roofs.
- Local Law 96 (2019)
  - Each building gets an energy efficiency score and label that will be displayed near a public entrance.
- Local Law 97 (2019)
  - All buildings larger than 25,000 sf must meet ambitious carbon reduction targets.

State Agency Requirements

- Executive Order 88 (2012)
  - Mandates a 20% reduction in energy cost for the collective portfolio of state owned and managed buildings, measured from 2011 baseline by 2020.
- SUCF Directive 1B-2 (2018) Defines and identifies goals for Net Zero Carbon (NZC) new buildings and Deep Energy Retrofits of existing buildings.
  - It is recognized that project s may not be able to obtain non-carbon energy sources, but it must be NZC “capable”.
  - Provides EUI limits by building type (which correlate to CU).
  - For Deep Energy Retrofits – reduce annual site energy consumption by 50% and carbon consumption by 25%.
  - Partial retrofits – include all energy efficiency measures with a simple payback of 10 years or less.
- SUCF Directive 1B-7 (Oct 2019), buildings >20,000 sf, new and major rehab
  - Design and construct project to LEED silver minimum
  - Provide energy model
  - Be fully commissioned (Directive 15H-9)
  - Implement IAQ Management and Construction waste diversion of a minimum of 50%.

Ithaca Green Building Code in draft

- CU provided extensive comments during the
- Currently, the City/Town are reviewing comments and revising code language. Anticipated completion by year end with 6-month implementation period
- **New construction** & **major renovations** (75% building gross area)
- **40% – 50% Reduction** in Greenhouse Gas (GHG) below code
- Policy becomes **increasingly stringent in 5-year iterations** (2025, and 2030)
- Poor “fit” for Cornell, does not “recognize” **district energy systems**
- Encourages “**electrification**”

Cornell Green Building Policy - LEED/30

- All projects exceeding $5M in total project cost are required to attain at a minimum LEED Silver Certification
- All projects must achieve a minimum 30% energy savings compared to an ASHRAE baseline building
- All projects must evaluate efficiency measures and strive to reduce energy usage by 50%
- All Projects must meet a project specific energy usage intensity target (kBtu/sf/yr)

Question:
How Many LEED Certified Buildings/Spaces exist at the Cornell Ithaca Campus?
Can you name any?

Alice Cook House - Certified

Teaching Dairy Barn - Certified

CVM Community Practice - Silver

Weill Hall - Gold

Cornell Combined Heat and Power Plant Offices - Gold

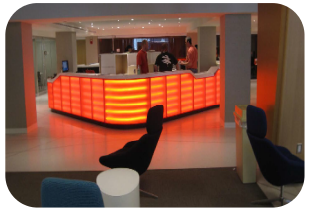
Riley Robb Biofuels Lab - Gold

Physical Sciences - Gold

MVR Phase I - Gold (CI)

NYS Vet Diagnostic Lab - Gold

Nevin Welcome Center - Gold



Marriott Learning Center - Gold (CI)

Fernow Hall - Gold

Milstein Hall - Gold

MVR Phase II - Gold (CI)

Gates Hall - Gold

Kimball Hall – Gold (CI)

Stocking Hall - Gold

CVM Center - Gold

Cornell Health - Gold

Hughes Hall - Gold

Human Ecology Building - Platinum

25 Cornell Ithaca Projects LEED certified since 2005

Warren Hall - Platinum

Law School Addition - Platinum

Klarman Hall - Platinum

Upson Hall – Platinum

Cornell Design and Construction Standards

- 30% below applicable ASHRAE baseline - Strive for 50%
  - 018110 GREEN BUILDING GUIDELINES – 1.04 C
    - Integrated renewable energy systems count towards achievement.
    - Projects where this standard is deemed impractical may be excused with written approval of senior administration.
- Energy Use Intensity (EUI) targets
  - 018110 GREEN BUILDING GUIDELINES – 1.04 D
    - At each design submission, consultant will provide updated energy model.
- Hydronic System Temperature: 130F supply and 100F return
  - 230520 page 4 Heat Generation
- LEED – Minimum Silver Certification
  - 018110 GREEN BUILDING GUIDELINES – 1.01 D
    - Applies to all projects >$5M total project value.
    - Each project shall conduct at least one LEED charrette (2.01 B)
    - Contract document requirements 2.02 and Post Design submittal (2.04 A, B)
    - Projects where this standard is deemed impractical may be excused with written approval of senior administration.

Cornell Design and Construction Standards
Energy Modeling

- A moving target depending on codes and agency requirements
- Summary table of CU requirements by phase (see Liz Kolacki)
- Summary table of applicable codes/ASHRAE models (see Liz Kolacki)

018130 ENERGY MODELING GUIDELINES

- Submit Modeling Plan – Identify inputs, software, options 2.02 A
- Submission requirements and analysis by phase 2.03 - 2.06

Cornell Design and Construction Standards Commission all Projects for Energy

- ECCO (energy conservation controls organization) will assist with no charge to project
- All projects pursuing LEED will need to Commission at a minimum building mechanical, electrical, plumbing and renewable energy systems. Engage prior to Design Development.
- Additional LEED credits are available for building envelope commissioning and monitoring based commissioning.
- NYS Energy Conservation Construction Code: Sec. C408 requires commissioning on mechanical systems, water heating, cooling, electrical power systems, and lighting systems meeting certain thresholds.
- ASHRAE 90.1 Section 6.7.2.4 requires HVAC systems serving >50,000 sf to be commissioned per ASHRAE Guideline 1.1

018000 STANDARD PRACTICE & GUIDE FOR BUILDING ENVELOPE COMISSIONING

- Provides direct reference to ASTM E 2813, E2947

Summary of applicable codes/ASHRAE baselines – Prepared by Liz Kolacki

	Current CODE	Cornell LEED 30	LEED v4 Current	LEED v4.1 Beta Testing now,	Ithaca Energy Code DRAFT	NYS Directive 1B-2 SUCF Projects	NYStretch Energy Code-2020 v1.0	Executive Order 88 (Revokes EO 111)
Requirement	Meet Prescriptive Requirements or Total Building Performance	Demonstrate Energy Consumption reduction below Current Code Baseline without incorporation of Central Plant Efficiencies	Demonstrate Energy Cost reduction below Baseline with incorporation of Central Plant Efficiencies	Minimum is to meet the requirements of ASHRAE 90.1	Comply with Commercial "EASY PATH" or "Whole Building Path" => 17 Optimize Energy Performance Points based on LEED v4	New Building => Net Zero Carbon (NZC) Existing Buildings => Deep Energy Retrofit (DER)	Buildings to comply with at least one of the following: 1-More efficient HVAC equipment 2-Reduced LPD 3-Enhanded digital lighting controls 4-DOAS with ERV 5-Enhanced Envelope performance 6-Reduced air infiltration	Reduce the average EUI in State-Owned and managed buildings.
Minimum	Meet Code	30%	New Construction => 5% Major Renovations => 3% Core and Shell => 2%	Meet Code (recognizes that each Code revision results in improved energy efficiency)	New Construction => 46% Major Renovations => 44% Core and Shell => 43%	NZC: Net zero capable using electrically powered, non-carbon renewable energy sources. EUI Performance Goals kbtu/sf/yr Classroom Bldg: 50 Office Bldg: 50 Lab Bldg: 150 Residence Hall: 32 DER: 50% reduction in the buildings CURRENT annual site energy consumption and 25% reduction of the building's CURRENT annual site carbon consumption estimated using existing metered building data	Replaces some requirements of ASHRAE and the IECC with new Tables and requirements (too many to summarize).	20%
Baseline	ECCC of NYS v. 2017 or ASHRAE 90.1-2013	ECCC of NYS v. 2017 or ASHRAE 90.1-2013	ASHRAE 90.1-2010	ASHRAE 90.1-2016	ASHRAE 90.1-2010	NZC: None DER: Existing Metered Building Data	IECCC of NYS v. 2018 and ASHRAE 90.1-2016	Years 2010/2011 EUI
Compliance Procedure	ECCC: Meet Prescriptive Requirements or ECCC Section C407: Total Building Performance Proposed Building Annual Energy Cost ≤ Annual Cost of Standard Reference Design or 90.1: Meet Prescriptive Requirements or 90.1 Section 11: Energy Cost Budget Method: Design Energy Cost < Energy Cost Budget	ECCC Section C407: Total Building Performance Proposed Building Annual Energy Cost ≤ Annual Cost of Standard Reference Design or 90.1 Section 11: Energy Cost Budget Method Design Energy Cost < Energy Cost Budget	90.1 Appendix G: Performance Rating Method Points for efficiency improvement are awarded based on a combination of reduction in energy cost alone.	90.1: Meet Prescriptive Requirements or 90.1 Section 11: Energy Cost Budget Method: Design Energy Cost < Energy Cost Budget or 90.1 Appendix G: Performance Rating Method Performance Cost Index ≤ Performance Cost Target Points for efficiency improvement are awarded based on a combination of reduction in energy cost AND greenhouse gas emissions	90.1 Appendix G: Performance Rating Method	Not prescribed	Meet Prescriptive Requirements of ECCC and 90.1 as amended by the Stretch Code or 90.1 Section 11: Energy Cost Budget Method Design Energy Cost < Energy Cost Budget or 90.1 Appendix G: Performance Rating Method Performance Cost Index ≤ Performance Cost Target	Not prescribed

A/E Agreement – Schedule G

	ITEM	PRE-SCHEMATIC DESIGN PHASE	SCHEMATIC DESIGN PHASE	DESIGN DEVELOPMENT PHASE	CONSTRUCTION DOCUMENTS PHASE
SUSTAINABLE DESIGN	**Sustainable Design**	Identify Sustainability Goals and Strategies Identify LEED target based on Cornell Standards Establish 30% below energy code/current NYS building code with 50% below energy code goal Preliminary LEED boundary Energy Modeling Plan Optimize Building Envelope	Energy Model report per Cornell Standards Cornell Option 1 Energy Model LEED Energy Model Establish EUI target, confirm 30% below energy code/current NYS building code with 50% below energy code goal Design Strategy LEED checklist	Continuation of Sustainable Design Updated Cornell Option 1 Energy Model Updated LEED Energy Model Establish EUI target, confirm 30% below energy code/current NYS building code with 50% below energy code goal Coordination of certification process with Cornell LEED professional Optimize MEP Systems Final LEED boundary	Full execution of Sustainable Design Updated Cornell Option 1 Energy Model Updated LEED Energy Model Final EUI target and confirmation of 30% below energy code/current NYS building code with 50% below energy code goal Final LEED Option 2 Energy Model Coordination of certification process with Cornell LEED professional

Expectations of PM and the Process Checklists

- Treat your energy budget just how you treat your cost budget. Reconcile the energy model prior to moving on to next phase
- High performing buildings do not need to cause higher first capital cost and will save operating cost for the lifetime
- Energy model should inform the project design with an integrated design approach
- Upcoming changes from code and meeting Carbon Neutral Campus will require high performing buildings
  - Energy Code will likely reference ASHRAE 2016 next year
  - Ithaca Green Building Code
- Seek guidance from FE and E&S to determine the energy goal at the very beginning of the project

Questions and Discussion