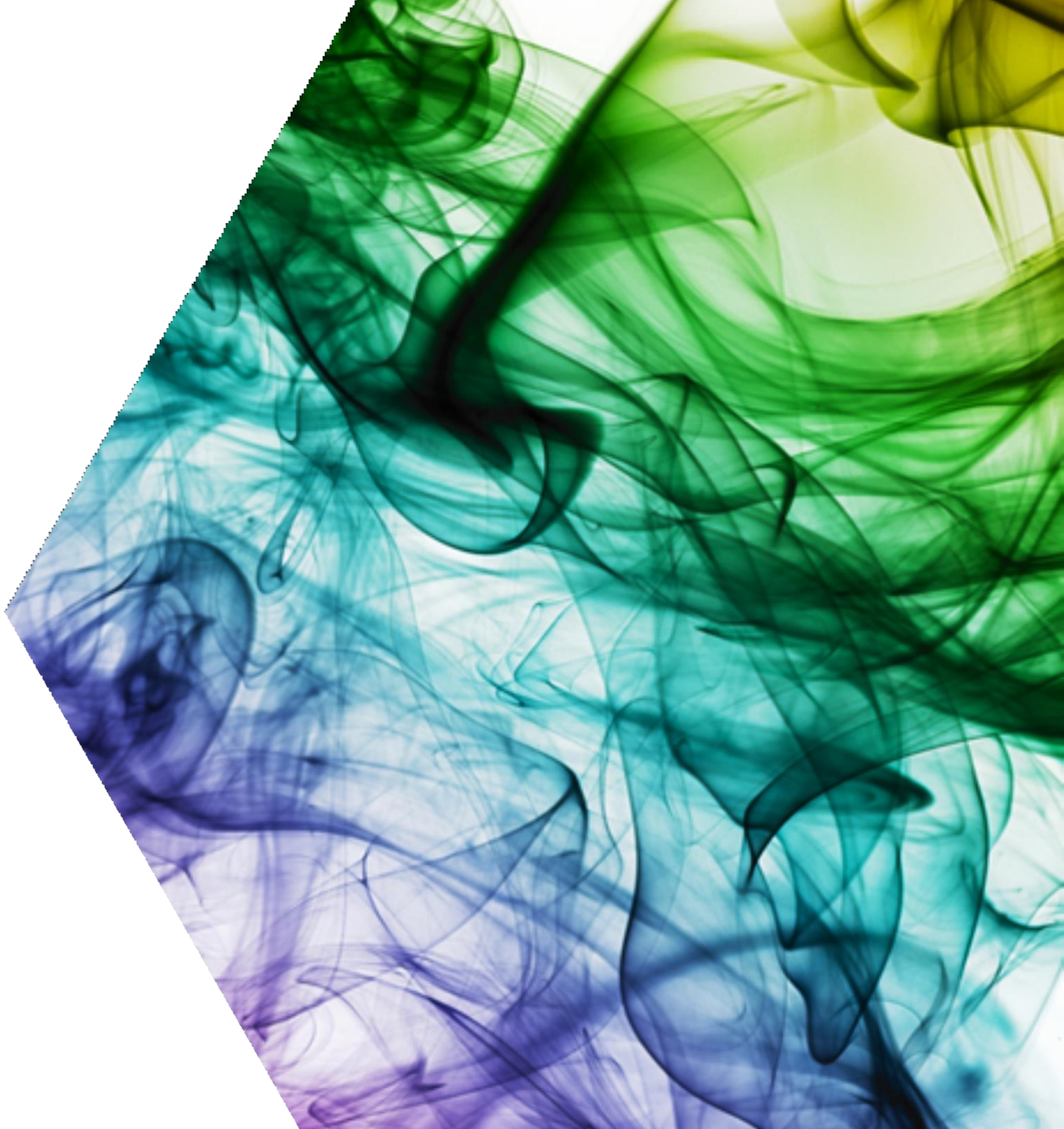
May 14,2020

Achieving High-Performance Buildings

VAEEC Spring 2020 Forum



Learning Objectives

1. What makes a building high-performance
2. Understand the various certification options for high-performance buildings
3. What are the pros and cons of each certification
4. Best practices for achieving EarthCraft and LEED certifications

VAEEC
VIRGINIA ENERGY EFFICIENCY COUNCIL

Session Speakers

Bryna Dunn

Director of Sustainability Planning & Design
Moseley Architects

Matt Waring

Technical Director
Viridiant

Elizabeth Beardsley (moderator)

Senior Policy Counsel, U.S. Green Building Council
VAEEC Board Member

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VAEEC Spring Forum
Achieving High Performance Buildings

March 14, 2020

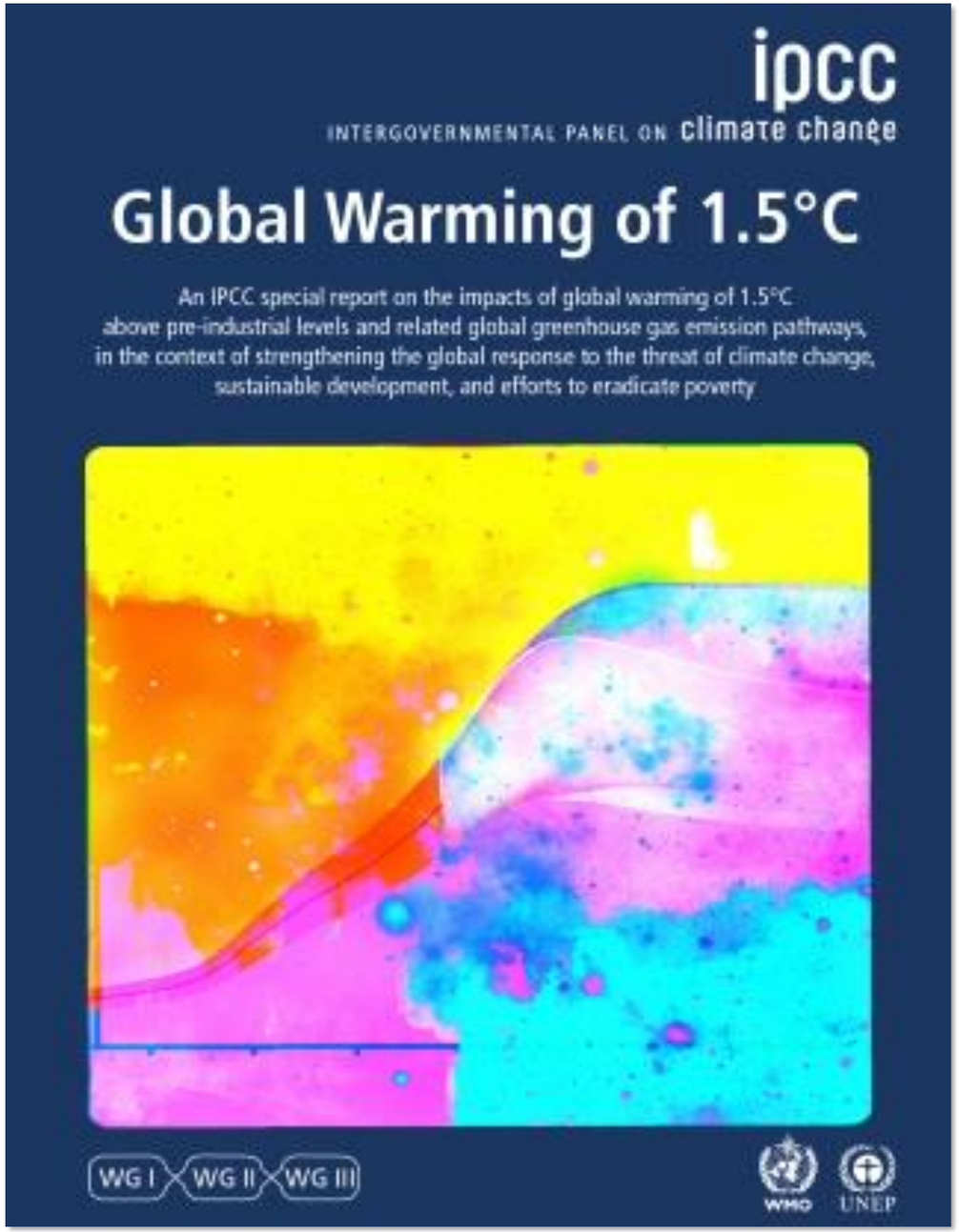
Elizabeth Beardsley Senior Policy Counsel

Why High-Performance Green Buildings?

- Save money
- Reduce waste
- Conserve resources
- Improve comfort
- Indoor environment
- Financial incentives
- Increase resilience
- Reduce climate impact
- Meet sustainability commitment
- Recognition
- Market competition

More than **80%**

of all employees say being productive on the job and having access to clean and quality indoor air contributes to overall workplace happiness.



- All building emissions to be reduced by 80–90% by 2050;
- new construction must be fossil-free and near-zero energy by 2020; and
- increase the rate of energy rehab of existing buildings to 5% per year in developed countries.

What is a High-Performance Green Building?

- Categories of impact and benefit
- Prerequisites + Optional credits / points
- Total points = level awarded
- Third party Certification
- Updates and evolution

LEED v4 SYSTEM GOALS

Reduce contribution to **global climate change**

Enhance individual **human health**

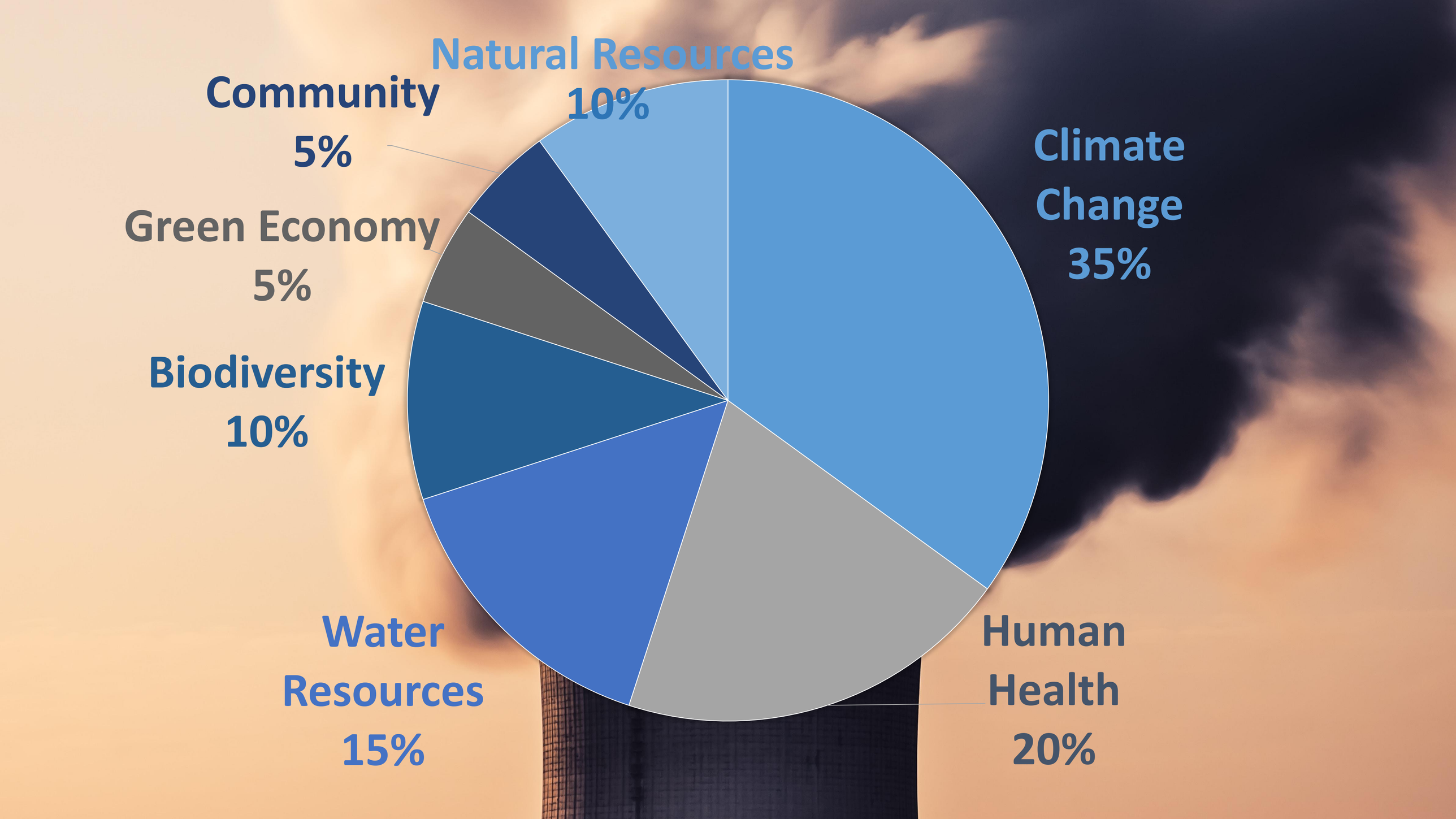
Protect and restore **water resources**

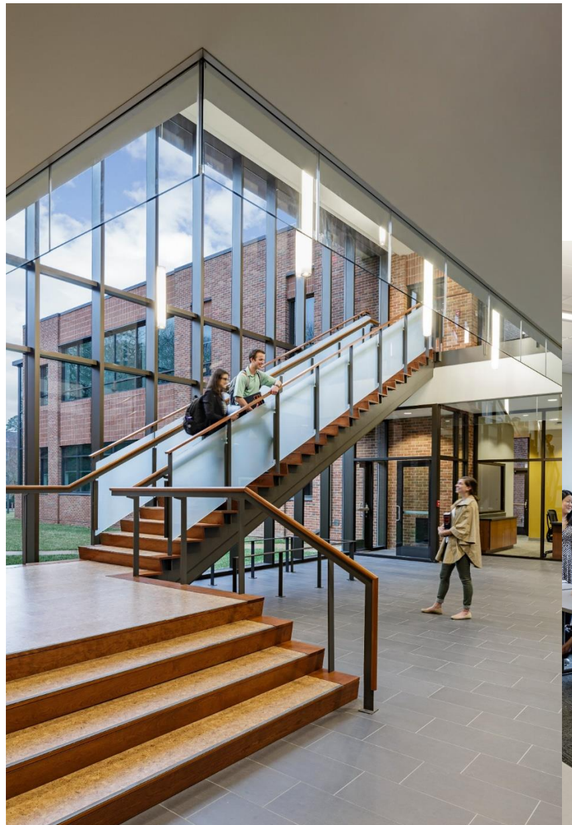
Protect and enhance **biodiversity and ecosystem services**

Promote **sustainable and regenerative** material cycles

Build a **green economy**

Enhance **community quality of life**


Natural Resources
10%
Community
5%
Green Economy
5%
Biodiversity
10%
Water
Resources
15%
Climate
Change
35%
Human
Health
20%



Recent Green Buildings in Virginia: Higher Ed

Virginia Landscape for High-Performance Green Buildings

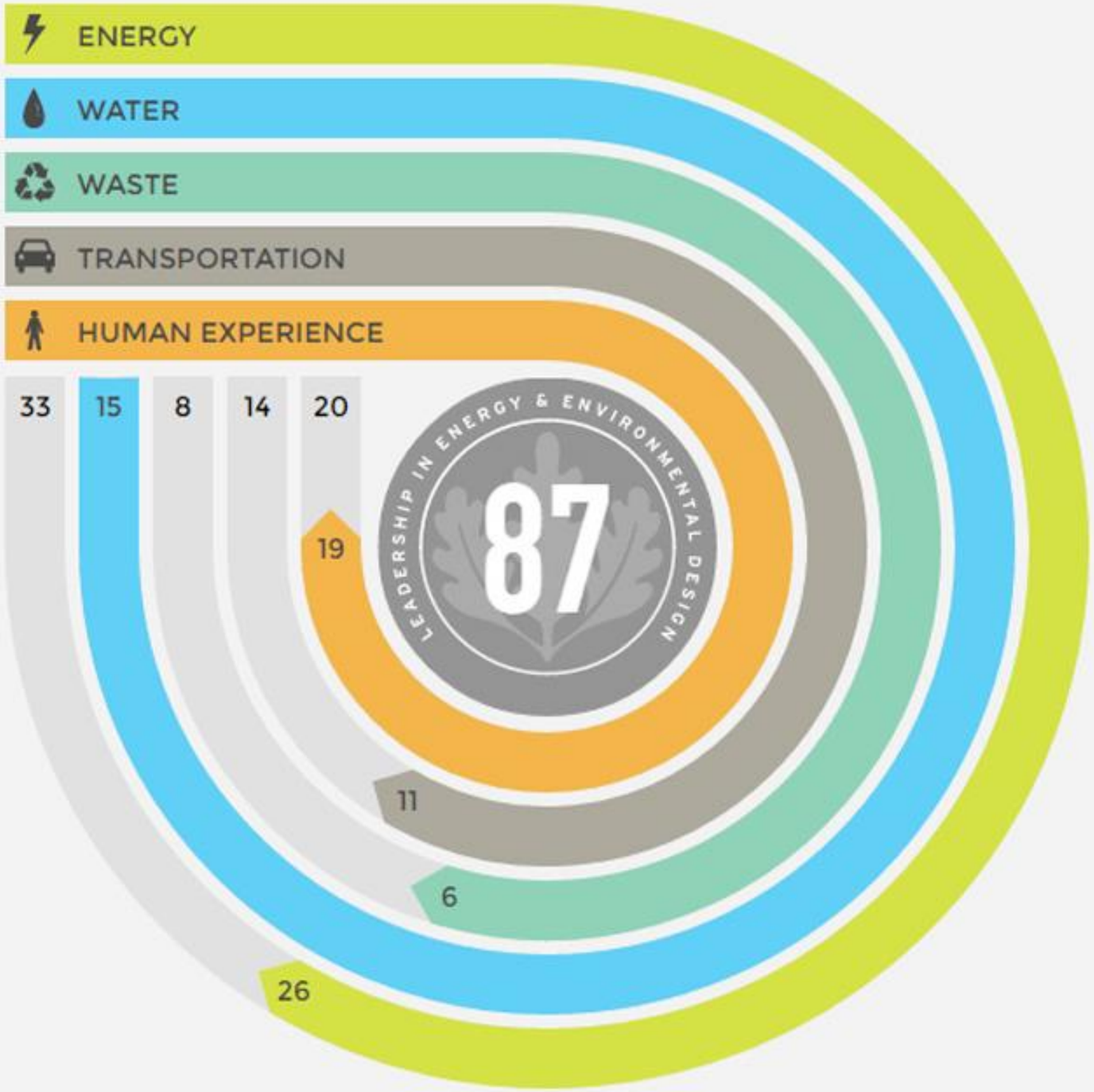
VA Clean Economy Act, Solar Freedom Act, will lead to:

- Additional energy efficiency power utility programs
- More opportunities for distributed and small-scale renewable energy

Virginia Landscape for High-Performance Green Buildings, cont.

- Residential energy audit disclosure
- SB 963 State energy & water benchmarking
- C-PACE
  - Statewide program (new law, DMME)
  - Resilience along with energy efficiency
- Local government incentives
- Public buildings policies – State, Local
- Higher Ed policies
- Low Income Housing Tax Credit green program

LEED® Zero


ENERGY
WATER
WASTE
TRANSPORTATION
HUMAN EXPERIENCE
33
15
8
14
20
19
11
6
26
LEADERSHIP IN ENERGY & ENVIRONMENTAL DESIGN
87

Project Performance

	Certified	Silver	Gold	Platinum
mTCO2e/occupant/year	**3.05**	**2.65**	**2.11**	**1.14**
Change in emissions per occupant	0%	-13%	-31%	-63%
mTCO2e/per commute/year	**3.89**	**2.99**	**2.58**	**1.64**
Change in commute emissions	0%	-23%	-34%	-58%
Median occupant satisfaction	**7.1**	**7.3**	**7.5**	**8.4**
Change occupant satisfaction	0%	+4%	+7%	+19%

High Performance Buildings:

EarthCraft Family of Programs

Virginia Energy Efficiency Council Spring Forum

viridiant

May 2020

INTRODUCTIONS

Matt Waring

Technical Director
Viridiant

- ***Former Superintendent***
- ***Certified Home Energy Rater, PHIUS+ Verifier***
- ***With Viridiant since 2011***

VIRIDIANT & EARTHCRAFT

viridiant

non-profit organization committed to supporting sustainable building processes through education, consultation, and certification

earthcraft

family of programs serving as a blueprint for energy and resource-efficient structures including single family, multifamily, renovation, light commercial, and communities

Families Served in 2018

SINGLE FAMILY

EarthCraft House	82 HOMES
EarthCraft House with ENERGY STAR®	11 HOMES
EarthCraft Renovation	1 HOME
ENERGY STAR®	3 HOMES
Certified HERS® only	10 HOMES

MULTIFAMILY

EarthCraft New Construction	1,277 UNITS
EarthCraft Renovation	1,175 UNITS
EarthCraft New Construction	18 PROJECTS
EarthCraft Renovation	18 PROJECTS

SINGLE FAMILY

107
TOTAL HOMES IN 2018

3,026
TOTAL HOMES THROUGH 12/31/18

MULTIFAMILY

2,452
TOTAL UNITS IN 2018

21,690
TOTAL UNITS THROUGH 12/31/18

36
TOTAL PROJECTS IN 2018

317
TOTAL PROJECTS THROUGH 12/31/18

2,559
FAMILIES SERVED IN 2018

24,716
FAMILIES SERVED THROUGH 12/31/18

EARTHCRAFT FAMILY OF PROGRAMS

Serving builders across the Southeast since 1999, in Virginia since 2006

EarthCraft Worksheet Categories

- Site Planning (SP)
- Construction Waste Management (CW)
- Resource Efficient Design (RE)
- Durability & Moisture Management (DU)
- Indoor Air Quality (IAQ)
- High Performance Building Envelope (BE)
- Energy Efficient Systems (ES)
- Water Efficiency (WE)
- Education & Operations (EO)
- Innovation (IN)

Typical Process

Pre-Review

- Online project registration
- Preliminary Spec Sheet
- Drawings
- Flat Review Fee

Pre-Construction

- Online Registration for Scheduling Design Review
- Submit ECMF workbook, plans, HVAC load calcs
- Design Review Meeting

Construction

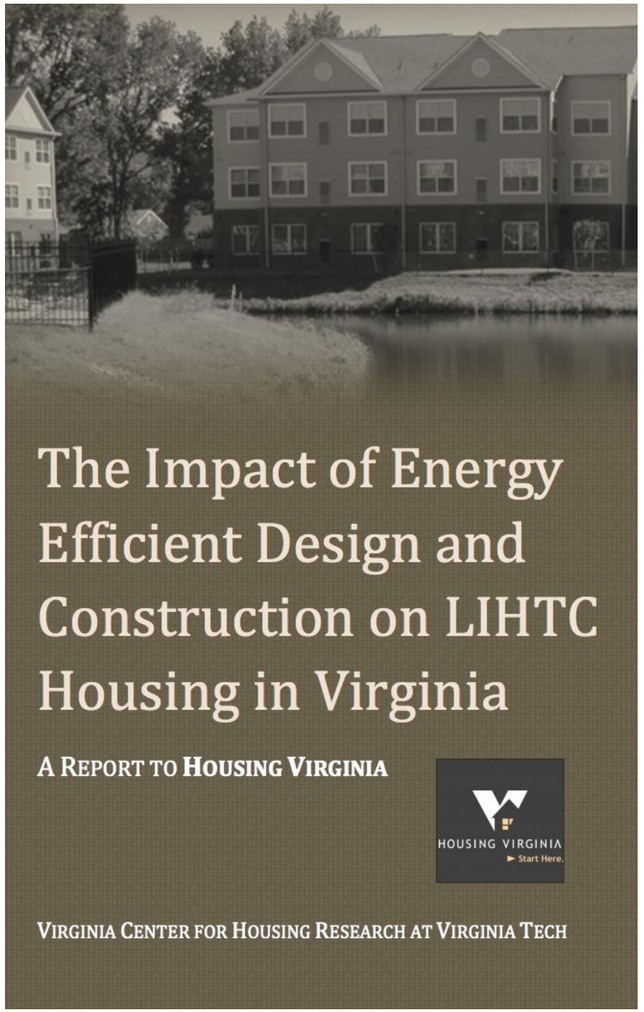
- Kick-Off Meeting with TA
- TA makes regular site visits to verify program items & test units
- Team coordinates documentation with TA

Project Closeout

- TA completes final diagnostic testing
- TA submits documentation package Viridiant
- PM & QAD review
- Certification

Pre-Review | Pre-Construction | Construction | Project Closeout

MF Housing Study - Executive Takeaways



1. VHDA's goal of promoting affordability via green building is working
2. EarthCraft average savings of $648/year
3. ECMF housing is generally more affordable, comfortable and residents are more satisfied
4. Value in 3rd party verification
5. Disconnect between resident education and owners

Read More: www.viridiant.org/aboutus/research-and-resources/vt-housing-study/

Best Practices for Project Success

VIRGINIA ENERGY EFFICIENCY COUNCIL SPRING FORUM

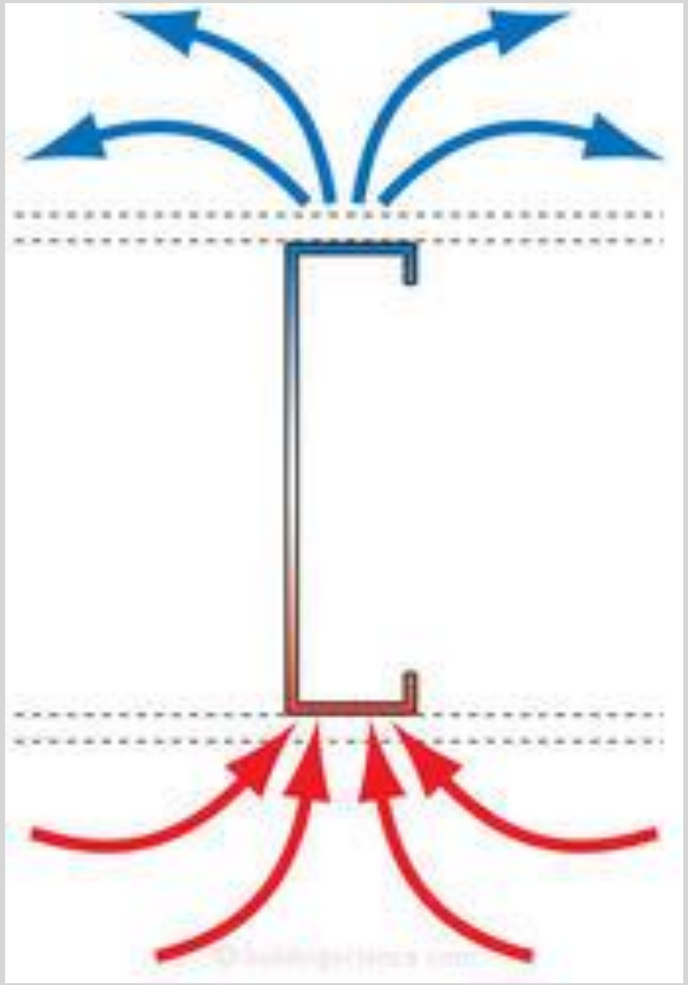
viridiant

MAY 2020

Best Practices for High Performance Buildings

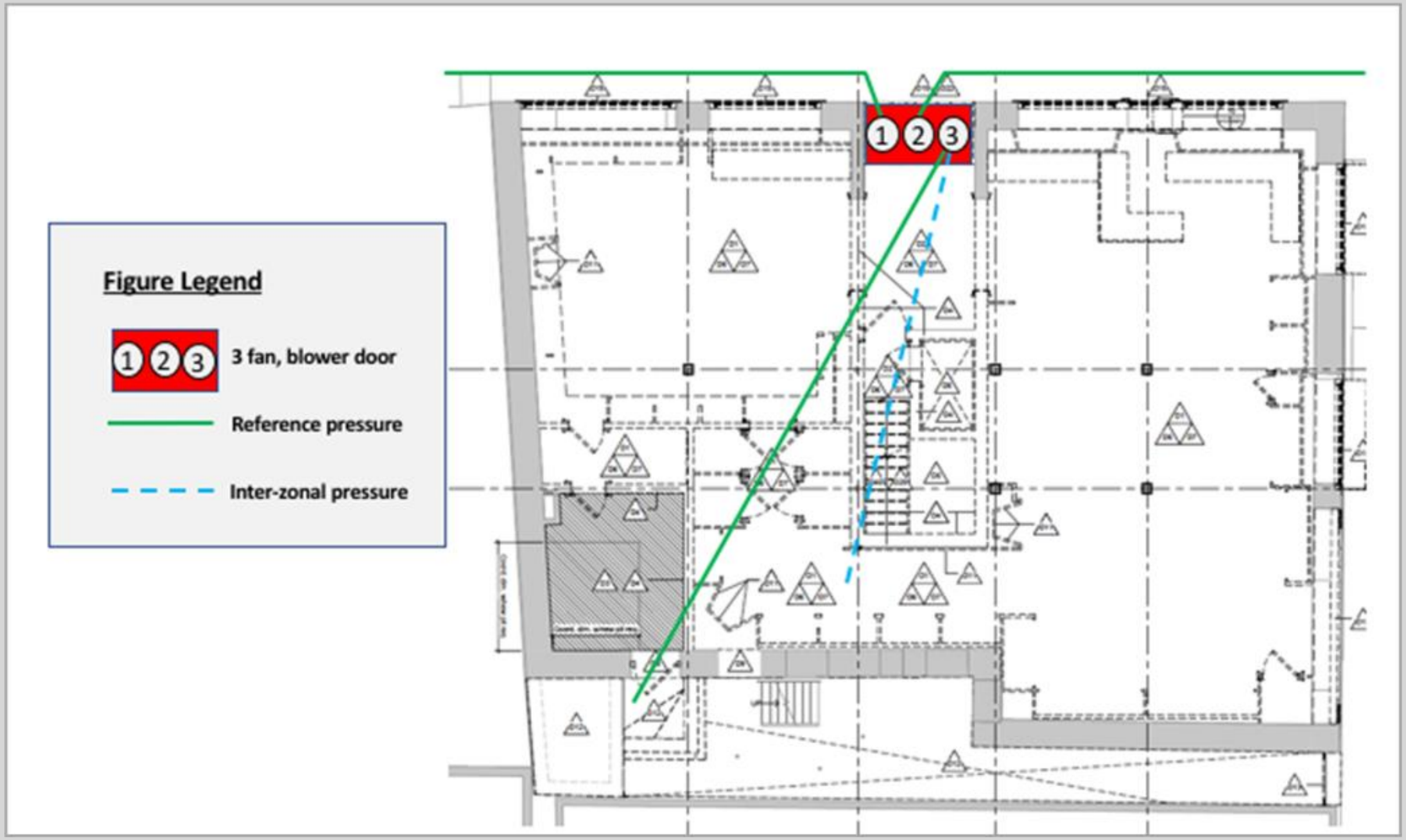
1. Engage Early and Often
2. Focus on the Envelope and Bring Everything Inside
3. Test Everything
4. Monitor Performance
5. Listen to Lew

2. Focus on The Enclosure, Bring Everything Inside



THERMAL BRIDGING SHOWN IN ENERGY MODELING

3. Test Everything



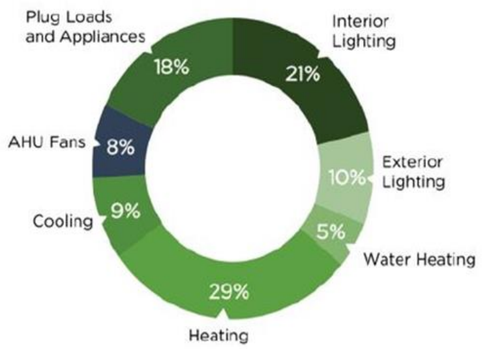
Communication and Testing Plan

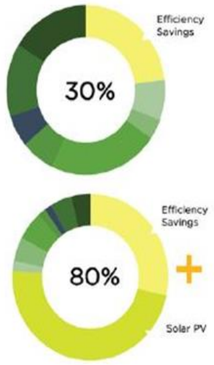
Multiple Fan Setup

4. Measure Performance: Greenstone on 5th

FINDINGS

The all-electric Greenstone is currently saving 30% in electricity consumption relative to a code-equivalent building (ASHRAE 90.1-2007), without accounting for the installed rooftop solar photovoltaic (PV) array. Including the rooftop solar PV, Greenstone is saving 80% in electricity consumption relative to a code-equivalent building.





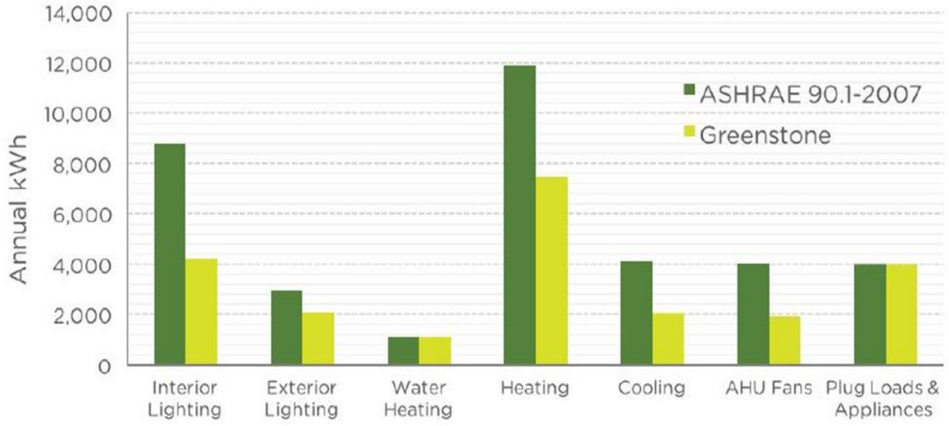
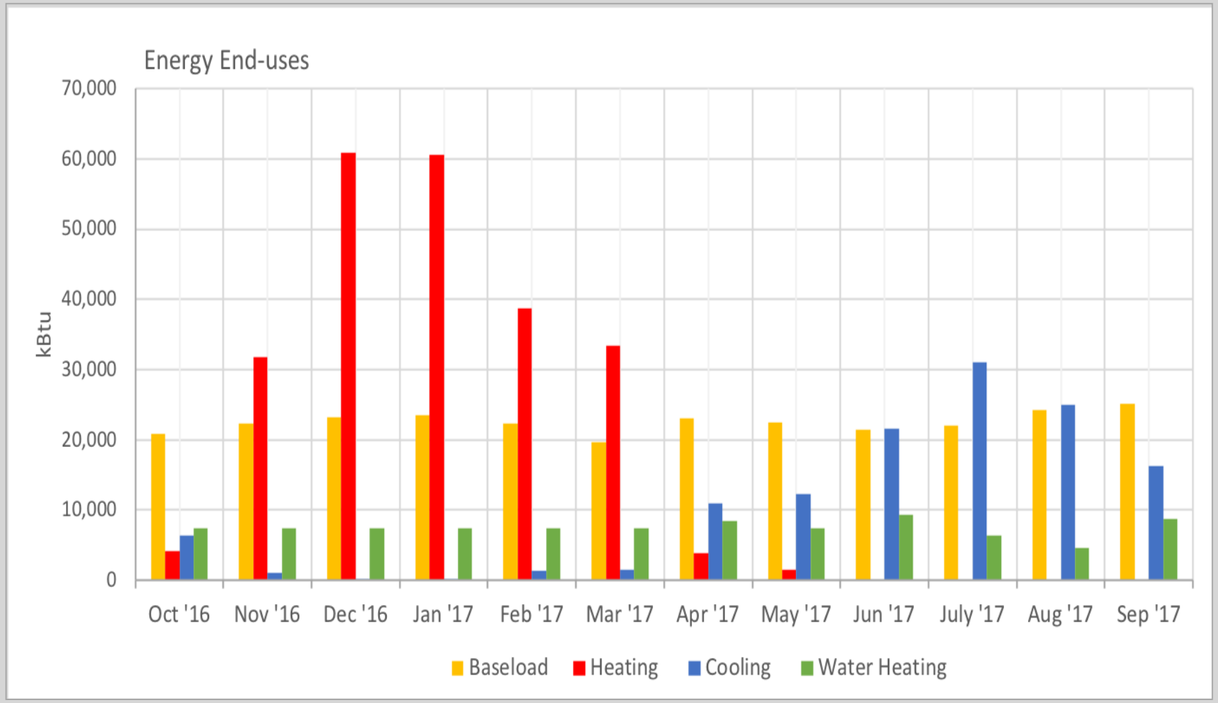


Figure 1 (above). Energy use segemented by end-use and comparisons of efficiency and Solar PV savings added to the energy picture.

Figure 2 (left). Overall effciency savings are driven by reductions in interior lighting, cooling, air handler fans, heating, & exterior lighting energy use.

Risk can be managed,

uncertainty cannot be managed



What gets measured, gets managed

– Peter Drucker

5. Listen to Lew – Focus on Moisture

"Secret Guide to Humidity Control and Mold Avoidance"

1. **Build air-tight** insulated enclosures with great windows.
2. **Dry the ventilation air,** using ASHRAE peak dew point design data to size the ventilation dehumidifier.
3. **STOP ventilation + exhausts** when nobody's in the building.
4. **Keep unoccupied buildings DRY (not cool)** by recirculating and operating the ventilation dehumidifier.

Lew Harriman – 'Wet N Wild – 40 Yrs. of Humidity Control'

May 14, 2020

Leveraging LEED to Achieve a High-Performance Building

Bryna Dunn, AICP, LEED Fellow

Presentation Outline

Learning Objectives

- ✓ Review the basics of the LEED Rating System structure
- ✓ Understand the basics of an integrative design process
- ✓ Identify the LEED prerequisites and credits that focus on energy performance
- ✓ Recognize the synergies between the performance credits

Q+A Session

When to use LEED?

Is it always the most appropriate choice?

WHEN IS LEED APPROPRIATE?

1

Whole Project Rating System

Are you looking for a framework that addresses multiple aspects of design and construction?

2

Third Party Verification

Are you looking for a third-party to verify the claims of your design and construction team?

3

National Benchmark

Are you interested in benchmarking your project against a national dataset?

4

Dovetails with Other Systems

Are you looking for opportunities to further certify under WELL, RELi, and LEED Zero?

How does LEED work?

Prerequisites, credits, points… oh my!

Integrative Process

Location + Transportation

Sustainable Sites

Water Efficiency

Energy + Atmosphere

Materials + Resources

Indoor Environmental Quality

Innovation + Regional Priority

icons courtesy of the USGBC

Scorekeeping

14

Prerequisites

Must complete each one

~40

Credits

Optional; worth different # of points

100

Points

Plus up to 10 bonus points

LEED v4 for BD+C: Schools
Project Checklist

Project Name:
Date: 4.15.2020

Y	?	N			
1			Credit	Integrative Process	1

5	1	9	**Location and Transportation**		**15**
			Credit	LEED for Neighborhood Development Location	15
1			Credit	Sensitive Land Protection	1
1		1	Credit	High Priority Site	2
2		3	Credit	Surrounding Density and Diverse Uses	5
	1	3	Credit	Access to Quality Transit	4
		1	Credit	Bicycle Facilities	1
1			Credit	Reduced Parking Footprint	1
		1	Credit	Green Vehicles	1

4		8	**Sustainable Sites**		**12**
Y			Prereq	Construction Activity Pollution Prevention	Required
Y			Prereq	Environmental Site Assessment	Required
1			Credit	Site Assessment	1
		2	Credit	Site Development - Protect or Restore Habitat	2
1			Credit	Open Space	1
		3	Credit	Rainwater Management	3
		2	Credit	Heat Island Reduction	2
1			Credit	Light Pollution Reduction	1
		1	Credit	Site Master Plan	1
1			Credit	Joint Use of Facilities	1

8		4	**Water Efficiency**		**12**
Y			Prereq	Outdoor Water Use Reduction	Required
Y			Prereq	Indoor Water Use Reduction	Required
Y			Prereq	Building-Level Water Metering	Required
2			Credit	Outdoor Water Use Reduction	2
5		2	Credit	Indoor Water Use Reduction	7
		2	Credit	Cooling Tower Water Use	2
1			Credit	Water Metering	1

28	2	1	**Energy and Atmosphere**		**31**
Y			Prereq	Fundamental Commissioning and Verification	Required
Y			Prereq	Minimum Energy Performance	Required
Y			Prereq	Building-Level Energy Metering	Required
Y			Prereq	Fundamental Refrigerant Management	Required
6			Credit	Enhanced Commissioning	6
18			Credit	Optimize Energy Performance	18
		1	Credit	Advanced Energy Metering	1
2			Credit	Demand Response	2
3			Credit	Renewable Energy Production	3
1			Credit	Enhanced Refrigerant Management	1

4	1	8	**Materials and Resources**		**13**
Y			Prereq	Storage and Collection of Recyclables	Required
Y			Prereq	Construction and Demolition Waste Management Planning	Required
		5	Credit	Building Life-Cycle Impact Reduction	5
1		1	Credit	Building Product Disclosure and Optimization - Environmental Product Declarations	2
	1	1	Credit	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2
1		1	Credit	Building Product Disclosure and Optimization - Material Ingredients	2
2			Credit	Construction and Demolition Waste Management	2

6	4	6	**Indoor Environmental Quality**		**16**
Y			Prereq	Minimum Indoor Air Quality Performance	Required
Y			Prereq	Environmental Tobacco Smoke Control	Required
Y			Prereq	Minimum Acoustic Performance	Required
1		1	Credit	Enhanced Indoor Air Quality Strategies	2
2	1		Credit	Low-Emitting Materials	3
1			Credit	Construction Indoor Air Quality Management Plan	1
		2	Credit	Indoor Air Quality Assessment	2
1			Credit	Thermal Comfort	1
1		1	Credit	Interior Lighting	2
	2	1	Credit	Daylight	3
	1		Credit	Quality Views	1
		1	Credit	Acoustic Performance	1

6			**Innovation**		**6**
5			Credit	Innovation	5
1			Credit	LEED Accredited Professional	1

2		2	**Regional Priority**		**4**
1			Credit	Regional Priority: Renewable Energy Production	1
1			Credit	Regional Priority: LTc3 High Priority Site	1
		1	Credit	Regional Priority:	1
		1	Credit	Regional Priority:	1

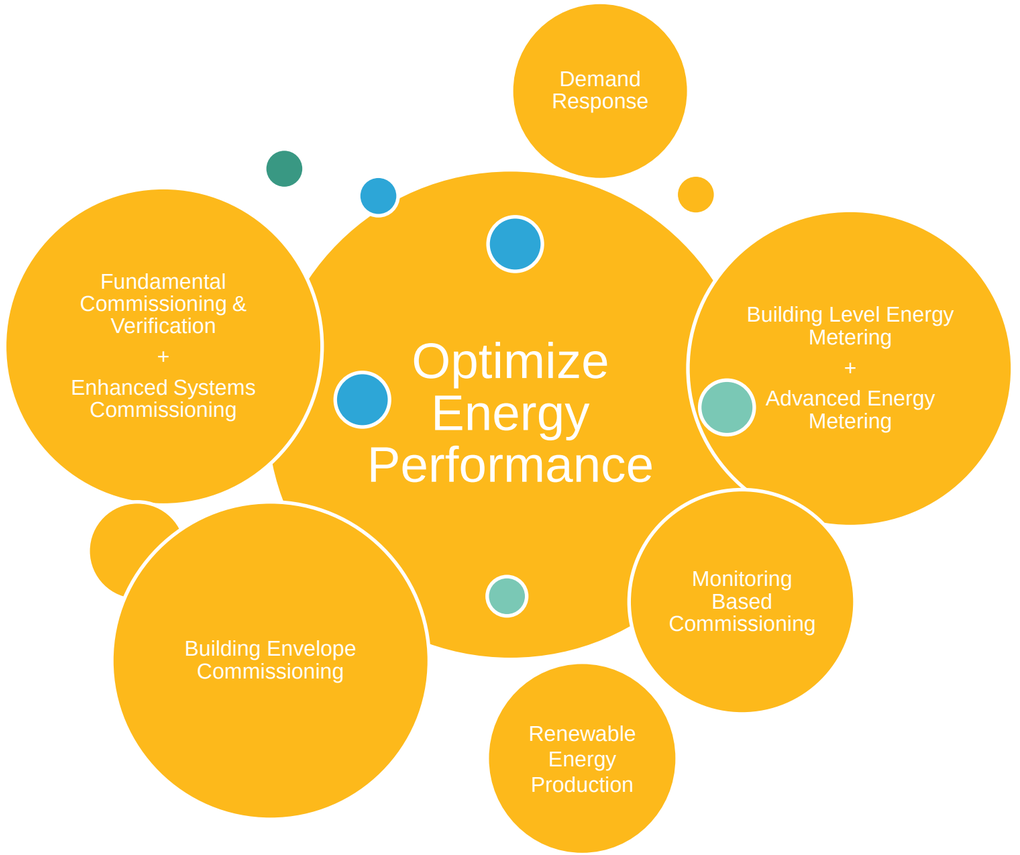
64	8	38	**TOTALS**	**Possible Points:**	**110**

Certified: 40 to 49 points, **Silver:** 50 to 59 points, **Gold:** 60 to 79 points, **Platinum:** 80 to 110

Optimize Energy Performance

is the core
of the EA section

Water Efficiency and Indoor Environmental Quality credits support Optimize Energy Performance



Are there LEED best practices?

Of course there are…

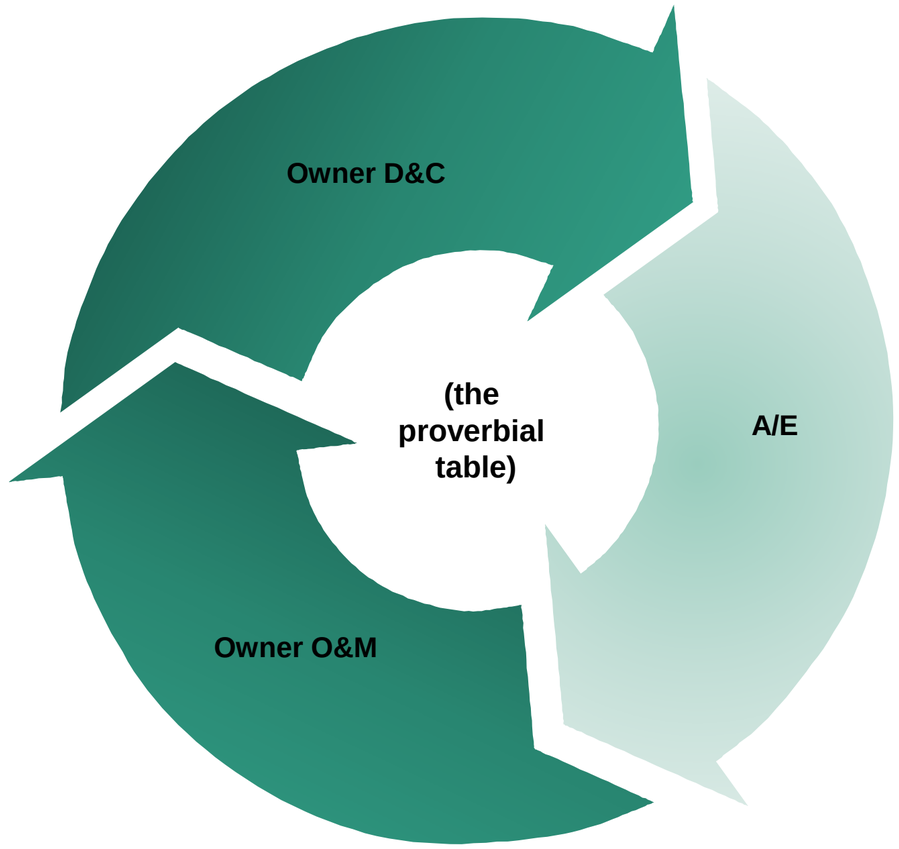
Integrative Process

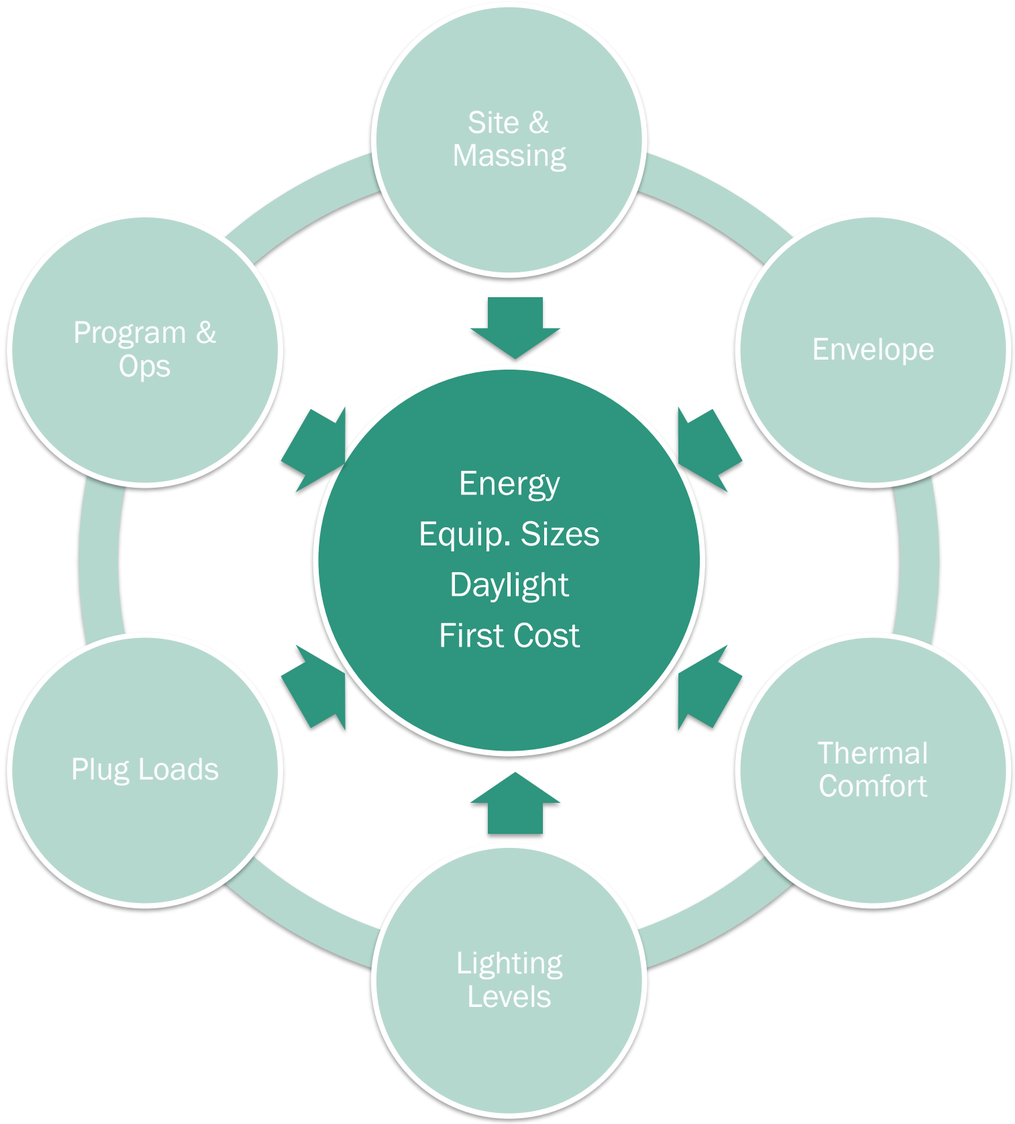
sets a project up for success

— begin during first ½ of schematic design

— revisit conversation regularly throughout design

— document preliminary calculations, such as daylight studies and solar PV master plans




Site &
Massing
Envelope
Thermal
Comfort
Lighting
Levels
Plug Loads
Program &
Ops
Energy
Equip. Sizes
Daylight
First Cost

Energy Modeling

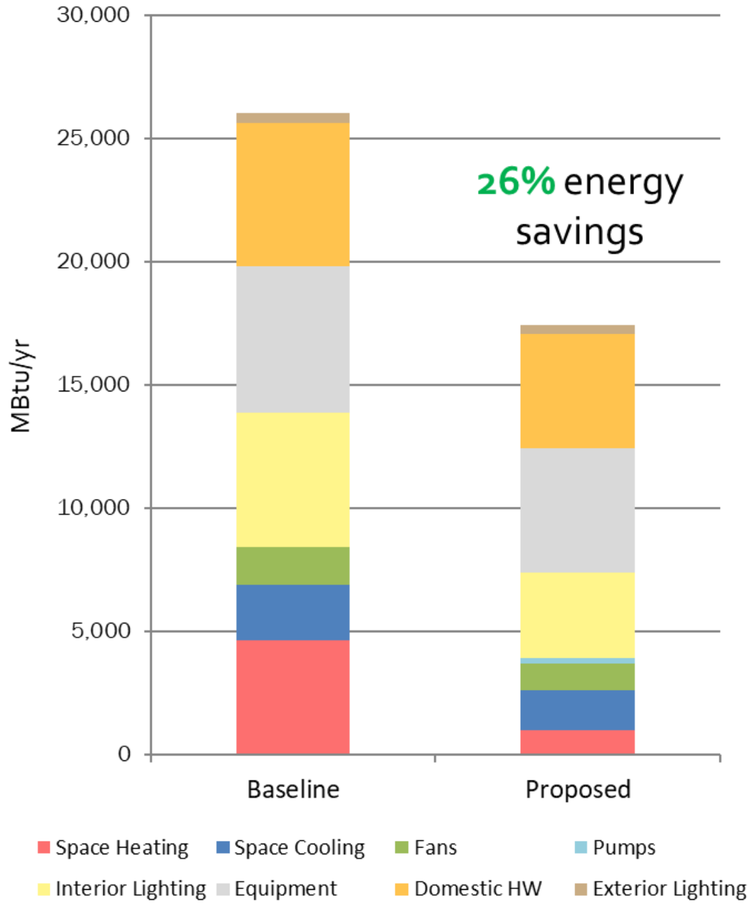
should be done early and often

— set design targets during first ½ of schematic design

— run preliminary models during schematic design

— update energy models during design development and construction documents

— complete compliance models at the end of design



Water Use Modeling

should be done early and often

— run preliminary models during schematic design

— specify fixtures and appliances that conserve (hot) water

— complete compliance models at the end of design

Interior Light and Daylight Modeling

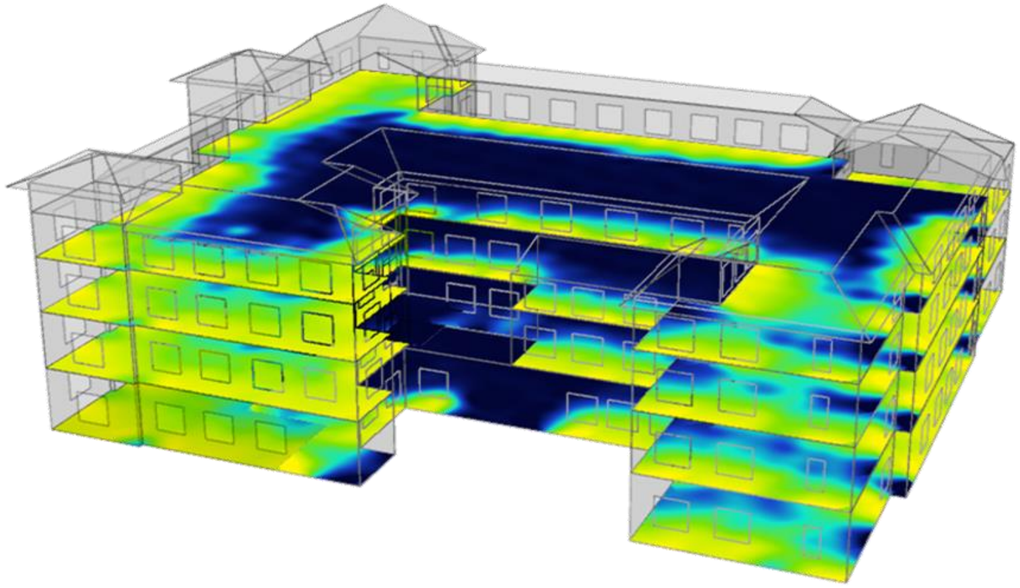
should be done early and often

— understand reflectivities of interior finishes

— run preliminary models during schematic design

— update models during design development and construction documents

— complete compliance models at the end of design



Commissioning Agent

should be hired during design development

— fundamental commissioning

— enhanced commissioning

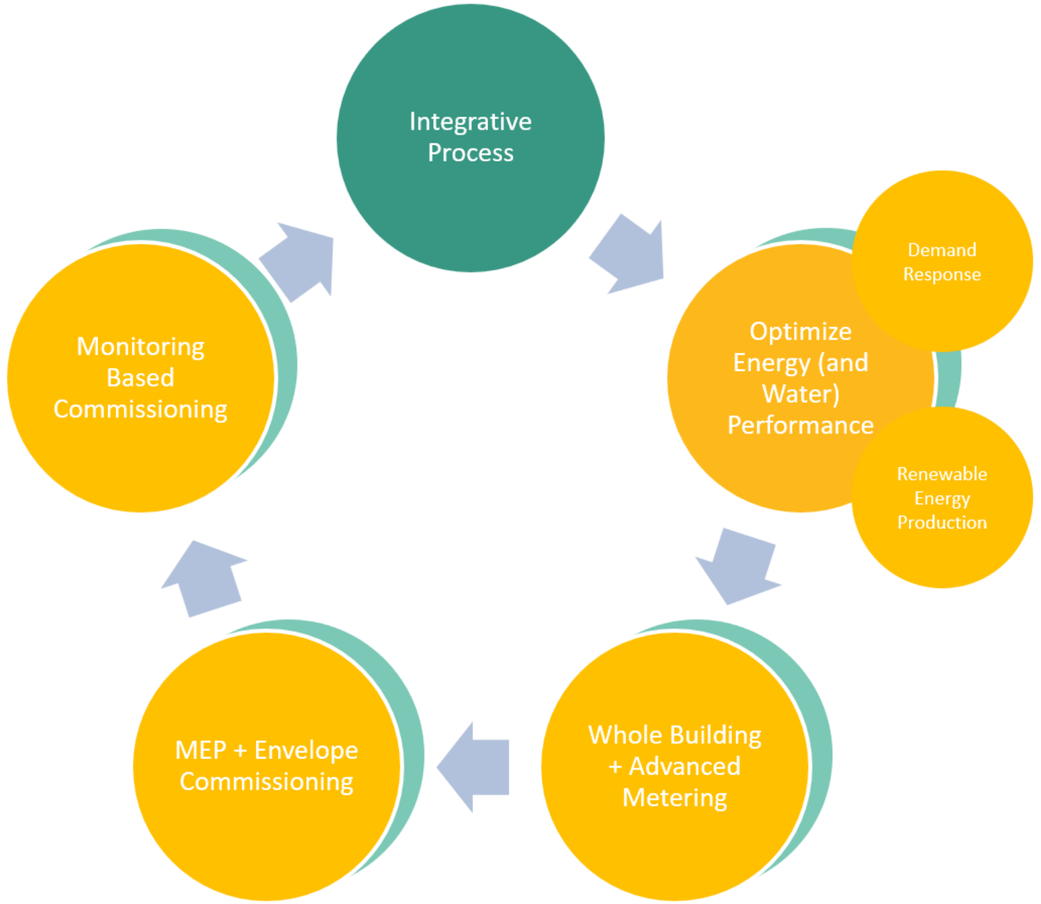
— monitoring based commissioning

— envelope commissioning

Integrative Process

drives a powerful high performance feedback loop

The Water Efficiency and Energy + Atmosphere credits work together to optimize performance



Not at the expense of good indoor air quality…

EQp1 Minimum Indoor Air Quality Performance

EQc1 Enhanced Indoor Air Quality Strategies

EQc3 Construction IAQ Management Plan

EQc5 Thermal Comfort

Thank you

For inquiries or follow-ups

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Q+A

Thank you for participating.

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