#edspaces

Lessons Learned:

EPIC CARBON NEUTRALITY STUDY

For Clemson University's New Forestry Building

November 8, 2023

@ 8am

SPEAKERS

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AGENDA

PROJECT BACKGROUND

ABOUT EPIC

DEFINITIONS

SETTING THE BASE CASE

DESIGN CASE SCENARIOS

KEY FACTORS FOR SUCCESS

WHAT NOW?

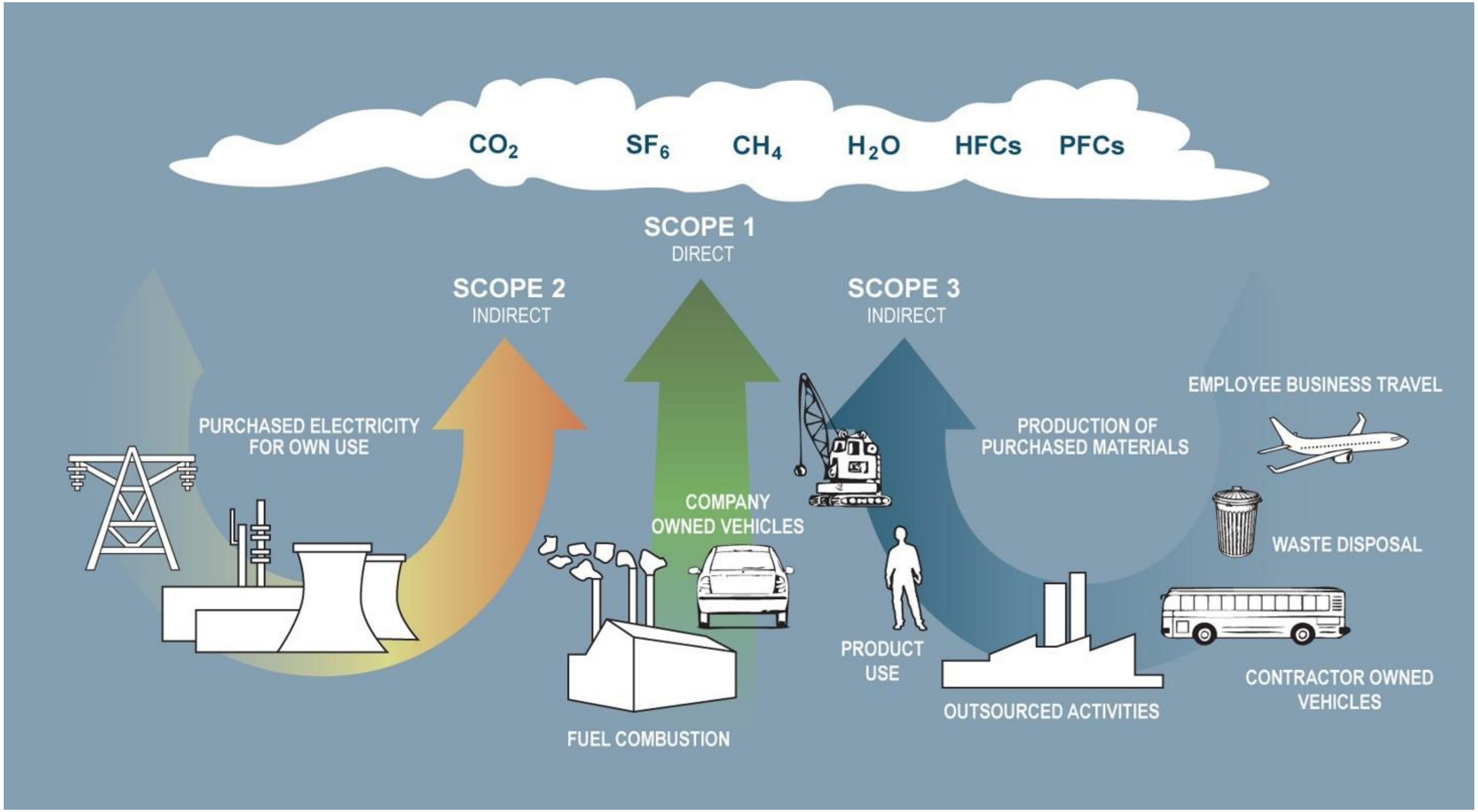
PROJECT BACKGROUND

2020-2030 ENERGY STATEMENT

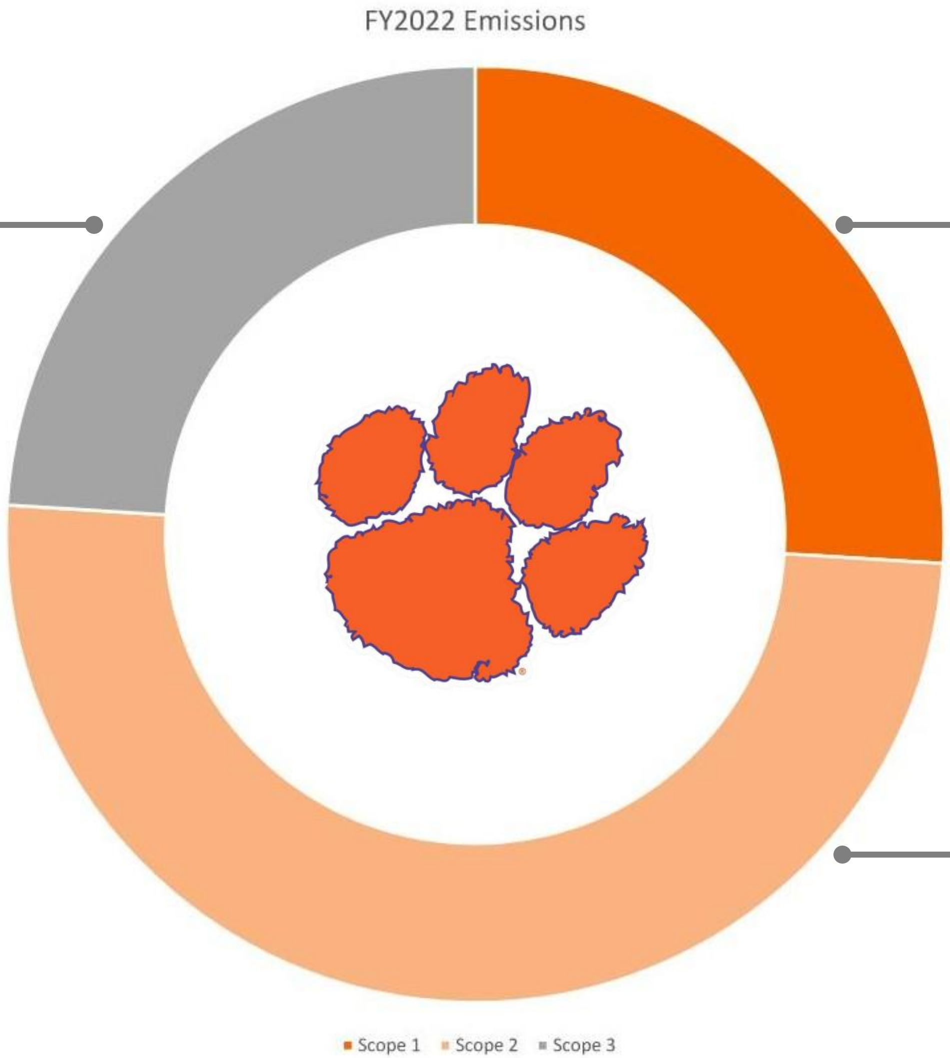
Clemson is committed to both cost efficiency and environmental sustainability. The University has set a **goal of being 100% carbon neutral by 2030** and is actively exploring and implementing solutions to achieve that goal.

A critical component of our rigorous planning around these initiatives is balancing these goals with cost effectiveness and efficiency. A phased approach over time will enable the University to incorporate the best-available technologies as they mature, avoid costly issues and disruptions associated with early adoption of new technologies, and achieve cost savings. This will also allow for a diversified generation portfolio that ensures reliability and resiliency needed to safely operate a world-class research university.

PROJECT BACKGROUND



PROJECT BACKGROUND



SCOPE 3
Commuting
Directly Financed Travel
Study Abroad Travel
Solid Waste
Wastewater
Paper
T&D Losses

13.1%
of scope 3

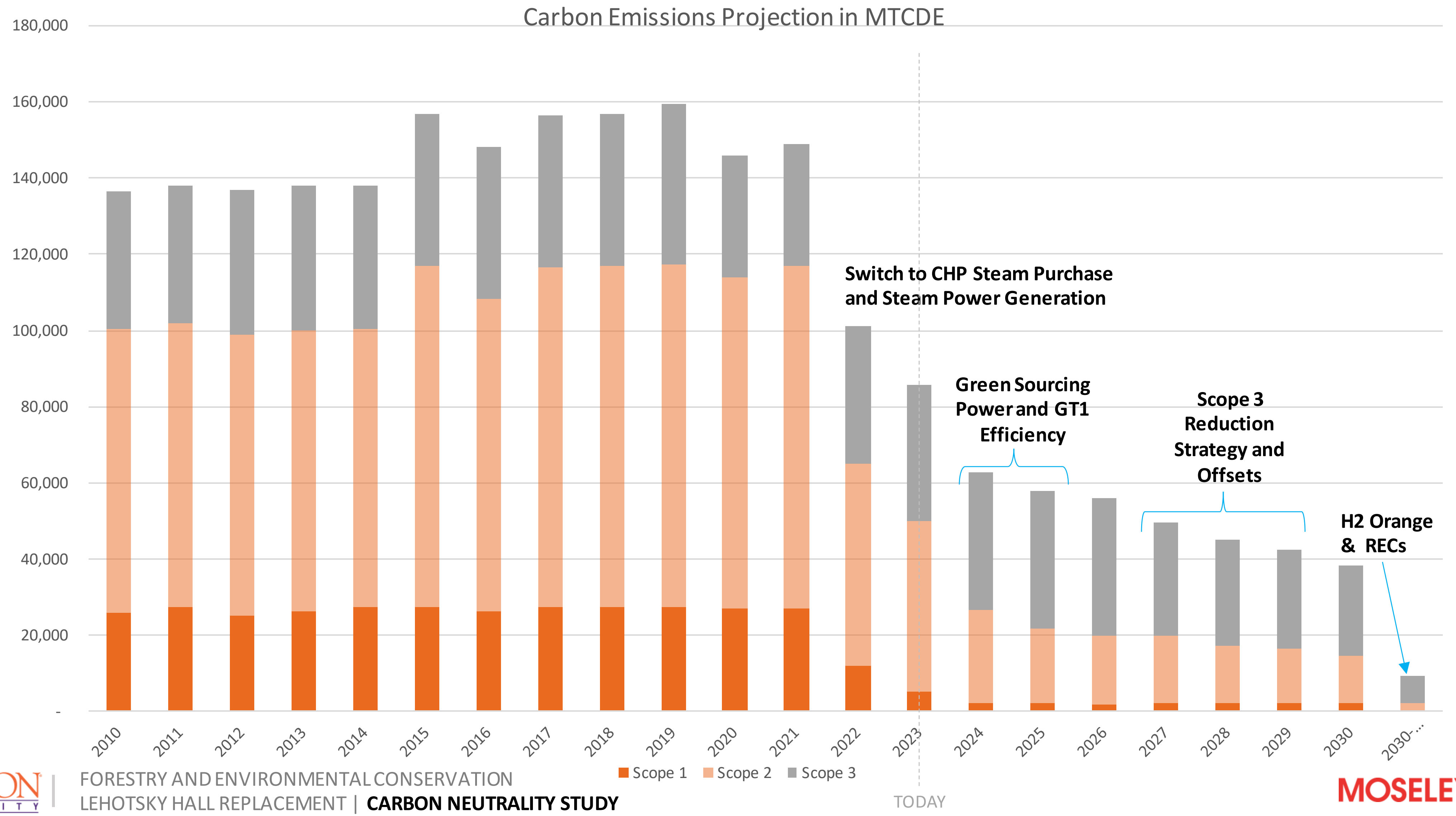
SCOPE 1
Fleet Vehicles
On-site Combustion
Refrigerants
Agriculture

65.9%
of scope 1

SCOPE 2
Purchased Electricity
Purchased Steam

100%
of scope 2

PROJECT BACKGROUND



PROJECT BACKGROUND

2019-2030 ENERGY PLANNING

High Energy Efficiency Improvements 20-30%

- Chiller Plant Optimization
- Combined Heat and Power Plant
- Green Tiger 1 – Energy Performance Contracting

On Campus Renewable Energy

- Solar PV - Multiple parking canopies and roof top installations 7-9 MW
- Energy Storage 20 – 30 MWh
- Net-Zero Plan on New Building Construction After 2025

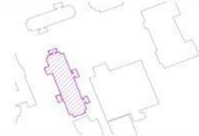
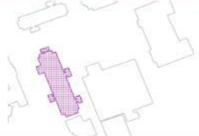
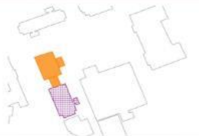
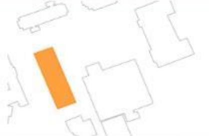
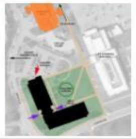
Direct Sourcing and RECs

- SC Renewable Energy through public utility programs such as DE GSA
- SC based renewable RECs – Solar renewable pipeline biogas supply

Innovation and Research – Decarbonization

- Carbon Capture
- H2 Orange
- Transition of Tiger Transit to Electric and or Hydrogen Busses


LEHOTSKY HALL

BUDGET OPTIONS FOR LEHOTSKY HALL					
DIAGRAMS					
	OPTION 1 PARTIAL RENOVATION	OPTION 2 FULL RENOVATION	OPTION 3 PARTIAL RENOVATION/ PARTIAL REBUILD	OPTION 4 FULL TEAR DOWN/ REBUILD ON SAME SITE	OPTION 5 NEW BUILDING NEW SITE
DESCRIPTION	This renovation would focus on the envelope/ building systems and code upgrades only. No space would be reconfigured . Any space changes would be limited to space assignment, not renovation.	This is a complete building renovation including the envelope, building systems , code upgrades and space reconfiguration to meet the current and future space needs of FEC	This is a renovation of the south portion of the building and complete demolition and rebuild of the north portion (with basement).	This is a complete tear down and rebuild on the same site.	This would be a complete new structure on a new site. Site TBD with campus planning.
RENOVATION COST	$ 17,680,628	$ 26,155,445	$ 8,250,000	$ -	$ -
ABATEMENT COST	$ 450,000	$ 600,000	$ 600,000	$ 600,000	$ -
DEMOLITION COST	$ 869,372	$ 1,400,000	$ 1,760,000	$ 2,000,000	$ -
NEW CONSTRUCTION COST	$ -	$ -	$ 19,030,000	$ 27,625,000	$ 27,625,000
SUBTOTAL - CONSTRUCTION COST	**$ 19,000,000**	**$ 28,155,445**	**$ 29,640,000**	**$ 30,225,000**	**$ 27,625,000**
A/E FEES	$ 1,805,000	$ 2,674,767	$ 2,815,800	$ 2,871,375	$ 2,210,000
CU PM FEES	$ 750,000	$ 1,111,295	$ 1,169,891	$ 1,192,[illegible]81	$ 1,090,359
PLANNING FUND	$ 150,000	$ 222,146	$ 233,860	$ 238,[illegible]75	$ 217,961
ART FUND	$ 100,000	$ 148,182	$ 155,995	$ 159,074	$ 145,390
INSPECTIONS & TESTING	$ 165,000	$ 195,000	$ 210,000	$ 250,000	$ 250,000
GREEN GLOBES FEES	$ 100,000	$ 148,182	$ 155,995	$ 159,074	$ 145,390
CM PRECONSTRUCTION FEES	$ 158,450	$ 158,450	$ 237,120	$ 241,800	$ 221,000
SUBTOTAL - SERVICES FEES	**$ 3,228,450**	**$ 4,658,023**	**$ 4,978,661**	**$ 5,112,[illegible]79**	**$ 4,280,101**
MOVE TO/FROM LEHOTSKY	$ 250,000	$ 250,000	$ 250,000	$ 250,000	$ 100,000
TEMPORARY LAB SPACES	$ 740,000	$ 1,300,000	$ 1,300,000	$ 1,300,000	$ -
OFFICE / CLASSRM SWING SPACES [RENO / MODULAR]	$ 1,500,000	$ 2,200,000	$ 2,200,000	$ 2,200,000	$ -
SHORT-TERM REPAIRS AT LEHOTSKY	$ -	$ -	$ -	$ -	$ 500,000
SUBTOTAL - RELOCATION & LOGISTICS	**$ 2,490,000**	**$ 3,750,000**	**$ 3,750,000**	**$ 3,750,000**	**$ 600,000**
FF&E	$ 1,172,000	$ 1,998,481	$ 2,000,000	$ 2,000,000	$ 2,000,000
UTILITIES	$ 453,184	$ 750,000	$ 750,000	$ 750,000	$ 2,000,000
NETWORK & I.T.	$ 328,183	$ 500,000	$ 600,000	$ 750,000	$ 1,000,000
AUDIO-VISUAL	$ 328,183	$ 500,000	$ 600,000	$ 750,000	$ 750,000
SUBTOTAL - FF&E & UTILITIES	**$ 2,281,550**	**$ 3,748,481**	**$ 3,950,000**	**$ 4,250,000**	**$ 5,750,000**
CONSTRUCTION COST ESCALATION	**Incl. in "Construction Cost" Above**	**Incl. in "Construction Cost" Above**	**$ 1,810,881**	**$ 1,218,875**	**$ 1,114,025**
OWNERS CONTINGENCY	**$ 3,000,000**	**$ 4,388,051**	**$ 4,870,458**	**$ 4,543,346**	**$ 3,630,874**
TOTAL PROJECT COST	**$ 30,000,000**	**$ 44,700,000**	**$ 49,000,000**	**$ 49,100,000**	**$ 43,000,000**
SCHEDULE	Open for Spring 2023 Classes	Open for Spring 2023 Classes	Portion Open for Spring 2023 Classes*	Open for Fall 2023 Classes*	Open for Fall 2023 Classes*
TOTAL GSF	95,591	95,591	85,000	85,000	85,000
TOTAL PROJECT COST / GSF	$ 314	$ 468	$ 576	$ [illegible]78	$ 506
CONSTRUCTION COST / GSF	$ 199	$ 295	$ 349	$ 356	$ 325
% OWNER'S CONTINGENCY	10%	10%	10%	9%	8%
	PROS	**PROS**	**PROS**	**PROS**	**PROS**
	Meets original budget	Meets FEC program needs w/ growth	Meets FEC program needs w/ growth	Meets FEC program needs w/ growth	Meets FEC program needs w/ growth
	Meets original schedule duration and opening date	Addresses all environmental, structural, and programmatic issues within the building.	Potential for phased occupancy within current approved funding (will require OSE approval)	Full benefits of long-term value provided by new building	Minimizes move cost. FEC to remain in Lehotsky until construction complete (assuming temp measures to improve indoor air-quality)
					Promotes new image for CAFLS & ehances recruiting opportunities
					Full benefits of long-term value provided by new building
	CONS	**CONS**	**CONS**	**CONS**	**CONS**
	Does not meet programmatic needs of FEC	Exceeds current funding authorization	Exceeds current funding authorization	Exceeds current funding authorization	Exceeds current funding authorization
	Will not address circulation and wayfinding issues.	Extends schedule for design & construction	Most complex option for all phases	Extends schedule for design & construction	New site to be determined
	Will require future hazardous material abatement	Disconnected basement areas still exist	Extends schedule for design & construction	Requires (2) moves for building user groups	Extends schedule for design & construction
	No significant difference in appearance	No new building entry experience included			
	COMMENTS	**COMMENTS**	**COMMENTS**	**COMMENTS**	**COMMENTS**
	"Temporary lab spaces" = 5,000 SF of modular lab space at TBD location on campus	"Temporary lab spaces" = 7,200 SF of modular lab space at TBD location on campus	*Renovated portion could be open for Spring 2023 classes if the project is phased while awaiting additional funding. (Phased Opening will require OSE approval)	*Fall 2023 opening dependent upon timing of additional funding approval.	*Fall 2023 opening dependent upon site selection and timing of additional funding approval.
			"Temporary lab spaces" = 7,200 SF of modular lab space at TBD location on campus	"Temporary lab spaces" = 7,200 SF of modular lab space at TBD location on campus	"Short-Term Repairs at Lehotsky" includes necessary HVAC and environmental repairs to keep Lehotsky functioning safely until users are vacated from the building.
			30,000 SF renovation + 55,000 SF new construction	Use of some existing spreadfootings on site seems viable option based on initial studies.	Future abatement and demolition of Lehotsky will need to be accounted for beyond this cost option. Estimated value of worked needed, escalated to mid-2024: $4M

PROJECT BACKGROUND

Department of
FORESTRY AND ENVIRONMENTAL CONSERVATION

FORESTRY

WILDLIFE

SOILS & AQUA SCIENCE

DESIGN TEAM

ARCHITECTURE ENGINGEERING SUSTAINABILITY	Moseley Architects
CIVIL	Land Planning Associates
LANDSCAPE ARCHITECTURE	Core Studio Design
CM@R	Ajax Building Company
Cx	PC Energy Solutions + The BEE Group

GREEN & MEMORABLE

- Respects campus traditions
- Creates special spaces

ENGAGED & INNOVATIVE

- Promotes collaboration
- Provides learning environments

WARM & WELCOMING

- Creates a strong sense of community

CONNECTED

- Promotes pedestrian connectivity
- Provides variety of transportation

SUSTAINABLE

- Promotes environmental objectives

PROJECT BACKGROUND

GUIDING PRINCIPLES

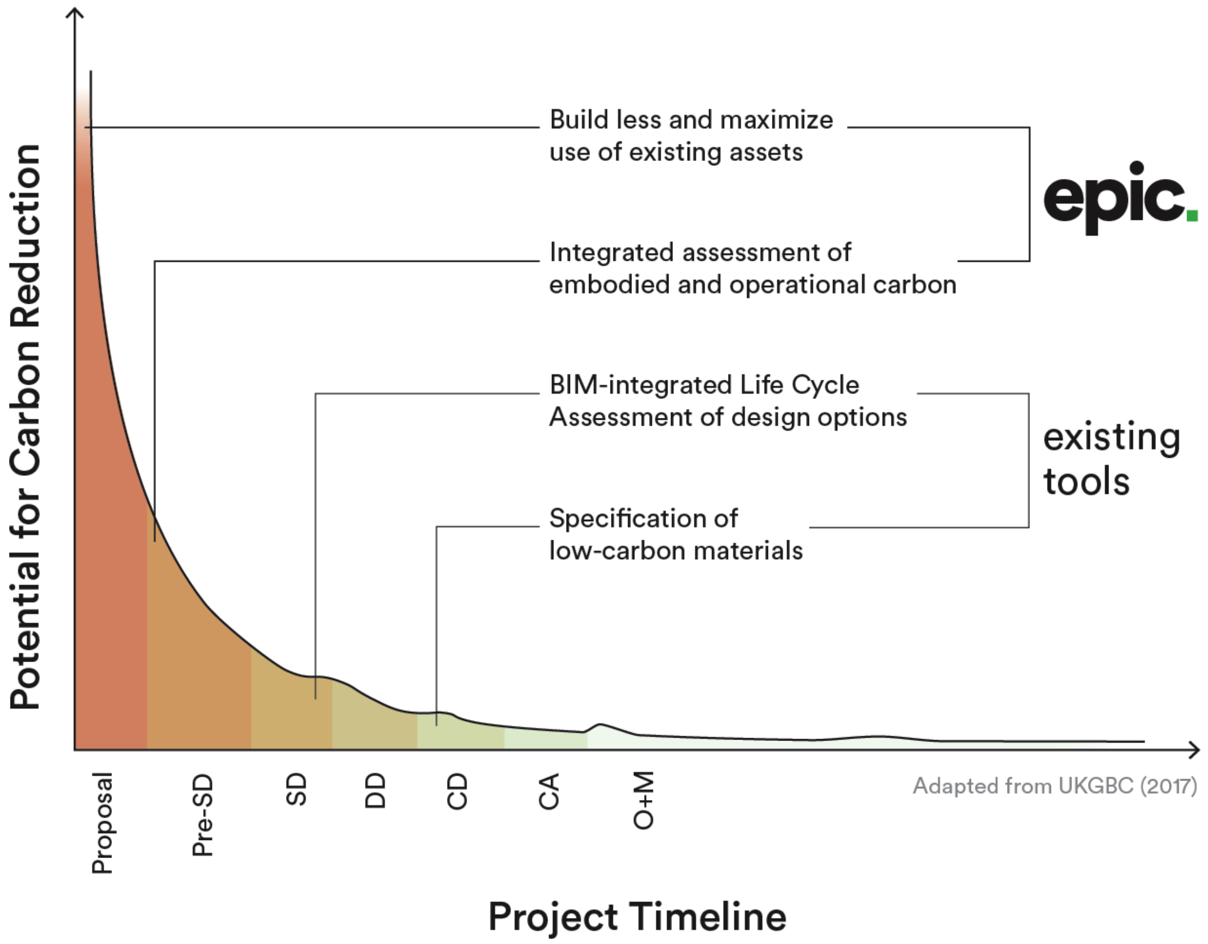
- Demonstrate the intersection of design excellence and sustainable performance
- Make the most of, and integrate with, the surrounding community and give back
- Connect with and contribute to the surrounding ecosystem
- Use water wisely and handle rainfall responsibly
- Demonstrate that higher performance can be cost effective
- Generate energy on-site from renewable sources and be transparent about the project's net carbon impact
- Promote the comfort and health of those who spend time in it
- Make decisions about materials based on an understanding of their impact (especially carbon impact)
- Anticipate adapting to new uses, climate change, and resilient recovery from disasters
- Catalog lessons for better design that have been learned through this project's design, construction, and occupancy

FORESTRY AND ENVIRONMENTAL CONSERVATION (FEC)

LEHOTSKY HALL REPLACEMENT

CARBON NEUTRALITY STUDY – kickoff
SEPTEMBER 23, 2022

ABOUT EPIC



https://epic-documentation.gitbook.io/epic/

The Early Phase Integrated Carbon (EPIC) assessment is a tool built by EHDD to support climate-positive design decisions in early project phases when data is scarce but the potential for carbon reduction is high.

EPIC combines the following to assess the relative impact of carbon reduction measures on both embodied and operational carbon footprints:

- Regionally specific background data
- Forward looking projections
- Peer reviewed findings
- Common sense assumptions

EPIC IS NOT A HIGH-RESOLUTION DESIGN TOOL

EPIC IS NOT A WHOLE BUILDING LIFE CYCLE ASSESSMENT TOOL

ABOUT EPIC

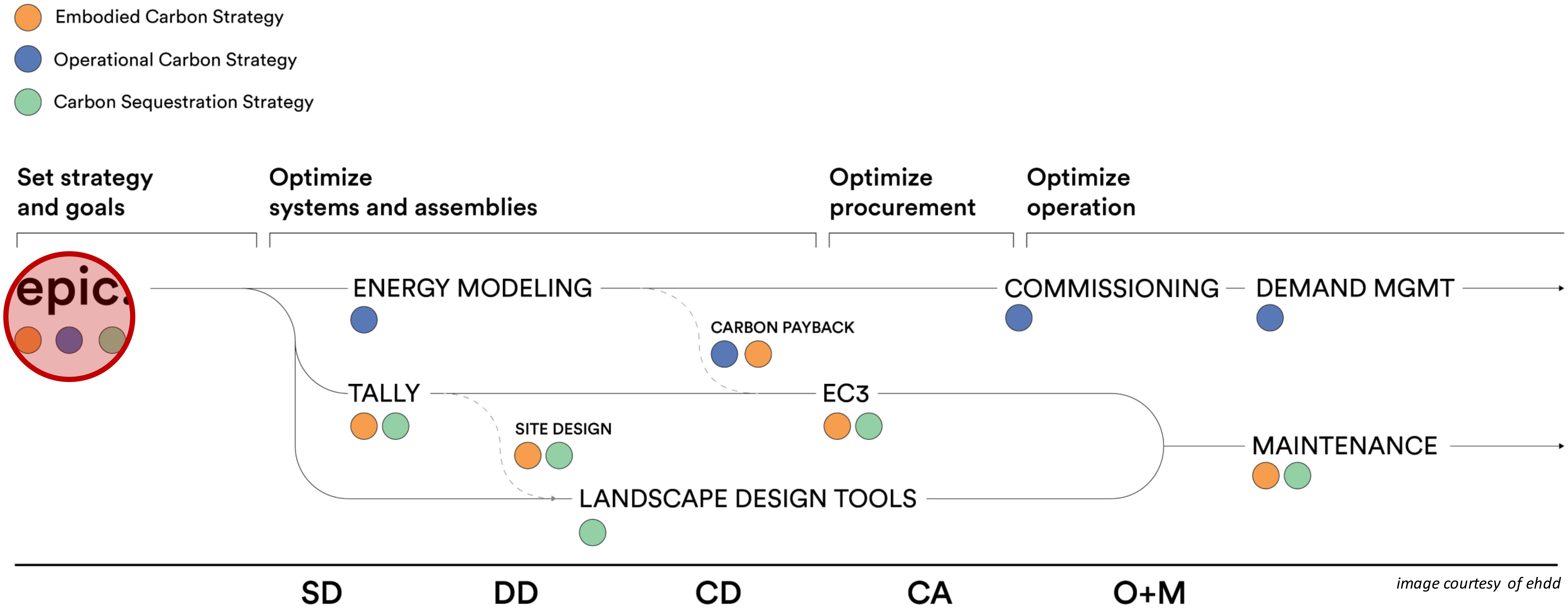
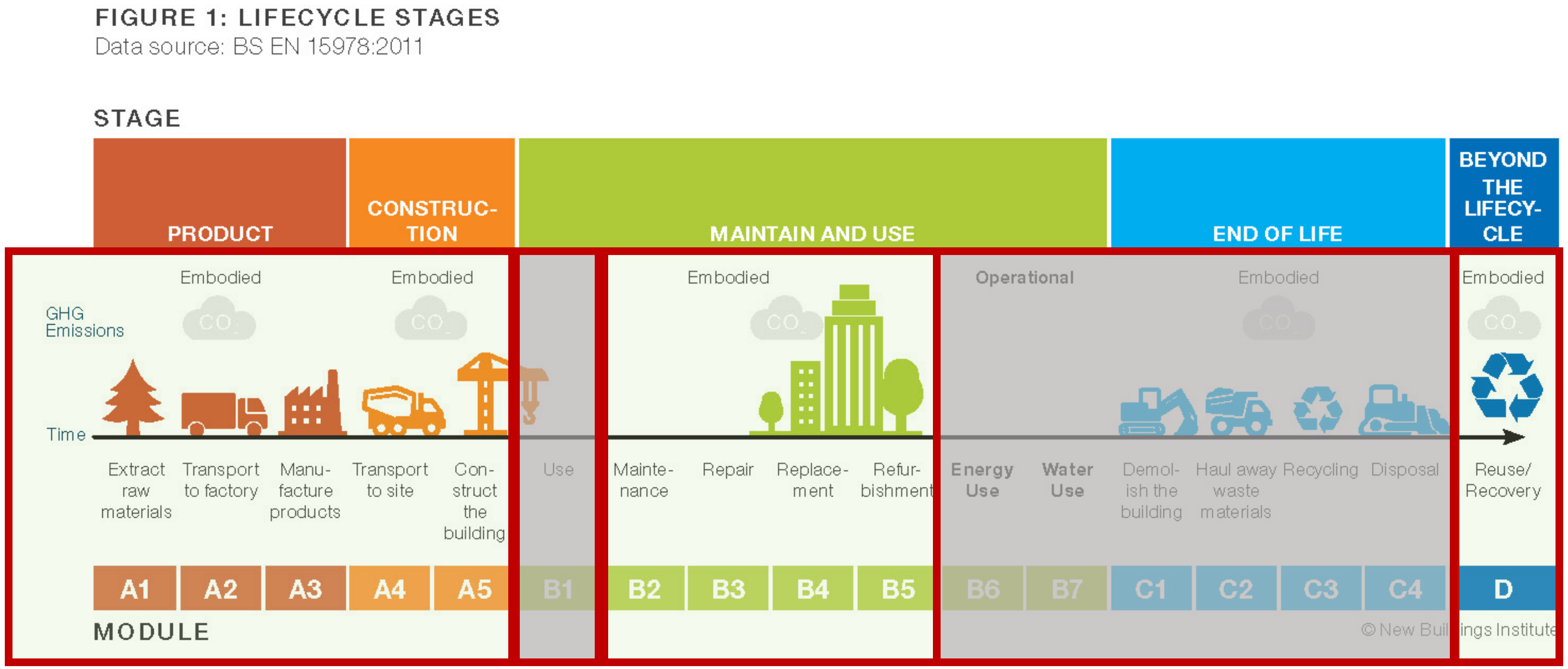


image courtesy of ehdd

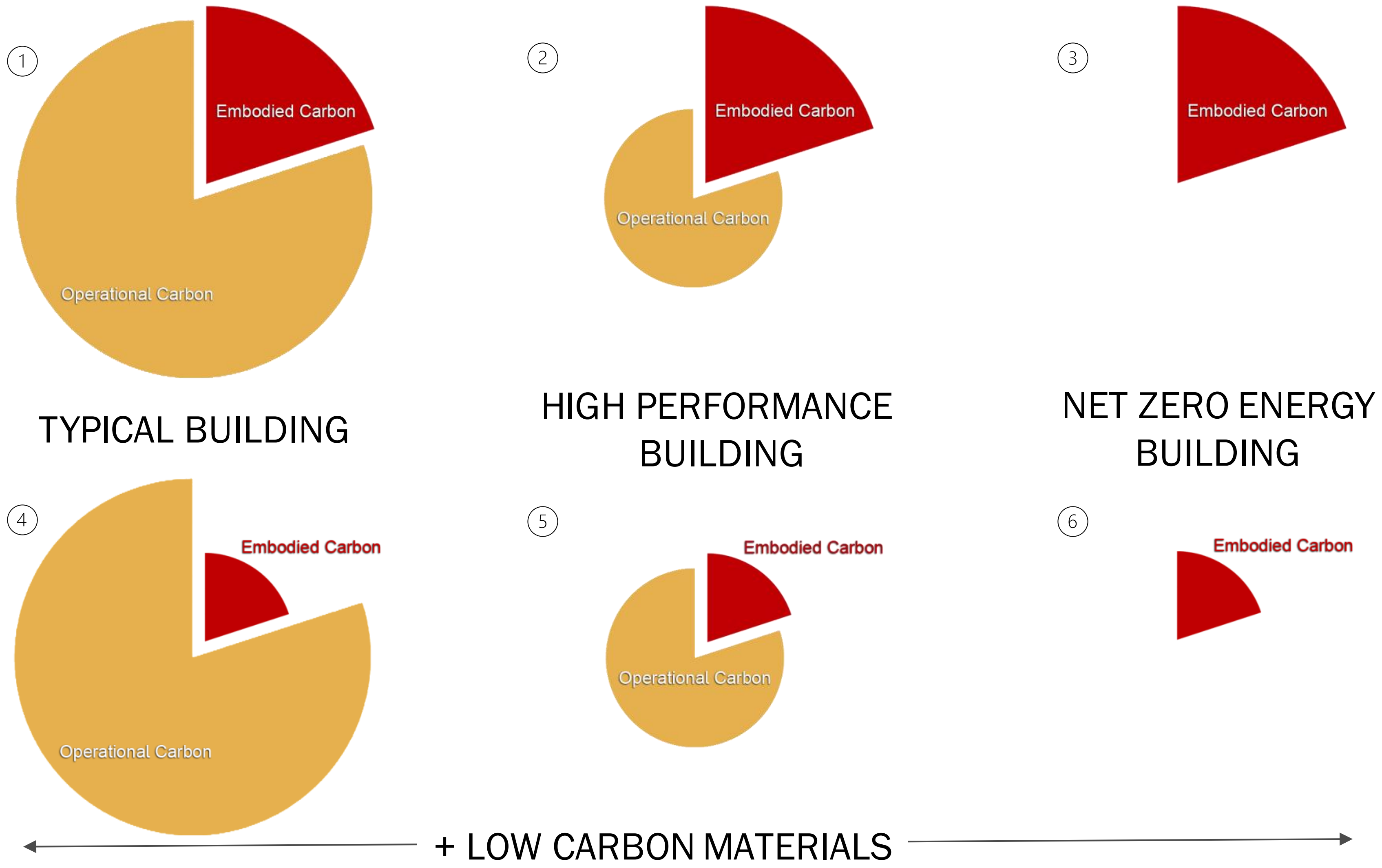
DEFINITIONS



Embodied Carbon: the greenhouse gas (GHG) emissions associated with the manufacturing, transportation, installation, maintenance, and disposal of construction materials

Calculated as global warming potential (GWP) and expressed in carbon dioxide equivalent units (CO2e).

DEFINITIONS



LCA COMPONENTS INCLUDED

- Structure and Foundations — always in analysis
- Envelope (Cladding, Glazing, Roofing)
- Interior Fitout
- Building Systems (MEP and PV)
- Site and Landscaping
- Refrigerants

(Envelope through Refrigerants: can toggle on/off)

DEFINITIONS

CONCRETE

- **Conservative**: typical concrete mix, no effort made to lower CO2 emissions
- **Best Practices:** concrete with 30-50% replacement of cement by supplementary cementitious materials (SCM) and careful sizing of concrete structural elements
- **Low Carbon:** concrete with >50% replacement of cement by SCM, lower carbon aggregate, and careful sizing of concrete structural elements

STEEL

- **Conservative:** typical steel with a typical recycled content, from a mix of blast and electric arc furnaces
- **Best Practices:** steel from electric arc furnaces or blast furnaces with gas recovery, with high recycled content, and structural design to minimize overspecification
- **Low Carbon:** steel from electric arc furnaces powered with renewable energy sources, potentially with biomass reductants, with high recycled content, and structural design to minimize overspecification and maximize reusability

TIMBER

- In accordance with ISO 21930, the carbon content of biogenic materials can only be counted as sequestered if the timber comes from a forest managed with sustainable practices.
- **An example of this is timber from an FSC or SFI certified forest.**
- *Important to obtain transparency documentation for actual wood procured*
- More information is available in the EPIC appendix under Biogenic Carbon.

ENVELOPE

- **Conservative:** Standard materials and assemblies, no effort made to lower carbon emissions
- **Best Practices:** Reduce redundancies and select low-carbon materials with high levels of recycled content
- **Low Carbon:** Maximize biogenic materials, innovate efficient assemblies, and reduce material use

INTERIORS

- **Conservative:** Standard fittings, furniture, and fixtures, no effort made to lower carbon emissions
- **Best Practices:** Address “hot spots” (flooring, acoustic panels, casework, etc)
- **Low Carbon:** Comprehensive low carbon design and specification of fit out

DEFINITIONS

PV ORIENTATION

- **Optimal**: There is no impediment on the site to maximum solar exposure.
- **Suboptimal:** There is solar potential on the site, but it is partly compromised. A 20% penalty on solar energy production is assessed.

CLEAN POWER PURCHASE

- **None:** no purchase of clean power or RECs.
- **Low:** Purchase of clean power to cover 50% of building energy use.
- **High:** Purchase of clean power to cover 100% of building energy use.
- **24/7 clean electrification:** Time matched purchase of zero-carbon power to ensure that building emissions are totally offset (coming soon).

LANDSCAPE

- **Low Sequestration:** An example is no-mow turfgrass.
- **Moderate Sequestration:** An example is low shrubs and small trees in a matrix of no-mow turfgrass.
- **High Sequestration:** an example is dense broadleaf shrubs and trees in a matrix of no-mow turfgrass.
- *Note*: the assumption for all planted areas reported in the base case is low sequestration.
- *Note*: do not report lawn areas or hardscape

BASE CASE EMISSIONS

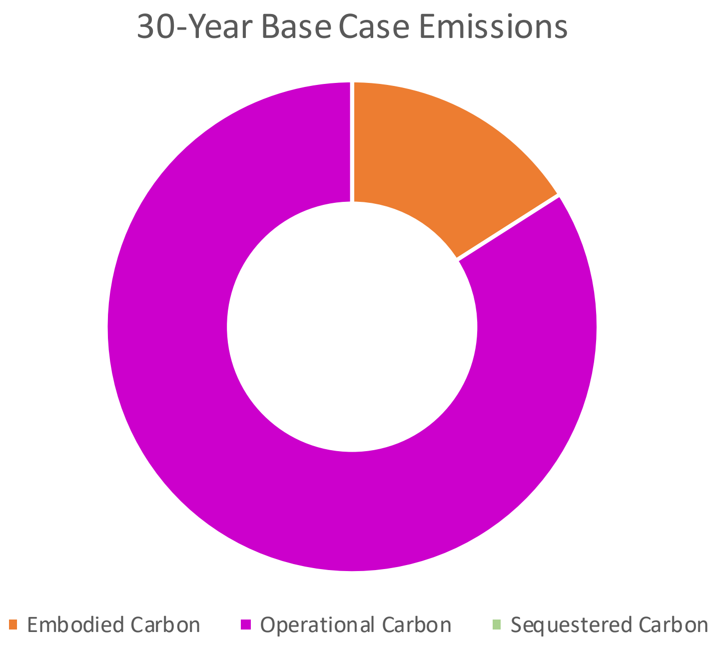
Key Assumptions:

- 85,000 sf
- Project complete in 2024

- Steel Framed Laboratory/Classroom
- 3 floors above ground (25,000 sf each)
- 1 floor below ground (10,000 sf)

- 45% Laboratory/55% University usage
- 181 kBtu/sf/yr benchmark EUI (override from 232 default)

- Previously developed site
- 235,224 sf site area
- No carbon sequestering plantings



Total Emissions	40,800 tCO2e
Embodied Carbon	6,500 tCO2e
Operational Carbon	34,200 tCO2e
Sequestered Carbon	0 tCO2e

SCENARIO MODIFICATIONS

MASS TIMBER

- Concrete and steel are set to best practices
- Envelope and interiors are set to best practices
- Responsibly sourced timber (RST) is toggled off
- EUI target is 105 kBtu/sf/yr
- Onsite solar PV is 50% of load (1,118 kW; 48,149 sf)
- Planting area: 62,810 low; 14,656 med; 27,218 high

RST MASS TIMBER

- Concrete and steel are set to best practices
- Envelope and interiors are set to best practices
- **Responsibly sourced timber (RST) is toggled on**
- EUI target is 105 kBtu/sf/yr
- Onsite solar PV is 50% of load (1,118 kW; 48,149 sf)
- Planting area: 62,810 low; 14,656 med; 27,218 high

100% PV

- Concrete and steel are set to best practices
- Envelope and interiors are set to best practices
- Responsibly sourced timber (RST) is toggled off
- EUI target is 105 kBtu/sf/yr
- **Onsite solar PV is 100% of load (2,237 kW; 96,297 sf)**
- Planting area: 62,810 low; 14,656 med; 27,218 high

INTENSIVE LANDSCAPE

- Concrete and steel are set to best practices
- Envelope and interiors are set to best practices
- Responsibly sourced timber (RST) is toggled off
- EUI target is 105 kBtu/sf/yr
- Onsite solar PV is 50% of load (1,118 kW; 48,149 sf)
- **Planting area: 10,468 low; 47,108 med; 47,108 high**

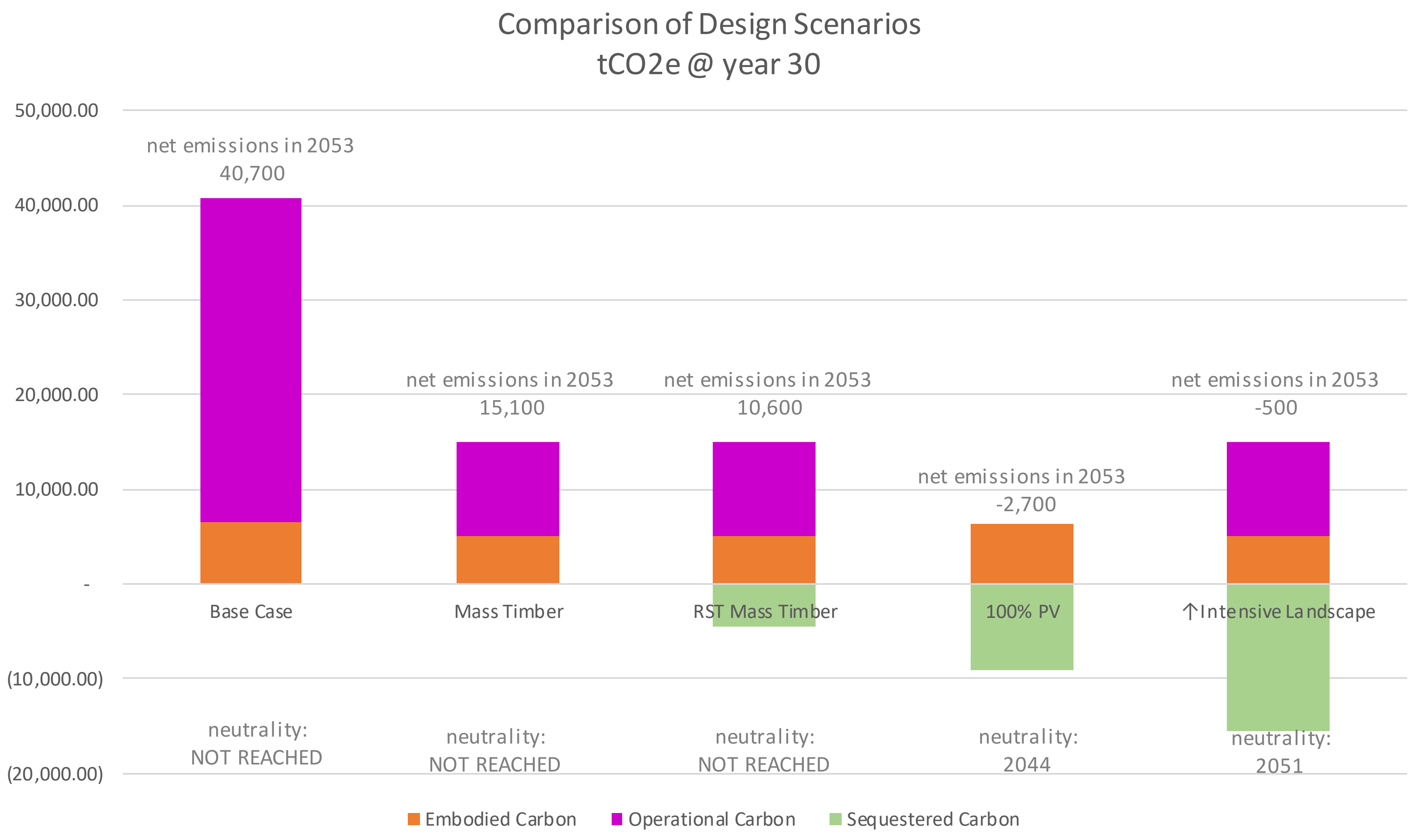
DESIGN CASE EMISSIONS

Key Assumptions:

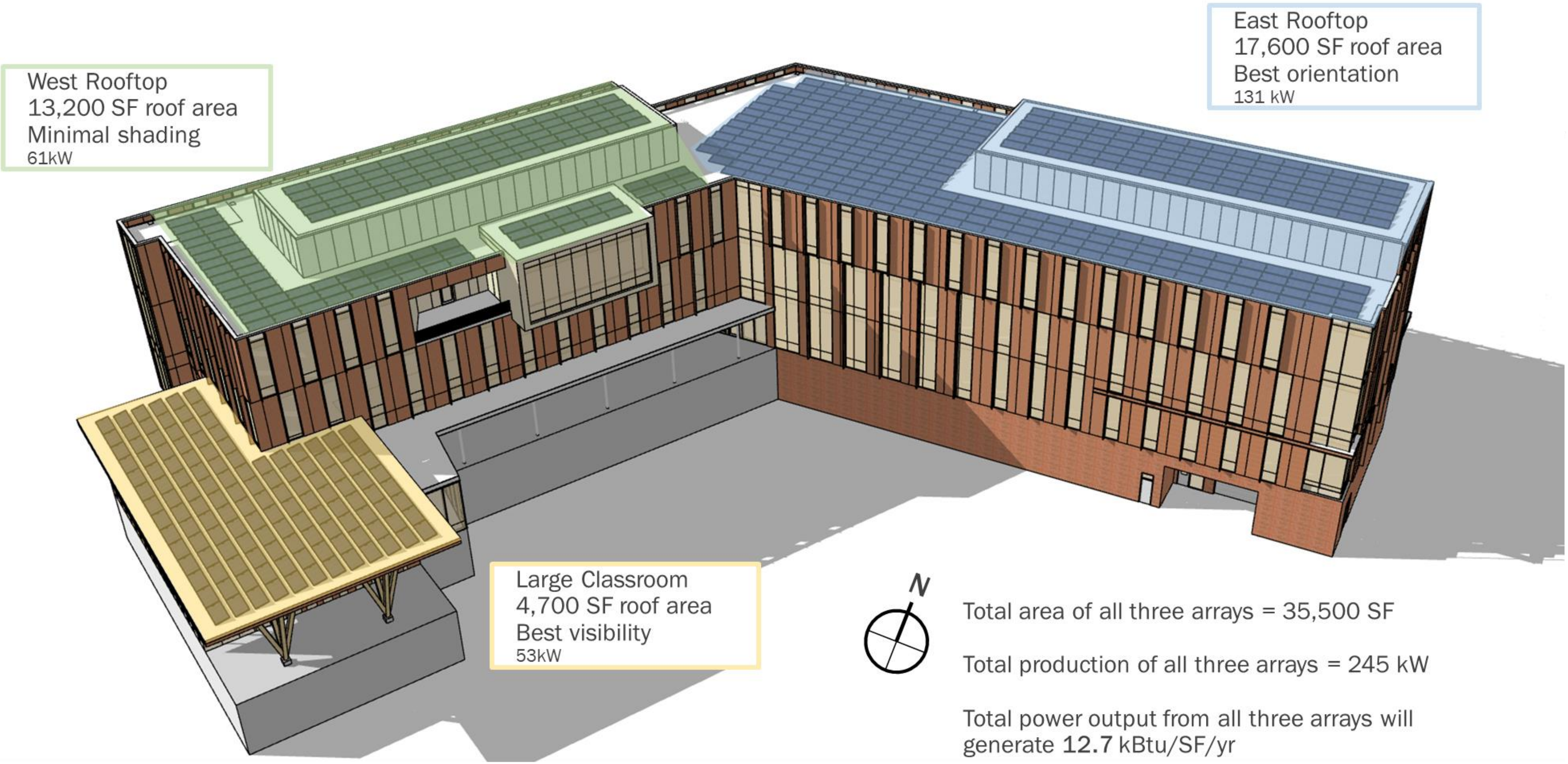
- Best practices:
  - concrete
  - steel
  - envelope
  - interiors
- Mass timber *(unless noted)*

- EUI target 105
- 50% PV offset *(unless noted)*
- Solar orientation optimal
- No clean power purchase

- Landscape *(unless noted)*:
  - 62,810 sf low
  - 14,656 sf med
  - 27,218 sf high



RENEWABLE ENERGY



Total area of all three arrays = 35,500 SF

Total production of all three arrays = 245 kW

Total power output from all three arrays will generate 12.7 kBtu/SF/yr

LANDSCAPE

SODDED LAWN PLANTING	60,339 SF
LOW INTENSITY VEGETATION	62,834 SF
MEDIUM INTENSITY VEGETATION	14,510 SF
HIGH INTENSITY VEGETATION	27,340 SF

KEY FACTORS

EMBODIED CARBON

- Responsibly Sourced Timber

OPERATIONAL CARBON

- EUI Target
- Onsite Solar PV Array(s)

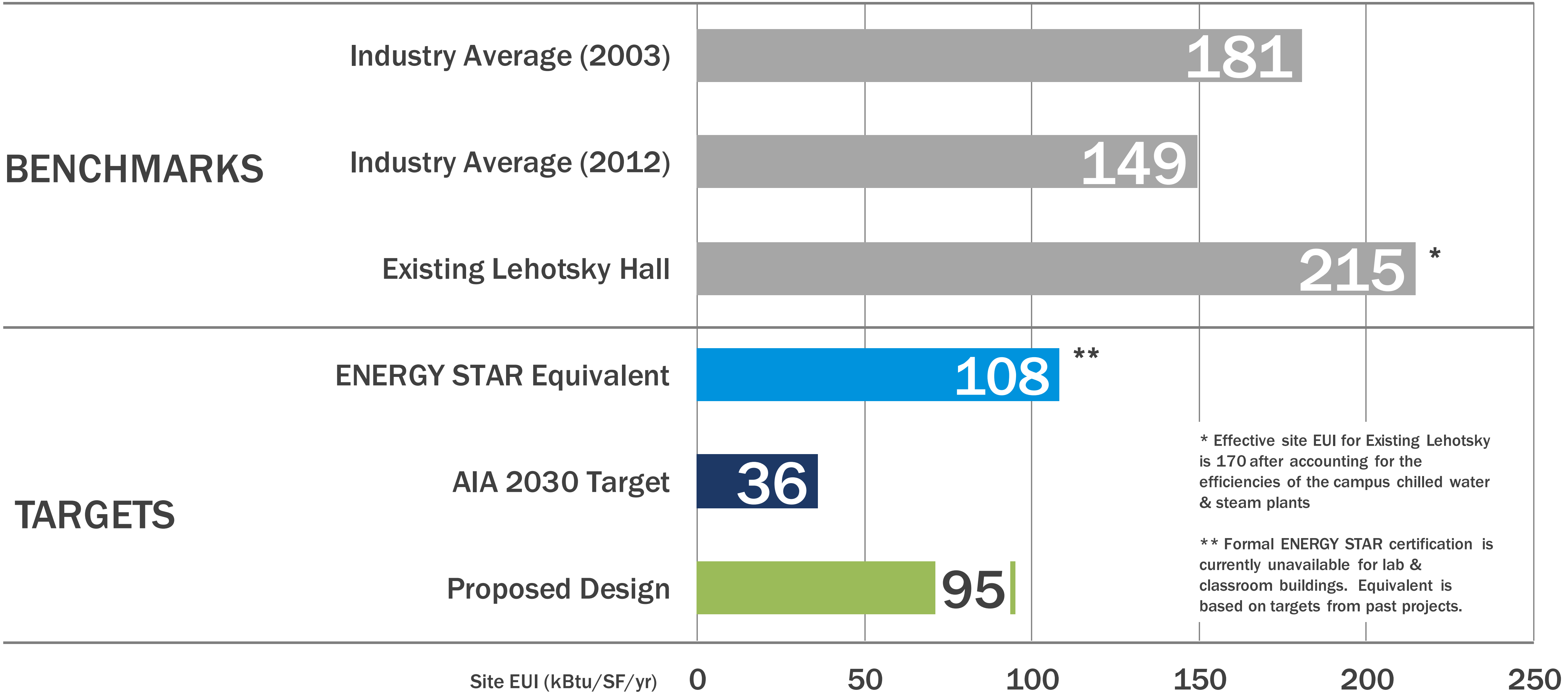
SEQUESTERED CARBON

- Moderate Sequestration Planted Area
- High Sequestration Planted Area

NEXT STEPS

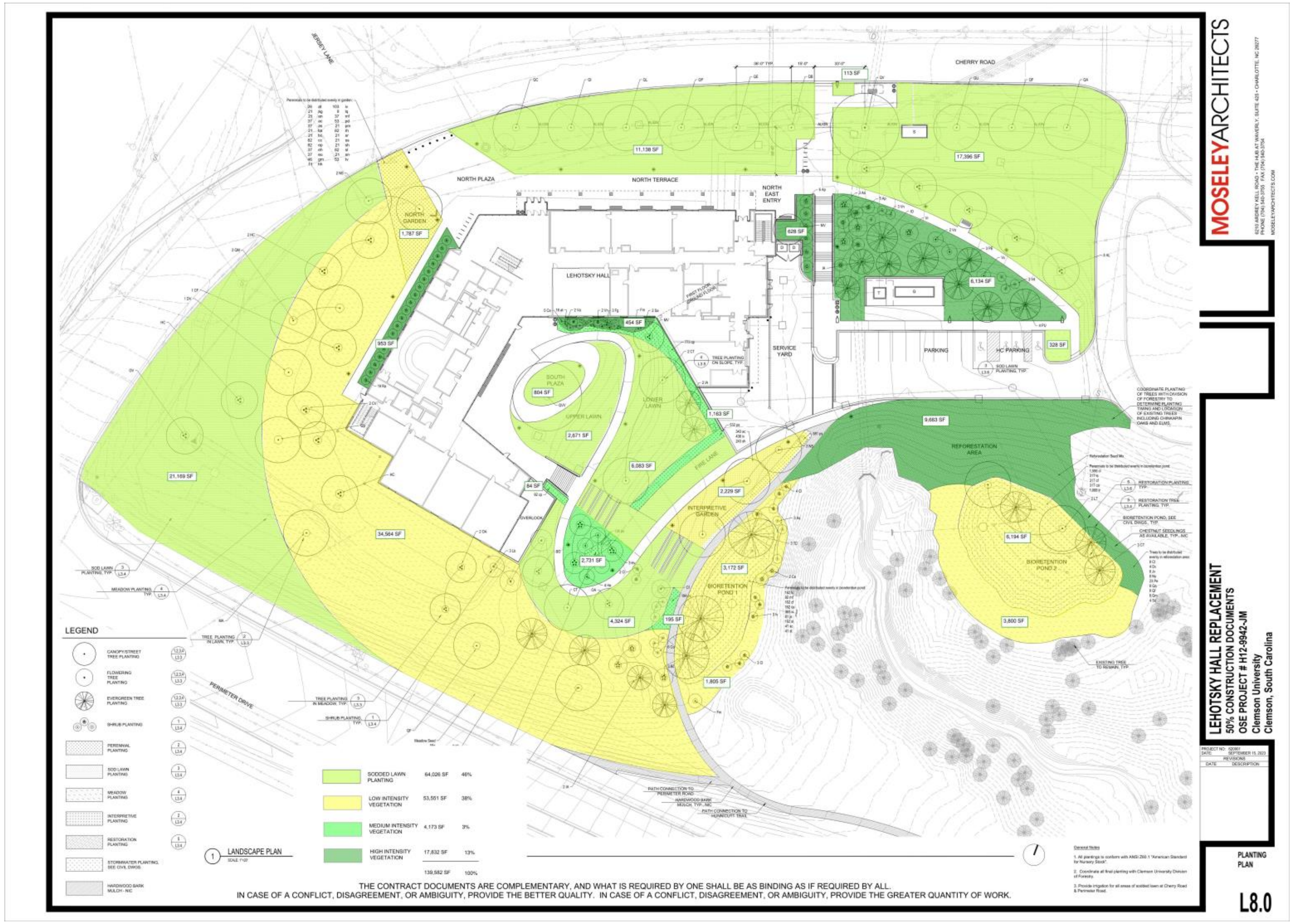
- Identify, layer, and refine preferred strategies to meet goals
- Update calculations with more sophisticated tools

WHAT NOW? (operational carbon)

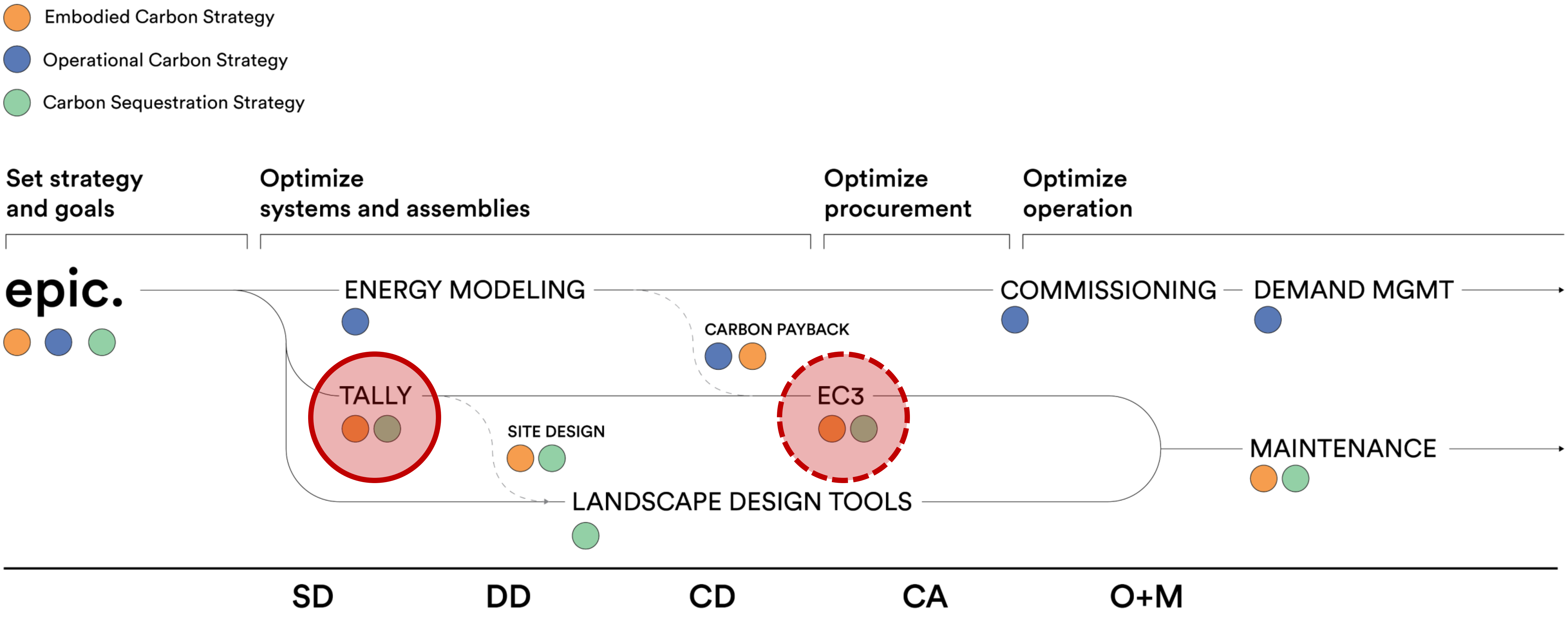


WHAT NOW? (sequestration)

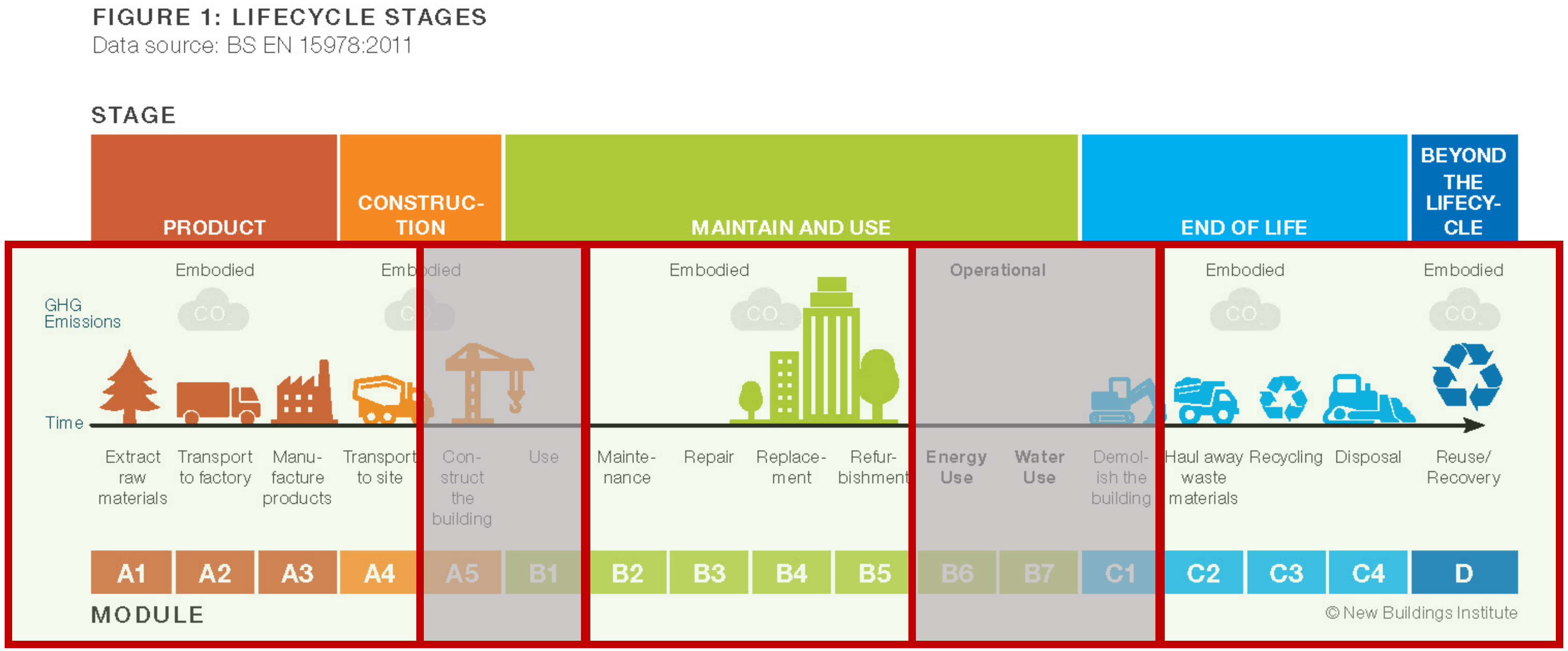
	SODDED LAWN PLANTING	64,026 SF
	LOW INTENSITY VEGETATION	53,551 SF
	MEDIUM INTENSITY VEGETATION	4,173 SF
	HIGH INTENSITY VEGETATION	17,832 SF
		139,582 SF



WHAT NOW?


Embodied Carbon Strategy
Operational Carbon Strategy
Carbon Sequestration Strategy
Set strategy and goals
Optimize systems and assemblies
Optimize procurement
Optimize operation
epic.
ENERGY MODELING
COMMISSIONING
DEMAND MGMT
CARBON PAYBACK
TALLY
SITE DESIGN
EC3
MAINTENANCE
LANDSCAPE DESIGN TOOLS
SD
DD
CD
CA
O+M

LCA PHASES INCLUDED (TALLY)



Embodied Carbon: the greenhouse gas (GHG) emissions associated with the manufacturing, transportation, installation, maintenance, and disposal of construction materials

Calculated as global warming potential (GWP) and expressed in carbon dioxide equivalent units (CO2e).

LCA COMPONENTS INCLUDED

EPIC

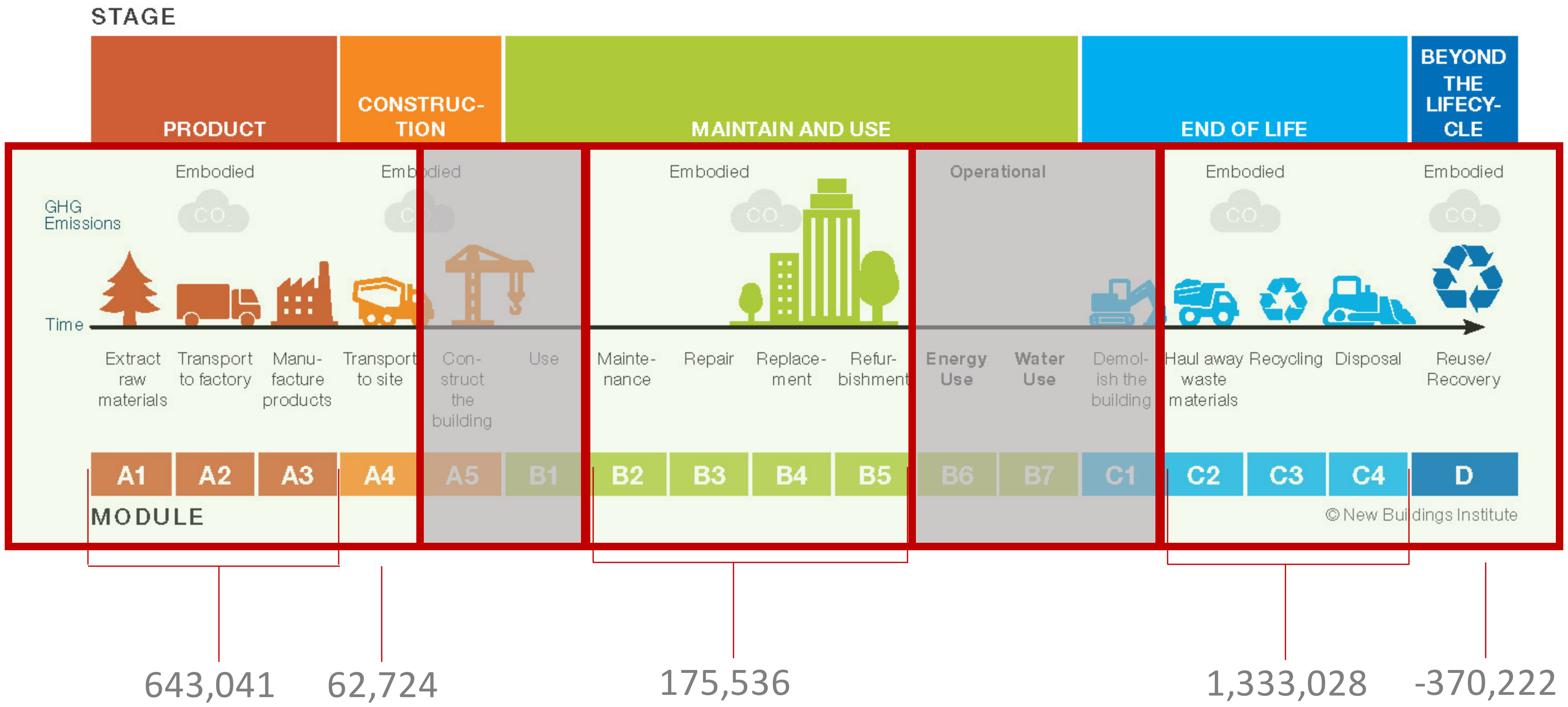
- Structure and Foundations
- Envelope (Cladding, Glazing, Roofing)
- Interior Fitout
- Building Systems (MEP and PV)
- Site and Landscaping
- Refrigerants

Tally

- Substructure
- Superstructure
- Enclosure
- Interiors

DESIGN CASE EMISSIONS (TALLY PRELIMINARY)

FIGURE 1: LIFECYCLE STAGES
Data source: BS EN 15978:2011



TOTAL: 1,844,150 kgCO2e

LARGEST CONTRIBUTORS

>100,000 kgCO2e

Substructure

- Cast-in-place concrete (custom mix)

Superstructure

- Cast-in-place concrete (custom mix)
- Steel, W section (wide flange shape)

Envelope

- Brick
- Cast-in-place concrete (structural concrete, 4000 psi)
- Curtainwall system (including glazing)

Interiors

- Wall board, gypsum

EMBODIED CARBON BENCHMARKS

Material	Tally kgCo2e [total]	EC3 spec range [kgCO2e/unit]	Other notes
Cast-in-place concrete, custom mix	682,956.53	183.80-315.40/yd3	CLF baseline: 309 kgCO2e/m3
Curtainwall System (including glazing)	260,296.98		
Cast-in-place concrete, structural concrete, 4000 psi	195,252.50	183.80-315.40/yd3	CLF baseline: 309 kgCO2e/m3
Wall board, gypsum	180,397.01	0.1093-0.4500/ft2	
Steel, W section (wide flange shape)	112,719.59		CLF baseline: 1,220 kgCO2e/MT
Brick	111,954.93		
Steel, C-stud metal framing	58,148.28		
Aluminum faced composite wall panel (ACM)	48,881.49		
Polyisocyanurate (PIR), board	43,296.33	0.1708-0.2668/ft2	
Mineral wool, board, generic	41,822.64	0.2881-0.5951/ft2	
Aluminum mullion system	35,120.91		
Extruded polystyrene (XPS), board	33,877.15	0.9112 – 1.452/ft2	
TPO roofing membrane	27,479.32		
Steel, HSS section	25,802.12		CLF baseline: 1,990 kgCO2e/MT

SPECIFICATIONS

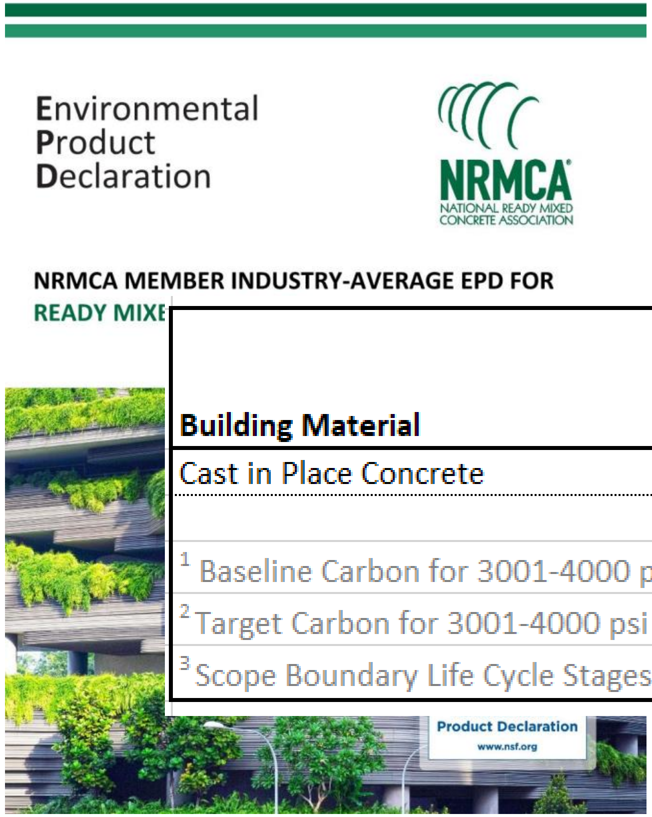


Table 8b. Summary Results (A1-A3): 3001-4000 psi (20.7-27.6 MPa) RMC product mix design, per cubic yard

		Minimum	Maximum	3001-4000-00-FA/SL	3001-4000-20-FA	3001-4000-30-FA	3001-4000-40-FA	3001-4000-30-SL	3001-4000-40-SL	3001-4000-50-SL	3001-4000-50-FA/SL
Core Mandatory Impact Indicator											
GWP	kg CO2e	182.50	293.28	293.28	251.66	229.14	205.47	227.48	205.64	183.74	182.50
ODP	kg CFC11e	5.32E-06	7.76E-06	7.35E-06	6.39E-06	5.87E-06	5.32E-06	7.60E-06	7.68E-06	7.76E-06	6.65E-06
AP	kg SO2e	0.68	0.90	0.88	0.79	0.74	0.68	0.89	0.89	0.90	0.80
EP	kg Ne	0.25	0.36	0.36	0.31	0.28	0.26	0.30	0.28	0.26	0.25
SFP	kg O3e	15.10	19.30	18.93	17.11	16.13	15.10	19.15	19.22	19.30	17.35
ADPf	MJ, NCV	455.23	509.67	509.67	483.28	468.67	455.23	489.53	484.71	478.75	464.29
CRU	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MR	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MER	kg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EE	MJ, NCV	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3001-4000 psi (20.69-27.58 MPa)	0-19% Fly Ash and/or Slag	4000-00-FA/SL
	20-29% Fly Ash	4000-20-FA
	30-39% Fly Ash	4000-30-FA
	40-49% Fly Ash	4000-40-FA
	30-39% Slag	4000-30-SL
	40-49% Slag	4000-40-SL
	≥ 50% Slag	4000-50-SL
	≥ 20% Fly Ash and ≥ 30% Slag	4000-50-FA/SL

Building Material	Total Volume [yd3]	Baseline Carbon [kgCO2e/yd3]	Target Carbon [kgCO2e/yd3]	Baseline Building Budget [kgCO2e]	Target Building Budget [kgCO2e]	% Reduction
Cast in Place Concrete	2,073.45	293.28	205.64	608,101.14	426,384.06	30%

[1] Baseline Carbon for 3001-4000 psi 0-19% Fly Ash and or Slag (4000-00-FA/SL)

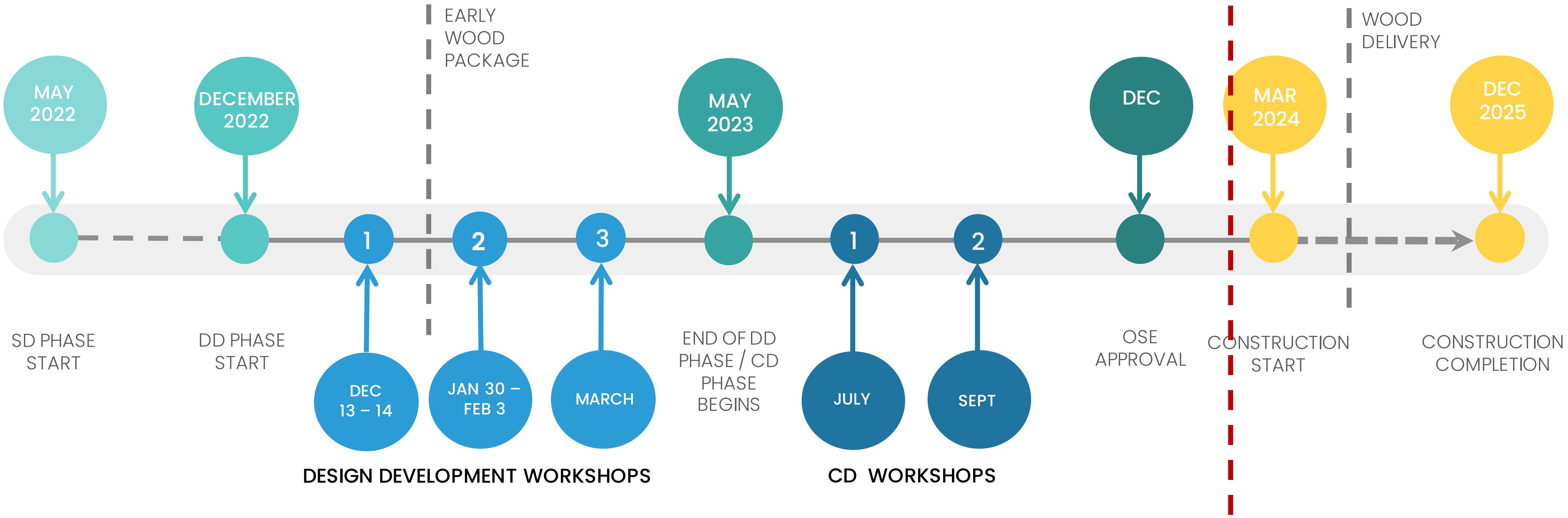
[2] Target Carbon for 3001-4000 psi 40-49 Fly Ash (4000-40-FA)

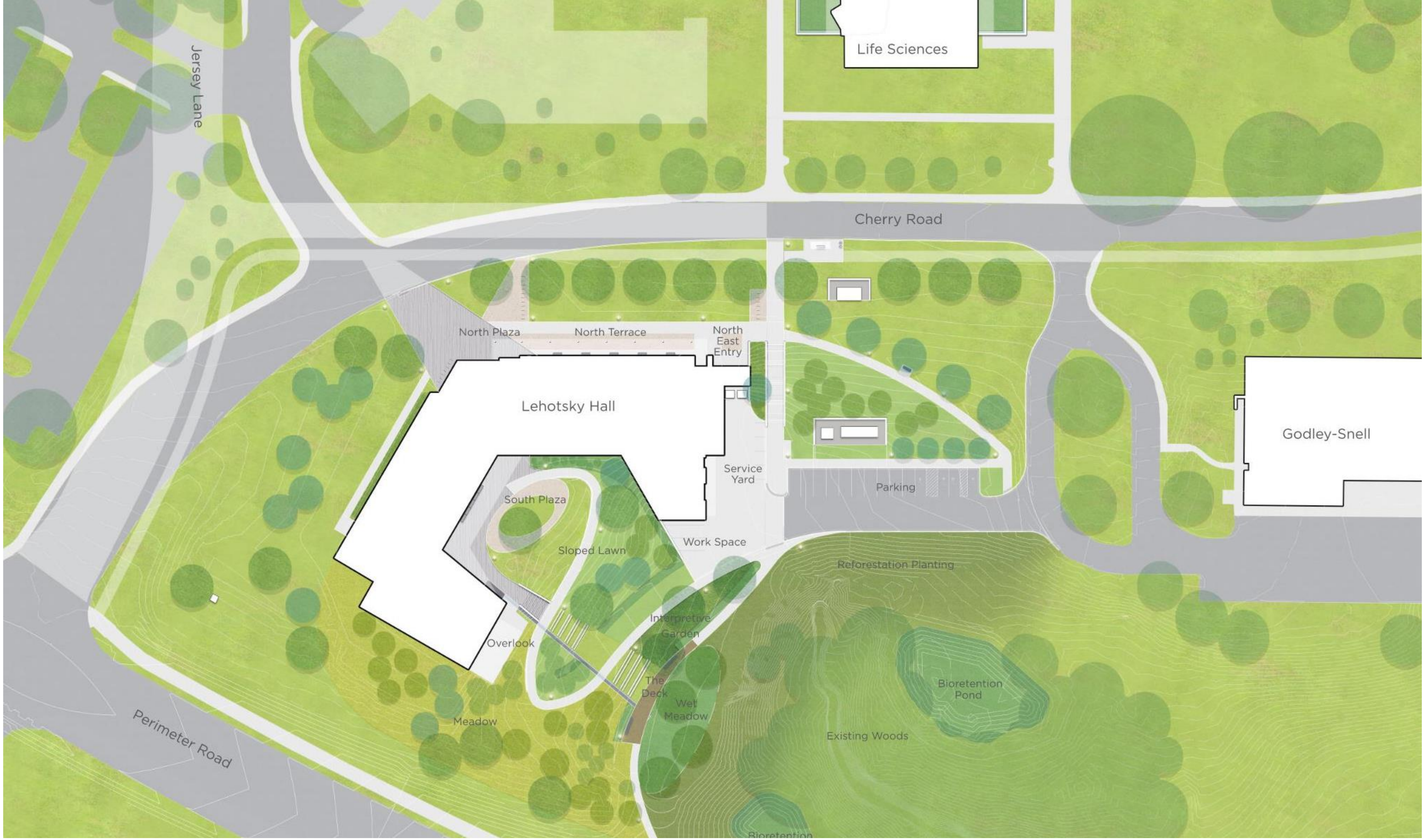
[3] Scope Boundary Life Cycle Stages A1-A3

CONCRETE MIXTURES

Supply concrete mixtures such that the Global Warming Potential (GWP) of all concrete on the project is less than or equal to 426,384 kgCO2e.

SCHEDULE OVERVIEW





Jersey Lane
Life Sciences
Cherry Road
North Plaza
North Terrace
North
East
Entry
Lehotsky Hall
Godley-Snell
Service
Yard
Parking
South Plaza
Sloped Lawn
Work Space
Reforestation Planting
Interpretive
Garden
Overlook
The
Deck
Wet
Meadow
Bioretention
Pond
Meadow
Existing Woods
Perimeter Road
Bioretention

LESSONS LEARNED

THIS IS INTERESTING

- Presented this information 4x to stakeholder groups
- Every audience was very engaged and looking for ways they could contribute to success

INCLUDE VISUALS

- The schematic building model, with renewables shown alongside their production capacity was valuable in comparing to EPIC sce narios
- The schematic landscape plan, with planting intensities, was valuable in discussing sequestration potential with other landsc ape goals

EMPHASIZE EMBODIED CARBON IN YEAR 1 (WHILE SHARING YEAR 30, TOO)

- Only sharing data from year 30 does not create the urgency to keep carbon out of the atmosphere today
- Only sharing data from year 1 would not create the urgency needed to prioritize sequestration, operational efficiencies, or r enewables

DON'T BE SHY

- Build any number of scenarios – you might be surprised what you learn
- A full presentation isn't necessary for this tool to be a useful conversation starter
- Keep following up with model and with teammates until you have a satisfactory design

WHAT NOW?

EPIC had a new release in May 2023:

- Expanded documentation annex (new data sources, increased data transparency)
- Direct integration with Zero Tool to set baseline EUI estimates
- Direct integration of NREL's PV Watts for solar PV energy generation estimates
- Improvement, expansion, and peer review of structural bill of materials modeling
- New features allowing users to further refine the scope of EPIC (including or excluding parts of model)
- Ability to enter custom carbon intensity data (assists with setting carbon budgets and tracking projects into later design phases)
- Streamlined user interface

Two things did not change:

- EPIC remains open access (it's free)
- EPIC will continue to maintain data privacy


Q & A?

#edspaces

Thank You!

Please scan the QR code to provide session feedback.

SCAN ME