

V-2 Preliminary LEED Scorecard, Forms and Energy Model



Table with columns for category (e.g., Integrative Process, Location and Transportation, Sustainable Sites, Water Efficiency, Energy and Atmosphere, Materials and Resources, Indoor Environmental Quality, Innovation, Regional Priority), status (Y, N, ?), and score. Includes sub-totals and a final LEED v4 for BD+C score of 110.

Illinois Department of Transportation - Construct Materials Lab

Bridging Documents – Final Report
CDB Project Number - 630-442-057

LEED v4/v4.1 NC
LEED Product Data Submittal Form

Project Name:	
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Fill out the following information for EACH compliant product:

Subcontractor	
Product Name	
Manufacturer	
Manufacturer Location	
Extraction/Harvest Location	
Materials Cost (all costs associated with material and getting material to site. Exclude installation costs.)	

MR BPDO Environmental Product Declaration (EPDs):	
EPD Type: None	Document Provided? <input type="checkbox"/>

IEQ Low Emitting Materials:				
Product (select and enter name below). <input type="checkbox"/> Paint and Coating <input type="checkbox"/> Adhesive and Sealant	Interior/ Exterior?	Wet-Applied on-site (y/n)?	VOC Content (g/L)	General Emissions Evaluation provided?
	Choose an item.	Choose an item.		Choose an item.
Wet-Applied Product Volume Used (L)				

Flooring Product (Enter Name)	General Emissions Evaluation Provided (y/n)
Ceilings (Enter Name)	General Emissions Evaluation Provided (y/n)
Insulation (Enter Name)	General Emissions Evaluation Provided (y/n)

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LEED v4/v4.1 NC
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Wall Panels (Enter Name)	General Emissions Evaluation Provided (y/n)
Composite Wood (Enter Name)	Composite Wood Evaluation Provided (y/n)
Furniture (Enter Name)	Furniture Evaluation Provided (y/n)



By submitting this cover sheet, the submitting party attests that the material information provided is accurate and represents the material qualifications required per the applicable LEED rating system.

Any changes or alternatives must first be approved by the project architect.

Signature: _____ Date: _____

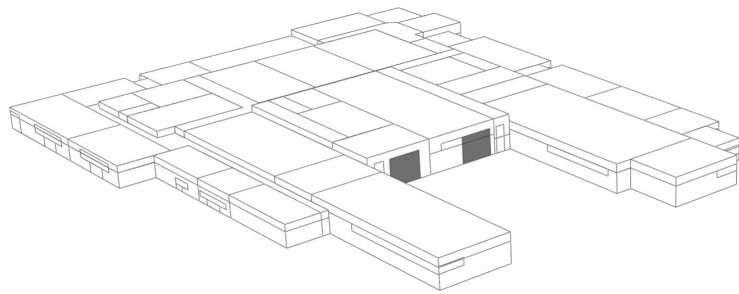
Preliminary Energy Model | Hanley Materials Lab

Context

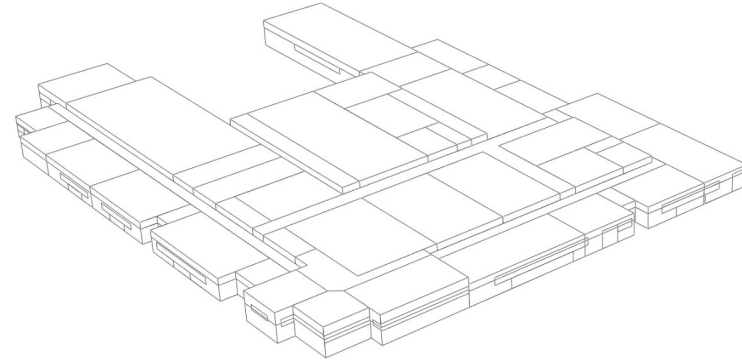
The model was developed based on available preliminary drawings and design specifications. It should serve as a preliminary high level evaluation of the building performance and assessment of LEED points. The final model could be different based on the actual design details.

Location: Springfield, IL **Climate Zone:** 5a-Cold And Humid, Heating Dominant, Hot Summer
Area: 75,986 Conditioned Floor Area (CFA) **Electricity Cost:** \$0.0965/kWh
Program: Mixed Use, Multifamily **Gas Cost:** \$0.91/Therm
LEED: **11-16 Optimize Energy Performance Points**

South East Perspective



North West Perspective

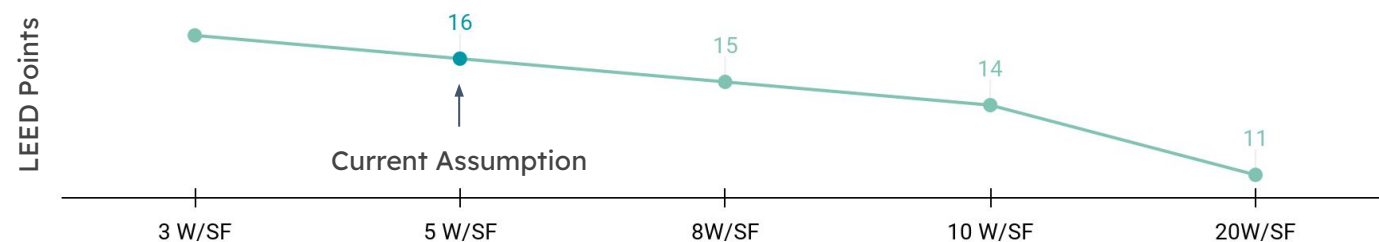


Executive Summary

Description	Unit	Baseline (LEED V4.0)	Proposed
Annual Site Energy Summary			
Electricity	kWh	2,236,418	1,468,005
Natural Gas	Therms	117,341	46,729
Total Site Energy Use	kBtu/sf-year	254.8	127.4
Site Energy Use Savings			50%
Annual Energy Cost Summary			
Electricity	\$/year	215,814	141,662
Natural Gas	\$/year	106,780	42,523
Total Energy Cost	\$/year	322,594	184,186
Site Energy Cost Savings			43%
Annual Carbon Emission Summary			
Electricity	Metric Tons/year	1,005	660
Natural Gas	Metric Tons/year	623	248
Total Carbon Emissions	Metric Tons/year	1,628	908
Carbon Emission Reductions			44%

Process Loads

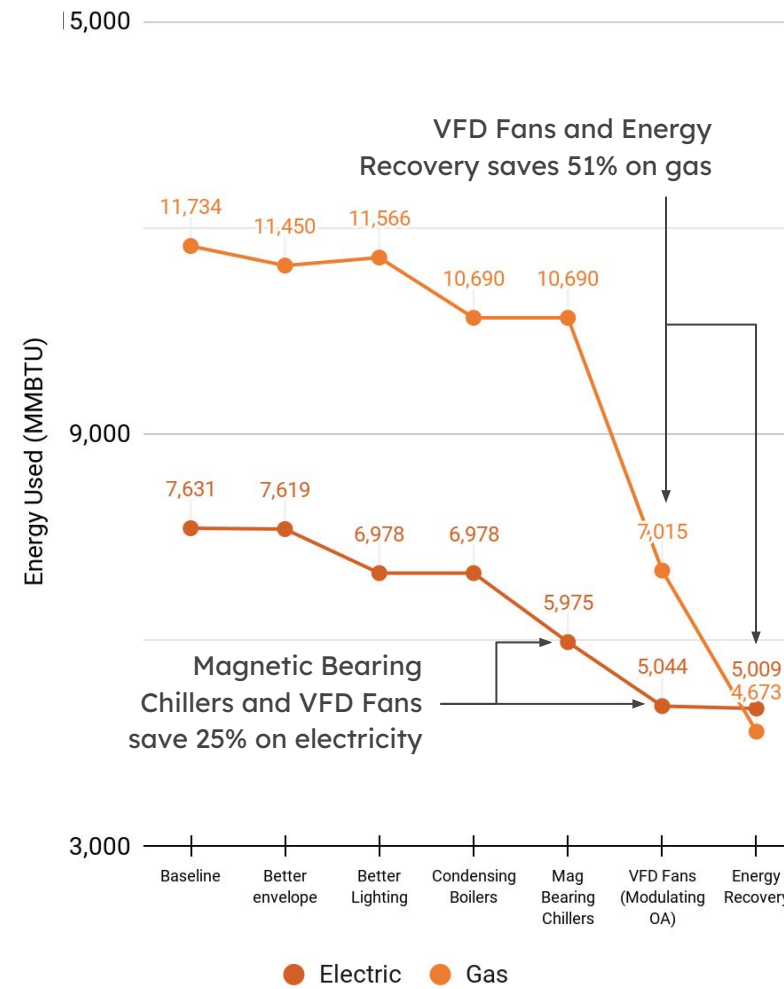
Process load is a major model variable that influences project performance + level of cost savings for LEED points. Frequency and duration of use also play a role. This analysis assumes VFD and energy recovery are implemented.



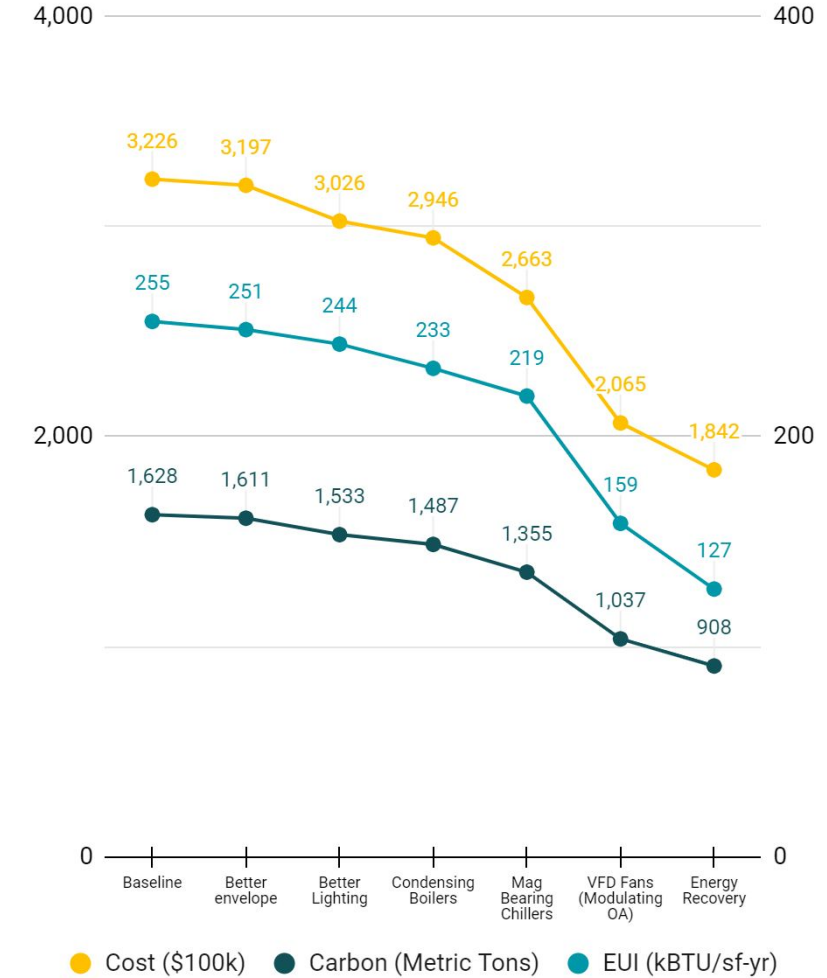
Energy Conservation Measures

These charts demonstrate the relative impact of various energy conservation measures. The cumulative benefits take the project from the LEED V4.0 baseline to the proposed design.

Impact of ECM on Electricity and Gas Usage

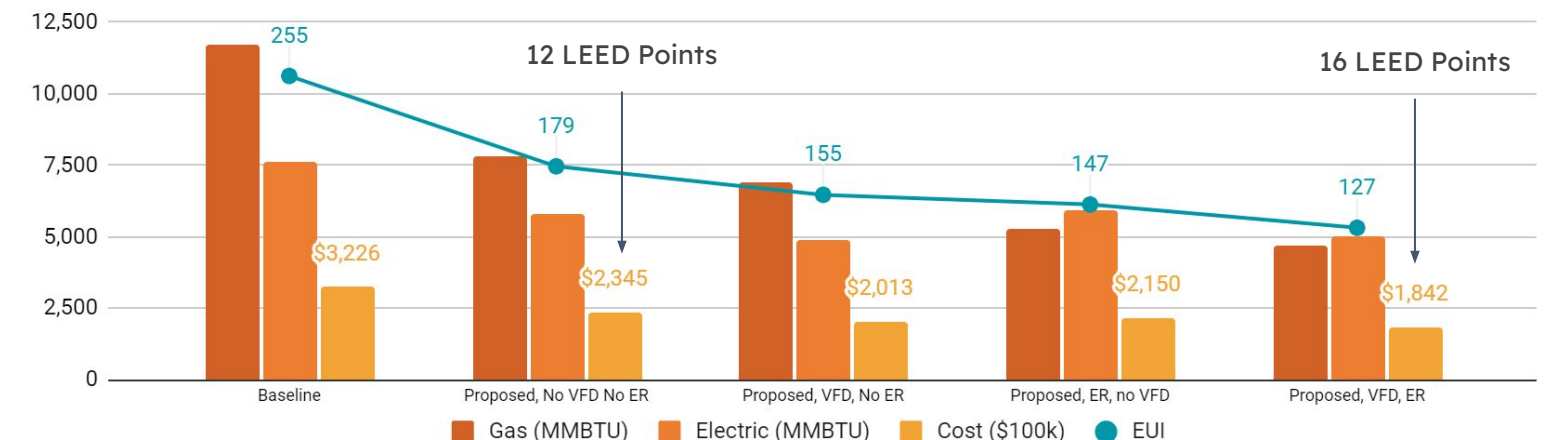


Impact of ECM on Cost, Carbon, and EUI



Sensitivity Study

Since VFD and Energy Recovery (ER) have such significant impacts on energy usage, carbon emissions, and cost, we examined ramifications of various possible combinations of their inclusion and exclusion here.



		Proposed (Design)	Baseline (LEED v4)	Notes	Impact
Summary	Energy Use Intensity (EUI) kBtu/SF-year	127.4	254.8	50.00% Energy Savings	NA
	Electricity Consumption kWh	1,468,005	2,236,418	34.36% Electricity Savings	NA
	Gas Consumption Therms	46,729	117,341	60.18% Gas Savings	NA
	Electricity Cost \$ @0.0965/kWh	141,662	215,814	34.36% Electricity Cost Savings	NA
	Gas Cost \$ @ 0.91/Therm	42,523	106,780	60.18% Gas Cost Savings	NA
	Total Cost \$	184,186	322,594	42.91% Energy Cost Savings, equivalent to 16 Energy Performance Points	NA
	Electricity CO2e Metric Tons @ 131.71kg/MBtu	660	1,005	34.36% Less Carbon Emissions From Electricity	NA
	Gas CO2e Metric Tons @ 53.11 kg/MBtu	248	623	60.18% Less Carbon Emissions From Gas	NA
	Total CO2e Metric Tons	908	1,628	44.23% Overall Less Carbon Emissions	NA
Why the savings?	1	Proposed has VFD on MAU and exhaust fans			High
	2	Proposed has run around loop energy recovery			High
	3	Proposed has lower lighting power densities			Medium
	4	Proposed has magnetic bearing chillers			Medium
	5	Proposed has better envelopes			Medium
	6	Proposed has condensing boilers			Medium
General	Location	Springfield, IL			High
	Climae Zone	5A			
	Weather	Cold and humid, heating dominant, hot summer			Medium
	Local Energy Code	IECC 2018			
	Purpose of this Study	LEED v4 Energy Performance			NA
	Energy Code Used	ASHRAE 90.1 2010			Medium
	Model Methodology	Appendix G Performance Rating Method			Medium
	Size sqft	75,986			NA
Building Usage	37,901 sqft of labs, 3,417 sqft of storage, and 34,578 sqft of office spaces			NA	
Schedule + Setpoints	Office Spaces	M-F 8-5, 70F Heating, 75F Cooling			Expected
	Lab Spaces	HVAC 24/7, 70F Heating, 75F Cooling			Expected
Envelope	Roof	R-30; U-0.032	R-20; U-0.048	Proposed Assumed; Baseline Per ASHRAE 90.1 2010	Medium
	Exterior Wall	Opaque Wall: Precast R-12; U-0.0725	R-13+R-7.5c.i.; U-0.064		Medium
	Slab on grade	R-10 at perimeter only, F-0.54	R-0; F-0.73		Low
	Glazing-Assembly	Double Pane Air filled Assembly U-0.36; SHGC-0.35	U-0.50; SHGC-0.40		Low
	Window Wall Ratio	16%	16%		Low
	Infiltration	0.03 CFM/sqft on concrete panels, 0.06 CFM/sqft on windows, 1 CFM/sqft on doors			Typical values based on construction types

Appendix

		Proposed (Design)	Baseline (LEED v4)	Notes	Impact
Lighting	Offices	0.5 W/SF	1.11 W/SF	55% lower	Medium
	Lobby	0.7 W/SF	0.9 W/SF	22% lower	Low
	Storage	0.25 W/SF	0.63 W/SF	60% lower	Low
	Corridor	0.35 W/SF	0.66 W/SF	47% lower	Low
	Labs	0.8 W/SF	1.81 W/SF	56% lower	Medium
	Exterior Lighting	Not Modeled	Not Modeled	Need site plan to estimate	Low
Receptacle and Process	Office Spaces	0.75 W/SF	0.75 W/SF	Estimated based on space usage	High
	Lab Spaces	5 W/SF	5 W/SF		
HVAC	Offices	AHU + VAV boxes, chilled water, hot water, VFD fan	System 5: Packaged VAV with Reheat, Air cooled DX @ COP 3.37, fossil fuel boiler, non condensing @ 80% efficiency	Proposed assumed; Baseline per ASHRAE 90.1 2010 AppG; https://www.usgbc.org/leedaddenda/10453	Medium
	Labs	MAU + Exhaust to meet ACH requirements, chilled water, hot water, VFD fans, run around loop recovery 40% effectiveness	System 5: Packaged VAV with Reheat, Air cooled DX @ COP 3.37, fossil fuel boiler, non condensing @ 80% efficiency for lab spaces with more than 5000CFM OA; System 3 Packaged Rooftop Air conditioner for lab spaces with less than 5000 CFM OA		High
	Chiller	Mag Bearing Chiller COP 5.5	NA		Medium
	Boiler	Condensing boilers @ 95% efficiency	Non-condensing, 80% efficiency		Medium
	Cooling Tower	VFD Fan	NA		Medium
Renewable	PV Panel	NA	NA	NA	NA
	Efficiency				
	Number of panels				
	DC Size kW				
	Annual Generation kWh				
CO2e Offset Metric Tons					
Domestic Hot Water	Usage	2 Gallon/Person-day	2.5 Gallon/Person-day	Proposed is assumed to have low flow fixtures	Low
	Water Heater	Electric Resistance Water Heater @ 97% efficiency	Electric Resistance Water Heater @ 97% efficiency	Proposed assumed; Baseline per ASHRAE 90.1 2010 AppG	Low