

Midwest: Re-Established

SOLAR DECATHLON DESIGN CHALLENGE

Ball State University
Urban Single-Family Residence

by

Michael Timberlake, Jeffrey Miller, Kurt Green, Brittany
Williams, Aaron Strayer, Ethan Talbot, & Nick Wesley

TEAM MEMBERS

Ball State University College of Architecture



Michael Timberlake, Team Leader
Energy Modeling, Engineering,
Life-Cycle Assessment



Aaron Strayer
BIM Operations,
Architecture



Kurt Green
Project Introduction, Market Energy Modeling, Energy Performance,
Potential, Presentation Comfort and Environmental Quality



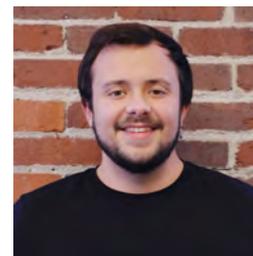
Brittany Williams



Jeff Miller
Financial Feasibility



Nick Wesley
Energy Modeling
Assistant, Resilience



Ethan Talbot
Innovation

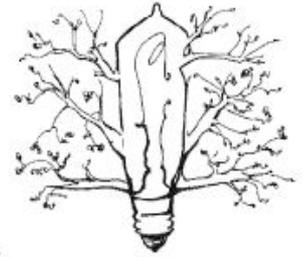
COMMUNITY PARTNERS



Michael Timberlake



Solutions by Design Since 1937



JEFFERSON ELECTRIC

ENGLEWOOD CDC

Project client



Kurt Green



Englewood Community Development Corporation (ECDC) staff

ENGLEWOOD VILLAGE

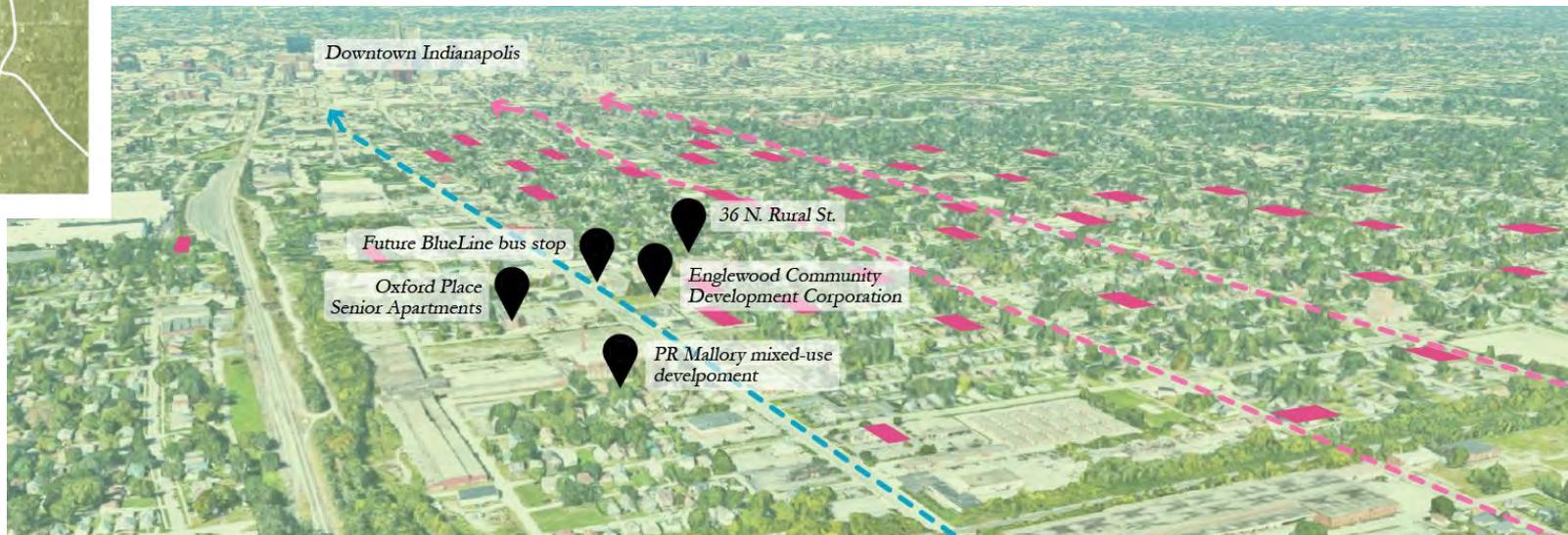
Neighborhood near downtown Indianapolis affected by decades of disinvestment and decay



Kurt Green



Indianapolis, Indiana



- - - - - Bike lane

- - - - - Future bus rapid transit

City-owned vacant house

ENGLEWOOD CDC

Reinvestment in Englewood Village



Kurt Green



ECDC Community Garden

ENGLEWOOD CDC

Reinvestment in Englewood Village



Kurt Green



ECDC Rooftop Hockey



ECDC Rooftop PV Modules

PROJECT SITE

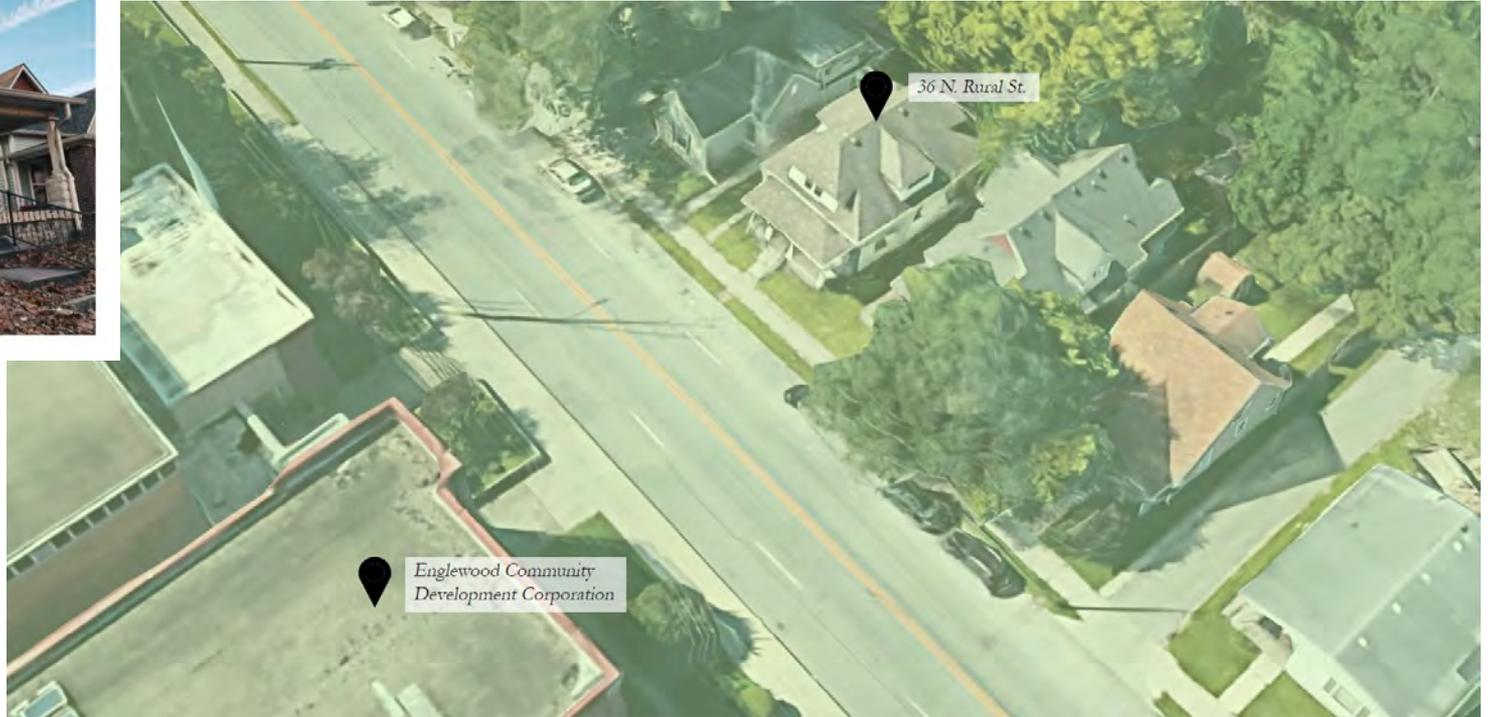
36 N Rural St. is one of forty vacant houses in Englewood



Kurt Green



Project Site: 36 N. Rural St.

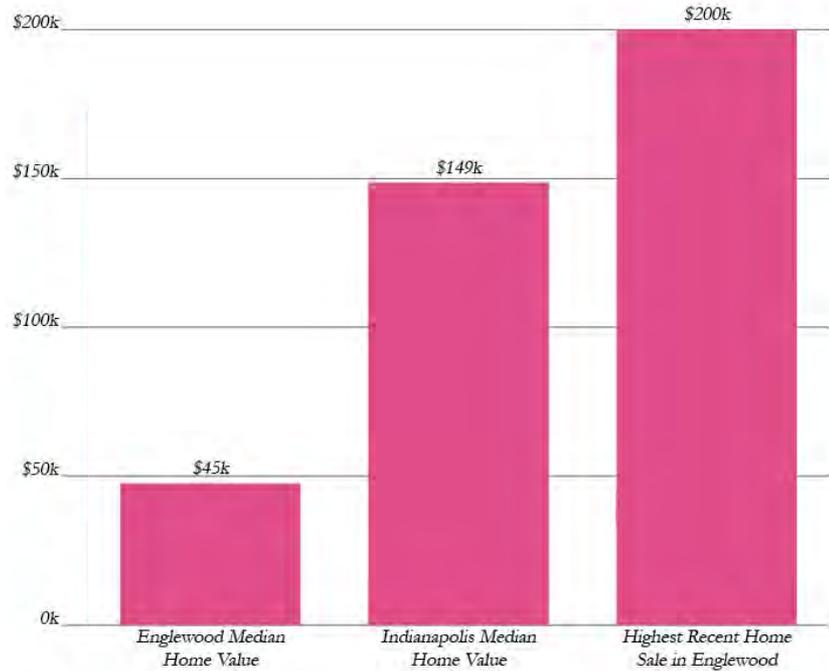


MARKET POTENTIAL

Significantly lower home value in Englewood than broader Indianapolis but on the upswing



Kurt Green

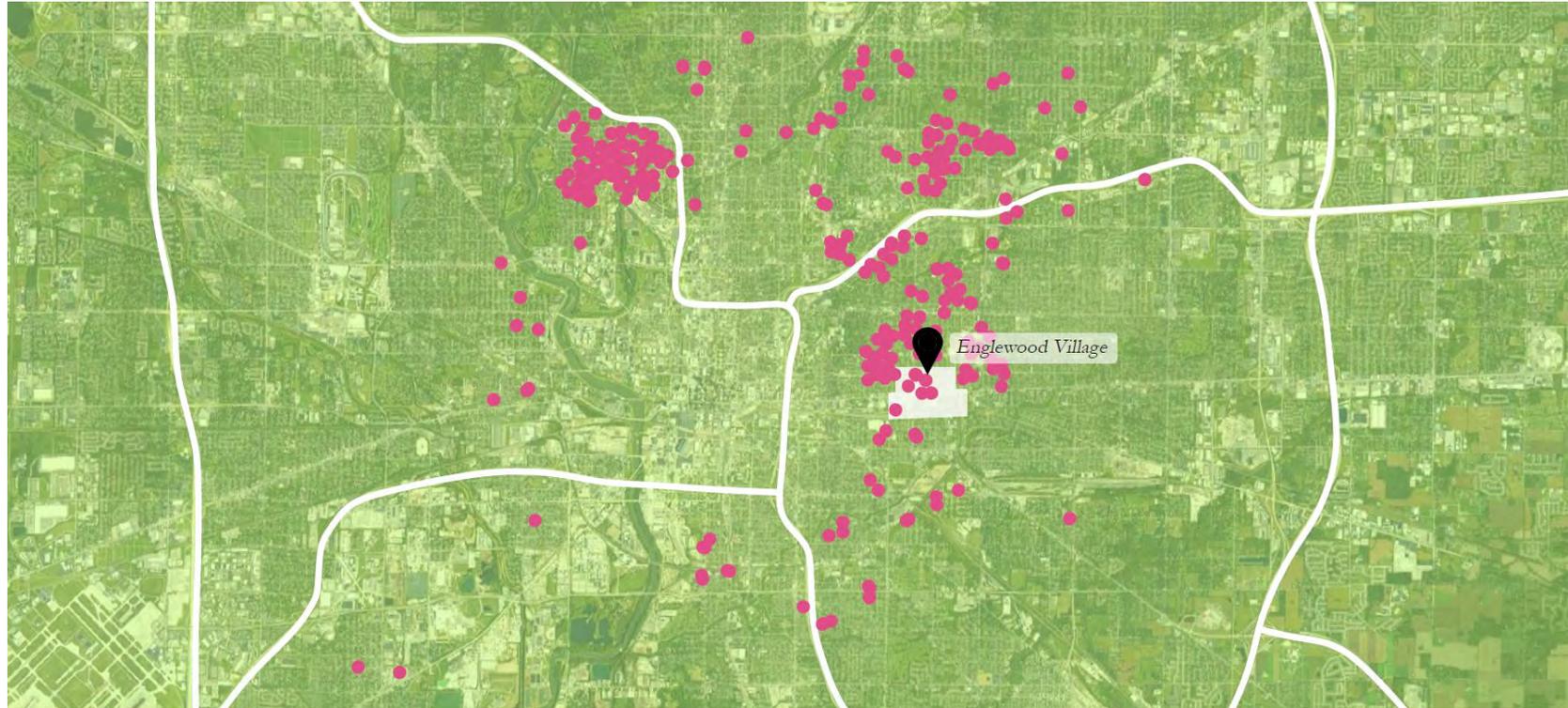


PROJECT SITE

36 N Rural St. is one of 14,000 (estimated) vacant houses in Indianapolis



Kurt Green



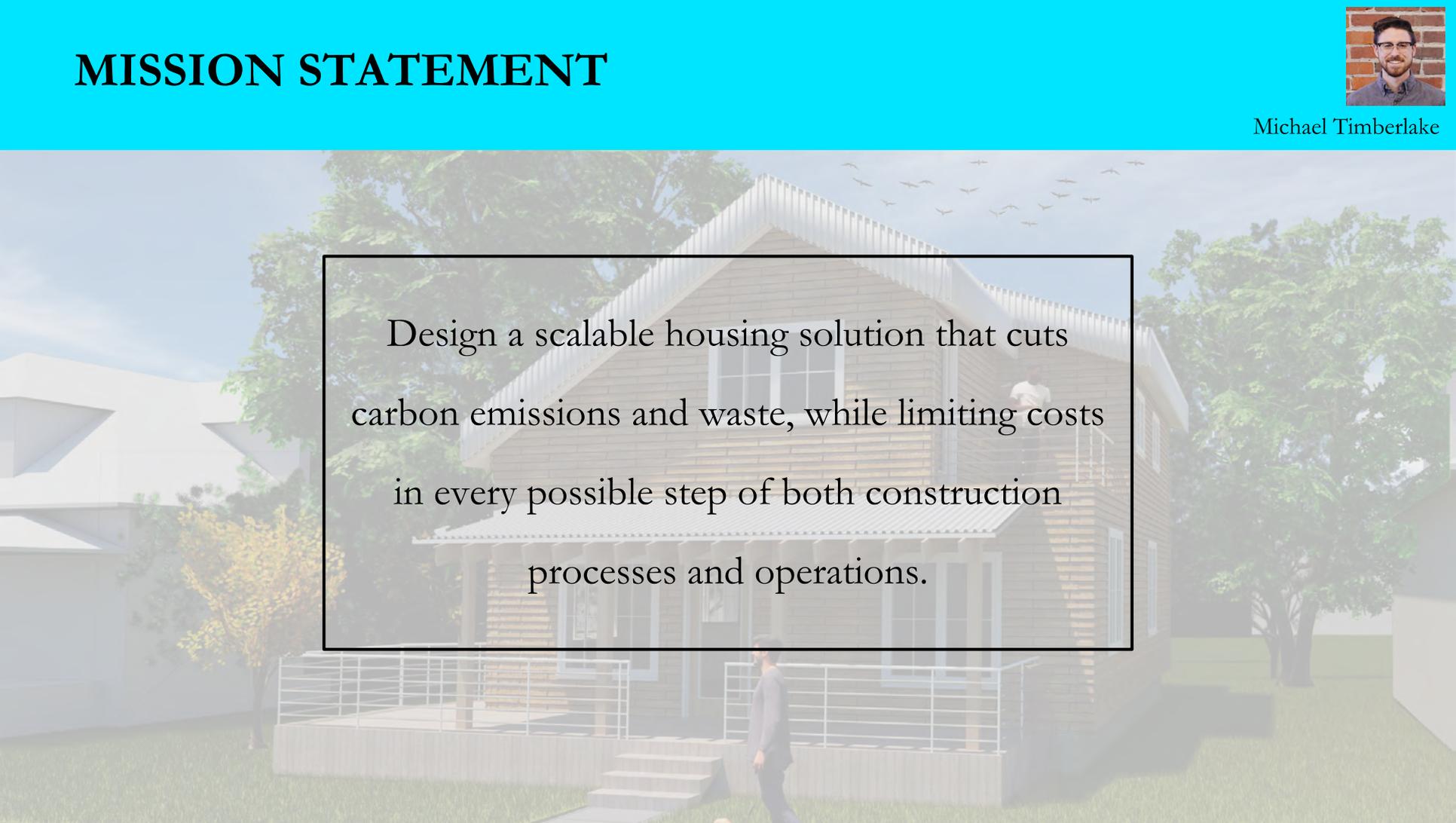
House Vacancy Throughout Indianapolis

● City-owned vacant house

MISSION STATEMENT



Michael Timberlake

A large architectural rendering of a modern, two-story house with a gabled roof and a porch. The house is surrounded by greenery and trees. A person is walking on the porch, and another person is standing on the lawn. The sky is blue with birds flying. The rendering is overlaid with a semi-transparent white box containing the mission statement text.

Design a scalable housing solution that cuts carbon emissions and waste, while limiting costs in every possible step of both construction processes and operations.

SCALABLE SOLUTIONS

Investing in urban fabric recovery



Michael Timberlake

Global Warming Potential Captured in Vacant Houses			
	36 N Rural St.	Englewood vacant houses	Indianapolis vacant houses
Embodied Carbon (tons CO2 eq.)	31.3	720	252,000

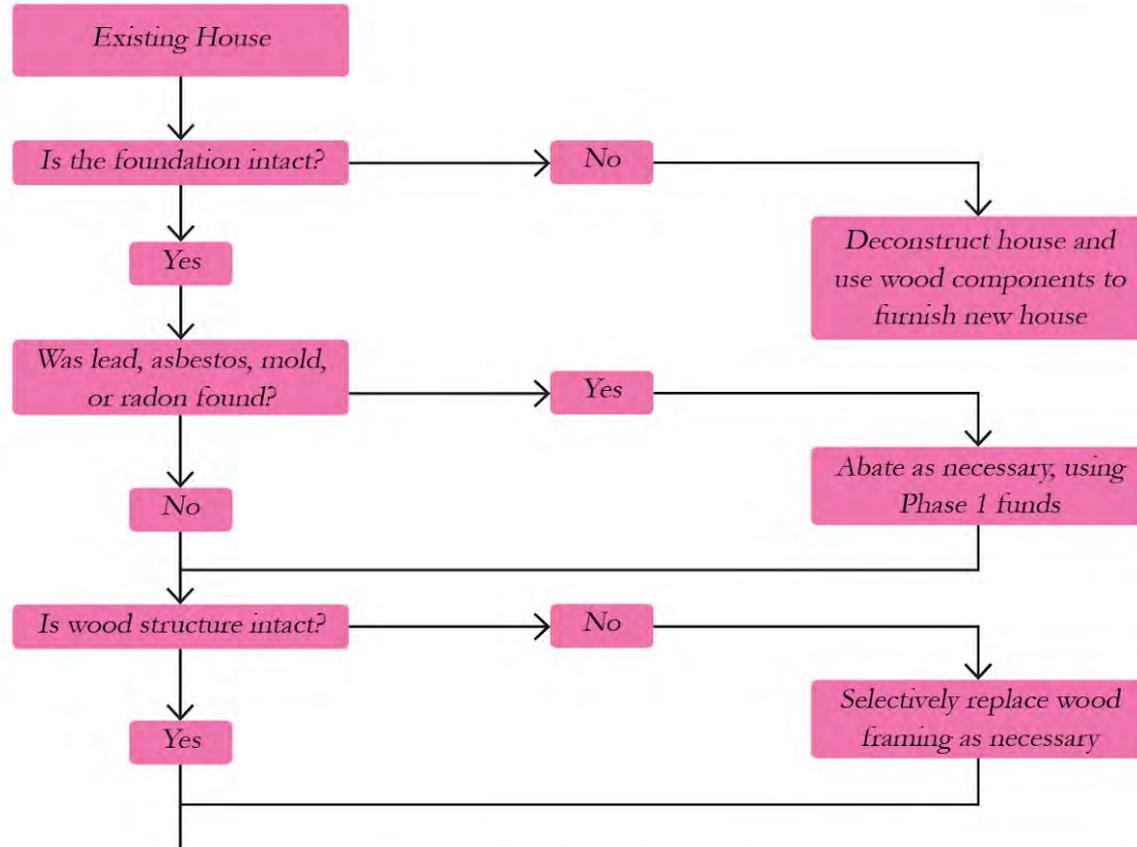


SCALABLE SOLUTIONS

Criteria for renovating vacant housing stock



Michael Timberlake

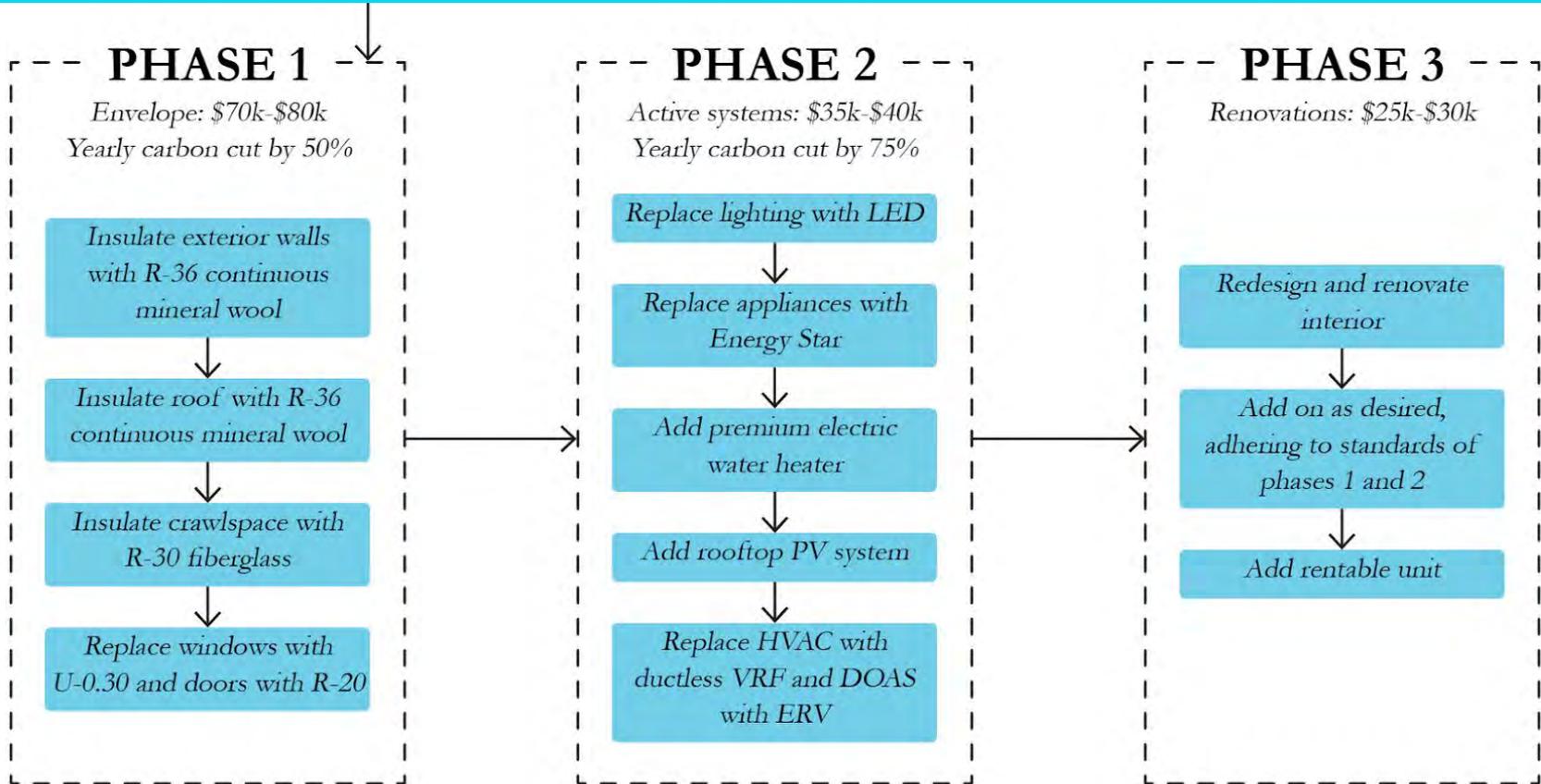


SCALABLE IMPACTS

Phased approach to renovating vacant Indianapolis houses



Michael Timberlake

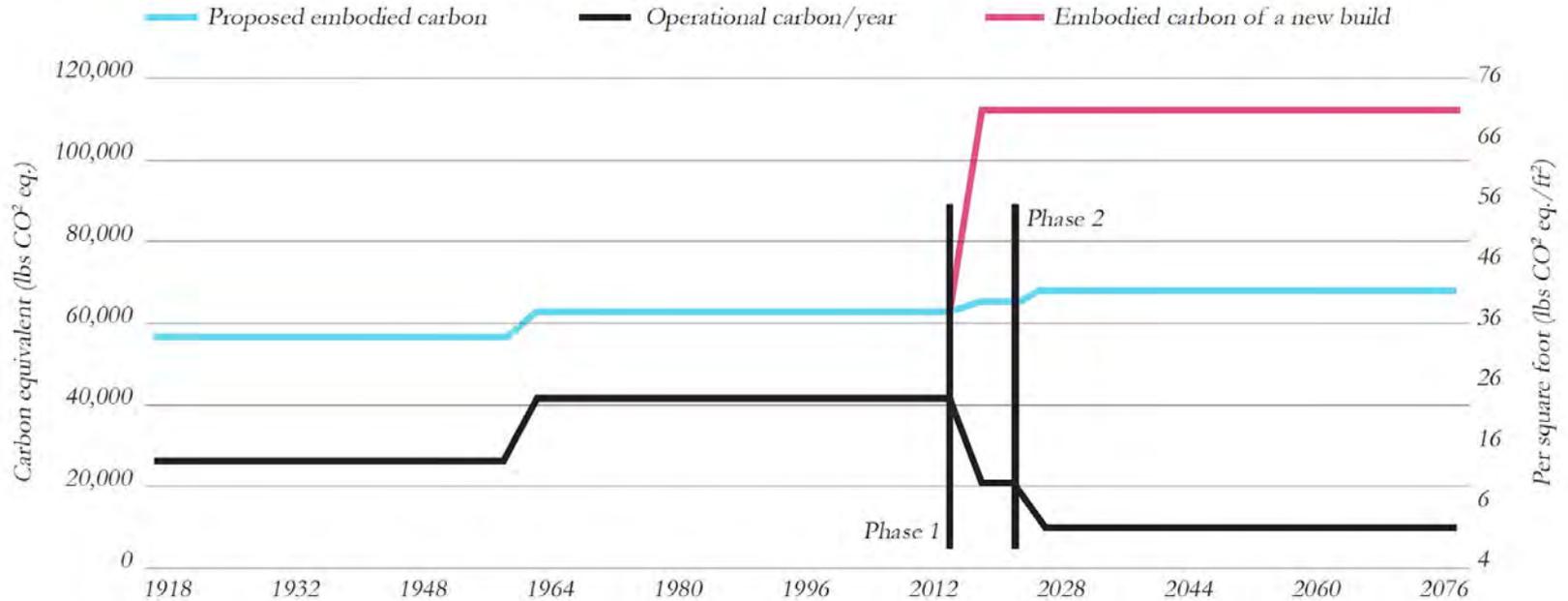


SCALABLE IMPACTS

Consequences of renovating 36 N Rural St. to net-zero



Michael Timberlake



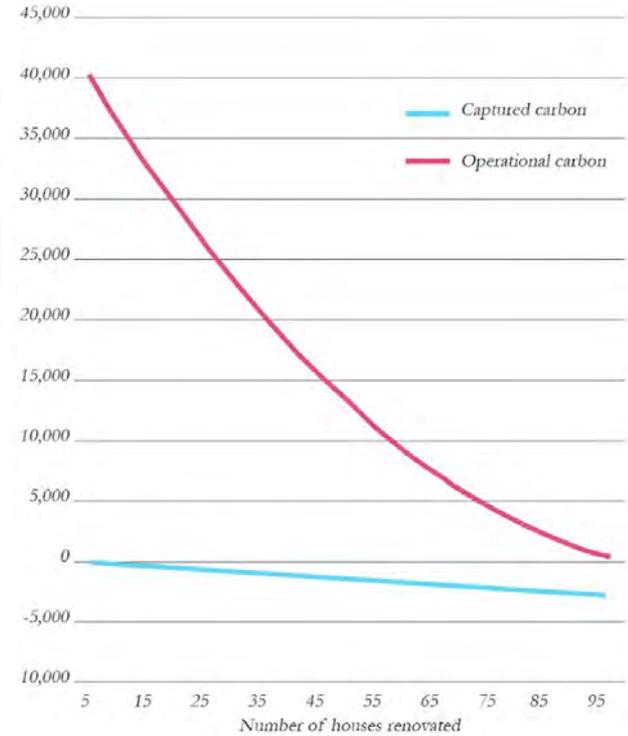
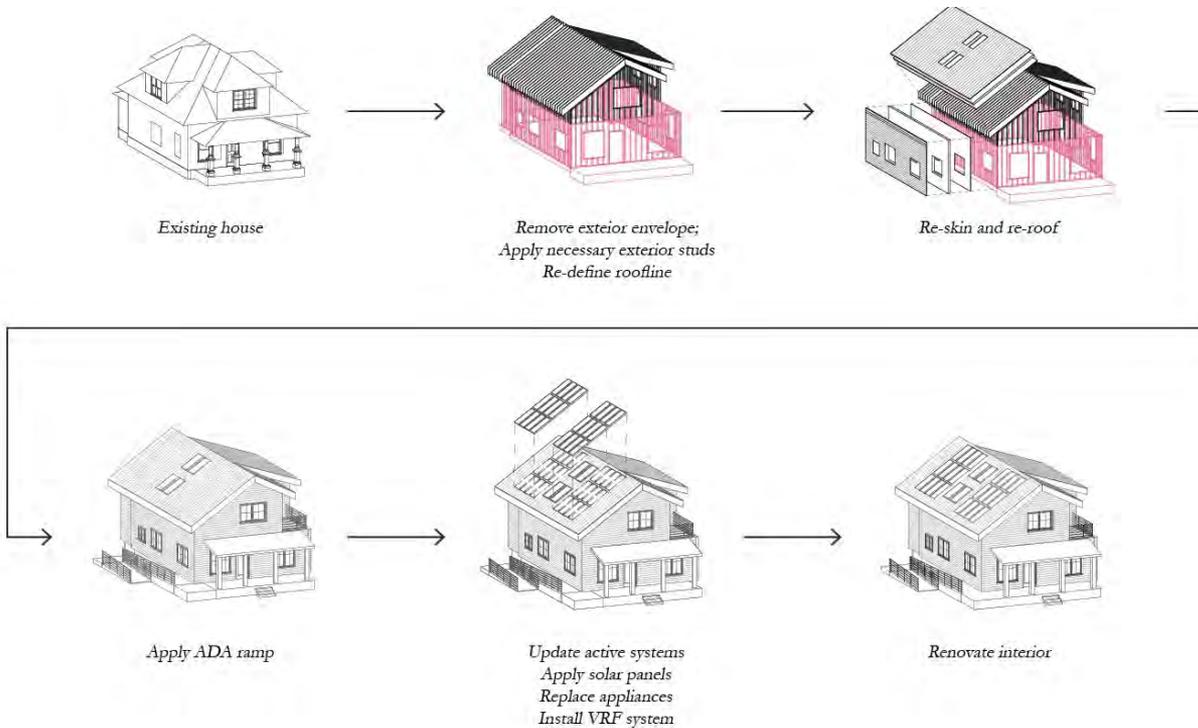
Global Warming Potential

SCALABLE IMPACTS

Consequences of scaling up net-zero renovations



Michael Timberlake



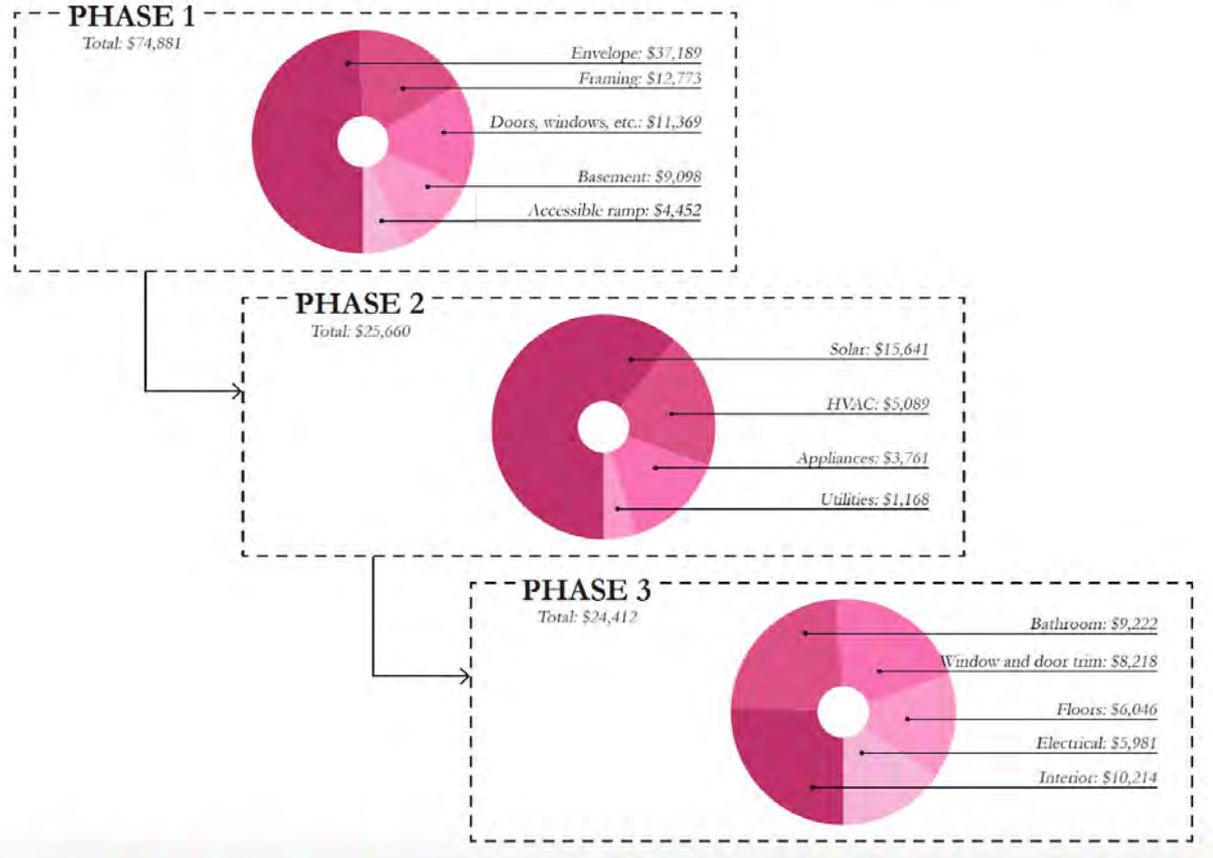
Carbon consequences if 5 houses are renovated each year for 20 years

SCALABLE IMPACTS

Consequences of scaling up net-zero renovations



Michael Timberlake



DESIGN CONCEPT

A contemporary residence with an emphasis on universal design and preservation of existing building stock



Aaron Strayer



DESIGN CONCEPT

A contemporary residence with an emphasis on universal design and preservation of existing building stock



Aaron Strayer



DESIGN CONCEPT

A contemporary residence with an emphasis on universal design and preservation of existing building stock



Aaron Strayer



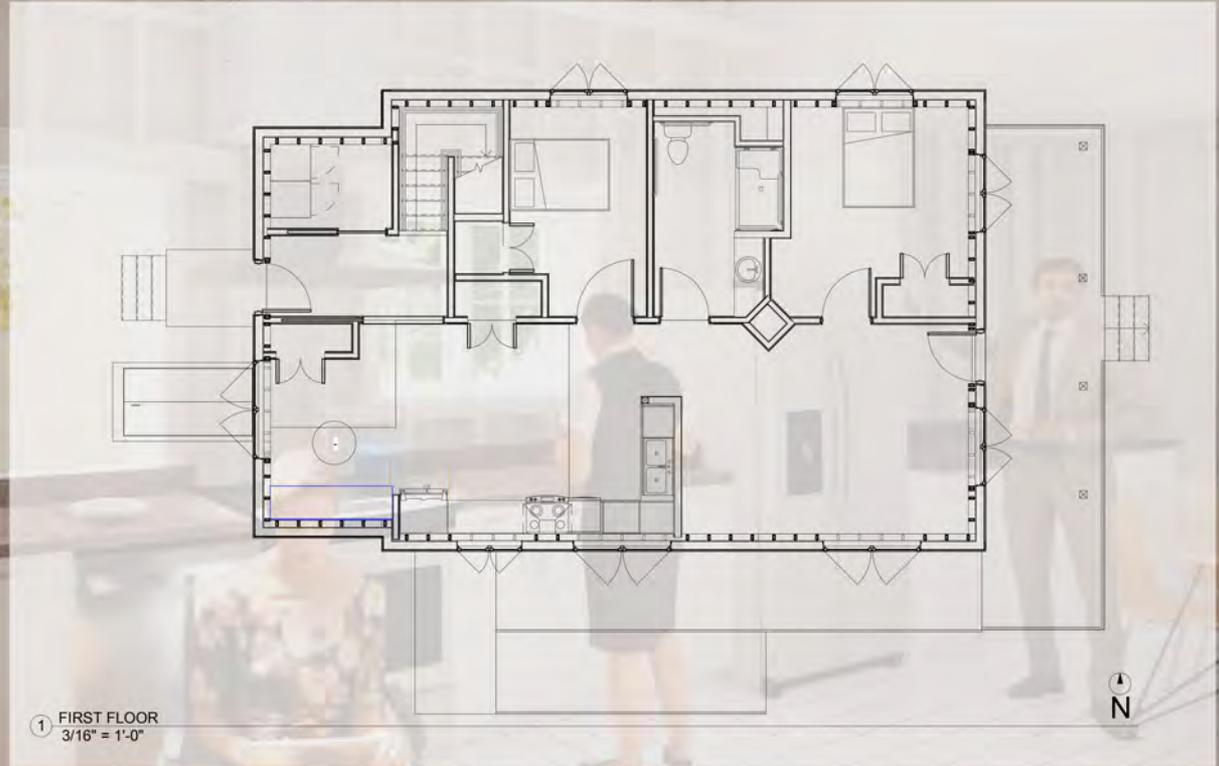
DESIGN CONCEPT

A contemporary residence with an emphasis on universal design and preservation of existing building stock



Aaron Strayer

- First floor is entirely ADA compliant
- Spacious rooms provide for complete accessibility.
- Multi-generational layout allows for independent design while giving peace of mind.



DESIGN CONCEPT

A contemporary residence with an emphasis on universal design and preservation of existing building stock



Aaron Strayer



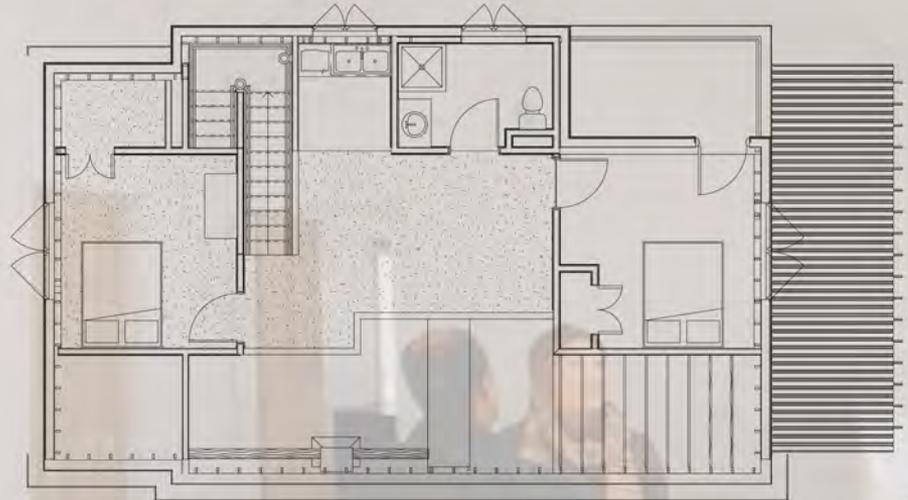
DESIGN CONCEPT

A contemporary residence with an emphasis on universal design and preservation of existing building stock



Aaron Strayer

- Upper floor serves as a semi-independent living space
- Amenities include two bedrooms a common area, and a small kitchenette.



① SECOND FLOOR
3/16" = 1'-0"



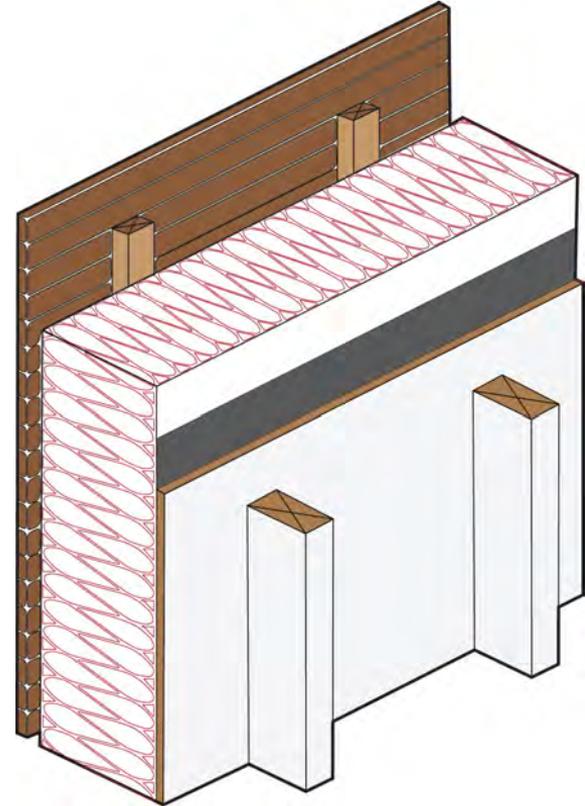
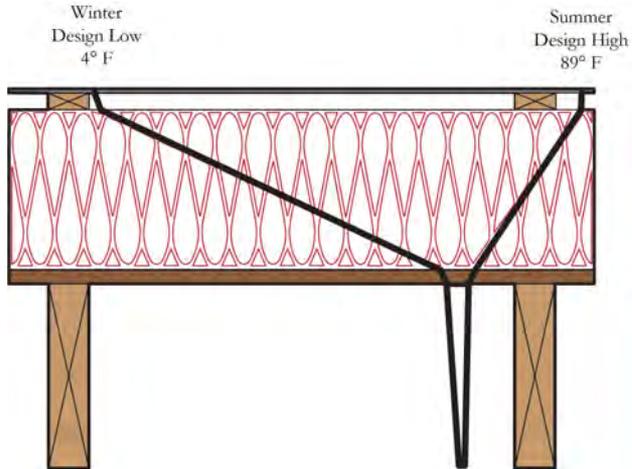
PERFECT WALL HOUSE

Rausser Design



“THE PERFECT WALL”

- Excellent air tightness (1 ACH50)
- R-36 continuous Rockwool insulation
- Make use of existing wall studs in an expressive way

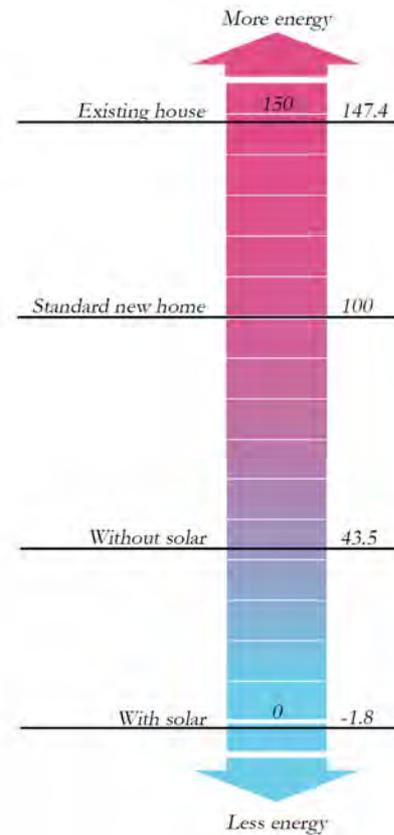
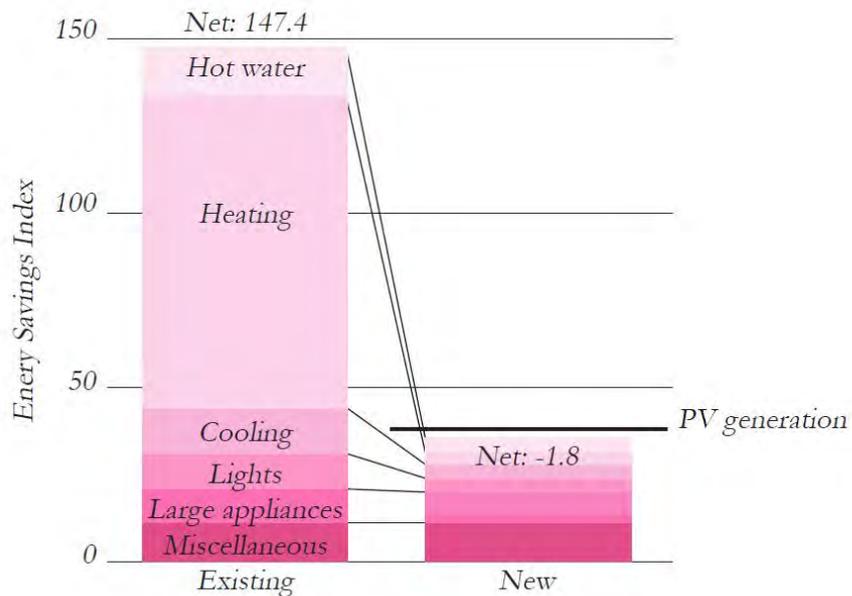


ENERGY PERFORMANCE

Energy Rating Index



Brittany Williams

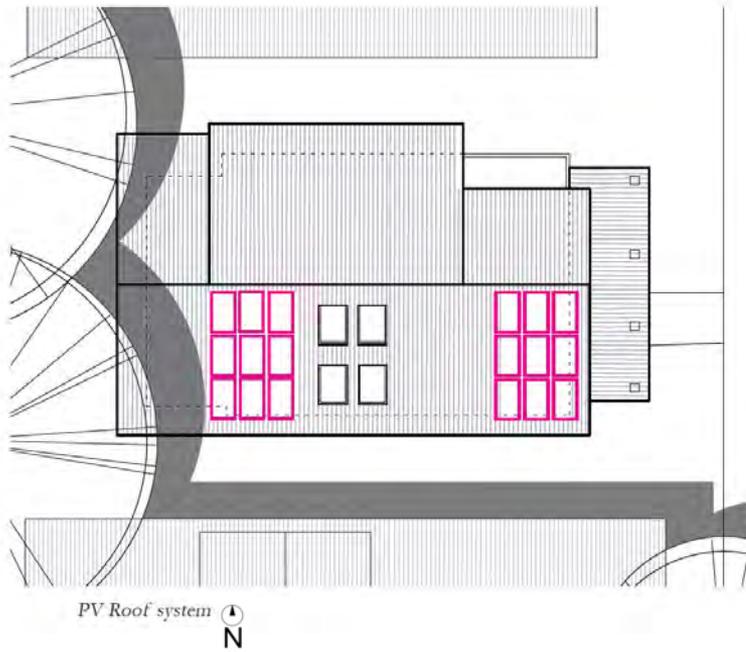


OPERATING SYSTEMS

PV Array



Brittany Williams

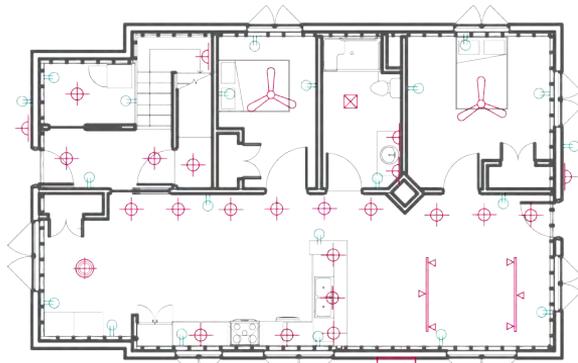


OPERATING SYSTEMS

Lighting Plan



Brittany Williams



First Floor



Second Floor

Symbol	Name	Product Spec	Energy Use
	Can	Downlight Gen II 2700k T24 LED Flush Mount	18.5 W
	Pendant	Aubrey™ 3 light pendant with LED bulbs	10 W
	Sconce	Joelson™ 2 light vanity light with LED bulbs	10 W
	Fan w/ light	20" Henry LED ceiling fan	18 W (light)
	Track lighting	CoreLine projector	24.5 W
	Bathroom fan w/ light	GreenBuilder Series 80 CFM ceiling exhaust bath fan with LED light	11 W
	Outlet		

Light Fixture Plan

	Room	Sq. Ft.	Watts/Sq. Ft.
First Floor	Living	239	0.93
	Kitchen	234	0.87
	Dining	102	0.10
	Hallway	57	0.65
	Bedroom 1	113	0.09
	Bedroom 2	168	0.06
	Restroom 1	90	0.34
Second Floor	Laundry	114	0.16
	Restroom 2	62	0.5
	Bedroom 3	136	0.07
	Kitchenette	38	0.26
	Common Area	184	0.05
	Bedroom 4	133	0.07

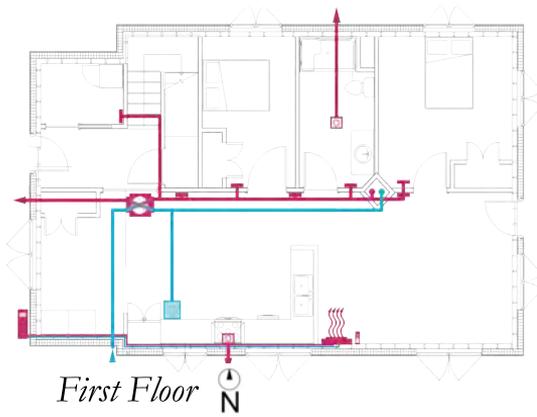
Lighting Levels Per Room

OPERATING SYSTEMS

HVAC System



Brittany Williams



- Floor diffuser
- Vertical chase
- DOAS unit with ERV
- Return vent
- Outdoor VRF unit
- Exhaust vent
- Fresh air intake
- Indoor VRF unit
- Refrigerant lines
- Ceiling fan
- Zone controller

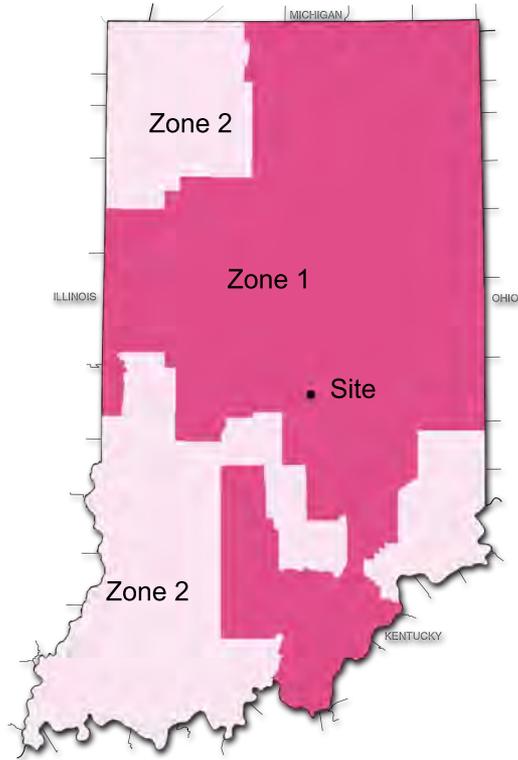


OPERATING SYSTEMS

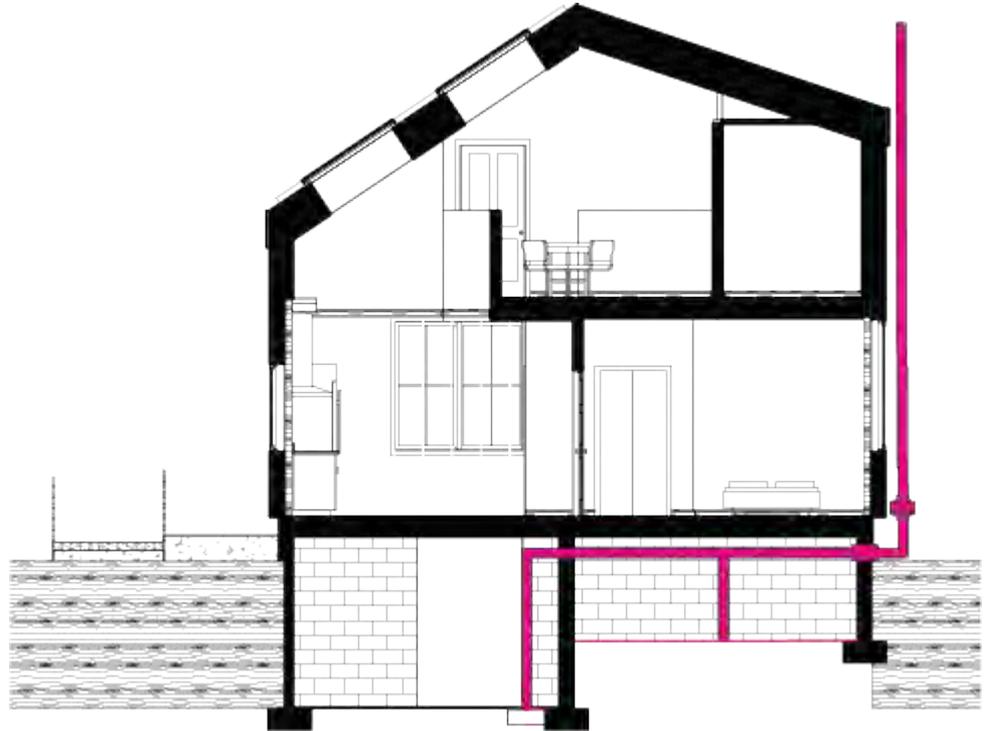
Radon Mitigation



Brittany Williams



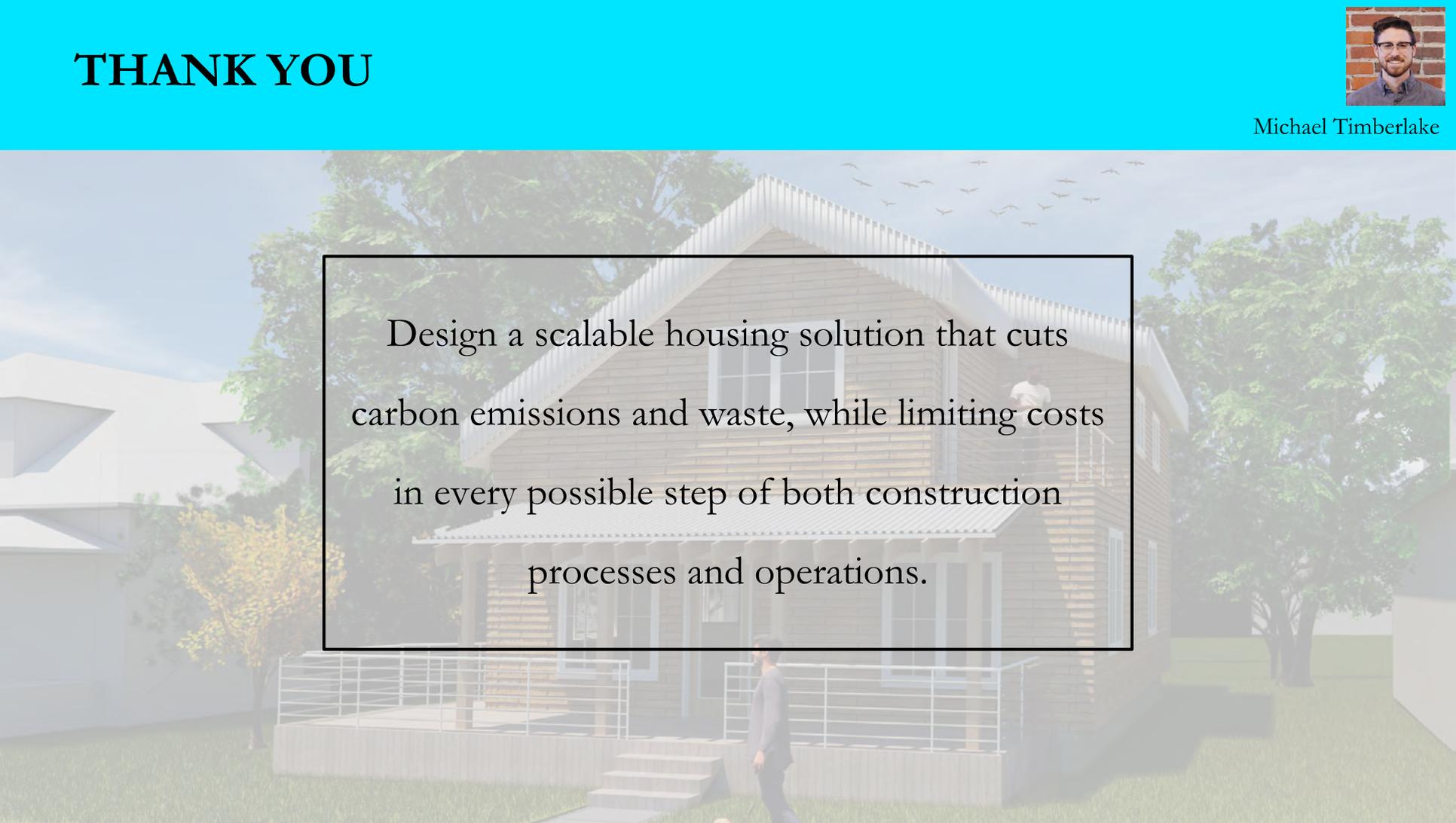
Radon in Indiana



THANK YOU



Michael Timberlake

A large architectural rendering of a modern, two-story house with a gabled roof and a porch. The house is surrounded by trees and a lawn. A person is walking on the lawn in the foreground, and another person is standing on the porch. The sky is blue with some birds flying. The rendering is overlaid with a semi-transparent white box containing text.

Design a scalable housing solution that cuts carbon emissions and waste, while limiting costs in every possible step of both construction processes and operations.