



ICCCFO Conference – Spring 2026

# *Heartland Net Zero Agriculture Complex and the State of Illinois 2050 Energy Goals*

*Noah Lamb – Heartland Community College  
Michael Lundeen Legat Architects*

# master planning resilience and getting to net zero energy

spring 2023 icccfo conference

case study - net zero energy (designed) agriculture complex



# state of illinois: goal of 100% clean energy by 2050 and ending carbon-emitting power by 2030

climate and equitable jobs act, september 2021

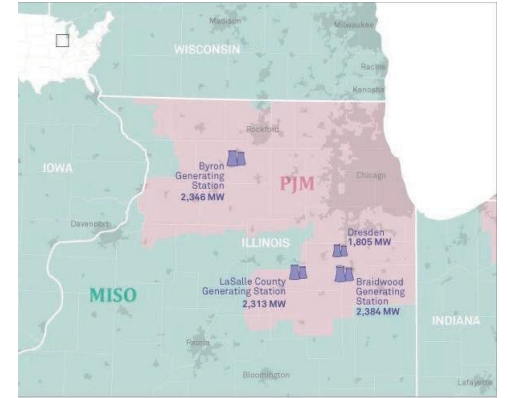
## ending carbon emitting power

one: slow the growth in energy grid demand (low draw new construction, renovations)

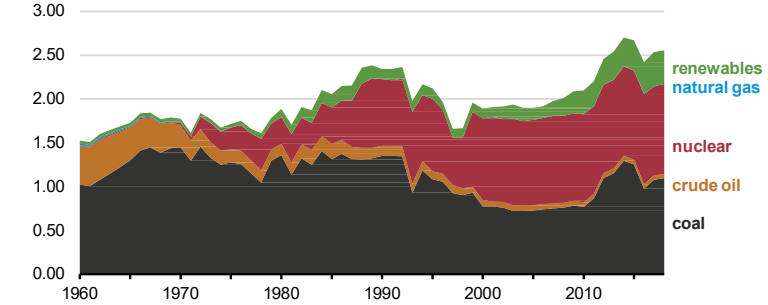
two: replacing current carbon sources with non-carbon sources (nuclear, wind, solar)



**IL in 2022:**  
**66.2% non-carbon sources**  
**33.8% carbon sources**



Total energy production by source in Illinois (1960–2018)  
quadrillion British thermal units





# State of Illinois Primary Long-Term Energy Goals:

**100% Carbon-Free Power:** Transition to 100% clean energy by 2050, with interim Renewable Portfolio Standard (RPS) targets of 40% by 2030 and 50% by 2040.

**Net-Zero Emissions:** Achieve net-zero greenhouse gas emissions by 2050, including a focus on reducing emissions in the building sector.

**Fossil Fuel Phase-Out:** Close all private coal-fired power plants by 2030 and natural gas plants by 2045.

**Energy Storage Mandate:** Support a reliable grid by establishing energy storage procurement goals.

**Equitable Transition:** Ensure clean energy jobs are supported by workforce development, specifically targeting communities impacted by the transition.



# ***How will the state get there?***



***Illinois Energy Code (IEC) – (& IEC Stretch Code)  
International Energy Conservation Code (IECC)***

## ***IECC - Progressive Efficiency Targets:***

***2024: 50% more efficient than the 2006 IECC.***

***2026: 60% more efficient.***

***2029: 67% more efficient.***

***2032: 75% more efficient.***





# ***Illinois Energy Code (IEC) (& IEC Stretch Code)*** ***International Energy Conservation Code (IECC)***

## ***Current Stretch Code (IEC)***

- ***Solar Ready Roofs***
- ***EV Charging Infrastructure***
- ***On-site Renewable Energy, or  
Eq. off-site arrangement  
(PPA or Renew. Energy Credits)***
- ***Energy Monitoring***
- ***Simulated Bldg. Performance***





## ***Future IECC and IEC over the next 10 years***

- ***Whole-building carbon metrics***  
*Life cycle assessments*
- ***Performance-based compliance***  
*Energy cost budget*
- ***Demand Flexibility***  
*Load shedding / demand response*
- ***Master Planning Sustainability***  
*Energy targets*
- ***Onsite Generation***
- ***Optional becoming Required***

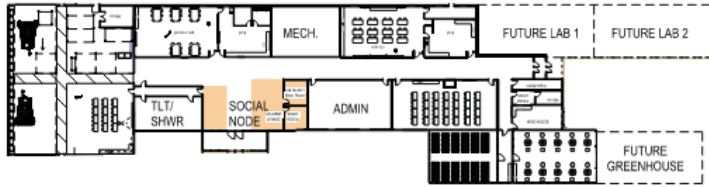




*designing  
a net zero  
energy  
building -  
how?*

04/21/2023

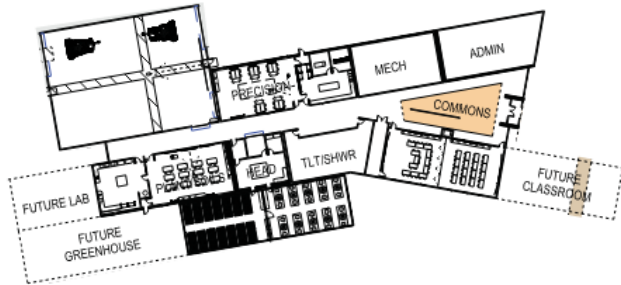
# schematic design - process



## Option 1 - "Stem"

- most energy efficient, EUI 30 (+10-15%)
- event space visible from Raab
- most feasible construction
- most feasible additions

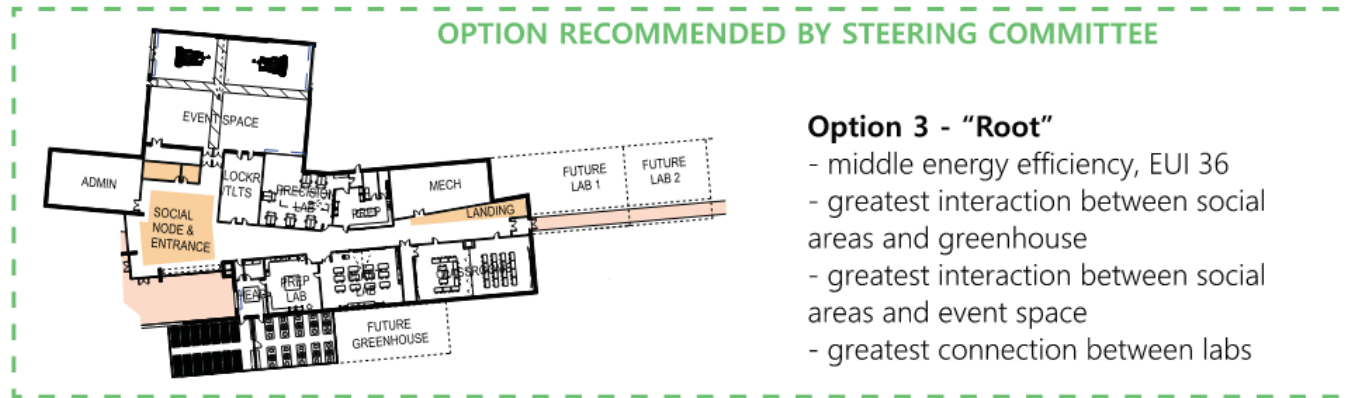
**pEUI: 30  
kbtu/sf/yr**



## Option 2 - "Petal"

- least energy efficient, EUI 38
- greatest connection to existing campus
- event space least connected to entrance
- shower/slt not connected to lab space

**pEUI: 38  
kbtu/sf/yr**

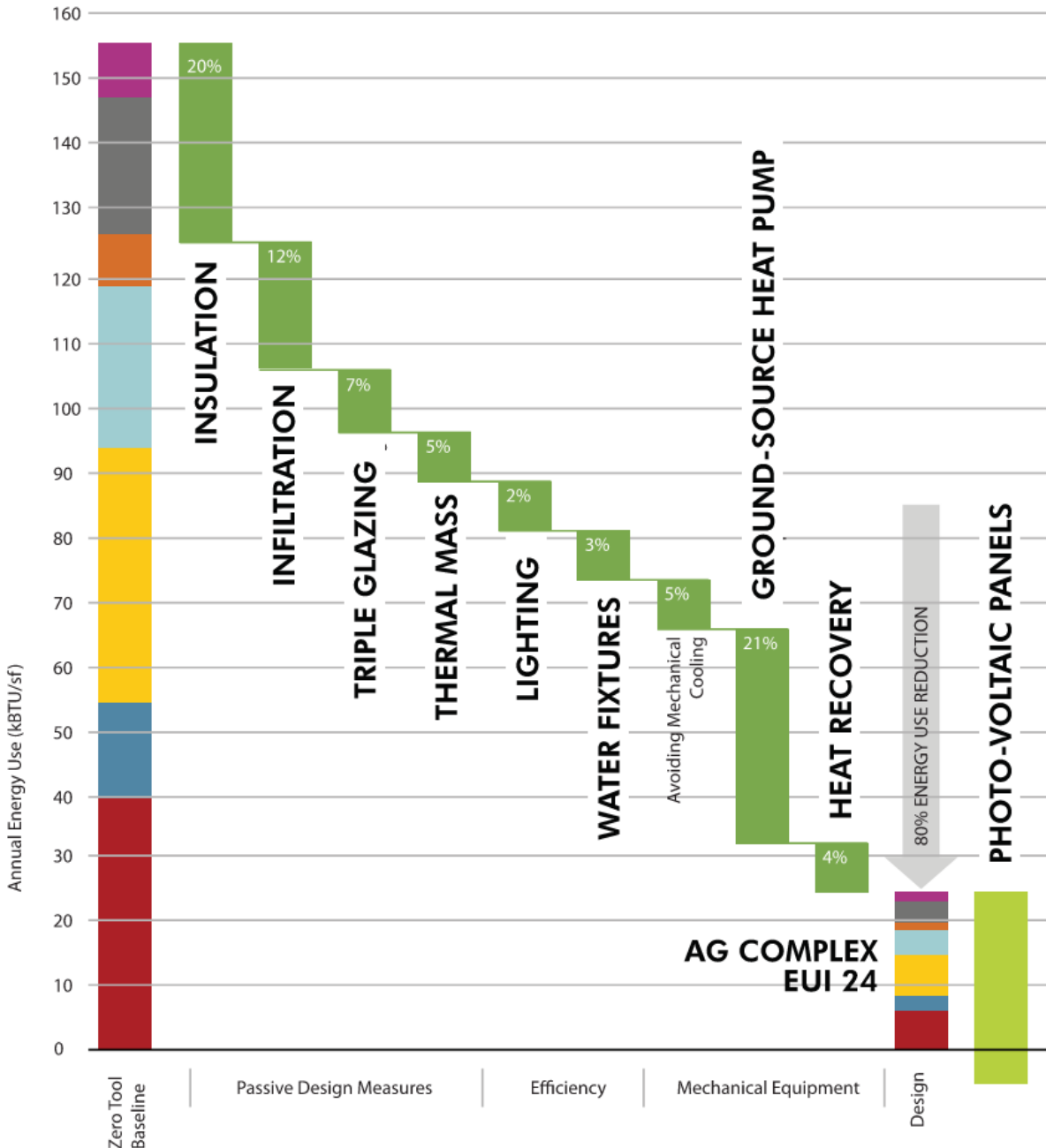


## Option 3 - "Root"

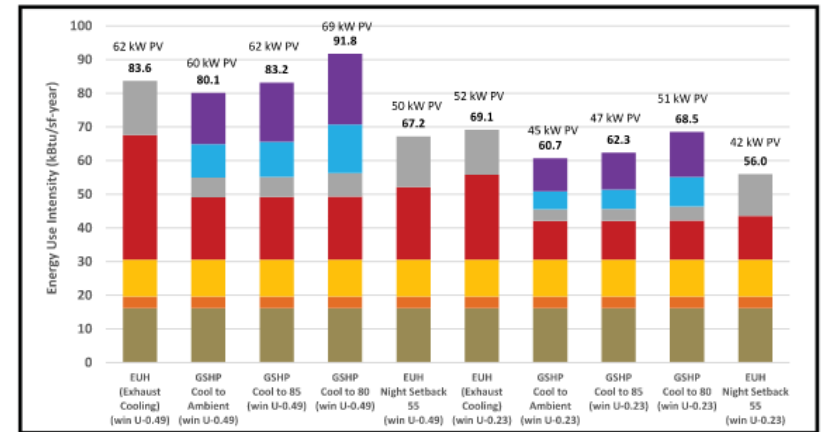
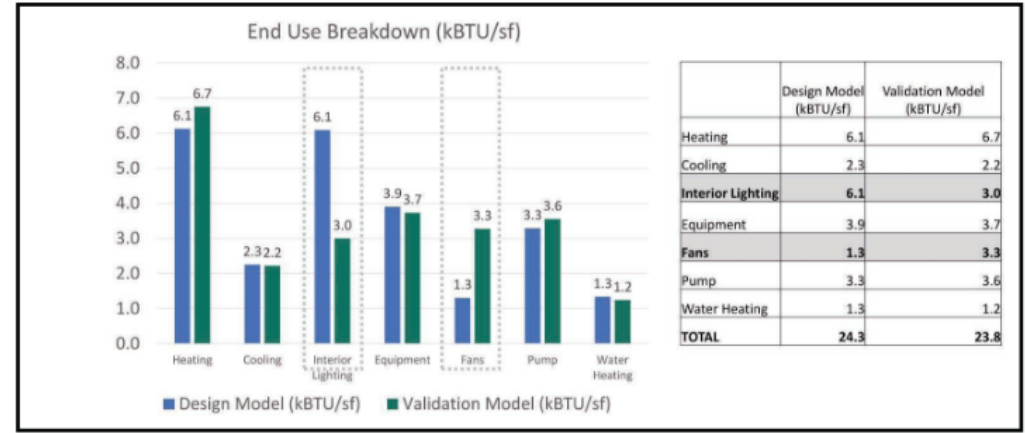
- middle energy efficiency, EUI 36
- greatest interaction between social areas and greenhouse
- greatest interaction between social areas and event space
- greatest connection between labs

**pEUI: 36  
kbtu/sf/yr**

# EUI 155 HISTORICAL AVERAGE - SCIENCE BUILDINGS



- Heating
- Cooling
- Interior Lighting
- Equipment
- Fans
- Pumps
- Water Heating
- Reductions
- Renewables



energy modeling -  
real-time feedback on  
decision making

AG Fields

Geothermal  
Wells



Teaching

Teaching

Food  
Forest

Test  
Plots

Greenhouses

0' 5'

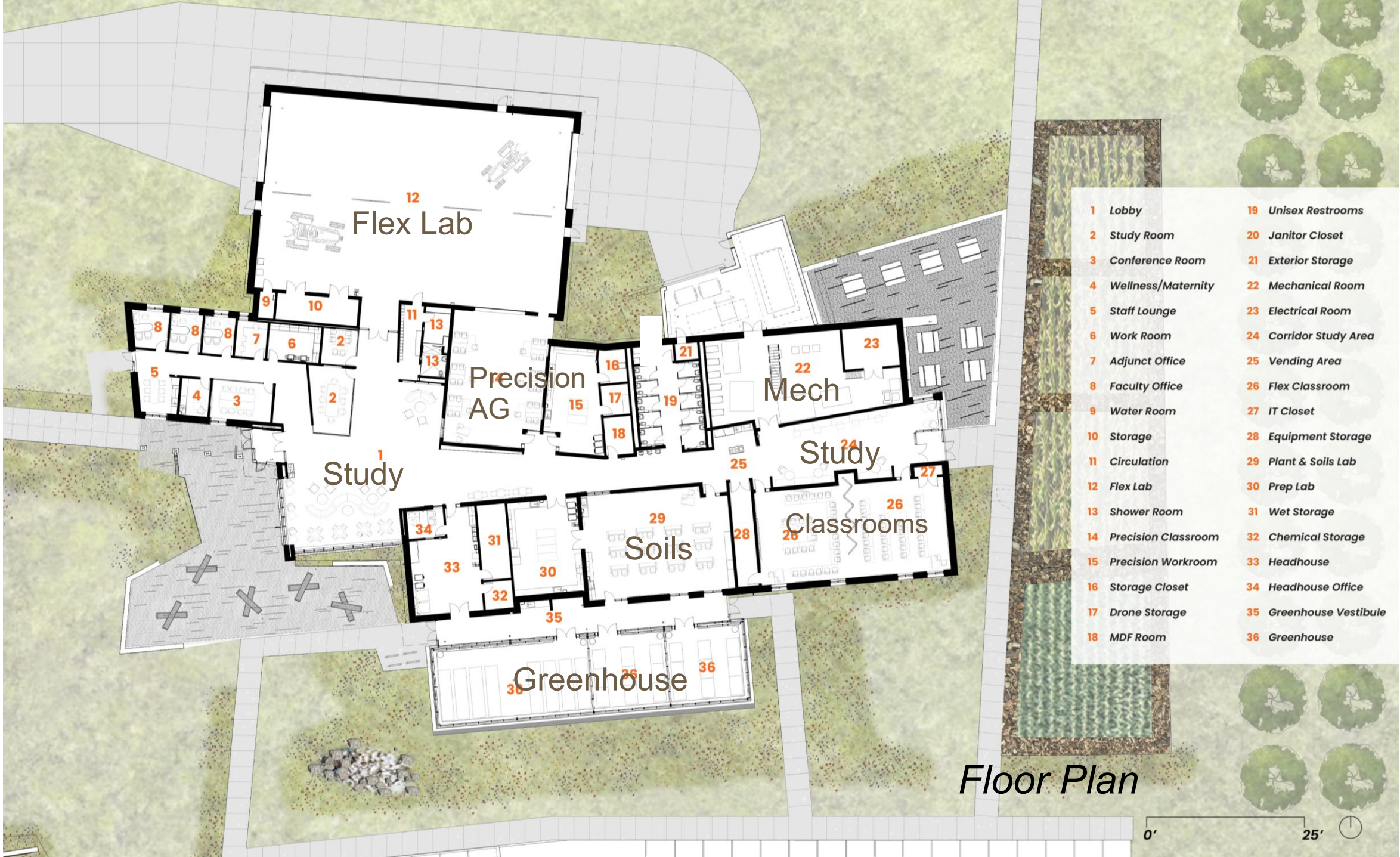




McLean County Farm Bureau  
Agritourism Lab







Flex Lab

Precision AG

Mech

Study

Study

Classrooms

Soils

Greenhouse

Floor Plan



COME MEET  
AGRICULTURE & TRUFARM CO. AT THE  
**FOOD FOR FUTURE  
SUMMIT & EXPO**  
SOUTH HALL STAND 5081



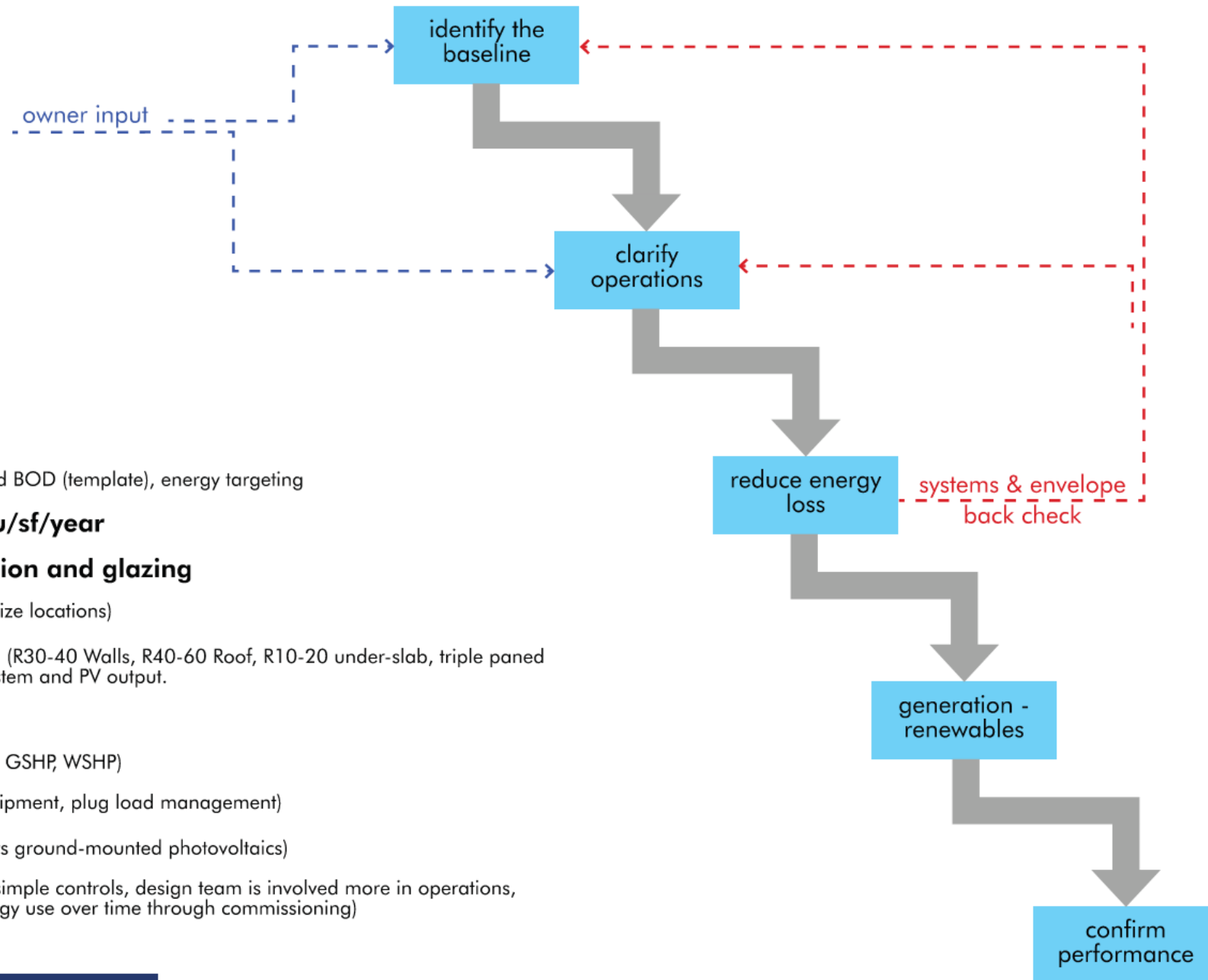








# getting to zero



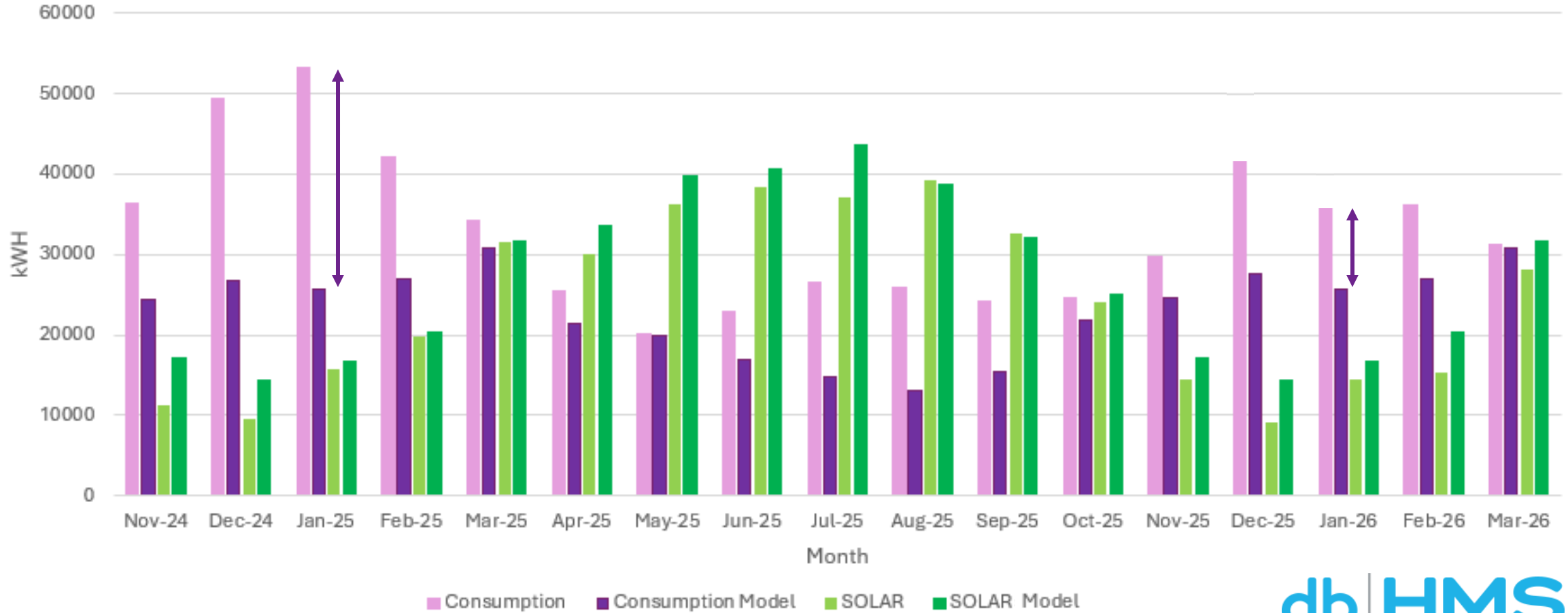
1. Integrative Process (box modeling, OPR and BOD (template), energy targeting)
2. **EUI Target: approx. 15-25 kbtu/sf/year**
3. **Passive Solar Design - orientation and glazing**
4. Solid to Glazing Ratio (approx. 30%, optimize locations)
5. **Continuous Envelope R Values** (R30-40 Walls, R40-60 Roof, R10-20 under-slab, triple paned windows) - balance against mechanical system and PV output.
6. Light Use Density Reductions
7. **Mechanical Systems** (compare VRF, GSHP, WSHP)
8. Equipment Energy (energy efficient lab equipment, plug load management)
9. **Renewable Energy** (roof-mounted vs ground-mounted photovoltaics)
10. Maintenance and Operations. (design for simple controls, design team is involved more in operations, design team needs to be able to track energy use over time through commissioning)

# Heartland AG Complex

## Performance to date



Consumption & Solar at AG

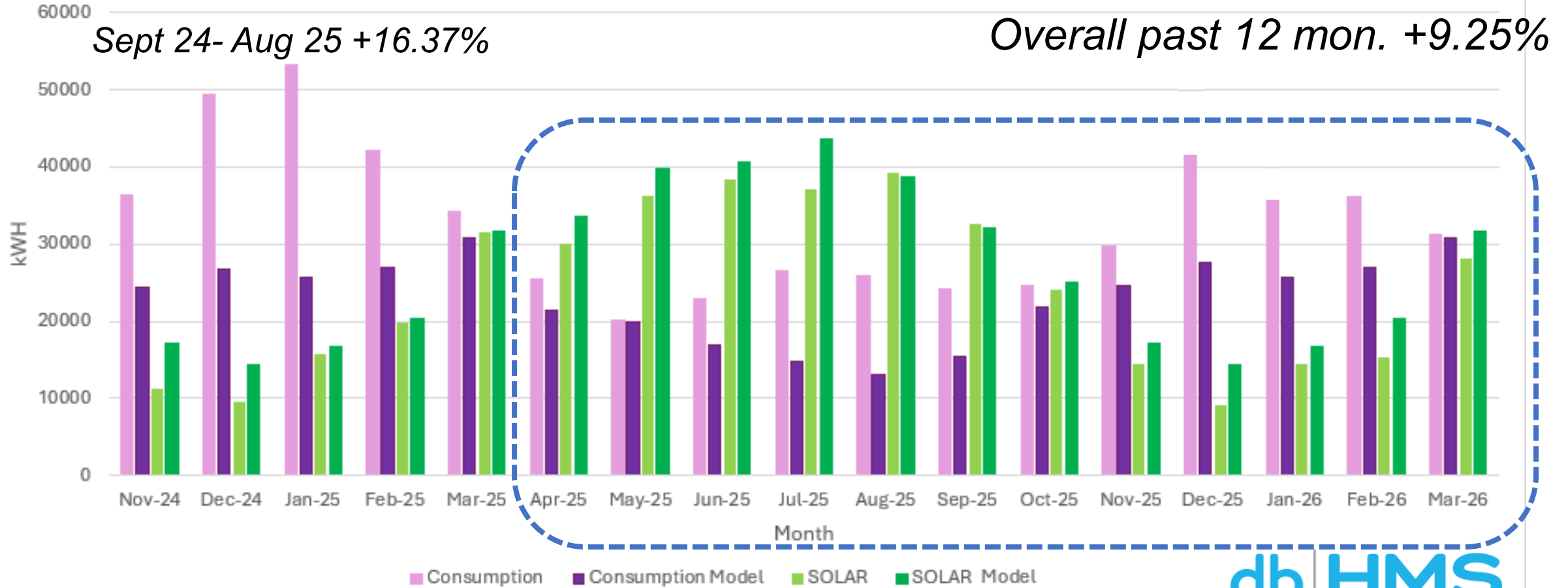


# Heartland AG Complex

## Performance to date



Consumption & Solar at AG







\$19.4



8.1 Acres



19 months



29,500 SF



EUI 24



Jan 2024

# Heartland Net Zero Agriculture Complex and the State of Illinois 2050 Energy Goals

# Thank you

Noah Lamb – Heartland Community College  
Michael Lundeen Legat Architects

# Heartland Net Zero Agriculture Complex - Legat Architects

<https://www.youtube.com/watch?v=At5UEUrXOW4>

