Local leaders are called upon to help communities prepare for a safe and sustainable future. Architects and engineers have unique expertise to help consider feasible strategic options for modifying existing buildings and planning for greener buildings in the future.

This interactive session will explore how more sustainable buildings and green municipal infrastructure will contribute to healthier, more equitable communities. Discussion will focus on practical elements of that vision including the latest advances in policy, energy codes and emerging grant opportunities that can support municipal facility design in the future. A discussion panel will include local consultants, architects, and engineers. Topics they explore will include reducing energy demand in existing buildings and electrifying more of our building systems in the future to support a carbon free grid.

Panelists:
Brian Meade Design Principal - FGM Architects, Inc.
Laura Vermeire Architect - Jacobs
Mike Lawless Director of Innovation - IMEG
Todd Sweeney Co-Founder - Navigate Building Solutions

Moderator:
Joshua Mandell Principal - FGM Architects, Inc.
Ice Breaker Survey / Poll #1: go to www.slido.com then enter MMML
https://app.sli.do/event/ifvcijqu

How Green do you think your Community is currently?

1. Not green at all
2. Beginning level Green Community initiatives
3. Don’t know
4. Mid level Green Community initiatives
5. Advanced level Green Community initiatives

Ice Breaker Survey / Poll #2: go to www.slido.com then enter MMML
https://app.sli.do/event/ifvcijqu

What is your personal experience in terms of sustainability?

1. I write policy for my community.
2. I volunteer for organizations.
3. I design or construct sustainable buildings.
4. I am interested in becoming more engaged.
5. I don’t have any personal experience yet.
Ice Breaker Survey / Poll #2:

RESULTS

https://admin.sli.do/event/ifvcijqu/polls

Questions / Topics:
1. How can Missouri Communities prioritize how much “Green” they can afford within their facilities and municipalities?
2. If a municipality wants to pursue a net zero energy facility, what are the basic steps involved?
3. What are some recent green policy, code initiatives, and grant opportunities that can help Missouri Communities?
4. In order to build green communities that are healthier, more diverse and equitable, how can Design help overcome bias and capitalize on building performance data to reach broader outcomes.
Setting the stage:

Buildings generate nearly 40% of annual global GHG emissions.

Source: [Architecture 2030](https://www.architecture2030.org)

STATE AND LOCAL GOVERNMENTS

State and local government buildings consume a combined 3.1 quad of energy each year and have the potential to save a combined $5.8 billion annually.

Explore webinars focused on energy efficiency and sustainability improvements at the state and local level:

[On-Demand Better Buildings Webinars](https://www.betterbuildingschallenge.org)

Grant opportunity resources:

- Database of State Incentives for Renewables & Efficiency (DSIRE) is a comprehensive source of information on state, local, utility, and federal incentives and policies that promote renewable energy and energy efficiency:
  - [https://programs.dsireusa.org/system/program/more](https://programs.dsireusa.org/system/program/more)
2. If a municipality wants to pursue a net zero energy facility, what are the basic steps involved?

"Net Zero Energy" – an emerging trend

Why "Net Zero Energy"?
• Reduce Energy Consumption
• Enhance Sustainable Energy Production

"Net Zero Energy" – defined

“One hundred percent of the building’s energy needs (on a net annual basis) must be supplied by onsite renewable energy.”
"Net Zero Energy" – certification

Certification opportunities were created to allow projects to demonstrate net zero energy performance through third-party audits and certification.

Who Independently Certifies "NET ZERO Energy" Buildings?

Two agencies currently offer NET ZERO Building Certification:

- Agency #1: ILFI - NET ZERO ENERGY BUILDING NZEB Certification 3.1
- Agency #2: PASSIVE HOUSE INSTITUTE US PHIUS Certification

Other Net Zero initiatives:

USGBC – Net Zero Energy (Requires LEED CERTIFICATION)

US Department of Energy has a working NET ZERO Energy Definition by no Certification Process

Multiple ZERO Carbon Initiatives
New Net Zero Waste Initiatives
New Net Zero Water Initiatives
Case Study #1: NAVIGATE Office Center (Used International Living Future Institute ILFI - Certification)

FIRST "NET ZERO" Commercial Building in the State of Missouri

Case Study #1:
NAVIGATE Office Center (highlights)

Why International Living Future Institute?
• Commercial Building Focus
• Internationally Recognized
• Simple Certification Process and Lower Cost

NAVIGATE’s Singular Focus:
• Helped us filter hundreds of inquiries, phone calls, sales pitches and “WHAT IF?” questions.

Case Study #1:
NAVIGATE Office Center (Go...... No Go Decision)

Building Geometry / Site Considerations
• High (solar SF / usable SF) ratio
• Single story
• No shade affect from neighboring structures
• North / South orientation

Occupancy Type – Office Tenant
• Limited internal heat gain
• Limited exterior infiltration

Potential Solar Capacity
• Free analysis available

Likely Energy Usage
• Available SF usage
Case Study #1: NAVIGATE Office Center (The Process)

**STEPS:**
1. Select Expert Partners
2. Perform a “GUT CHECK”
3. Set your GOAL
4. Register your project with ILFI
5. Meet w/ your ILFI coach & obtain program materials
6. Advance building / site design
7. Prepare MEP Design-Build criteria
8. Competitively bid, Design-Build Packages
   - Solar System (Negotiate a solar generation guarantee)
   - MEP System (Require energy use analysis)
9. Check with your local utility company
10. Verify you meet all City/AHJ requirements
11. ILFI final design review
12. Bid and construct building
13. Verify use and generation over a 12 month period
14. ILFI final audit and certification

Case Study #1: NAVIGATE Office Center (Energy Generation)

**Solar System Size:**
- 78KW System - 107,236 KWH

**Modeled Energy Usage:**
- 96,550 KWH (EUI 40)

**Special Features:**
- On Line Monitoring Software
- Electric Car Charging Station

Case Study #1: NAVIGATE Office Center (the Payback)

**Additional Construction Costs:**
- Solar system
- Additional AMEREN service costs
- Solar electrical feed cost
- Additional Soft Cost:
  - Preliminary load modeling
  - ILFI – NET ZERO certification cost
- Additional accounting
- Additional “MY TIME”
- Lost rentable SF

**Cost Neutral Solutions:**
- HVAC set back controls
- Heat pump modification
- Economizers

**Savings:**
- Utility Savings
- Ameren PV Rebate
- Federal Tax Credit
- State MACRS
- Federal Depreciation
Case Study #2: Prairie Trails Elementary Scale (Used PHIUS Certification)

• Made possible through an Illinois Clean Energy Community Foundation grant of up to $2,000,000
• Summer 2021 completion; twelve-month performance evaluation required
• Net Zero energy usage
• Target EUI of 24 to 29
• Certification required through the Passive House Institute US (PHIUS). The project must meet PHIUS+ and PHIUS+ Source Zero performance criteria.
• PHIUS+ is a “high-performance building standard” – it challenges the building industry to construct buildings that can maintain a comfortable indoor environment with very low operating energy.
• No natural gas service to the school.

Case Study #2: Prairie Trails Elementary School (highlights)

• Mechanical system
  • The existing hot water boiler system will be replaced with a new electric variable refrigerant flow (VRF) system with heat recovery
  • Code minimum: hot water boiler and air-cooled chiller serving unit ventilators
  • New temperature controls: load-specific electrical monitoring, including plug loads, lighting loads, HVAC loads, and energy generation from the PV panels. Integration of the net-zero technologies will be through the BAS system.
  • New solar panel system to produce electricity
  • New rooftop photovoltaic system to generate on-site renewable energy. The annual production target is currently 239.5 KWh, which includes a 22.7% buffer (grant - 10%)
Case Study #2: Prairie Trails Elementary School (highlights)
• The existing built-up roof system will be replaced.
  Increase roof insulation performance value from R-30 to R-65 (average) using additional thickness of polyisocyanurate foam board insulation. New roof system to be a single ply synthetic rubber roof
• Existing uninsulated exterior wall system modified to receive new wall cladding. Foundation modified to include new insulation below grade. Existing face brick removed and new thermally broken rail system with new insulation applied under new exterior cladding.
• Remodeling included new LED lighting, with light harvesting to reduce energy consumption
• Original single pane aluminum windows replaced with new double thermally broken curtain wall framing system with triple pane dual low e insulated glazing

3. What are some recent green policy, code initiatives, and grant opportunities that can help Missouri Communities?
Green Policy Example #1: Building Energy Awareness Ordinance - Passed & Signed in 2017

www.stlbenchmarking.com

Requirements:
• Municipal & private buildings > 50,000 square feet must track & report energy and water use annually – including multi-family
• Some exemptions (low or no occupancy, manufacturing, financial institutions, state & federal buildings)
• Buildings not in compliance with ordinance would not be eligible for issuance of new residential or commercial occupancy permits.

An energy performance standard creates a legal requirement for building owners to ensure their buildings meet a minimum level of energy performance (the standard).

Building owners use ENERGY STAR Portfolio Manager tool to document compliance with the BEPS by calculating each individual buildings EUI:
• EUI is expressed as energy per square foot per year. It’s calculated by dividing the total energy consumed by the building in one year by the total gross floor area of the building.
• The ENERGY STAR score allows everyone in your organization, from the maintenance tech to the CEO, to quickly understand how your building is performing. A score of 50 represents median energy performance, while a score of 75 or higher indicates your building is a top performer — and may be eligible for ENERGY STAR certification.
• Standards are calculated such that at least 65% of buildings have to improve their energy performance.

Building Division issues an annual benchmarking report
• Address + Energy Star score / EUI will be available online

St. Louis Energy Benchmarking Report 2018

www.stlbenchmarking.com
Green Policy Example #2:  
Energy and Water benchmarking ordinance (33-O-16)  
Passed December 2016  

Background:  
- In Evanston IL, 80% of greenhouse gas emissions come from existing buildings.  
- In order for Evanston to meet goals outlined in Climate Action and Resilience Plan (CARP), existing buildings need to make significant reductions in their energy consumption and greenhouse gas emissions.  
- Evanston City Council voted to approve this ordinance which requires municipal owned & other buildings >20,000sf in Evanston to track and report their annual energy and water usage.  

Green Policy Example #3:  
2020-11 Resolution Passed  
September 2020  

Background:  
- On September 21st, the Village Board unanimously approved a Resolution that commits Cottage Grove, WI to transitioning from fossil fuels to renewable energy sources with the goal of having 100% of Village operations sourced from renewable energy by 2040.  
- 2020-11 Resolution

4. In order to build green communities that are healthier, more diverse and equitable, how can Design help overcome bias and capitalize on building performance data to reach broader outcomes?
Equity by Design
Overcoming bias and capitalizing on data to reach broader outcomes

- Though not part of the general public's consciousness, awareness of the built environment's effects on social inequality has been growing, gradually, within the AEC industry.
- The infrastructure we design can be part of the solution instead of the problem.
- Several industry equity initiatives already exist.

Data-driven equity by design examples

- Decarbonization of the built environment.
- Improving indoor environments
- Ensuring quality through digital twins

Steps to equity

- Expand awareness of unintentional bias
- Encourage diversity outside of our firms
- Make the health and social equity impacts of our buildings more tangible
- Track the impact
LED lighting upgrade: How smarter design can impact the community

- Financial impact
  - First cost
  - Return on investment
  - Maintenance savings
- Occupant impact
  - Improved light quality
  - Better color rendering
  - Reduced glare
- Community impact
  - Improved air quality
  - Improved health
  - Less waste

Final Questions | Comments

Thank You!