

## Session Descriptions—Tuesday, February 21, 2023

### What Your Business Needs to Know About the Inflation Reduction Act

At the heart of the Inflation Reduction Act (IRA) is a \$369 billion package of investments that advocates call the most significant legislation in history to advance the clean energy transition. Estimates suggest it could cut US greenhouse gas emissions by 40% by 2030. The IRA will supercharge clean energy investments. Is your business ready? Attendees will walk away knowing more about how this bill will impact residents and: electric vehicles, energy assessments, energy efficiency rebates, energy efficiency tax credits, and solar. This session will also cover commercial grants and tax incentives, and solar direct payment for nonprofits and government.

*Peter Lindstrom, Clean Energy Resource Teams*

### Understanding Thermally Modified Wood

Advancements in technology allow domestically and responsibly sourced wood to be used on exterior applications which are typically unforgiving to a natural product. This session will describe the basic

components of a wood cell wall and define how modification affects these components. The natural processes used to modify wood for improved durability will be discussed, with an emphasis on thermal modification. Suitable applications for modified wood will be explored along with an understanding of how these products can reduce embodied carbon and contribute to LEED objectives.

*Jon Heyesen, Arbor Wood Co.; Matt Aro, UMD Natural Resources Research Institute*

### Lead-Safe Methods for Remodeling, Repair and Painting Activities

This session will be an introduction into how, when and why lead-safe methods and work practices are required, especially when contractors and builders are conducting activities that disturb painted surfaces in residential structures built before 1978.

*Nate Cox, Lake States Environmental, Ltd.*

### Heat Pumps 101: Cold Climate Air Source Heat Pumps: A Primer and Launch Pad

This session will provide an overview of cold climate air source heat pumps, their potential for growth in Minnesota, and then dive deeper into specifics of how different applications of this equipment perform and compare with conventional heating and cooling solutions in Minnesota's climate. The presenters will discuss how to identify scenarios for each installation application. The presentation team will conclude with an overview of various resources to find rebates and financing options for customers, free training, best practices, and field research.

*Dan Wildenhaus and Rabi Vandergon, Center for Energy and Environment*

### On the Road to Net Zero Energy Homes

For high-performance, net zero energy homes, it is critical to get the building enclosure and mechanical systems right. While renewable energy can be added or acquired later, it is not as easy to change the overall efficiency of the building enclosure or HVAC system. It is critical to identify cost-effective approaches to get the loads low and efficiencies high. This session will explore specific design and

technology strategies to deliver optimized, cost-effective solutions for an affordable, efficient, durable, and healthy DOE Zero Energy Ready Home.

*Patrick Huelman, University of Minnesota*

### EEBA: Fundamentals of Building Science for High Performance Homes

In this session participants learn how the many complex changes in home design, building materials, mechanical systems, appliances, consumer lifestyles and expectations over the last 30 years makes the job of every designer, builder, supplier and trade contractor more complex and demanding. The segment will outline the need for change in the way we design, the materials chosen and the techniques used to ensure houses are ever safer, healthier, more comfortable, more durable and more efficient. This session will identify the fundamentals of building science that can be used to ensure success; the three mechanisms of heat flow, the three mechanisms of air flow and the four mechanisms of moisture flow.

*Andrew Oding, Building Knowledge Canada*

### What Matters Most in Determining Heat Pump Application Types

When discussing replacing or supplementing existing heating systems with air source heat pumps, the archetype or application type will play a critical role in what is likely to be successful. In this session, we'll explore what are the unique system features, considerations, and guidance needed in order to have a successful heat pump adoption in the home or structure. This includes guidance on sizing, system type, efficiency ratings, and product features that can help both the realized savings and homes performance align with expectations.

*Dan Wildenhaus and Rabi Vandergon, Center for Energy and Environment*

### How I Built a Net-Zero House

Follow along step-by-step the construction of a 1208 square foot, super-insulated, super-air tight, net-zero energy home. See what I chose for foundation, wall, and roof assemblies and why. Find out how the mechanical systems work and how the home is performing after living

in it for 2 years. Learn how to reduce waste by choosing non-toxic and bio-degradable materials and how to minimize cut-offs to eliminate the need for a dumpster. Ask me what I would do differently next time.

*Amber Westerman, Amber Westerman Building Design*

### EEBA: Application of Building Science to the Building Enclosure from the Ground Up

In this session the fundamentals of building science will be applied to the physics of foundations and how to make them work better, creating durable, thermally efficient walls and efficient, durable attic assemblies. For each of these, recommendations will be provided to ensure cost effective material and process choices are identified. Techniques for comprehensive heat, air and moisture management in each building segment will be presented and discussed.

*Andrew Oding, Building Knowledge Canada*

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### Increasing Performance of Forced Air Heating Systems

What is the relationship between manual j load calculations, furnace selection, and overall performance on a retrofit replacement? This presentation is a carryover from Improving Residential HVAC Performance and will include actual heat load calculations and real-world installation case studies, as well as how to test a furnace before the new retrofit is installed, and recommended tests for the new furnace installation. These measure proper air flow and total external static pressure to improve performance, increase system life expectancy, increase comfort and SYSTEM (versus equipment) efficiency.

*Bruce Stahlberg, Affordable Energy Solutions, Inc.*

### When the Order Matters: A Roadmap for Retrofit

Upgrading the existing housing stock is front and center of our energy, emissions, electrification, decarbonization, and climate change conversations. However, some remodeling measures come with potential harm to the building or the occupant. How do we know when the risk from an enclosure or HVAC upgrade will be minimal or when it might push the house "over the cliff"? When does the "order matter" and how do we communicate that to the owner? Are there lower risk

approaches to achieve our climate goals without sacrificing the home or its occupants? In this session, learn how to use a systems-guided approach to remodeling.

*Patrick Huelman, University of Minnesota*

### EEBA: Application of Building Science to Windows and Heating and Cooling Systems

In this session the fundamentals of building science will be applied to the science of windows and space conditioning systems. Specifically, participants will be shown the decision criteria for choosing appropriate windows that avoid condensation and balance comfort against energy performance. Installation techniques for windows will be outlined to ensure proper water management. Then, participants will learn the basics of sizing for heating and cooling systems for high performance homes and techniques for the effective distribution of energy throughout a home in all seasons.

*Andrew Oding, Building Knowledge Canada*

### Strategies for Heat Pump Adoption at the Time of Air Conditioning Replacement

This session will provide an update of research projects conducted by CEE that explore market characteristics and cost effectiveness of using heat pumps as an alternative to AC Replacement. This session will present results related to performance, operational costs, and applications in heating climates fueled by natural gas and other fuels as our two research projects near critical milestones. This will include a closer look at operational nuances of these applications such as choosing an economic switchover temperature and the sensitivities surrounding fuel prices. Lastly, this session will review results from customer and contractor surveys regarding the AC replacement opportunity.

*Samantha Hill and Dan Wildenhaus, Center for Energy and Environment*

### Introduction to Solar Technologies

Learn about solar resources, technologies, and trends. This session will take a deeper look into the dominant solar technology of photovoltaics with details on system components, over system design, and rules for installing systems.

*Paul Helstrom, Minnesota Power*

### EEBA: Mechanical Systems for Hot Water, Indoor Air Quality and Validating Application of Building Science Principles

This session will cover selections to optimize water heating and ventilation performance as well as identifying strategies for validating the performance of high-performance homes to ensure the principles of building science have been accomplished. Appropriate options when choosing water heating and other appliance technologies will be identified. The basics of indoor air quality will be outlined, including the four essential strategies and equipment options for optimizing the quality of air in homes. Finally, a decision matrix for making changes to building processes over the next 1, 3 and 7 years will be presented along with performance metrics that can be used to validate and track performance of homes. Participants will be encouraged to create their own plan for continuous improvement using the principles of building science to guide decisions.

*Andrew Oding, Building Knowledge Canada*

Session Descriptions - Wednesday, February 22, 2023

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7:00-8:15 am

High Performance Window Installation

This hands-on demonstration will feature a mock-up construction wall with a rough opening, along with an attached weather resistive barrier. The instructor will use these materials to illustrate presentation content regarding installation concerns, noting level, plumb, square, and true, and to explain the barrier system. The demo materials will also be used to present methods of installation, and to discuss substrates and material choices for sealants and flashings and how they interface with the wall. Different high performance wall conditions will be addressed.

Brandon Jordt, Marvin Windows and Doors

Decarbonizing Through Thermal Energy Districts

District energy systems have been shown to be a resilient and energy efficient way to heat many buildings all at once. Learn how Duluth Energy Systems has been transforming into a modern, efficient community energy system. This session will walk through historic and

modern operations of Duluth’s downtown thermal district, talk about results from a recent Superior Street transformation, and show some future opportunities for this community asset.

Mindy Granley, City of Duluth; Justin Reid, Duluth Energy Systems

Asbestos – Yes, It’s Still Around!

This presentation and interactive discussion will provide the latest on where asbestos is (still) encountered in residential remodeling and how new regulations require that it is handled. In this session, extensive experience and insight will be utilized to provide attendees with the where and why asbestos is found in residential remodeling and reconstruction. This session will cover the update to the MDH rules that became effective in the later half of 2021 that have critical implications to the residential contracting industry.

Bob Rogalla, Lake States Environmental, Ltd.

Systems Thinking and Integrated Design

This session will address the concepts of systems thinking and integrated design as tools for better building performance. In design and construction, aspects of a building are often considered and developed separately, without regard for the interdependent and interacting mechanisms between the separate parts of the whole. Systems Thinking describes the idea of seeing the “whole” as sets of things working together as parts of an interconnected network. Integrated Design is a process to guide systems thinking, requiring a constant consideration of the interactive nature of people, materials, spaces, systems, and forces on a site and a building during design, construction and operation throughout the life of the building. These concepts are actually tools for better building performance.

Rachel Wagner, Green New Deal Homes SBC

operational carbon from avoided carbon and embodied carbon. This session will address where we are now and where we need to go to embrace decarbonization in our homes and buildings.

Dan Wildenhaus, Center for Energy and Environment

EEBA: Introduction to Carbon Emission Reduction Challenges

In this session participants will learn about the success of energy efficiency initiatives over the last 40 years and how well the construction industry has done in reducing energy consumption in new homes. Then participants will learn how the new imperative is to drive greenhouse gas emissions (or carbon emissions) down to zero by 2050 and how the energy efficiency successes of the past can be used to accelerate this new focus on carbon reductions. Participants will be introduced to the concepts of embodied and operational carbon.

Andrew Oding, Building Knowledge Canada

The Joy of Decarbonizing in Homes

Decarbonization is a hot topic, but can sometimes be confusing. In this up-tempo discussion session, we’ll cover the basics of why decarbonization matters, discuss how beneficial electrification and responsible decarbonization are related, cover how to prioritize

Extending the Life of a Roofing Assembly

This session details information on how breathable, vapor-open roofing underlayment mitigates water intrusion though allows drying. Extending the Life of a Roof Assembly will describe the history of roofing underlayments, provide an understanding of the differences between asphalt felt and current synthetic underlayment. Building science principles defining the roof assembly barriers; heat, air and moisture will be discussed.

Scott Wood, VaproShield LLC

Feeling Hot, Hot, Hot...Water!

This session will provide a technology overview and look at Heat Pump Water Heater industry changes over the last two years. This roundtable will engage manufacturers reps from AO Smith, Rheem, and Bradford White to learn about how each OEM is handling code changes, policy drivers, supply chain issues, and training the next work force, all while delivering hot water and cool savings. This session will be informed by work being done by the Northwest Energy Efficiency Alliance, one of the longest running Heat Pump Water Heater programs in the country.

Dan Wildenhaus, Center for Energy and Environment and panel members Francois Lebrasseur, A. O. Smith; Gregg Holladay, Bradford White Water Heaters; Tim Gaughan, Rheem Manufacturing Company

EEBA: Studying the Impact of Operational Carbon Reductions

This session will focus on how energy efficiency measures impact the operational carbon emissions of homes. Participants will be shown how the energy modelling often done for code or energy program compliance can be used to assess the impact of common energy efficiency measures considered by builders in Minnesota on greenhouse gas emissions. A case study for one house will be demonstrated showing the relative carbon reduction impact for each of improving air tightness, improving window performance and improving thermal effectiveness alternatives for above grade walls. The session will include a discussion of process, costs and trade challenges for each one.

Andrew Oding, Building Knowledge Canada

Highly Permeable Membranes Allow Vapor Diffusive Drying and Stop Heat Loss

This presentation describes water vapor and air transmittance, ASTM test methods currently in use and what permeance is. Low permeance vapor barriers can increase interior condensation and trap moisture within the wall assembly. Due to the problems with impermeable water-resistive / air barriers (WRB/AB) installation we are now incorporating vapor open WRB/AB systems. Studies show that highly permeable WRB/AB systems increase substrate drying, reduce the wet time of absorptive claddings allowing permeable WRB/AB membranes to enhance the wall assembly performance. This presentation investigates the current research on vapor open systems and discusses how more permeability enhances wall assembly performance.

Scott Wood, VaproShield LLC

Having Success With Cold Weather Heat Pumps

This session will review a case study project of installing a one 1/2 ton heat pump (with no backup!) on a Minneapolis home. Learn details of what was considered and what work was done to make this project a success. Learn about what broader lessons we can apply as customers look to install more cold-weather heat pumps in our region.

Bill Graber and Jake McAlpine, The Energy Conservatory

EEBA: Embodied Carbon

This session will provide participants with important information about how the embodied carbon of building materials are assessed and modelled to provide a total embodied carbon metric for individual houses. The session will introduce the most common modelling tools for residential embodied carbon assessment and the process of modelling, showing what components are included and which ones aren’t. The results from a case study of embodied carbon modeling of one house will be presented such that participants will learn how to read and analyze results.

Andrew Oding, Building Knowledge Canada

A Field Perspective on Balanced Ventilation HRV and ERV

This session on balanced ventilation is from a 35-year perspective and is based on experience gained from the field, from a design, installation, operation and service view point. This session will follow language around 2015 Energy Code. This session will discuss balanced ventilation, HRV/ERV and what works and what does not work.

Mike Wilson, Dakota Supply Group

Location, Location, Location for EV Charging

Electric Vehicles are coming fast, but where are we going to charge them? In this session, we will talk about charging at single family homes, condominiums and apartment buildings, workplaces, fleet garages, shopping centers, “gas” stations, convenience stores, restaurants, auto dealers, hotels, parks and any other place our customers want to know about. This session will discuss where to use what kind of charging technology, when and why. Utility company representatives will share information on how they are helping to build this infrastructure to power our transportation now and in the future.

Jukka Kukkonen, Shift2Electric

EEBA: Cost Effective Decisions to Reduce Carbon Emissions in the Construction Industry

This session will use a sample house to show how embodied carbon and operational carbon are combined to show the total impact of a house over time. This case study will be used to identify the biggest carbon contributors in the building and operation of homes and how to assess cost effective measures to reduce total carbon emissions. Participants will learn about the design, material choices, supply chain and trade opportunities associated with carbon reduction initiatives. Participants will be challenged to consider their own next steps to reducing carbon emissions in the projects they work on over the next 1, 3, 10 and 30 years.

Andrew Oding, Building Knowledge Canada

8:30-10:00 am

10:30-12:00 pm

10:30-12:00 pm cont'd

1:00-2:30 pm

3:00-4:30 pm