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Dr. Crawley leads the U.S. Department of Energy's Building Technologies Program team working to achieve cost-effective net-zero energy commercial buildings by 2025. He is also responsible for managing the DOE's building energy software tools development activities including EnergyPlus (winner of an R&D 100 Award in 2003), Energy Design Plugin for Google SketchUp, Energy-10, DOE-2, and SPARK, among others.

With more than 30 years of experience in buildings energy efficiency, renewable energy, and sustainability, he has worked in government research and standards development organizations, as well as building design and consulting companies. A registered architect, he recently completed his PhD in Mechanical Engineering on the topic of building simulation as a policy tool at the University of Strathclyde in Glasgow, Scotland.

He is active in ASHRAE (Chair of Technical Committee 2.8 Building Environmental Impacts and Sustainability, Chair of Standard 169 *Weather Data for Building Design Standards*, member of SSPC 189.1P *Standard for the Design of High-Performance, Green Buildings Except Low-Rise Residential Buildings*, former member of the Research Administration Committee, and former chair of TC 4.2, 4.7, and 7.1). He was made an ASHRAE Fellow in 2009, received an ASHRAE Distinguished Service award in 2003 and a 1999 Symposium Best Paper Award for "Which Weather Data Should You Use for Energy Simulations of Commercial Buildings?"

He is also active in AIA, IBPSA, USGBC (member of the Research Committee and former member of the Energy & Atmosphere TAG), and serves on the editorial boards of three international Journals. He has written more than 100 papers and articles and made more than 300 presentations on energy efficiency, sustainability, and renewable energy topics throughout the world.

LECTURE TOPICS:

Getting from AEDGs to Zero-Energy Buildings

Buildings account for nearly 40% of U.S. energy use. ASHRAE, IESNA, USGBC, AIA, and DOE have collaborated on a series of Advanced Energy Design Guides (AEDGs) for at least 30% energy savings beyond Standard 90.1-1999. The guides provide prescriptive packages for each climate zone to reach the 30% energy savings. The AEDGs are accepted for points toward LEED-NC certification (instead of simulation). Recent studies have shown that it is possible today to achieve a zero-energy building but they are costly. This presentation provides an overview of the AEDG process as well as examples of packages and case studies from each guide. Also presented are examples of today's zero-energy buildings and a number of activities to aggressively move buildings to substantial energy savings over the next few years.

Advanced Energy Design Guides

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Are High Performance Buildings Really Performing?

It is possible today, at an incremental construction cost of 2-10%, to create buildings, which operate at 25, 50, and even 75% less energy than Standard 90.1-2004. A few high profile buildings touted to be designed as low-energy have been extensively metered and studied. This presentation provides an overview of the process, performance, technologies, and lessons learned for these recent 'high performance' buildings which range in measured energy savings of 25-70% over Standard 90.1 and opportunities for even greater savings in the future—achieving cost-effective net-zero energy commercial buildings by 2025.

Future Trends in Buildings and Energy Simulation

The buildings industry faces many challenges and opportunities over the next few decades. The buildings touted today as 'most energy-efficient' or 'green' would not be possible without energy simulation—but no single simulation tool can model all aspects of our buildings today. Over the next ten years, changes in building technology—particularly wireless controls and solid-state lighting—will profoundly alter how our buildings are designed, built, and operated. This presentation provides an overview of trends and drivers affecting the building industry as well as the simulation tools of tomorrow.

Standard 189.1 – Structure, Requirements, and Energy Savings

Standard 189.1, Standard for the Design of High-Performance, Green Buildings except Low-Rise Residential Buildings, is the first code-intended commercial green building standard in the United States. It provides a long-needed green building foundation for those who strive to design, build, and operate green buildings. The standard covers key topic areas of site sustainability, water use efficiency, energy efficiency, indoor environmental quality and the building's impact on the atmosphere, materials and resources, and includes construction practices as well as plans for operation of the building after occupancy. This presentation provides an overview of the structure and requirements of Standard 189.1 as well as the expected energy savings by commercial building type.

EnergyPlus, DOE's New Generation Building Energy Simulation Program

With the interest in green building certification and requirements that new Federal buildings achieve 30% energy savings beyond Standard 90.1-2004, simulating the energy performance of buildings has become increasingly important. EnergyPlus includes many building energy simulation features that have not been available together in a mainstream building energy simulation program--including variable time steps, configurable modular systems integrated with a heat balance-based zone simulation, on-site power, hybrid natural/mechanical ventilation, and UFAD. This presentation introduces the types of simulation tools available today, demonstrates a few of the available tools, and provides an overview of EnergyPlus simulation methodologies, capabilities and utilities and interfaces--including the Energy Design Plugin for Google SketchUp.

Impacts of Climate Change and Urbanization on Future Building Performance

In a study of potential climate change and urban heat island impacts, typical and extreme weather data were created for 25 locations (20 climate regions) to represent a range of predicted climate change and heat island scenarios for building simulation. Prototype buildings that represent typical, good, and low-energy practices around the world were simulated. The potential impacts of climate change include impacts on equipment use and longevity, fuel swapping as heating and cooling ratios change, environmental emissions, and comfort. The study also found that low-energy buildings can significantly mitigate any potential climate variation.