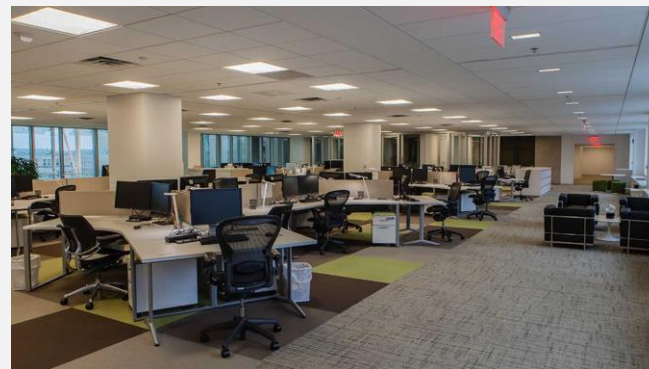
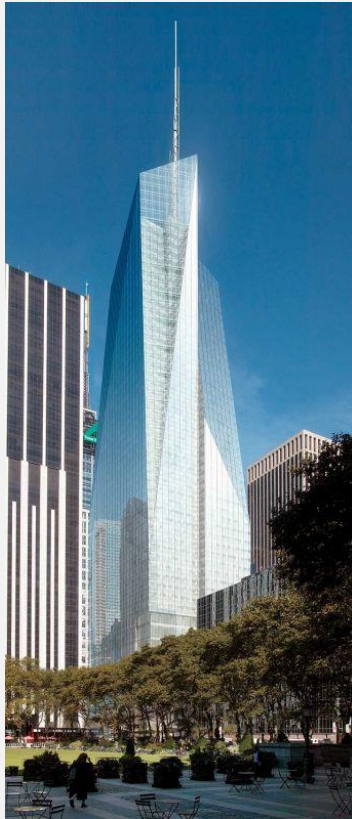


# Enhancing EUI: EUI Task Group Update to the GBAC



Drake Wauters, Projjal Dutta, EUI TG Co-Chairs  
April 28, 2016

# Green Building Advisory Committee (GBAC) Task Group Members or Designees

Amy Costello, Armstrong World Industries

Bob Fox, Cook Fox Architects

Bucky Green, Environmental Protection Agency

Chris Tremper, U.S. Department of Energy FEMP

CJ Cordova, U.S. Department of Veterans Affairs

David Kaneda, Integral Group

Drake Wauters, AIA Technical Design for Building Performance (Co-chair)

Emily Stoddart, Department of Energy

John Park, U.S. Department of Veterans Affairs

John Shonder, U.S. Department of Energy

Kent Peterson, P2S Engineering

Nicolas Baker, U.S. Department of Energy FEMP

Projjal Dutta, New York State Metropolitan Transportation Authority (Co-chair)

Timothy Unruh, U.S. Department of Energy FEMP

## GSA & Contractor Attendees

Brian Gilligan, GSA OFHPGB

Donald Horn, Office of Federal High-Performance Green Buildings

Frank Giblin, GSA Urban Development/Good Neighbor Program

Kathy Nguyen, Noblis

Ken Sandler, GSA OFHPGB, Designated Federal Officer

Martin Weiland, GSA Public Buildings Service

Ruth Kroeger, GSA Urban Development/Good Neighbor Program

## Observers

Abinash Selvacanabady, PNNL

Bruce Hunn, Hunn Building Energy

John Thomas, Environmental Protection Agency

Kathleen Judd, PNNL

Micah Thomas, Green Building Initiative

Wendolyn Holland, Holland Consulting LLC<sup>2</sup>

# Today's Discussion

- Background Refresher
- Status of Proposals and Testing:
  - EUI Density Metric
  - EUI Transportation Metric
- Outreach and Implementation
- Questions & Comments?

# EUI TG Background

- EUI use in Federal government
  - BTU/square foot used as official metric since 1970s
- Limitations
  - BTU/square foot can conflict with Reduce the Footprint goals
  - Lack of consideration of transport energy can conflict with Sustainable Location goals
- Task Group Goals:
  - Develop concept (approved at last GBAC meeting)
  - Test concept (underway)

# EUI TG Background

- Proposal
  - Form a working group to develop guidelines for creating a new energy intensity metric that factors energy use intensity and passenger miles traveled by employees to more accurately indicate how densified facilities, centrally located workplace sites that reduce overall commuting, and expansion of telework and hoteling result in overall lower energy use per hour worked.
    - The purpose of the new metric is to add a useful level of transparency to facility planning, design and workplace decision effectiveness to reduce overall energy use.

# EUI TG Background

- Develop a new facility energy metric that correlates annual energy used per facility divided by the number of agency staff and visitors served by the facility in order to more accurately convey site specific energy efficiency.
- Develop a new transportation energy metric that correlates annual energy used per agency staff and visitors served by the facility in order to more accurately convey site specific energy efficiency.
- Express the energy used per person for facilities (Scope 1 and 2) and transportation (Scope 3) in the same units to further assist strategic decision makers when seeking lower energy solutions.

# EUI TG Background

- Expanding EUI concept to include occupant density & transportation
  - EUI, based solely on energy consumption per square feet, can have the opposite of the desired effect of energy use reduction by accommodating fewer users per unit area.
  - Denser occupancy is effectively penalized in the conventional EUI definition, although it is an excellent means of increasing building efficiency.
  - EUI needs to be re-defined to account for occupant density.



# EUI TG Background

- Expanding Energy Use Intensity Concept to Include Occupant Density & Transportation
  - Transportation is a major consumer of energy.
  - A building's location can have a greater impact on energy consumption than green features incorporated into it.
  - An accurate EUI needs to factor in distances traveled by occupants and the mode of that travel.

# EUI Density Metric Proposal

- Energy Use Intensity to Density Metric
  - Develop a new facility energy metric that correlates annual energy used per facility divided by the number of agency staff and visitors served by the facility in order to more accurately convey site specific energy efficiency.

# EUI Density Metric Proposal

- Energy Use Intensity to Density Metric
  - Determine a more useful measure of how energy efficient a facility is by factoring in occupant (both staff and the public/customer) populations to arrive at a new metric that is total energy consumed by the building in one year per person served by the building.
  - Full Time Equivalent (FTE) of 1.0 for agency staff and the public (visitors, patients, litigants, passengers, prisoners, etc.) population represents one person.
  - A method for addressing public access as FTE versus agency staff could also be determined.

# EUI Density Metric Proposal

- Energy Use Intensity to Density Metric
  - The new term Full Time Equivalent Occupant (FTEO) can be correlated to kBtu/ft<sup>2</sup>-year to generate an inverse occupant density of ft<sup>2</sup>/FTEO and assigning the kBtu/person-year.

# Status of Testing Density-Based EUI

- At its 10-28-15 meeting, the full GBAC proposed that the Task Group's EUI concepts be tested through case analyses, pilot studies and/or modeling simulations, and DOE agreed to support this work.
- To help validate the Density-based EUI approach the Pacific Northwest National Lab (PNNL) is mobilizing an Occupancy-Adjusted EUI Study with funding from FEMP.
- Kathleen Judd, PNNL Project Lead

# EUI Transportation Metric Proposal

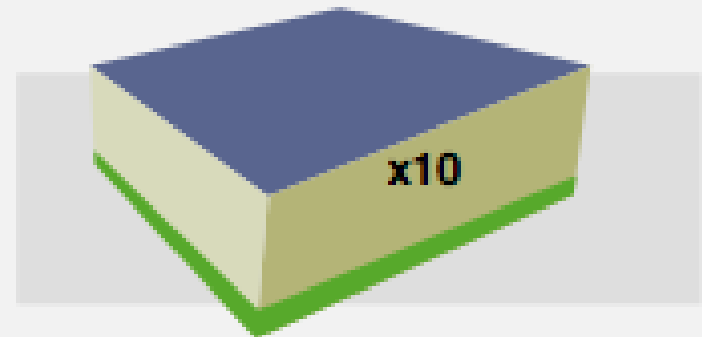
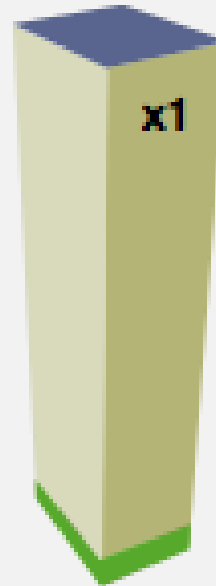
- Traditional EUI is the quotient of site-delivered energy and building square footage.
- This ignores impacts of location of the building as well as density of usage.
- The GSA Public Buildings Service Urban Development/Good Neighbor Program (Frank GIBLIN & Ruth Kroeger) has already been working on location scoring, which would be very appropriate to create a seamless addition to conventional EUI

# Energy Consumption: Tall Urban Building vs. Low-Rise Office Park



# Energy Consumption: Tall Urban Building vs. Low-Rise Office Park

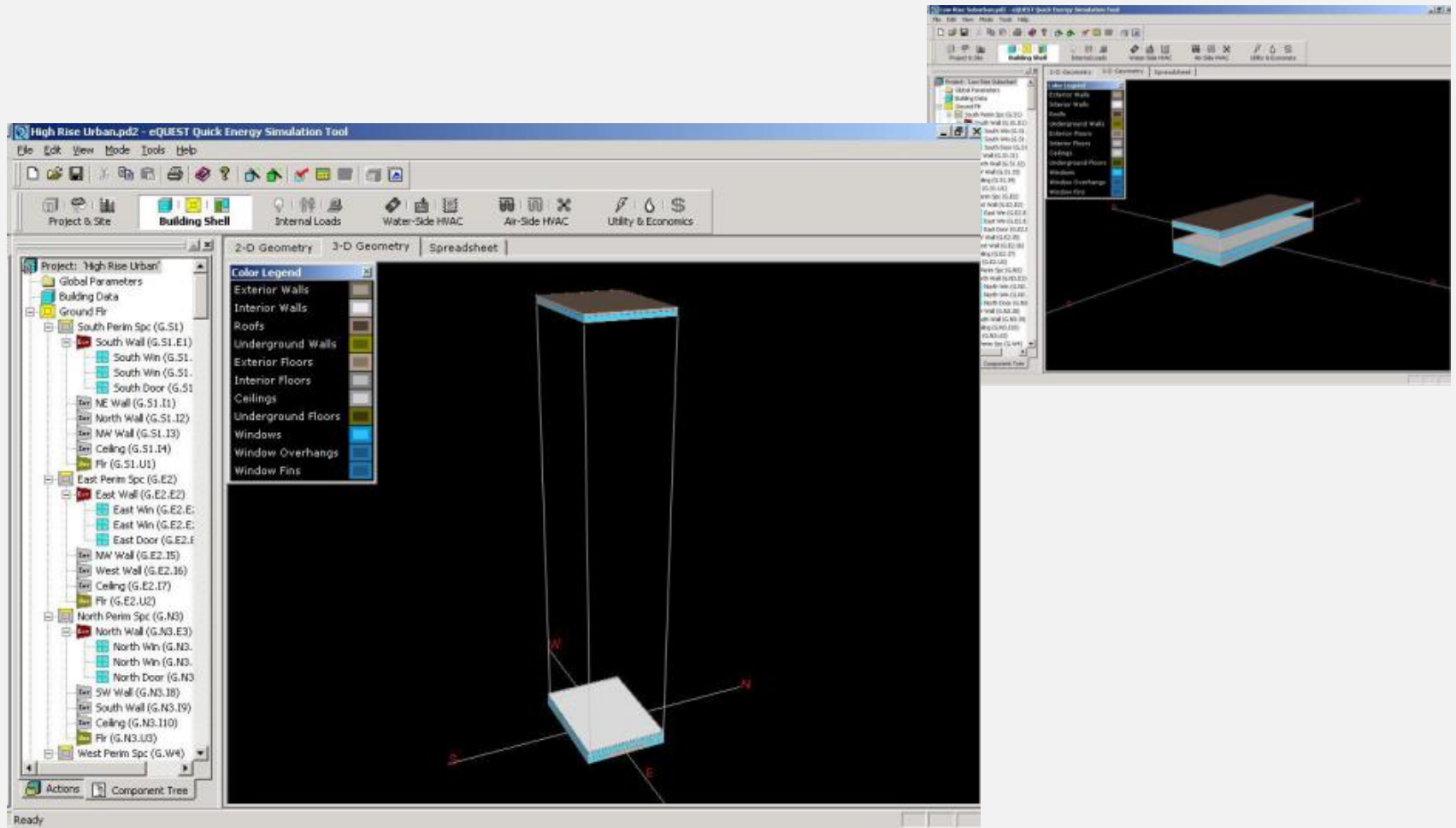
**Number of buildings**  
High-Rise: **1**  
Low-Rise: **10**



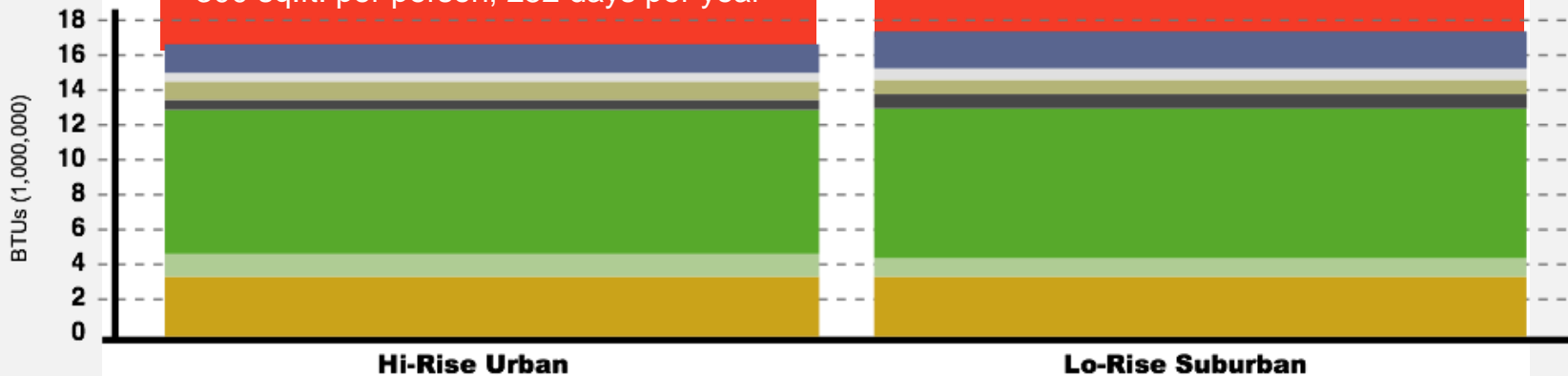
<b>Average floor size</b>	<b>30,612 sf</b>	<b>36,000 sf</b>
<b>Area of roof</b>	<b>88,000 sf</b>	<b>375,000 sf</b>
<b>Area of ext. wall</b>	<b>343,000 sf</b>	<b>385,000 sf</b>
<b>Area for parking</b>	<b>0 sf</b>	<b>1,837,500 sf</b>



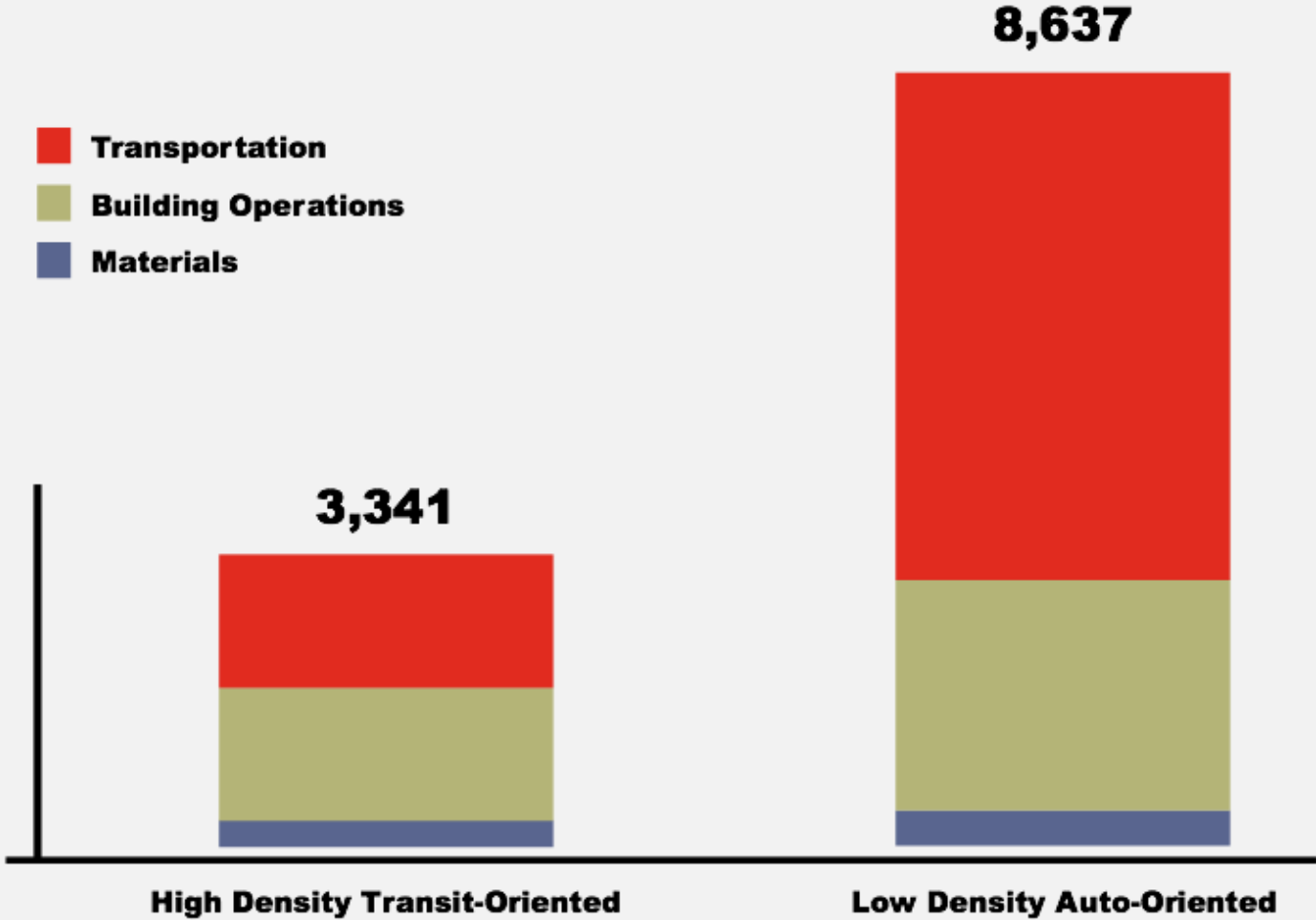
# Energy Consumption: Tall Urban Building vs. Low-Rise Office Park



# Energy Consumption: Tall Urban Building vs. Low-Rise Office Park



# GHG Per Person: Kg CO2E (Carbon dioxide equivalent) pa.



Source: Journal of Urban Planning and Development, Norman, March 2006

# Peripheral Issues

In response to GBAC comments at the 10-28-15 meeting, the TG examined several issues:

- Site vs Source
  - TG recommends using source energy to capture full energy impacts
  - Also allows fairer comparison with on-site sources
- Electric cars
  - Not addressed in the proposal. Too many variables and uncertainties at this time, but as the market settles down, can reassess
- Telework
  - Not addressed in the proposal due to complexities & unknowns. Some research shows telework increasing rather than cutting energy use.

## Plans Moving Forward

- Both metrics, EUI/FTEO and Transportation Energy could be developed so they are easy to use.
- The metrics should be transferable and scalable among federal agencies and adaptable to private stakeholders.
- They can also provide more effective tools to support sustainable portfolio planning.

Questions or Comments?

