



Retrofitting the Workforce for Net Zero Energy Buildings

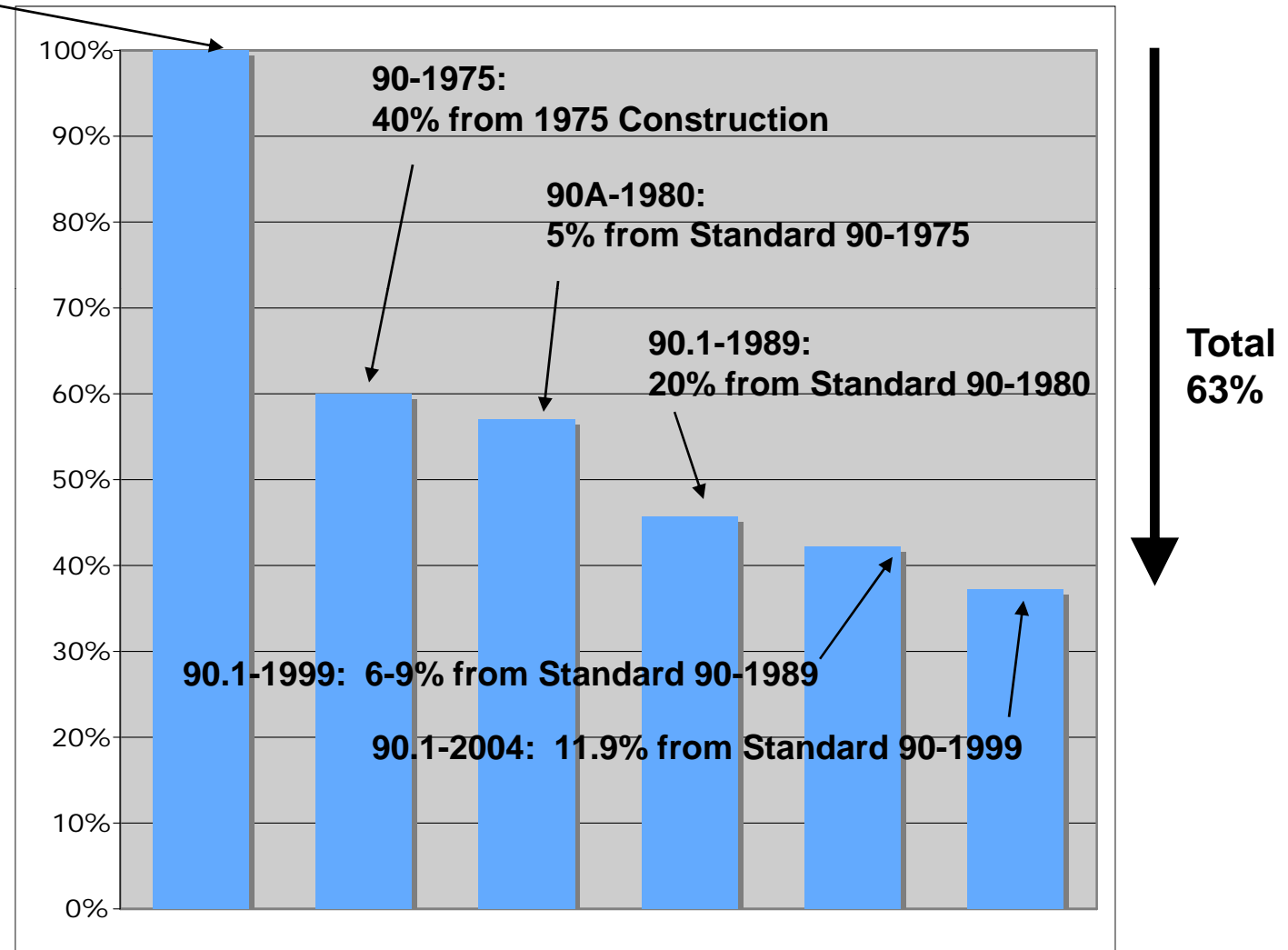
*(Training for continuously emerging
advanced energy technology in buildings)*

Joseph Deringer, AIA, LEED AP
Visiting Researcher
Building Technologies Department
Lawrence Berkeley National Laboratory
Email: JJDeringer@lbl.gov



35 Years of energy savings from ASHRAE Energy Standard *(estimates from simulations)*

1975 Construction



Sources: J. Deringer & www.energycodes.gov



Building Energy Goals

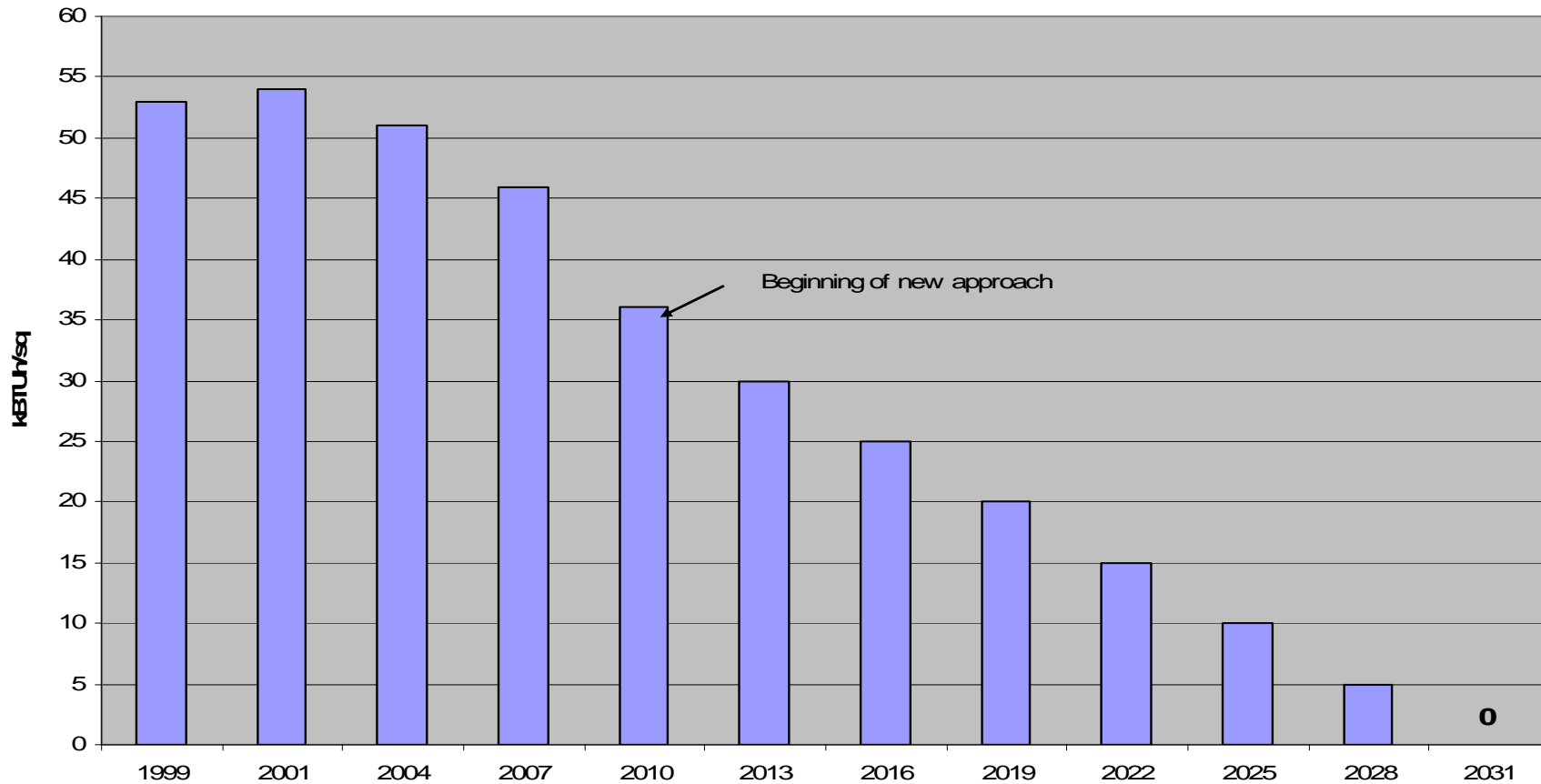
- National
 - Net-Zero Energy Buildings by 2025
 - Net-Zero Energy Homes by 2020
 - Low incremental cost.
- California
 - Net-Zero Energy New Commercial Buildings by 2030
 - Net-Zero Energy Homes by 2020
- ASHRAE
 - Net-Zero Energy Standards by 2031





ASHRAE Energy Goals

Energy Intensity





Some Ways to Save the next 30% - 50% in Typical New Commercial Buildings Today

- Daylighting (properly done)
- Efficient indoor lighting
 - *that is well controlled*
- Efficient exterior lighting
 - *that is well controlled*
- Efficient computers, peripherals, and other plug load equipment
- High efficiency HVAC systems
 - *designed for reduced interior and exterior loads*
- Advanced building envelope systems
- Effective controls for all of the above
- Use of on-site renewables



Training Audiences by Phase of Building Life Cycle (Commercial)

	Design	Documentation	Construction	Testing & Calibration	O&M	Retrofit, TI, etc.
Designers	X					
Modelers	X					
Specifiers		X	X			
Cx	?	x	X	X	x	X
Mfgs		?	X	?		
Installers			X	x		
Technicians			x	X	X	x
Operators					X	x



Some Key Needs

- High Quality Curricula
- Access to Hands-on Labs
- Virtual Environments
- Energy Centers – learning & demos
- Tool-lending Libraries



Some Key Needs (2)

- High Quality Curricula
 - Range of audiences
 - Range of building systems and technologies
 - Sharable
 - Updatable
 - In-person / hybrid / online
- Access to Hands-on Labs
 - HVAC (res., light comm., comm)
 - Lighting
 - Daylighting
 - Construction
 - Advanced controls
 - Virtual Labs (Supplement to hands-on)



Example Resources: Energy Centers - California

- PG&E Energy Centers
 - Pacific Energy Center, San Francisco
 - Energy Training Center — Stockton
- SCE Energy Centers
 - Agricultural Technology Application Center (AGTAC)
 - Customer Technology Application Center (CTAC)



Example Resources: Utility-based Workforce Training

- PG&E Power Path Program
 - Working with 6 community Colleges
 - Access to PG&E curriculum assets
 - Technical support
- SCE Building Operator Certification & Training
 - 6 courses are provided
 - A series of five "Level 1" courses and one "Level 2" course
 - Building Systems Overview
 - Facility Electrical Systems
 - Energy Conservation Techniques
 - HVAC Systems and Controls
 - Efficient Lighting Fundamentals
 - Environmental Health & Safety Regulations
 - Indoor Air Quality



Example Resources: California Consortium

- **California Energy & Utility Workforce Consortium**
 - A statewide organization created to address joint workforce needs.
 - Members include:
 - Energy and water utilities
 - Unions
 - The California State Community College System
 - The State Workforce Investment Board



Example Energy Centers & Labs

- Seattle Lighting Design Lab
 - www.lightingdesignlab.com
- Seattle Daylighting Lab - IDL Seattle
 - www.daylightinglab.com
- MIT Daylighting Lab
 - daylighting.mit.edu
- Florida Solar Energy Center (FSEC)
 - www.fsec.ucf.edu
- Energy Systems Lab (ESL- Texas A&M)
 - www-esl.tamu.edu



Example Resources: Other Centers and Activities

- Advanced Technology Environmental and Energy Center (ATEEC)
 - ATEEC is a national center funded by the National Science Foundation (NSF), Advanced Technological Education (ATE) Program. Vision is to collaborate in the creation of a world class network of community and technical college environmental programs & links to H.S. programs.
- 2010 SEET Technology Workshop
 - June 20—July 1, 2010 at the National Renewable Energy Laboratory in Golden, CO
 - Professional development opportunity for high school and community college energy technology instructors
 - Applications until April 15.
 - Travel funds available.



Example Resources: Other Centers and Activities

- Partnership for Environmental Technology Education
 - The Partnership for Environmental Technology Education (PETE), a non-profit 501(c)(3) organization, helps facilitate, augment, and broker partnerships with educational institutions, industry, and government.
 - the PETE network includes over 500 community and technical colleges, representing one-third of America's two-year institutions.
 - Also, partners with ATEEC



Some Open Source Software Tools

- Learn HVAC
 - *www.learnhvac.org*
 - *2007 version available – free download (NSF funding)*
 - *2010 version to be released in late spring (funded by California Energy Commission (CEC))*
 - *2012 version planned and funded by (CEC)*
- Learn Green Buildings
 - *www.learngreenbuildings.org*
 - *HVAC, envelope, lighting, daylighting*
 - *2012 version planned and funded by CEC (\$2M)*
- 21st Century eLearning Platform (*DOE funding*)
 - *Under development*
 - *Weatherization version*
 - *Commercial building lighting/daylighting version*



Example Univ. & CC Resources:

- Purdue University, ME Dept.
 - *Virtual labs & online education*
- Iowa Energy Center
 - *Excellent HVAC Lab*
- Nashville State Community College
 - *Problem-based case learning methods*
- Laney College, Oakland
 - *Energy & commissioning (Cx), good HVAC labs*
- Sacramento City College, Los Rios District
 - *Energy & commissioning (Cx), good HVAC labs*
- Hudson Valley Community College
 - *Residential weatherization*
- Lane Community College, Portland



Questions?

Joseph Deringer, AIA, LEED AP
Visiting Researcher
Building Technologies Department
Lawrence Berkeley National Laboratory
Email: JJDeringer@lbl.gov