Testimony of:

Mr. Edward Mazria
Founder and Executive Director
2030, Inc. / Architecture 2030

Mailing Address:
607 Cerrillos Road, Suite G
Santa Fe, NM 87505

Before the United States Senate
Committee on Energy and Natural Resources
"Building Sector Energy Policy Issues"

Thursday, February 26, 2009, 2:15 p.m.
Room SD-366, Dirksen Sentate Office Building

Edward Mazria

Founder & Executive Director
Architecture 2030

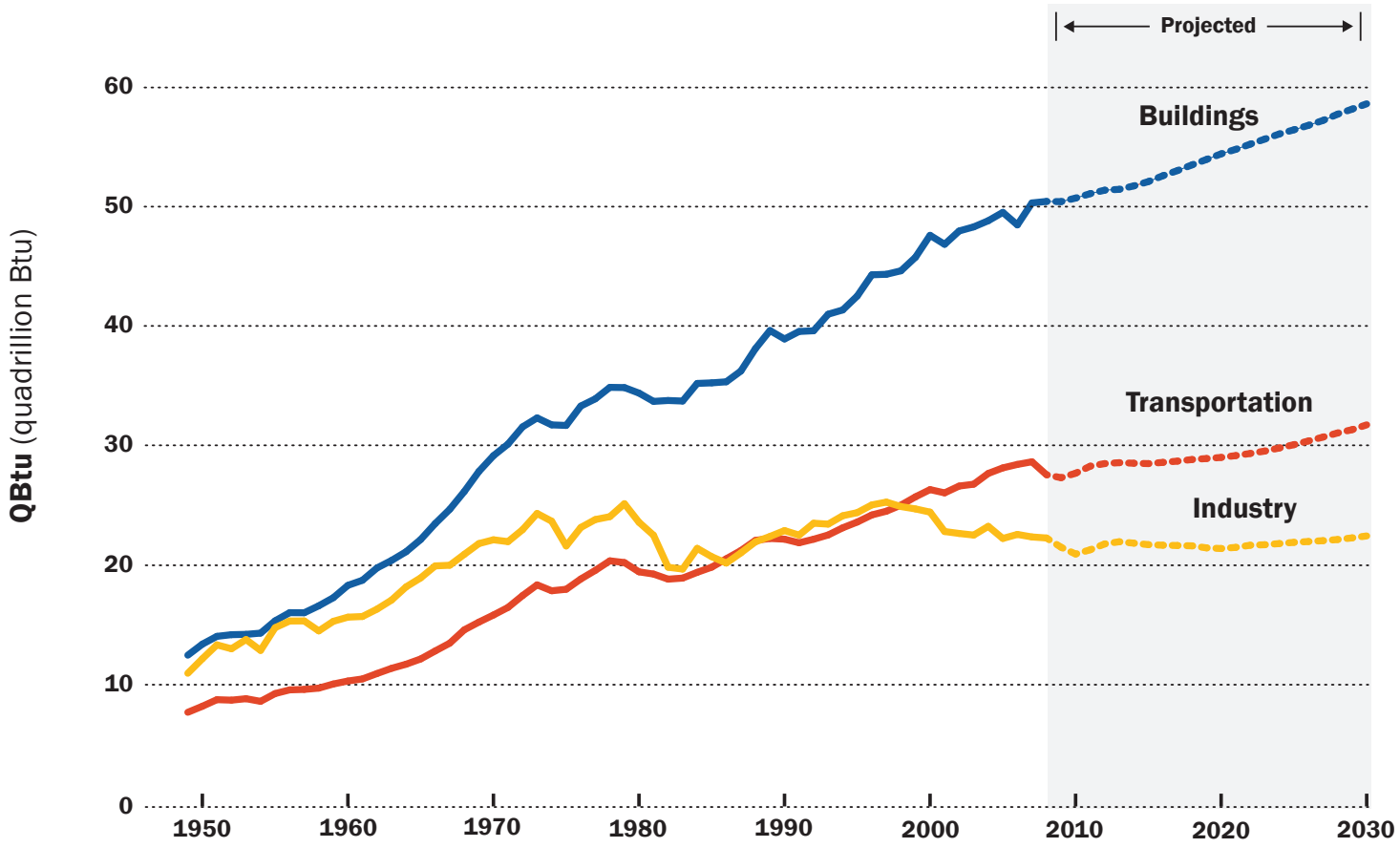
Brief Biography

Edward Mazria is an internationally-recognized architect, author, researcher and educator with a long and distinguished career. His award-winning architecture and planning projects span over a thirty-five year period and each employs a cutting-edge environmental approach to design. He is the author of numerous published works, including the 'bible' of solar design, *The Passive Solar Energy Book*, which is currently in use worldwide.

Most recently, Mr. Mazria has reshaped the national and international dialogue on energy and climate change to incorporate building design and the Building Sector. He is the founder of Architecture 2030, an innovative and flexible research organization focused on this issue. He developed and issued The 2030 Challenge, a measured and achievable strategy to dramatically reduce global energy consumption and greenhouse gas emissions by the year 2030. He speaks nationally and internationally on the subject of architecture, design, energy and climate change and has taught architecture at several universities including the University of New Mexico, University of Oregon and UCLA. His numerous awards include AIA Design Awards, AIA Design Innovation Award, American Planning Association Award, Department of Energy Awards, the American Solar Energy Society Pioneer Award, first recipient of the Equinox Award, and most recently a 2008 National Conservation Achievement Award from the National Wildlife Federation. He is a fellow of the Design Futures Council.

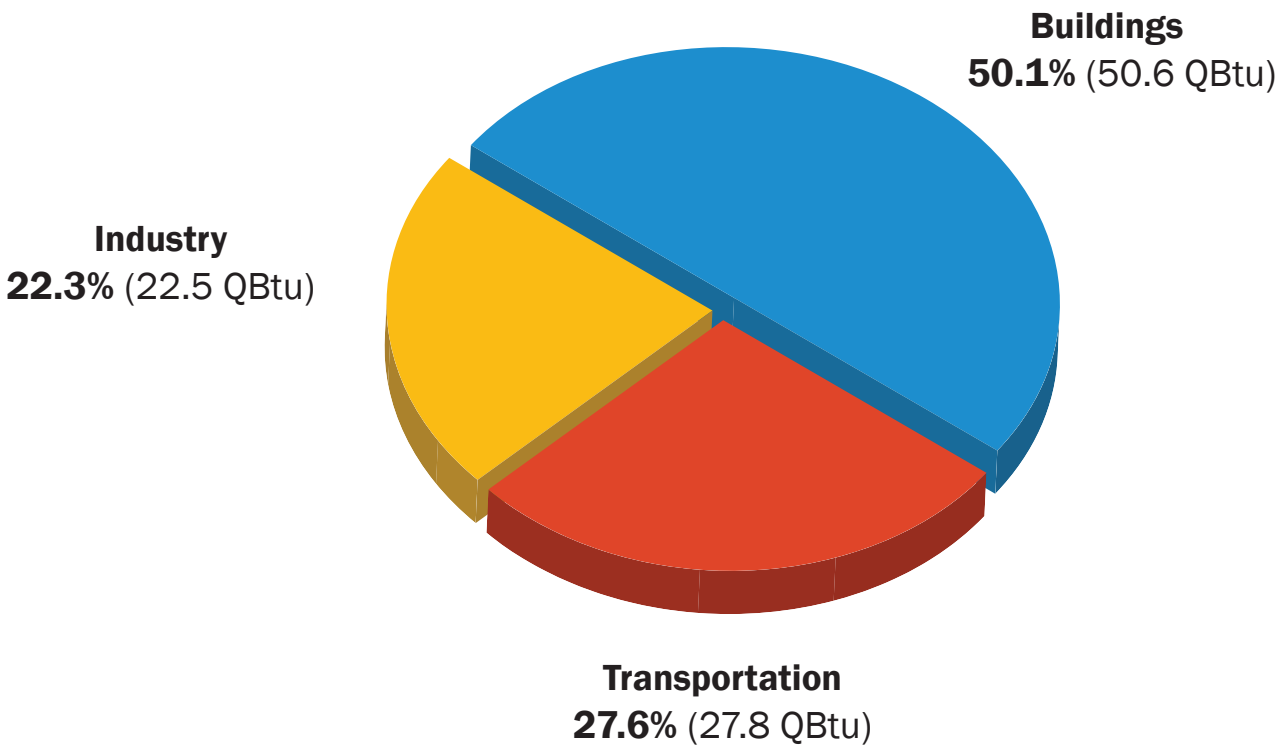
U.S. Energy Consumption by Sector

(Historic / Projected)



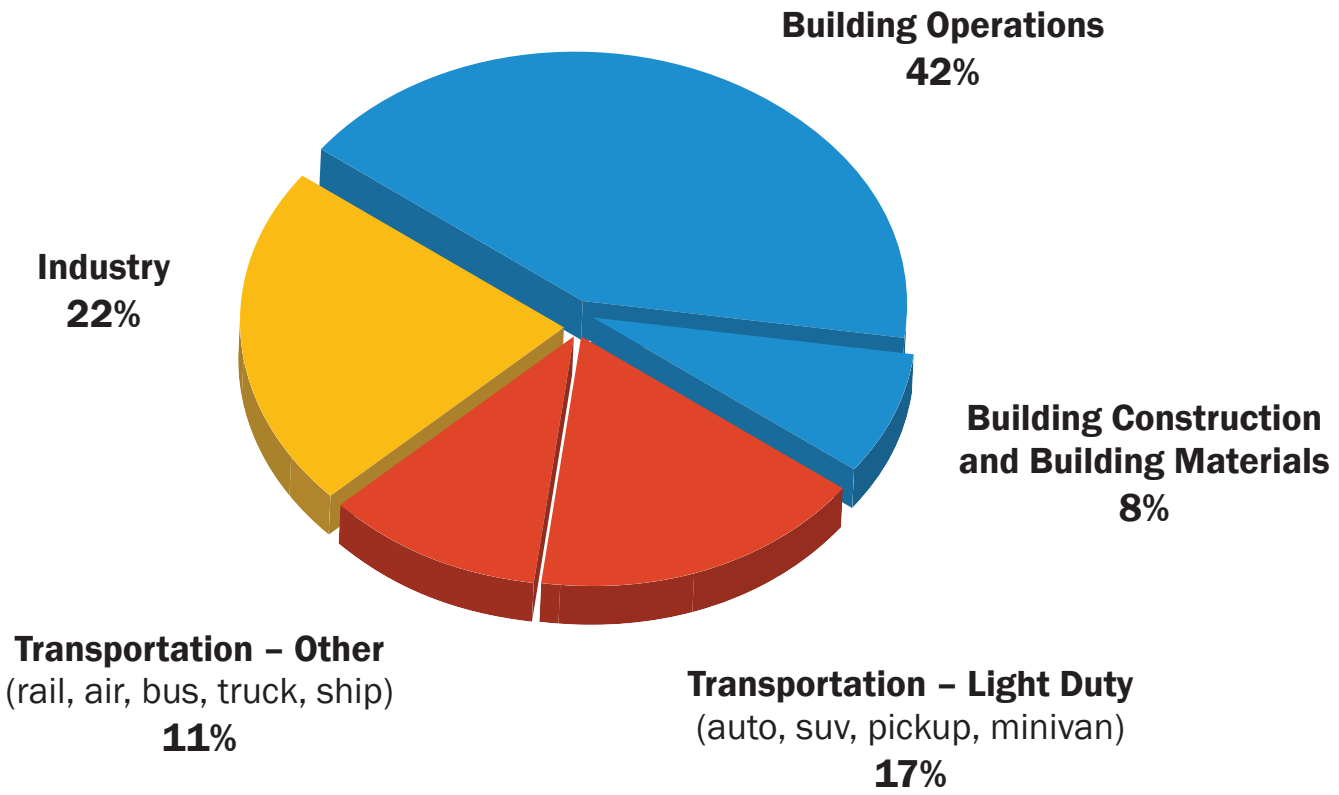
U.S. Energy Consumption by Sector

(2008)



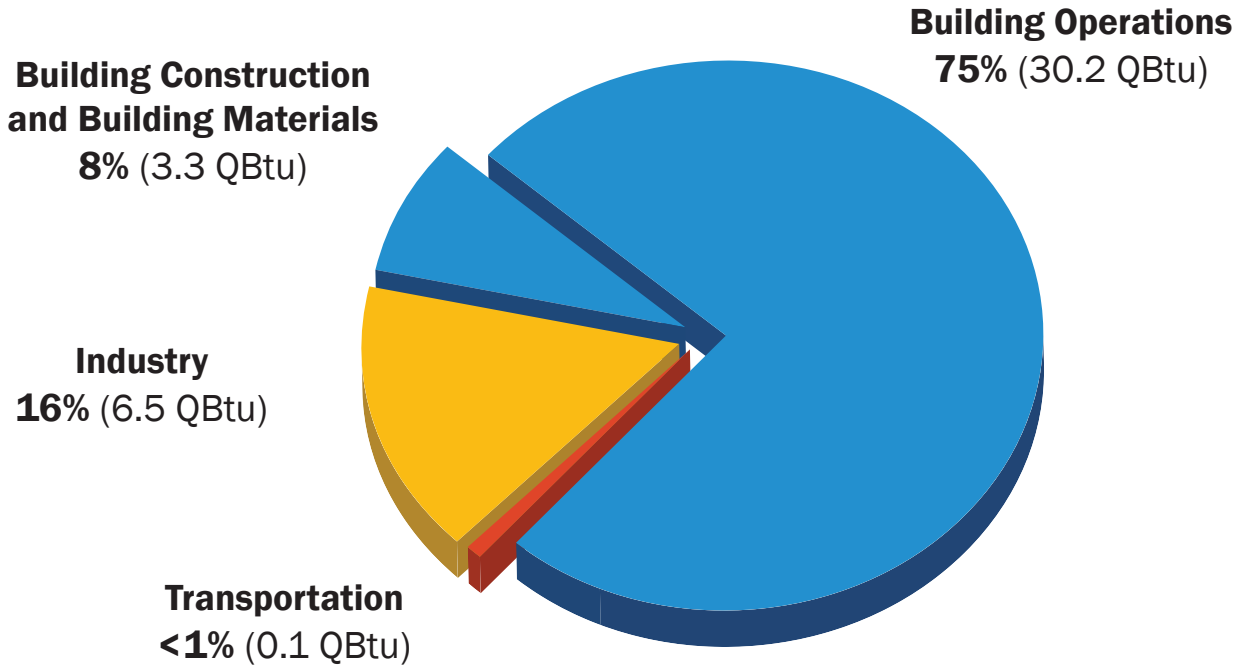
U.S. Energy Consumption by Sector

(2008)



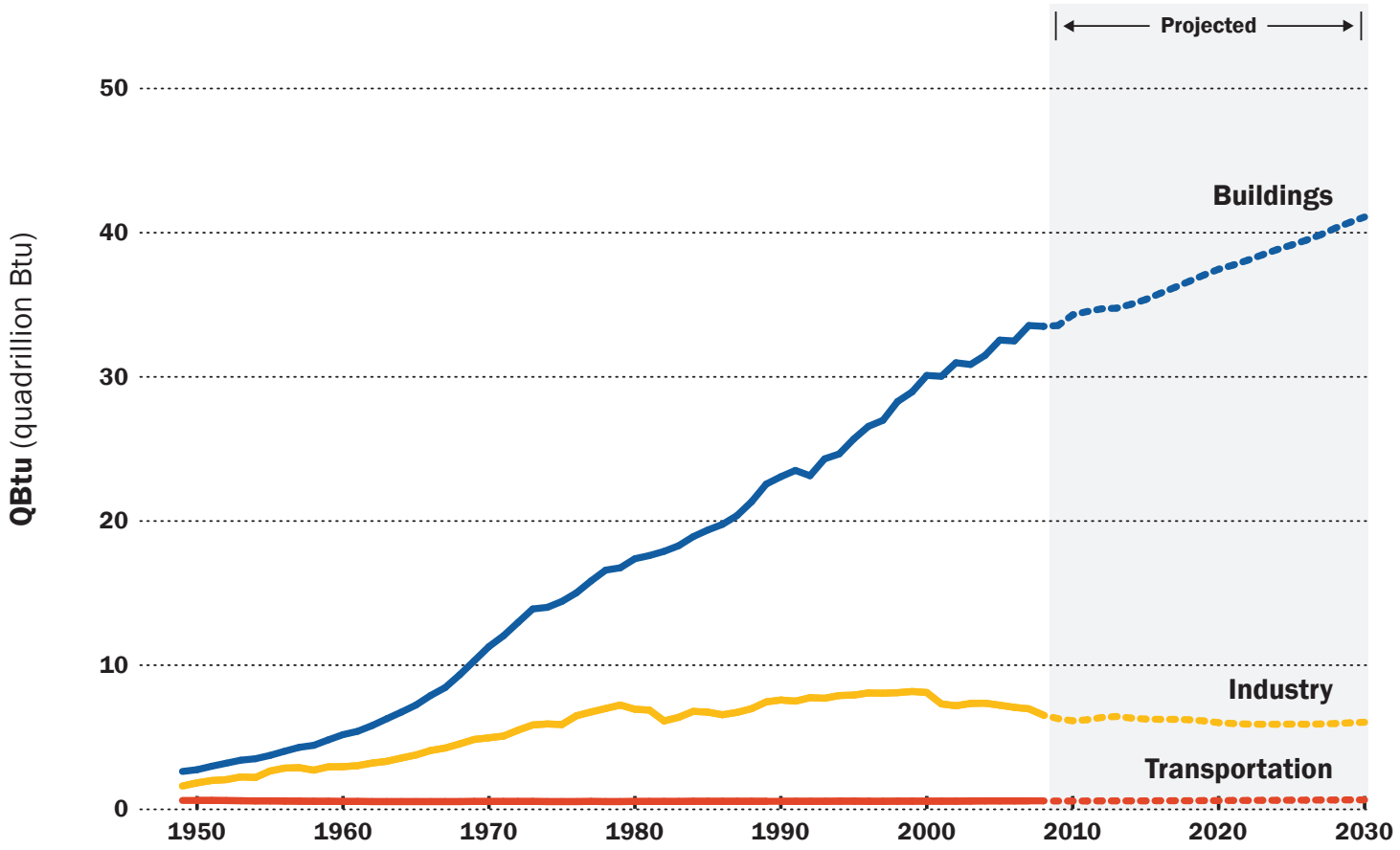
U.S. Electricity Consumption by Sector

(2008)



U.S. Electricity Consumption by Sector

(Historic / Projected)



Total U.S electricity consumption in 2008 is 40.56 QBtu.

Total projected U.S. electricity consumption in 2030 is 47.90 QBtu.

The 2030 Challenge

Energy Consumption Reduction Targets

New Buildings &
Major Renovations – 50%

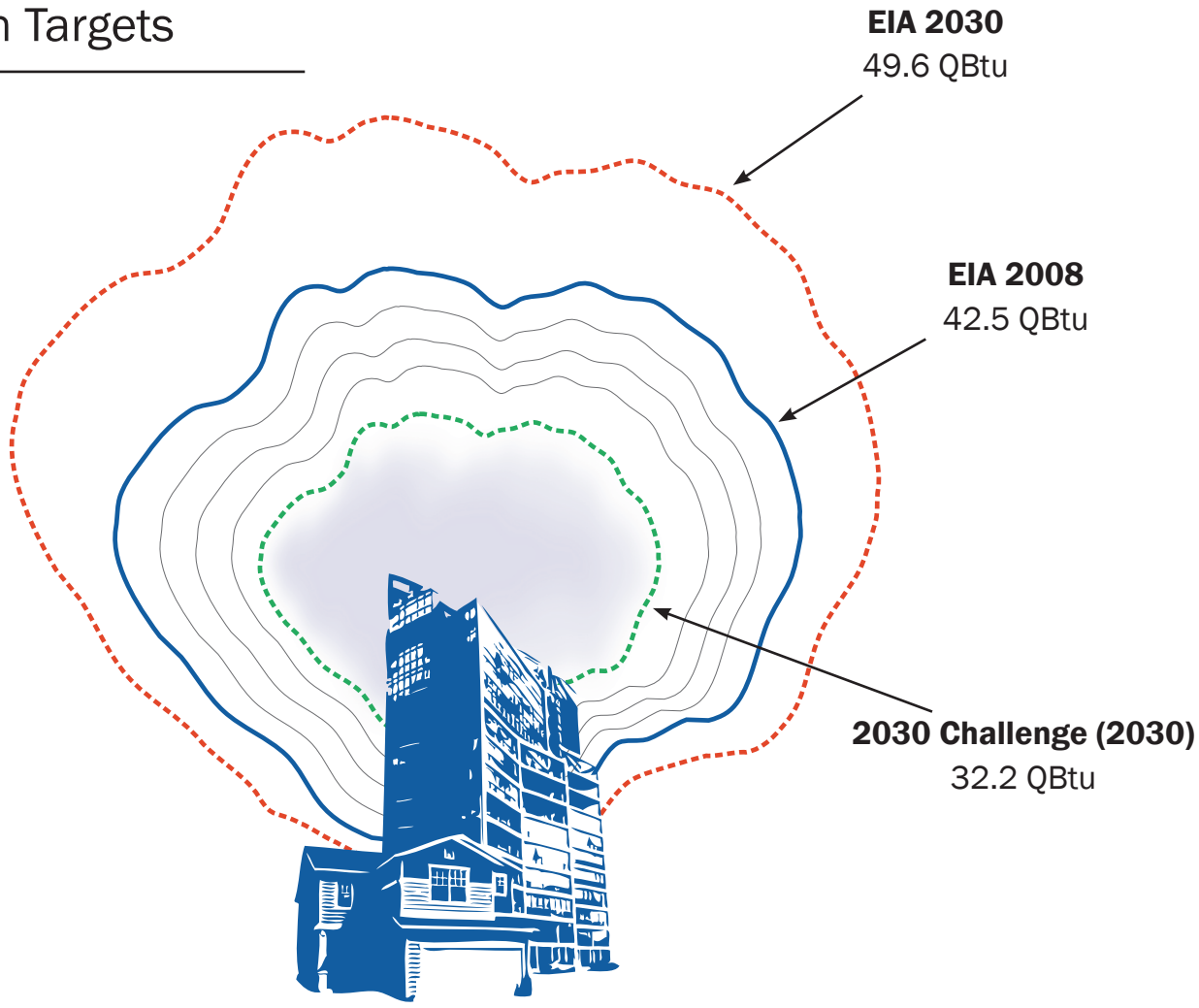
2010 – 60%

2015 – 70%

2020 – 80%

2025 – 90%

2030 – Carbon Neutral
(or net-zero)



See www.architecture2030.org for a complete explanation of the 2030 Challenge.

The 2030 Challenge

Adopters

FEDERAL GOVERNMENT

Energy Independence and Security Act 2007
(Federal buildings)

STATES

State of California (all buildings)
State of Illinois (State buildings)
State of New Mexico (State buildings)
State of Minnesota (State funded buildings)
State of Oregon (guide for public buildings / pending legislation)

LOCAL GOVERNMENT

U.S. Conference of Mayors (USCM)
National Association of Counties (NACo)
County of Sarasota, FL
County of Santa Fe, NM
The Boulder Consortium of Cities, CO
County of Fulton, GA
City of Albuquerque, NM
City of Santa Fe, NM
City of Santa Barbara, CA
City of Durango, CO
City of Portland, OR
City of Lafayette, CO
City of Vancouver, Canada
City of Seattle, WA
City of Richmond, VA
City of Dallas, TX

ORGANIZATIONS

The American Institute of Architects (AIA)
U.S. Green Building Council (USGBC)
Royal Architecture Institute of Canada (RAIC)
Residential Energy Services Network (RESNET)
International Council for Local Environmental Initiatives (ICLEI)
World Business Council for Sustainable Development (WBCSD)
National Wildlife Federation (NWF)
Society of Building Science Educators (SBSE)
AIA Committee on the Environment (AIA/COTE)
Association of Collegiate Schools of Architecture (ACSA)
Union Internationale des Architectes (UIA)
American Solar Energy Society (ASES)
American Society of Interior Designers (ASID)
Better Bricks
Rocky Mountain Institute (RMI)
Congress for the New Urbanism (CNU)

SUPPORTERS

Environmental Protection Agency (EPA/Target Finder)
American Society of Heating, Refrigeration and
Air-Conditioning Engineers (ASHRAE)
Green Building Initiative (GBI)

Gleneagles G8 Summit, July 2005

Agreeing to act with resolve and urgency, the G8 Heads of State committed to:

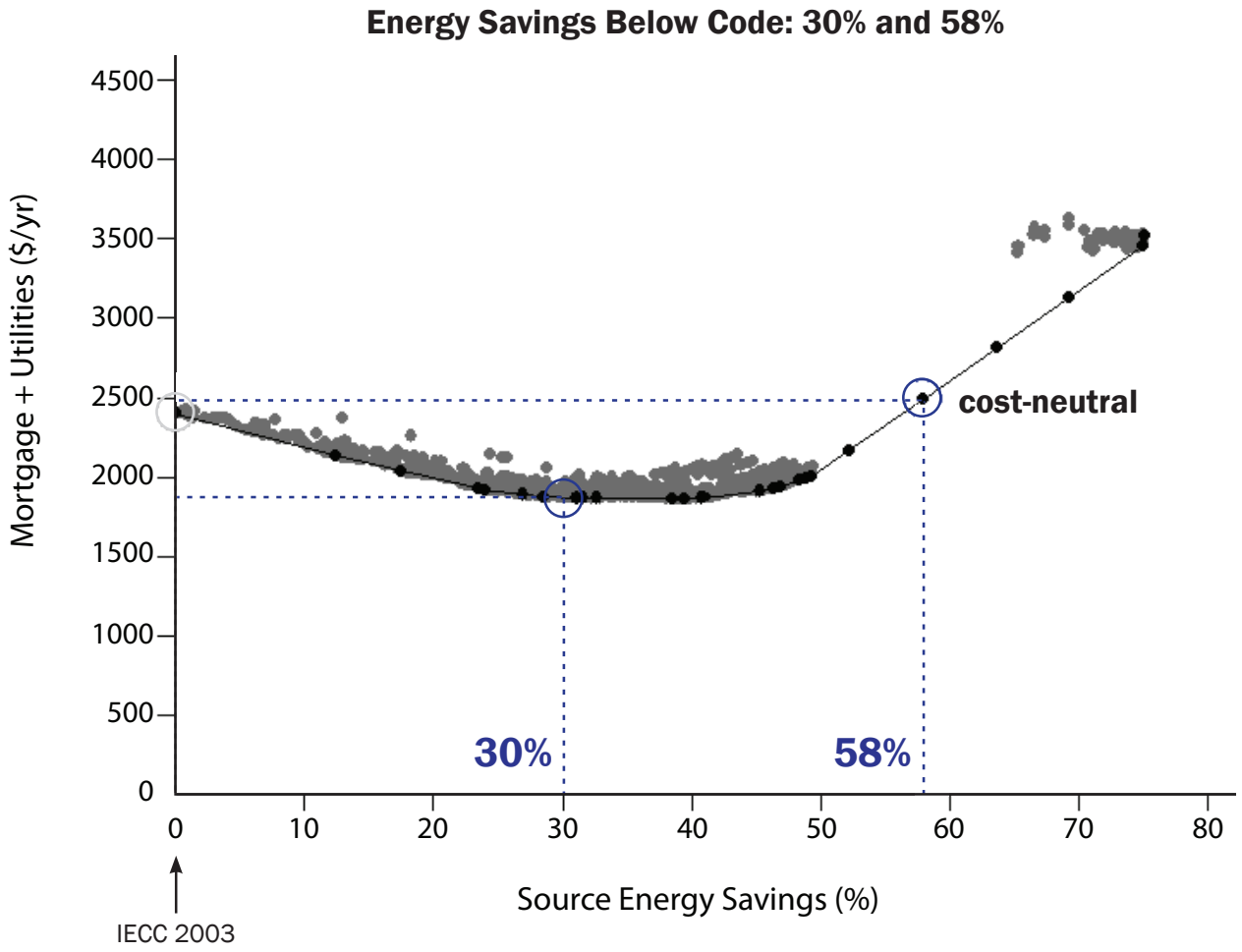
"Energy efficiency standards for new buildings should be set by national or state governments and should aim to minimize total costs over a 30-year lifetime."

U.S. Department of Energy

(National Renewable Energy Laboratory)

Greensburg, Kansas

Estimated First Cost (30% below code)	$4,000
Annual Amortized Cost (7%, 30-year mortgage)	$211
Annual Utility Bill Savings	$723
Net Annual Savings	$512



2000 square foot, 2-story, 16% window to floor ratio, unconditioned basement.

Evaluated relative to the minimum 2003 IECC.

Assumes marginal tax bracket of 28% and includes present value of future replacements of equiment over 30 year life of mortgage.

U.S. Department of Energy

Estimated Cost Savings

30% Energy Savings Below Code (2006 IECC)

CITY	ANNUAL SAVINGS
Houston	$577
Phoenix	$412
Chicago	$407
Atlanta	$577
Denver	$408
New Orleans	$403
Seattle	$472

Annual saving evaluated relative to the 2006 International Energy Conservation Code, using average utility rates and climate data for each location.
Based on a 2,500 square foot new home, 30-year mortgage at 7% APR.

Federal Energy Legislation:

Update National Model Building Energy Code Standards

2010 – 30% below code (below IECC 2006, ASHRAE 90.1-2004)
2016 – 50% below code (performance code)
2022 – 75% below code (performance code)
2028 – carbon neutral (performance code)

Performance codes do not pick clean-energy technology winners and losers.

Federal Energy Legislation:

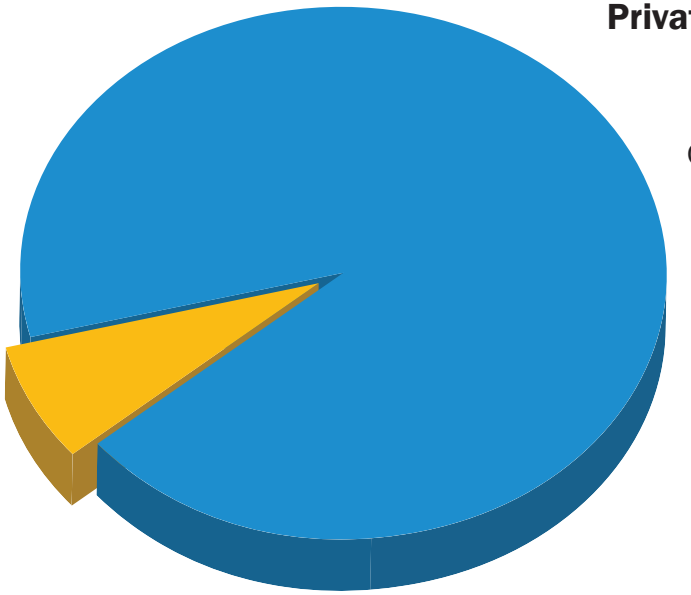
Incorporate Voluntary Performance "Reach Codes"

2010 - 2016	• **30% below code – national standard** • 50% below reach code • 75% below reach code • carbon neutral reach code
2016 - 2022	• **50% below code – national standard** • 75% below reach code • carbon neutral reach code
2022 - 2028	• **75% below code – national standard** • carbon neutral reach code
2028	• **carbon neutral code – national standard**

A Reach Code, when adopted by a state or local government, must take precidence over federal minimum appliance and equipment standards.

Economic Recovery

U.S. Energy Consumption by Sector (2008)



Private Building Sector
93%

Residential -39%
Commercial -17%

Public Building Sector
7%

Government +6%
Schools +6%

U.S. building stock is approximately 254.3 billion square feet. Public buildings is approximately 17.8 billion square feet.

$96 Billion Federal Investment

(each year for two years)

1. **Housing mortgage interest rate buy-down**
2. **Commercial building accelerated-depreciation program**

For buildings that meet:

3. **Energy reduction targets:**
   - **30% below code** (HERS 70)
   - **50% below code** (HERS 50)
   - **75% below code** (HERS 25)
   - **carbon neutral**

Investment Plan Benefits

- 9 million new jobs
- $1 trillion in new private spending
- $236 billion/year new renovation market
- $44 – $69 billion in consumer savings
- 2.16 QBtu U.S. energy consumption reduction
- New tax base pays for the Plan

Homes

(housing example)

Mortgage Interest Rate

Existing	New	Energy Reduction
4.0%	4.5%	30% below code
3.5%	4.0%	50% below code
2.5%	3.0%	**75% below code**
2.0%	2.5%	Carbon neutral

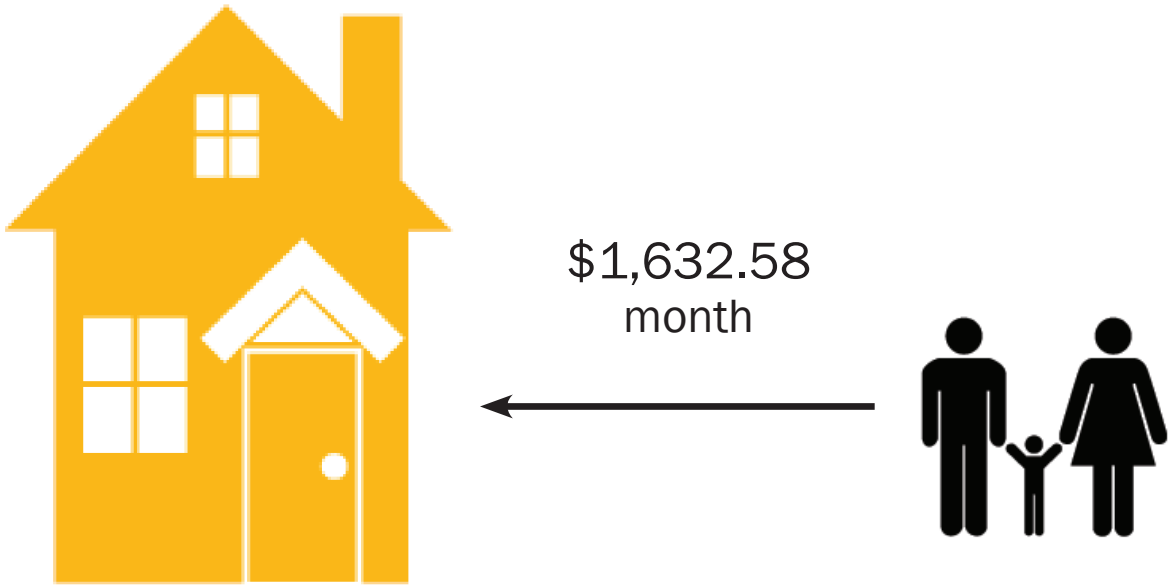
Economic Recovery

The Two-Year, Nine-Million-Jobs Investment Plan

$272,300 Mortgage Loan @ 6%

Mortgage balance = $260,300

Equity = $12,000

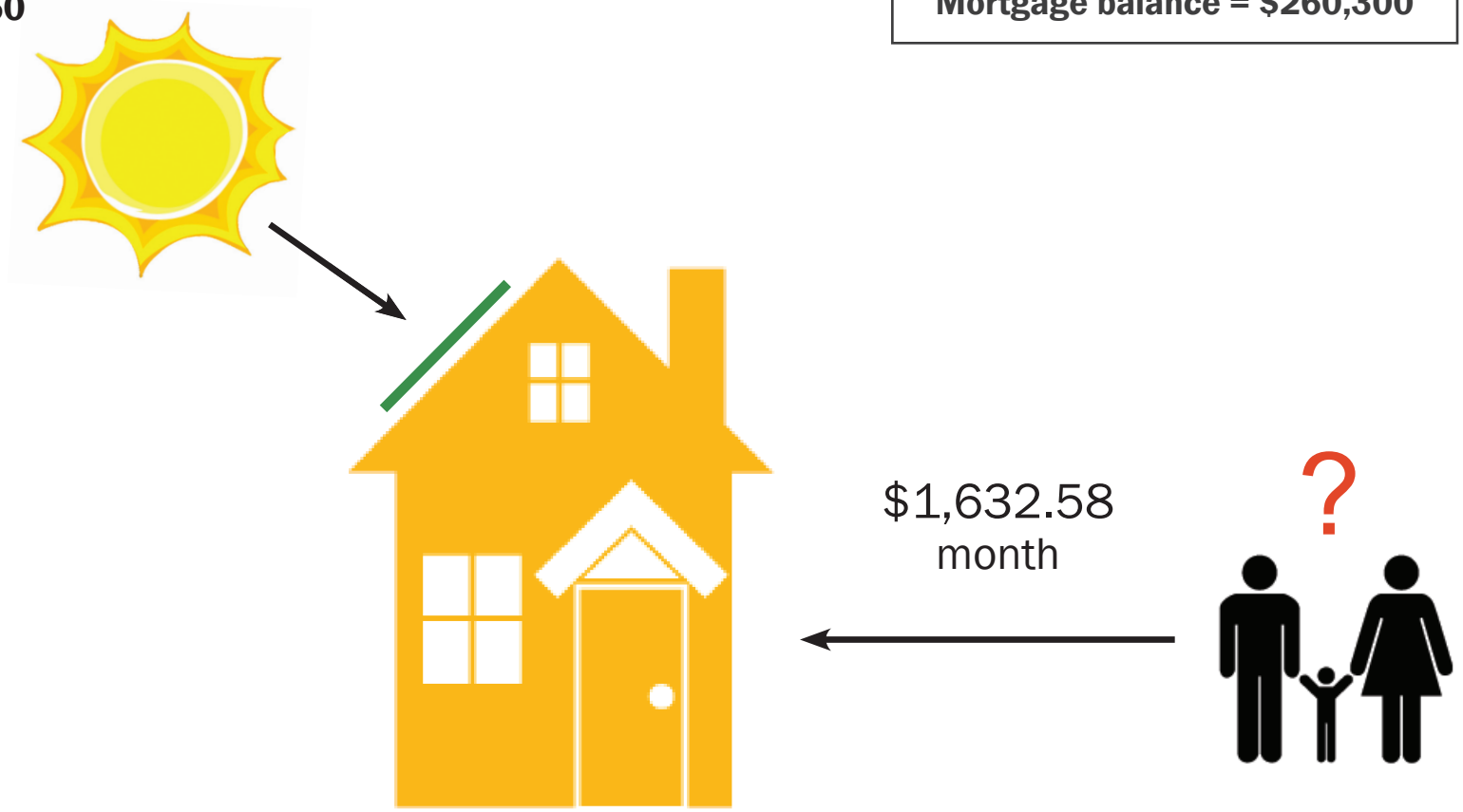


Economic Recovery

The Two-Year, Nine-Million-Jobs Investment Plan

75 % energy reduction
Cost = $51,250

Mortgage loan @ 6% = $272,300
Mortgage balance = $260,300



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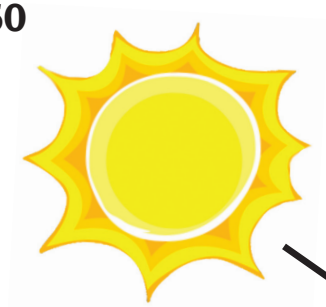

Mortgage loan @ 6% = $272,300
Mortgage balance = $260,300

INVESTMENT

2.5%
mortgage

$7,000
tax credit

$1,632.58
month

Economic Recovery

The Two-Year, Nine-Million-Jobs Investment Plan

75 % energy reduction
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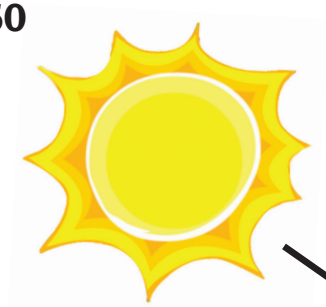


New Mortgage
$304,550

~~$1,632.58~~
~~month~~

INVESTMENT

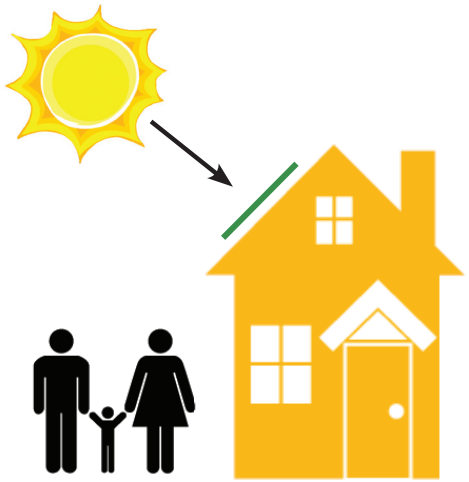
2.5%
mortgage

$7,000
tax credit

$1,203.34
month

Economic Recovery

The Two-Year, Nine-Million-Jobs Investment Plan



Mortgage Loan $304,550 @ 2.5%

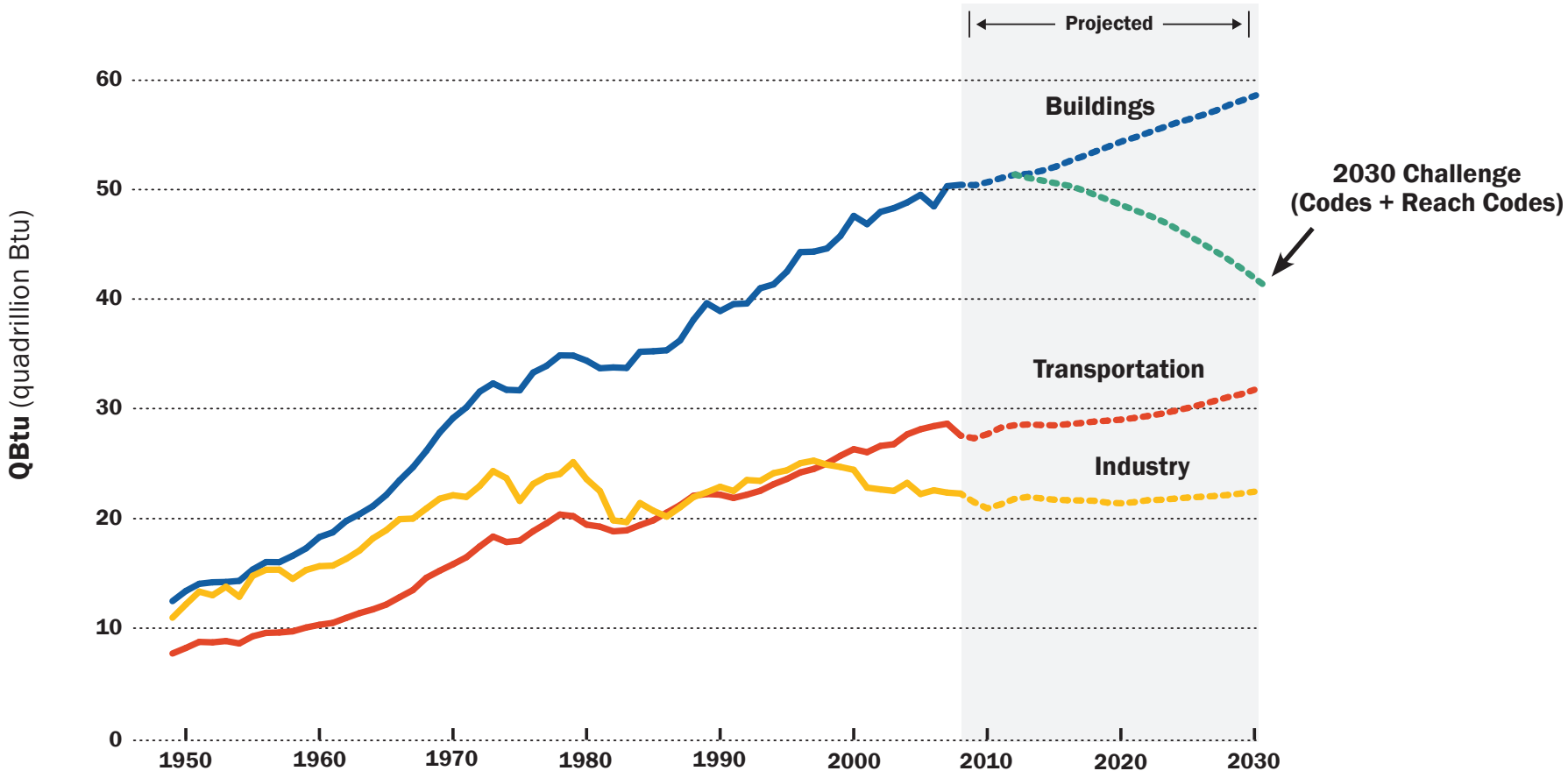
Original monthly payment =	$1,632.58
New monthly payment =	- $1,203.34
Mortgage savings =	$429.24
Monthly energy savings =	+ $145.94
TOTAL MONTHLY SAVINGS =	**$575.18**

BUILDING SECTOR
Products / Materials / Industries

Demolition
Earth Work
Equipment Rental
Concrete
Masonry
Steel
Metals
Wood
Plastics / Rubber
Waterproofing
Insulation
Doors
Windows / Skylights
Glass / Solar Systems
Plaster / Gypsum Board
Paints
Tile / Carpet
Coatings / Sealants
Mech. / Elect. Equipment
Hardware
Lighting
Furnishings
Trees, Shrubs, Grasses
Architects / Engineers
Planners / Interior Designers
Contractors
Construction Workers
Banking / Real Estate

U.S. Energy Consumption by Sector

(Historic / Projected)



Notes

BUILDING SECTOR ASSUMPTION

To create a U.S. Building Sector, the Residential buildings (operations) sector, Commercial buildings (operations) sector, Industrial sector - building operations estimate and the Industrial sector - annual building construction and materials embodied energy estimate were combined.

PAGE 2: U.S. ENERGY CONSUMPTION BY SECTOR

Notes:

6.2% of Industry goes to Buildings for Industrial Building Operations (HVAC and Lighting). Based on the 2004 Building Energy Databook: Summary Table 6.

8% of Total U.S. Energy goes to Buildings for the annual embodied energy of buildings. Based on assumptions from the study, “Energy and Building Construction”, in Richard Stein’s book, “Architecture and Energy”, and embodied energy defined as 20% of the 50 year operational energy of a building.

Sources:

U.S. Energy Information Administration, Annual Energy Review (AER), Table 2.1a Energy Consumption by Sector, 1949–2007; http://www.eia.doe.gov/emeu/aer/consump.html.

U.S. Energy Information Administration, Annual Energy Outlook 2009 Early Release, Tables 2 Energy Consumption by Sector and Source; http://www.eia.doe.gov/oiaf/aeo/aeoref_tab.html.

U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, 2004 Building Energy Databook, Summary Table 6

Stein, R., Architecture and Energy, Anchor Press, 1977

PAGE 3: U.S. ENERGY CONSUMPTION BY SECTOR

Sources:

U.S. Energy Information Administration, Annual Energy Outlook 2009 Early Release, Table 2 Energy Consumption by Sector and Source; http://www.eia.doe.gov/oiaf/aeo/aeoref_tab.html.

PAGE 4: U.S. ENERGY CONSUMPTION BY SECTOR

Sources:

U.S. Energy Information Administration, Annual Energy Outlook 2009 Early Release, Table 2 Energy Consumption by Sector and Source and Table 7 Transportation Sector Key Indicators and Delivered Energy Consumption; http://www.eia.doe.gov/oiaf/aeo/aeoref_tab.html.

Notes

PAGE 5: U.S. ELECTRICITY CONSUMPTION BY SECTOR

Sources:

U.S. Energy Information Administration, Annual Energy Outlook 2009 Early Release, Tables 2 Energy Consumption by Sector and Source; http://www.eia.doe.gov/oiaf/aeo/aeoref_tab.html.

PAGE 6: U.S. ELECTRICITY CONSUMPTION BY SECTOR

Sources:

U.S. Energy Information Administration, Annual Energy Review (AER), Tables 2.1a, 2.1b, 2.1c, 2.1d and 2.1e; http://www.eia.doe.gov/emeu/aer/consump.html.

U.S. Energy Information Administration, Annual Energy Outlook 2009 Early Release, Tables 2 Energy Consumption by Sector and Source; http://www.eia.doe.gov/oiaf/aeo/aeoref_tab.html.

PAGE 7: THE 2030 CHALLENGE

Sources:

See Architecture 2030 at: www.architecture2030.org

U.S. Energy Information Administration, Annual Energy Outlook 2009 Early Release, Tables 2 Energy Consumption by Sector and Source; http://www.eia.doe.gov/oiaf/aeo/aeoref_tab.html.

PAGE 8: THE 2030 CHALLENGE

Notes:

For a complete list of adopters see: www.architecture2030.org

PAGE 9: GLENEAGLES G8 SUMMIT. JULY 2007

Source:

2008 International Energy Agency report, In support of the G8 Plan of Action – ENERGY EFFICIENCY POLICY RECOMMENDATIONS.

Notes

PAGE 10: U.S. DEPARTMENT OF ENERGY

Source:

U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, National Renewable Energy Laboratory, “Example Performance Targets and Efficiency Packages, Greensburg, Kansas”.

PAGE 11: U.S. DEPARTMENT OF ENERGY

Source:

U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Program, Builders Challenge Technology Information Packages.

PAGE 12: FEDERAL ENERGY LEGISLATION

Notes:

Update Section 304 of the Energy Conservation and Production Act (42 U.S.C. 6833), SEC. 304. UPDATING STATE BUILDING ENERGY EFFICIENCY CODES to the 2030 Challenge targets.

PAGE 13: FEDERAL ENERGY LEGISLATION

Notes:

Update Section 304 of the Energy Conservation and Production Act (42 U.S.C. 6833), SEC. 304. UPDATING STATE BUILDING ENERGY EFFICIENCY CODES to the 2030 Challenge targets, incorporate Reach Codes, and provide incentives for States and local governments that adopt Reach Codes.

PAGE 14: ECONOMIC RECOVERY

Source:

McGraw Hill Construction report, December 18, 2008. From January through November 2008, construction of infrastructure projects grew by 2%. Construction of institutional buildings grew by 6%, helped by public and government buildings (up 6%) and educational buildings and schools (up 6%). Construction of residential buildings declined 37% and commercial buildings 17% over this same period.

U.S. Department of Energy, Energy Efficiency and Renewable Energy, 2008 Building Energy Databook.

Notes

PAGES 15 - 23: ECONOMIC RECOVERY

Source:

From the report, Two-Year, Nine-Million-Jobs Investment Plan by Architecture 2030. Complete Plan can be downloaded at www.architecture2030.org.

PAGE 24: U.S. ENERGY CONSUMPTION BY SECTOR

Assumptions:

Assumes that new codes become effective as follows (year codes come into effect - percent better than code):

2010 - 30% 2016 - 50% 2022 - 75% 2028 - carbon neutral

Assumes 25% of all new buildings meet the new code the first year it becomes effective; that 50% of all new buildings meet the new code the year after; and that 100% of all new buildings meet the new code every following year until a new base code is adopted.

Assumes the amount of existing building square footage renovated annually is equal to the square footage built new. Also assumes that of this square footage, 25% of renovations meet the new code the first year it becomes effective; that 50% of renovations meet the new code the year after; and that 100% of all renovations meet the new code every following year until a new code is adopted.

Assumes aggressive Reach Code implementation and incentives.

Sources:

EIA's Annual Energy Review (AER): Table 2.1a Energy Consumption by Sector, 1949–2007; http://www.eia.doe.gov/emeu/aer/consump.html.

EIA's Annual Energy Outlook 2009 Early Release: Tables 4 and 5; http://www.eia.doe.gov/oiaf/aeo/aeoref_tab.html.