

How Architects Can Stop Global Warming



Architecture 2030

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Zero Non-Renewable Energy Buildings

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Zero Non-Renewable Energy Buildings

The BIG Picture – Climate Change

- Global consensus
- National momentum
- Significant reduction in greenhouse gasses (GHG) required (80 % by mid-century)

The Infamous Hockey Stick



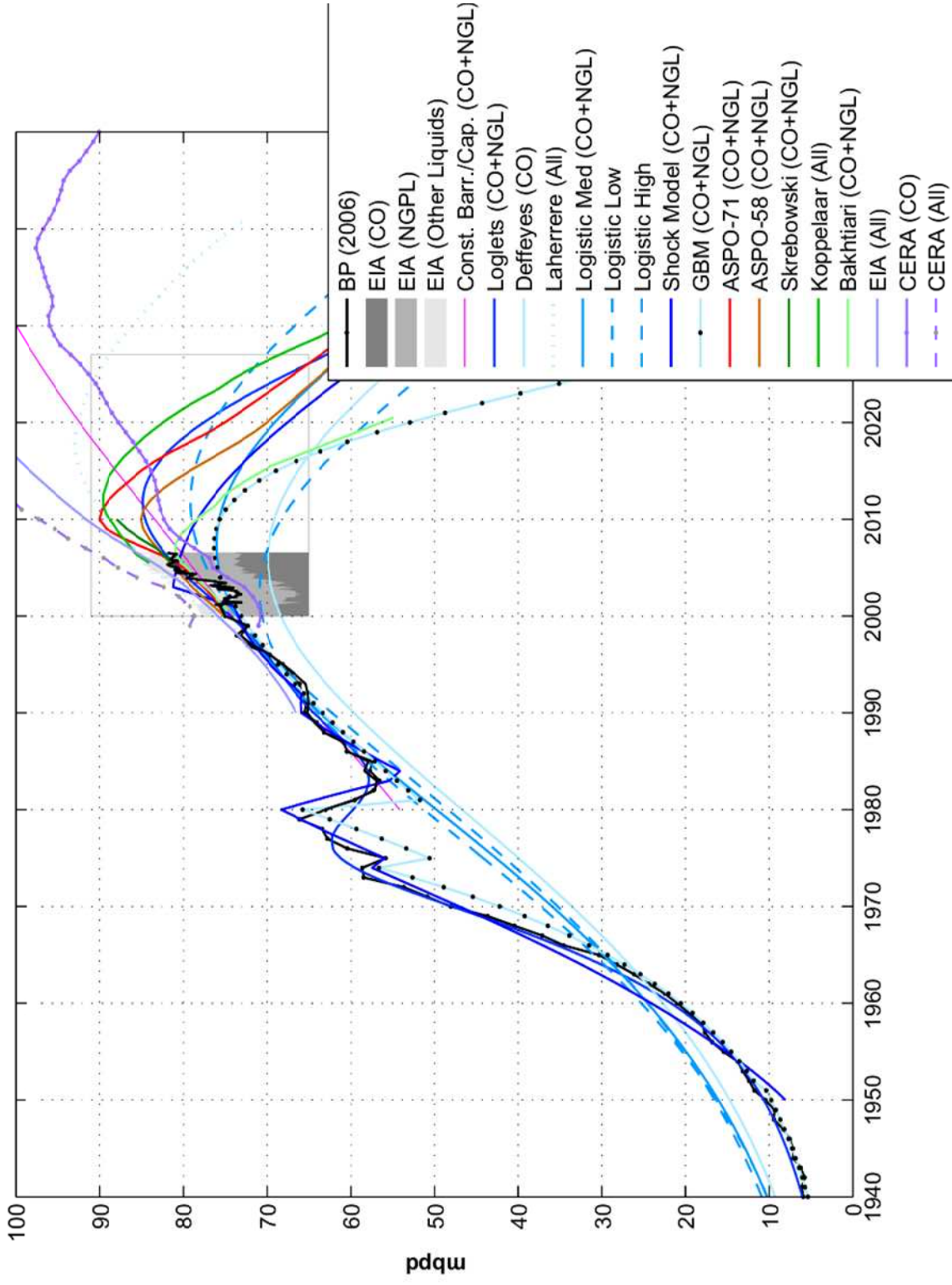
Zero Non-Renewable Energy Buildings

The Infamous Hockey Stick



Zero Non-Renewable Energy Buildings

Projected Oil Extraction



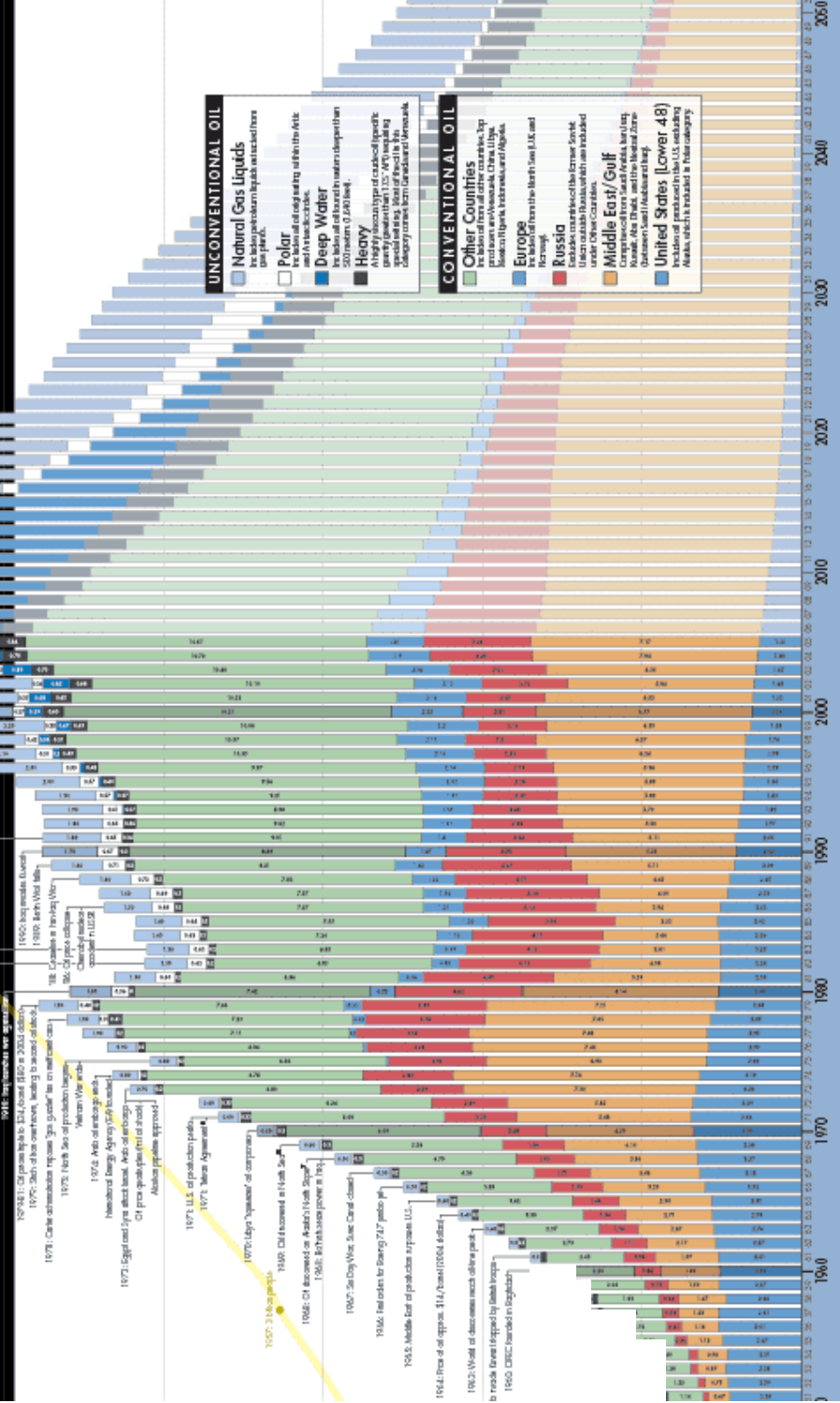
Zero Non-Renewable Energy Buildings

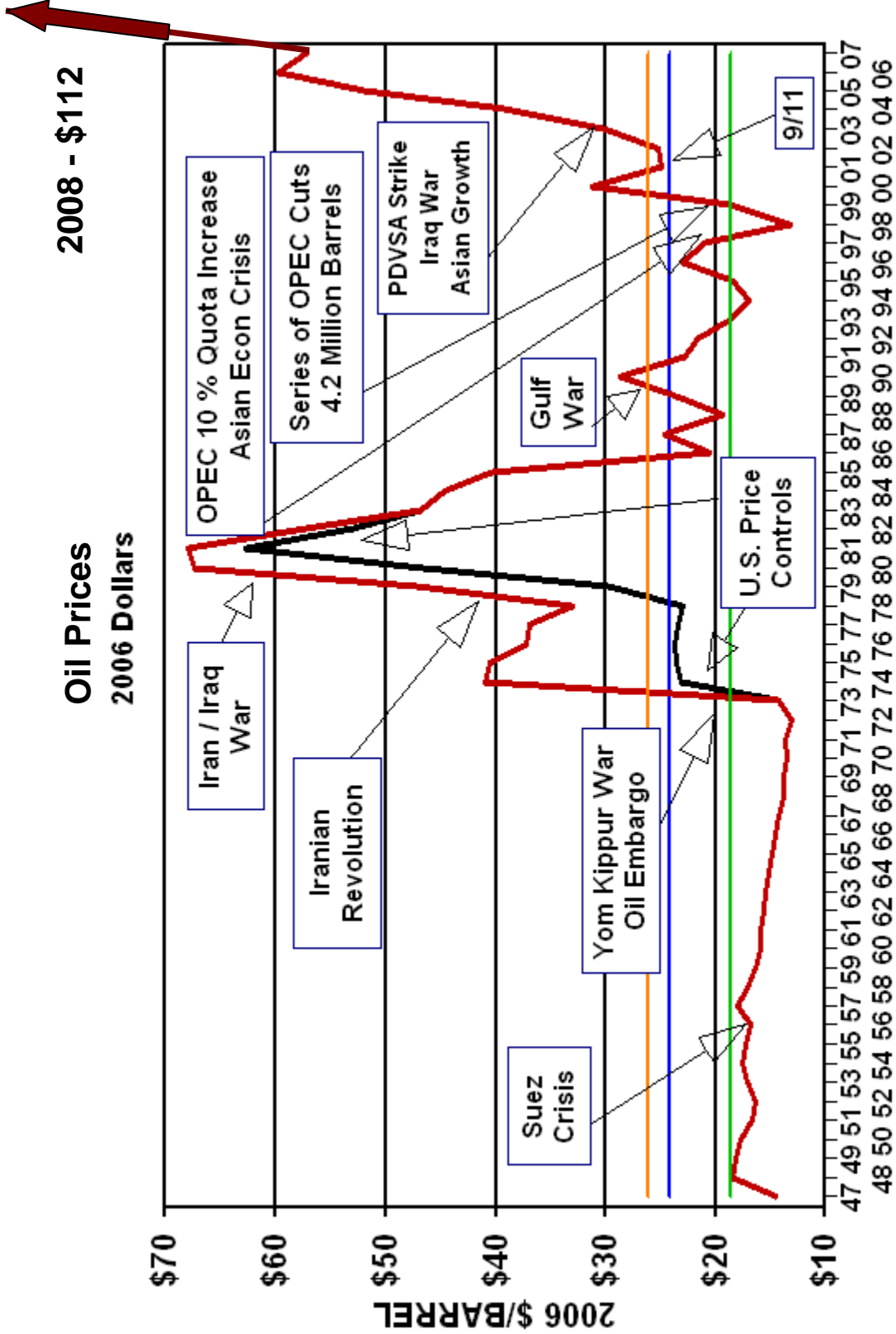
THE OIL AGE

World Oil Production

Peak Oil
The above peak of global production is a second peak of oil. The first peak of new oil discoveries was in the 1970s. The world is not ready for peak oil. The world's oil reserves are being depleted. The world's oil reserves are being depleted. The world's oil reserves are being depleted.

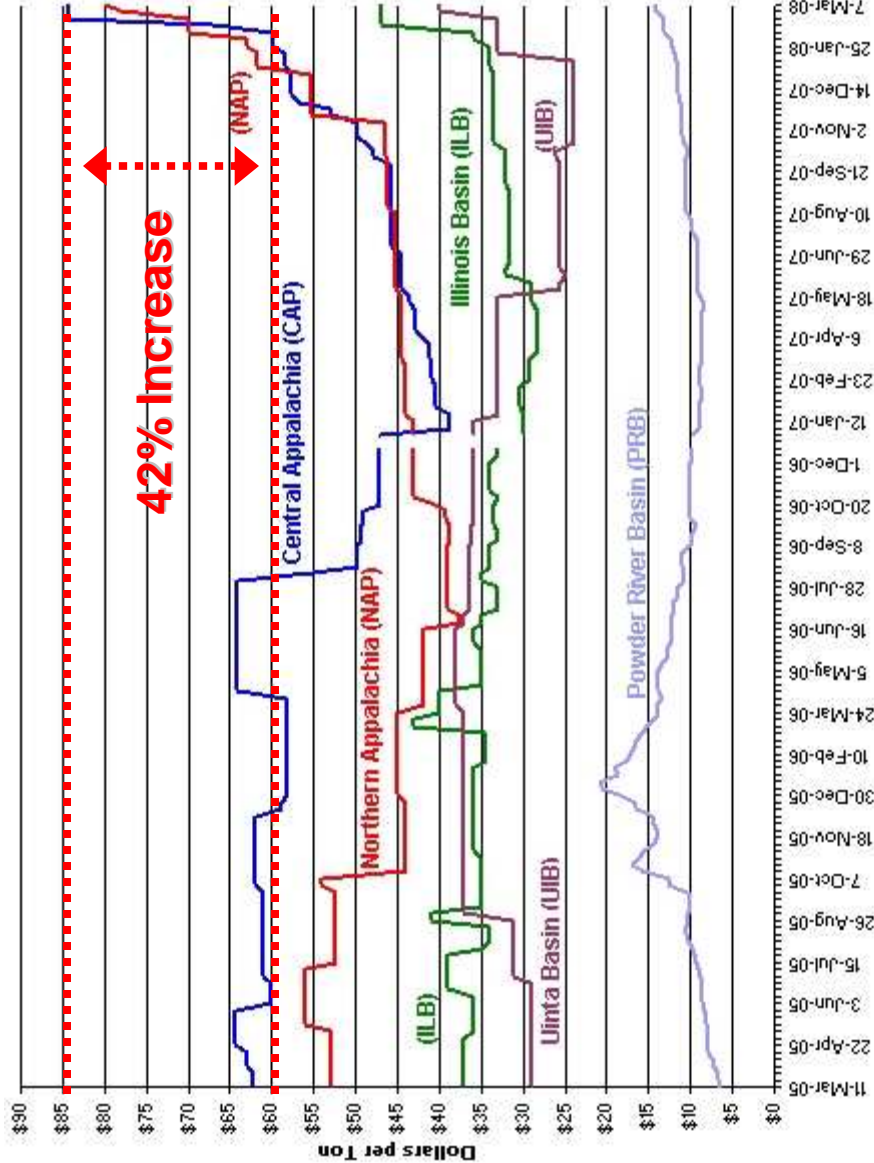
Historical Peak Oil
1970: Oil was extracted from the ground at a rate of 1.5 billion barrels per day. The world's oil reserves were estimated at 1.5 trillion barrels. The world's oil reserves were estimated at 1.5 trillion barrels.





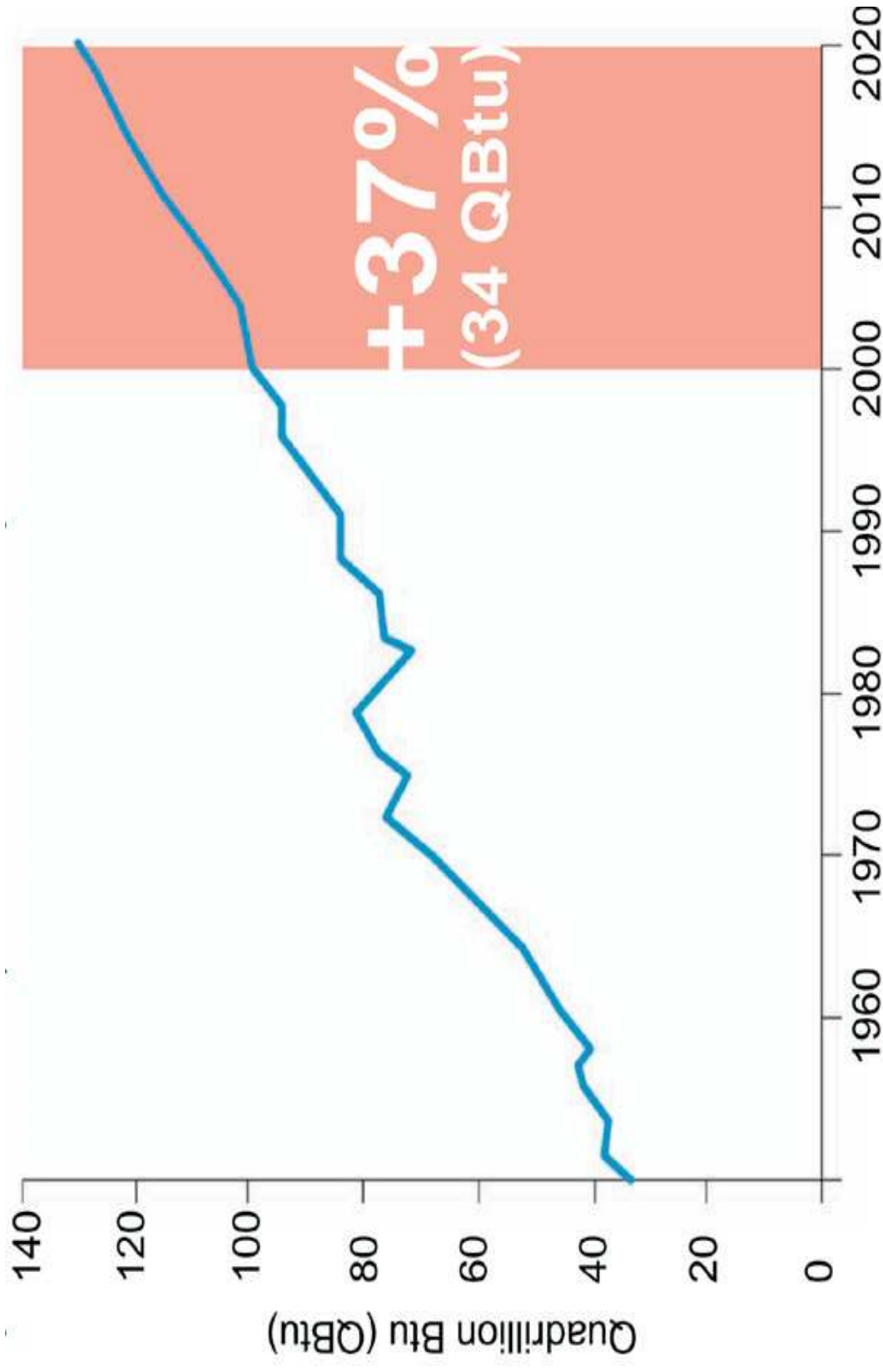
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Coal Prices 2005 to 2008



Key to Coal Commodities by Region

- Central Appalachia: Big Sandy/Kanawha 12,500 Btu, 1.2 lb SO₂/mmBtu
- Northern Appalachia: Pittsburgh Seam 13,000 Btu, <3.0 lb SO₂/mmBtu
- Illinois Basin: Illinois Basin 11,800 Btu, 5.0 lb SO₂/mmBtu
- Central Appalachia (CAP): Powder River Basin 8,800 Btu, 0.8 lb SO₂/mmBtu
- Northern Appalachia (NAP): Uinta Basin in Colo. 11,700 Btu, 0.8 lb SO₂/mmBtu
- Illinois Basin (ILB):
- Uinta Basin (UIB):
- Powder River Basin (PRB):

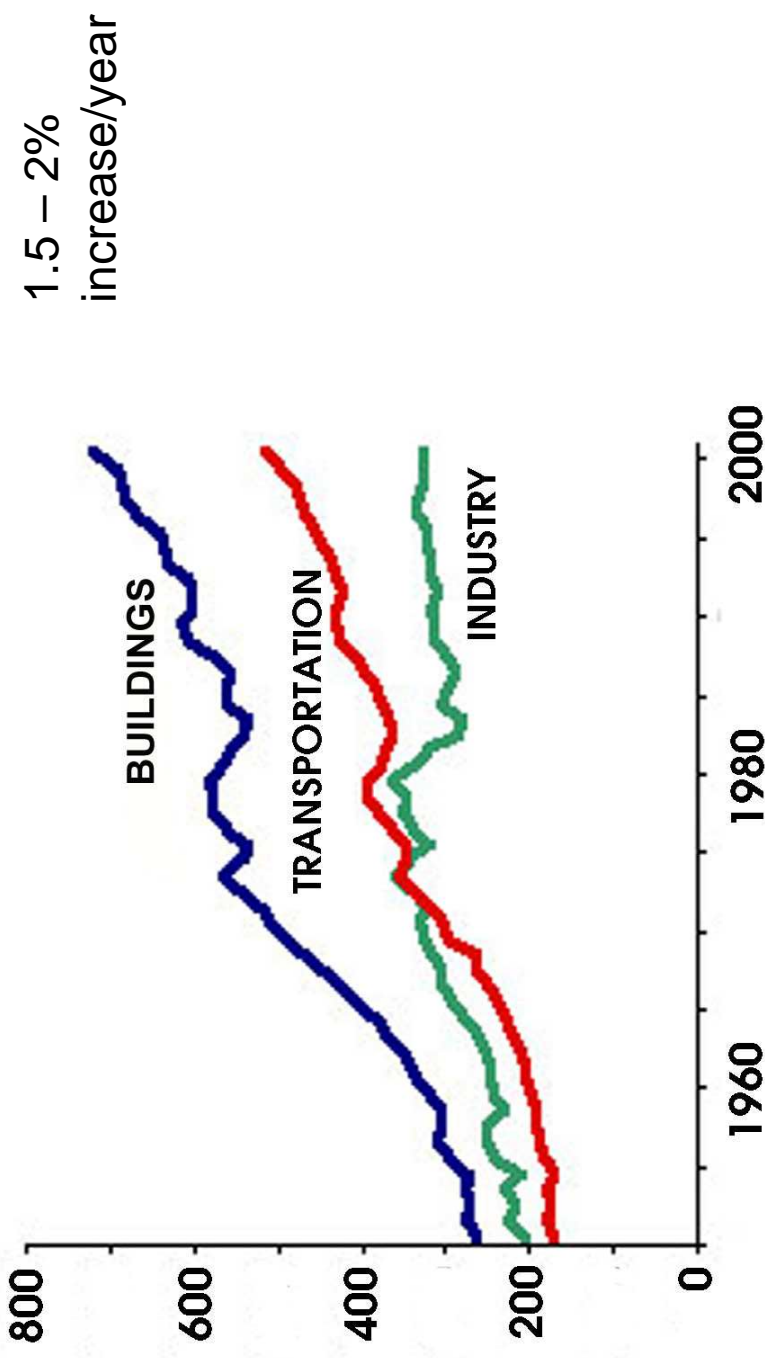


U.S. Energy Consumption Projections

Source: U.S. Energy Information Administration Statistics Center

Zero Non-Renewable Energy Buildings

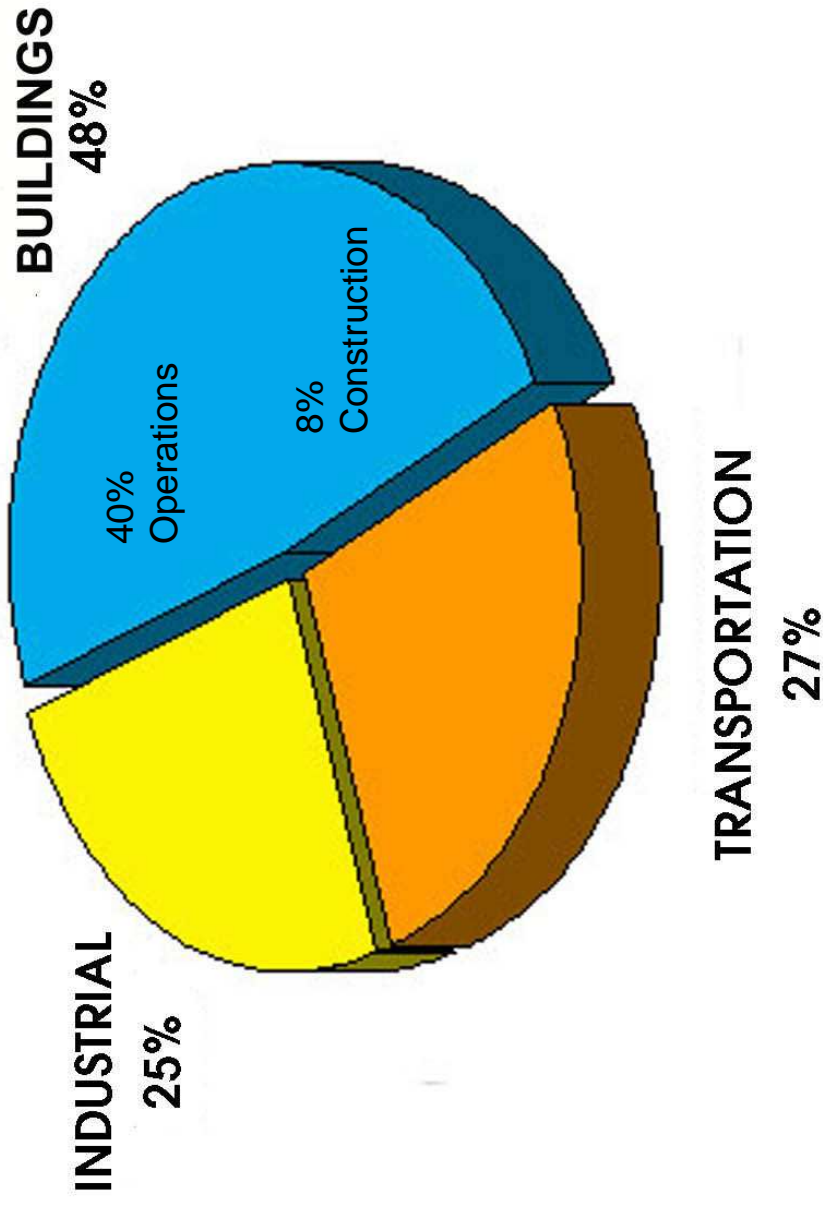
The BIG Picture – Buildings Matter



CO2 EMISSIONS by SECTOR
(Million Metric Tons of Carbon)

Zero Non-Renewable Energy Buildings

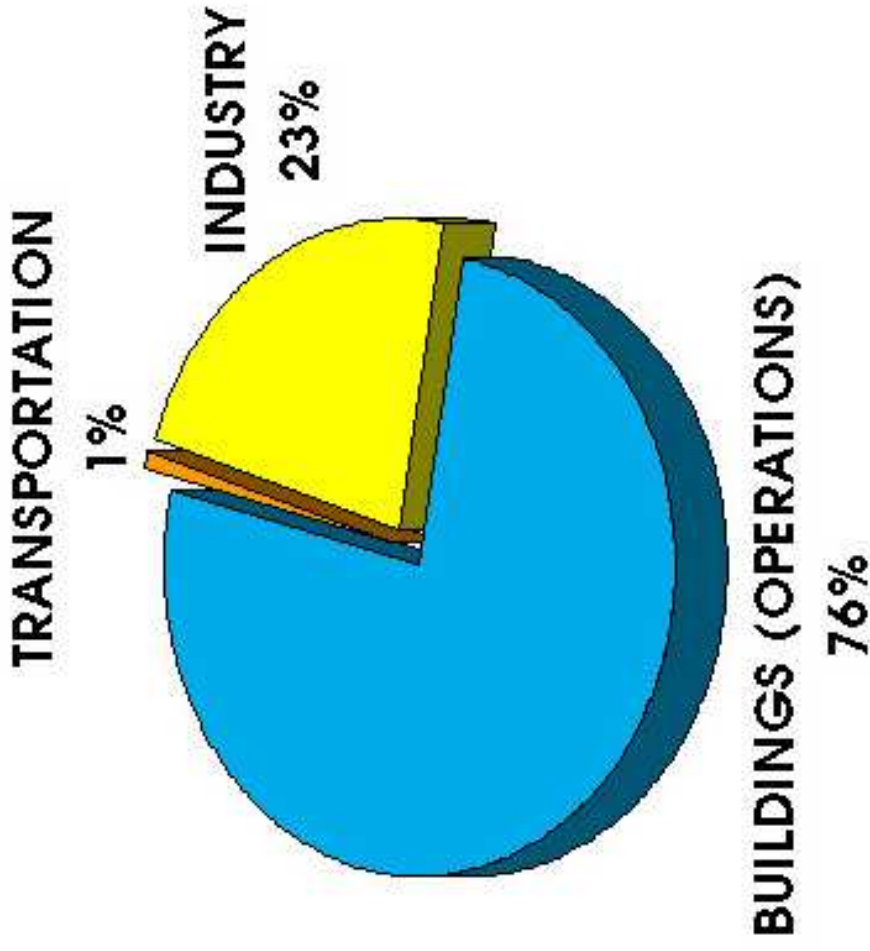
The BIG Picture – Buildings Matter



U.S. ENERGY CONSUMPTION

Zero Non-Renewable Energy Buildings

The BIG Picture – Buildings Matter



U.S. ELECTRICITY CONSUMPTION

Zero Non-Renewable Energy Buildings

The 2030 Challenge



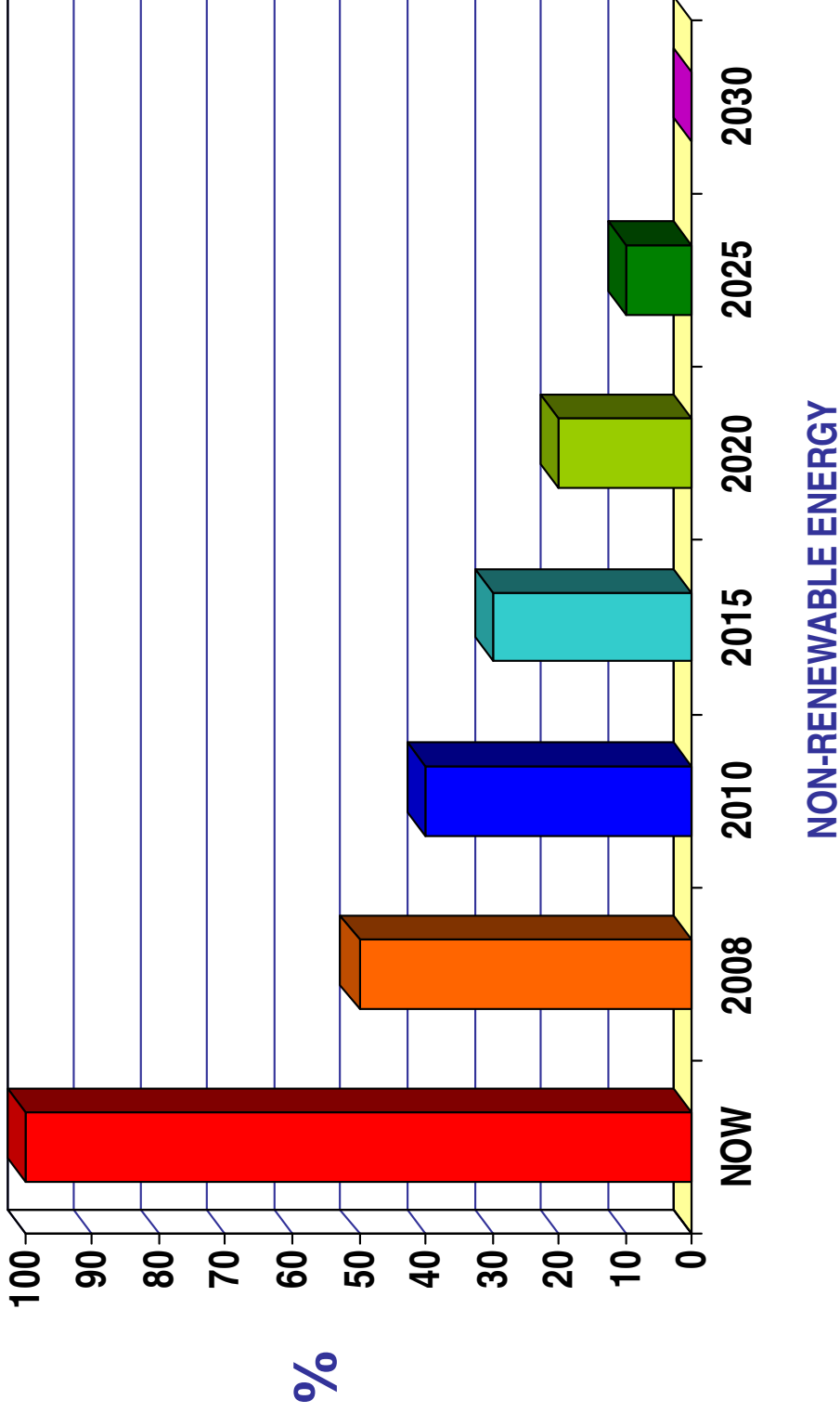
What is it?

- **Architecture 2030**: independent organization established in response to the global warming crisis
- **Goal**: dramatic reduction in greenhouse gas emissions by changing the way buildings are planned, designed and constructed
- Plan to reduce non-renewable energy to 0 by 2030

Slowing the growth rate of greenhouse gas emissions and then reversing it over the next ten years will require immediate action and a concerted global effort.

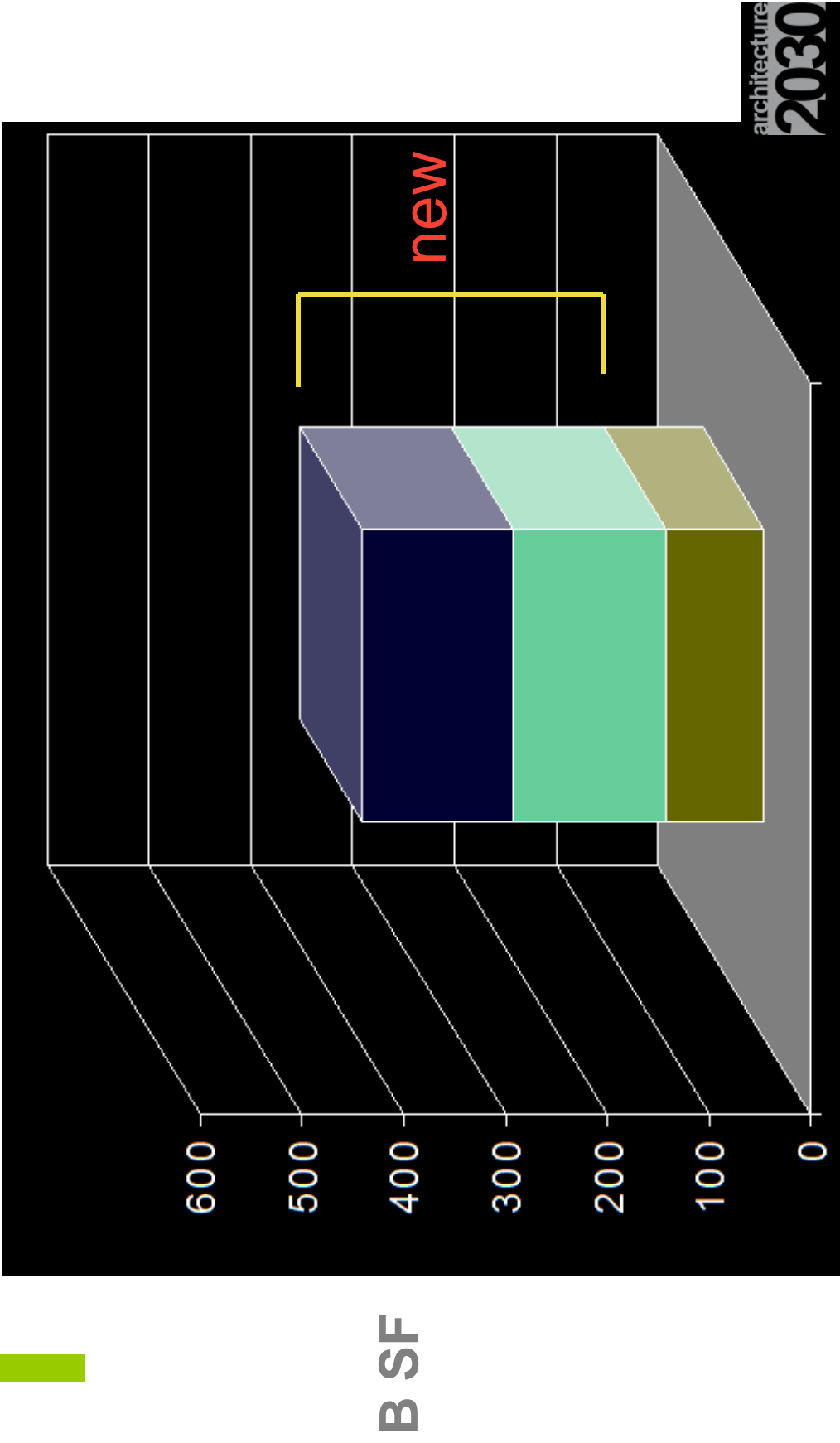
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The 2030 Challenge



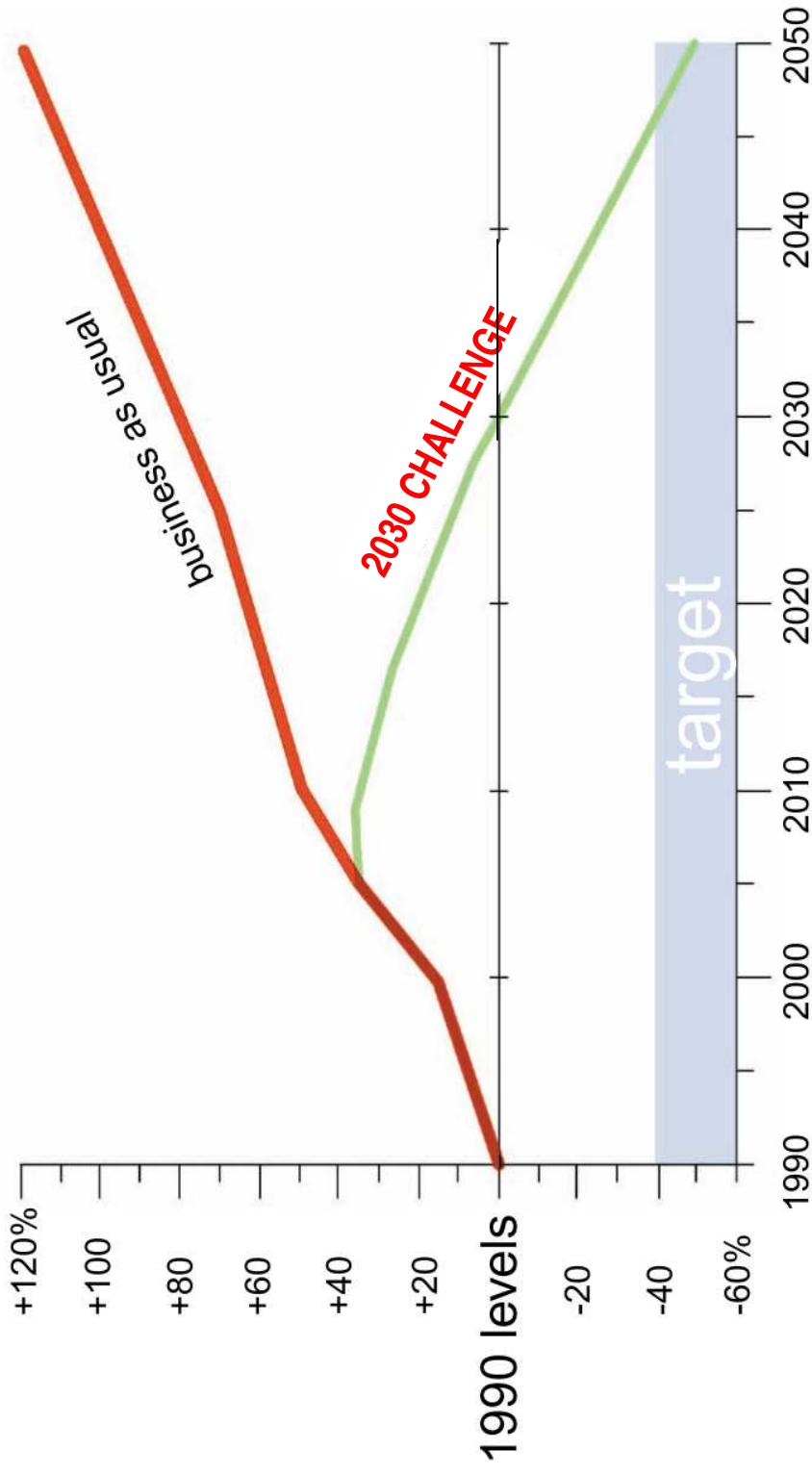
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The BIG Picture – Buildings Matter



Zero Non-Renewable Energy Buildings

The BIG Picture – Climate Change



U.S. Building Sector CO2 Emissions

Source: Mazria Inc. 2005 (Assumes a 15% embodied energy reduction in the construction of new buildings)

Zero Non-Renewable Energy Buildings

Comparison 2030 Plans

Year	Standard 90.1	AEDG**	Standard 189 ^{II}	CBECs [†]	AIA 2030 [‡]
1999	53.3	-	-	85.1	-
2001	51.6	-	-	-	-
2003	-	-	-	91.0	-
2004	47.0	-	-	-	51.0
2007	44.0*	38.5 (30%\$)	34.3	-	-
2010	36.0*	18.0 (50%\$)	25.2	-	36.0
2013	30.0*	-	21.0	-	27.0
2020	18.0*	10.0	12.6	-	18.0
2025	10.0*	-	6.3	-	9.0
2030	-	Zero [†]	Zero	-	Zero

*Indicates projected estimate only. [†]CBECs numbers are based on actual survey data and, therefore, are not goals.

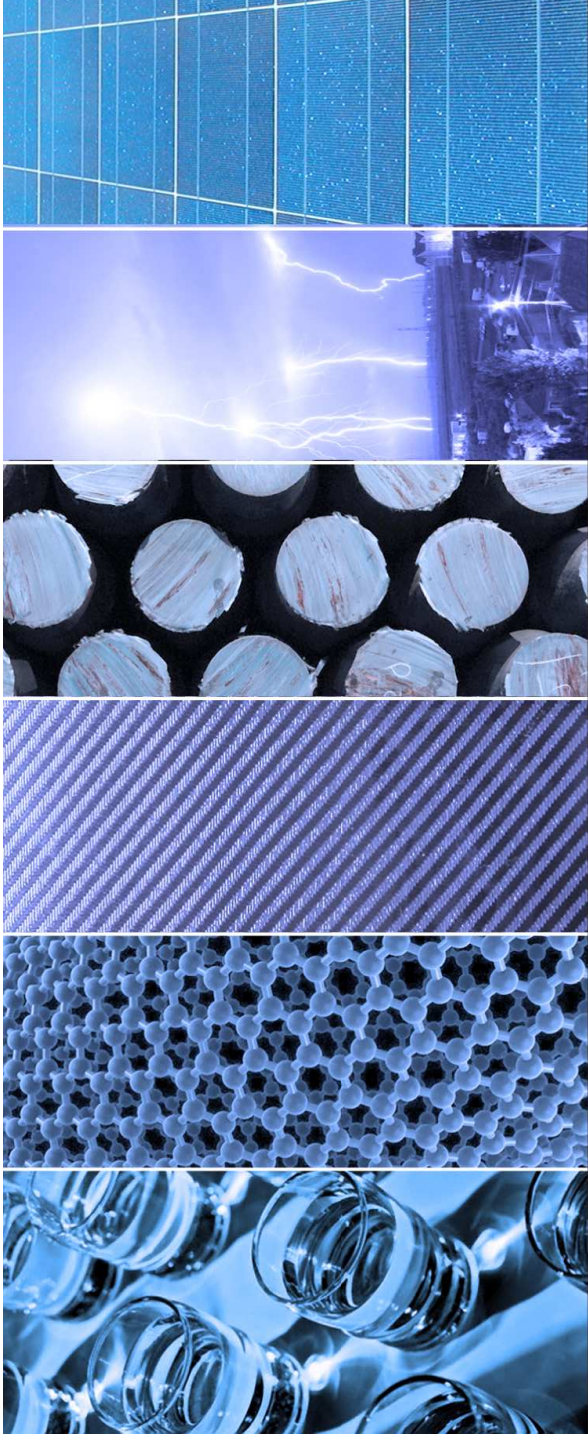
[‡]AIA 2030 Challenge targets are predicated on ultimate reduction of carbon equivalent use towards a net-zero or carbon neutral target. ^{\$}Targeted at 30% or 50% below Standard 90.1-1999. ^{II}Targeted to be at 30% below Standard 90.1 ongoing.

[†]Target for net-zero series of Advanced Energy Design Guides. ** Advanced Energy Design Guide

Ashley McGraw Architects, P.C. Advanced Building Studio



Zero Non-Renewable Energy Buildings



2030 Advanced Buildings

Ashley McGraw Architects is the first Central New York architecture firm to adopt the 2030 Challenge, an initiative that calls upon all of us to immediately reduce fossil fuel energy usage by 50 percent in all the new buildings and major renovations we design. The ultimate goal of the 2030 Challenge is the creation of zero fossil fuel energy buildings by the year 2030.

To meet the Challenge, Ashley McGraw has formed the Advanced Building Studio. ABS is working to increase energy efficiency by fundamentally changing the way buildings are designed.

Zero Non-Renewable Energy Buildings





Advanced Building Studio (ABS)

VISION

Creation of a zero carbon footprint and zero fossil fuel energy buildings, combined with the use of environmentally responsible materials and construction methods.

The 2030 Challenge – ABS Process

Strategies for Non-renewable Energy Reduction

1. Use of passive strategies 35%
2. High performance building envelope & equipment 35%
3. Renewable energy use on site 30% to 15%
4. Purchase renewable energy credits 0% to 15%

Non-Renewable Energy Reduction 100%

Zero Non-Renewable Energy Buildings

The 2030 Challenge – ABS Process

Use of Passive Strategies 35%

- Passive solar heating
- Building siting & window location
- Number of stories
- Earth sheltering
- 100% daylighting/bilateral
- Shading and no direct sun
- Landscaping for shade cooling, wind control
- Mass in exterior walls
- Natural ventilation
- Exterior light reflection
- High quality infiltration control
- Building colors and SRI

The 2030 Challenge

Use of Passive Strategies 35%

- Volumetrics – air flow & light
- Open planning vs. closed high ceilings
- Window overhangs SEW
- Atriums & stack effect towers
- Sloped roofs facing south
- Site pond for geo exchange / cooling tower / firefighting / storm drainage
- Open stairs
- Owner / occupant green instruction signs / manual / training
- Integrated design
- Green charrette
- USGBC LEED rating
- NYSERDA assistance

The 2030 Challenge – ABS Process

High Performance Building Envelope & Equipment 35%

- Night purge cycle
- High performance walls (R – 48)
- High performance roof (R – 48)
- High performance windows (R – 12)
- High performance foundation
- Heavy mass walls
- High quality infiltration control
- Radiant heat & cooling
- Displacement ventilation
- High performance indirect / direct lighting
- Daylight dimming system
- High performance motors
- Geoexchange earth system

The 2030 Challenge – ABS Process

High Performance Building Envelope & Equipment 35%

- ENERGY STAR equipment
- Continued heat & power
- Energy management system
- Exhaust heat exchange recovery
- Condensing heat equipment
- Equipment sizing
- Off peak heat / cold storage
- CO2 ventilation control
- Service hot water use waste heat
- Commissioning
- Site lighting
- High performance elevators
- LEED AP architects, engineers, landscape architects

The 2030 Challenge – ABS Process

Renewable Energy Use on Site 15% to 30%

- Small windmill(s)
- Photovoltaic panels
- Solar thermal panels
- Solar preheat wall
- Solar hot water panels
- Bio-fuel system
- Net metering

The 2030 Challenge – ABS Process

Purchase Renewable Energy Credits 0% to 15%

- Cooperative construction – assist with the institutions to buy/build own REF
- Cooperative purchase – with of without others, purchase long-term (10 year) RE at fixed price
- Buy market rate RECs

Bring It Together

5 Prong Approach

- Goal Setting (Energy, other)
- Green Whole Team Charrettes
- 2030 Challenge - ABS Process
- LEED Gold
- Future – State, Federal, World

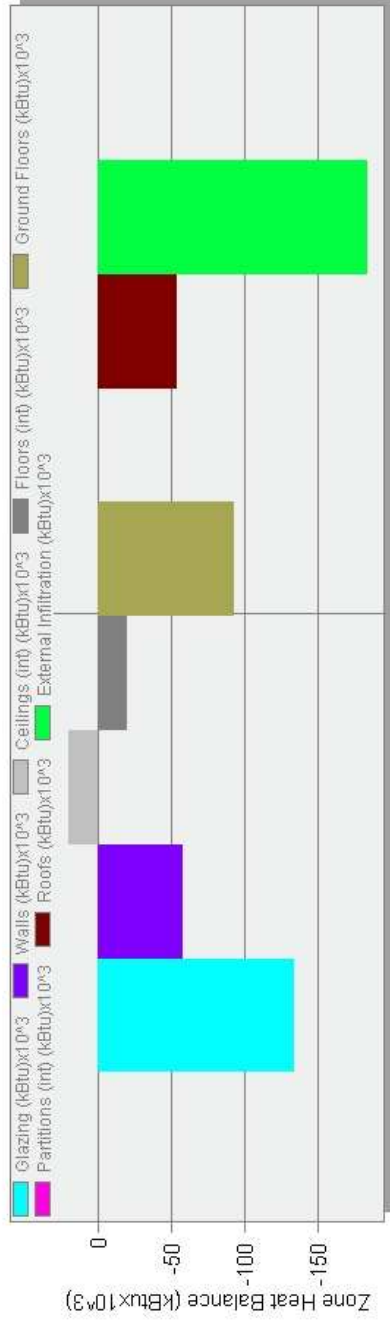


EnergyPlus Output

Fabric and Ventilation - Oswego_Test, Oswego Addition

1 Jan - 31 Dec, Annual

Licensed



Year

Glazing (kBtu)x10 ³	-134.86
Walls (kBtu)x10 ³	-58.48
Ceilings (int) (kBtu)x10 ³	19.91
Floors (int) (kBtu)x10 ³	-19.99
Ground Floors (kBtu)x10 ³	-93.46
Partitions (int) (kBtu)x10 ³	-0.10
Roofs (kBtu)x10 ³	-54.52
External Infiltration (kBtu)x10 ³	-184.72
Mech Vent + Nat Vent + Infiltration (ac/h)	0.34

Annual Envelope Heat Gains & Losses

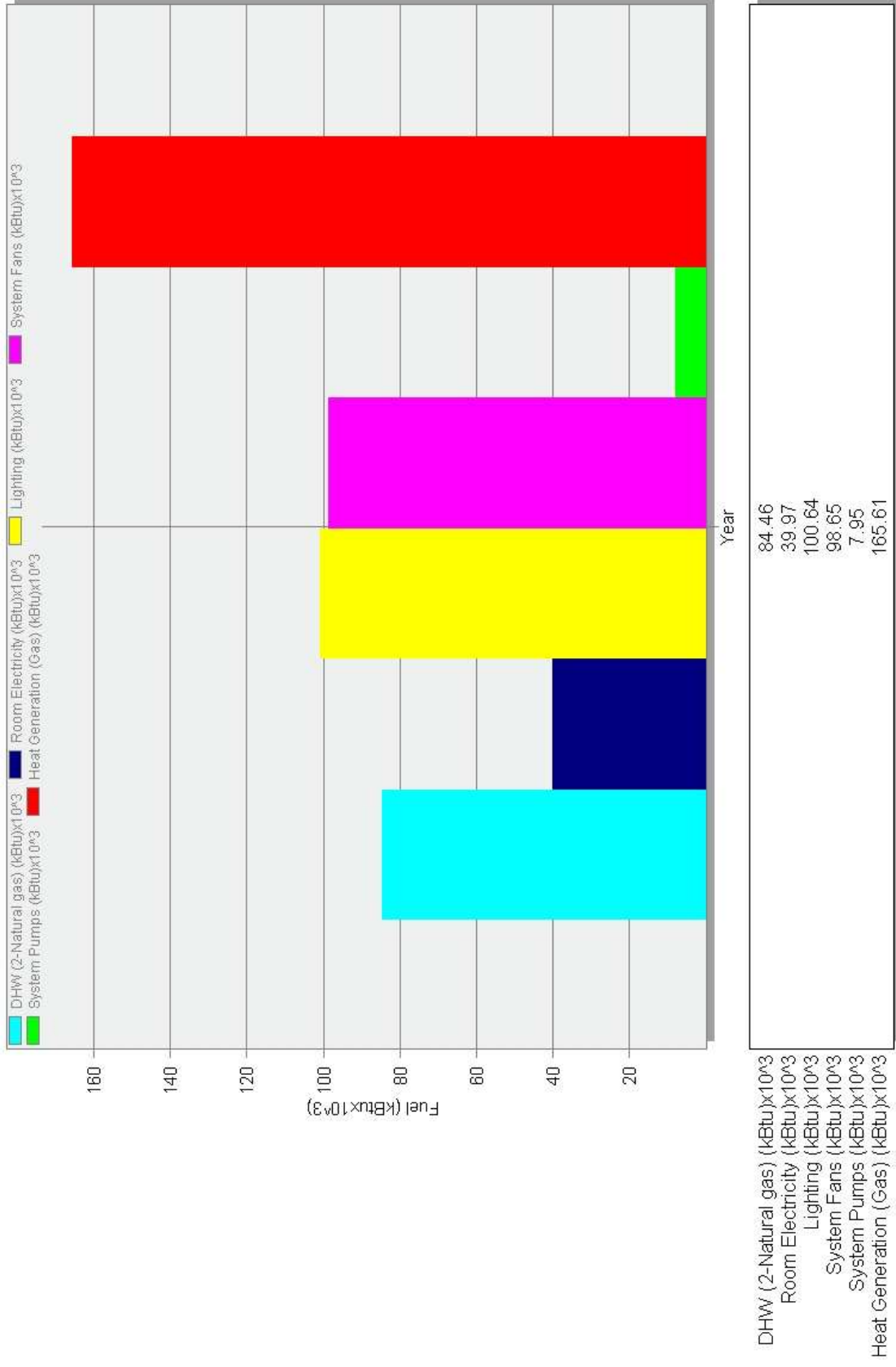
Zero Non-Renewable Energy Buildings

Fuel Breakdown - Oswego_Test, Oswego Addition

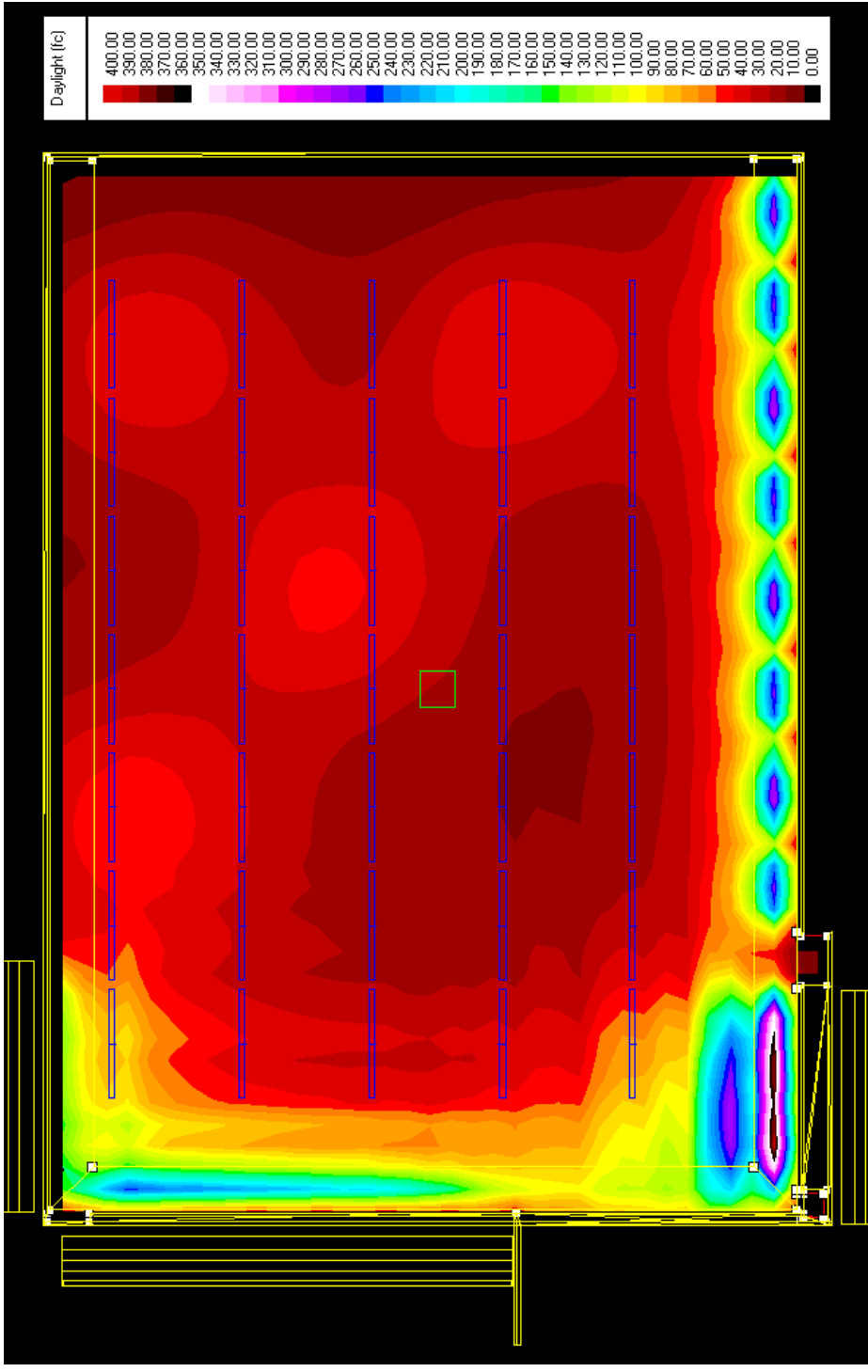
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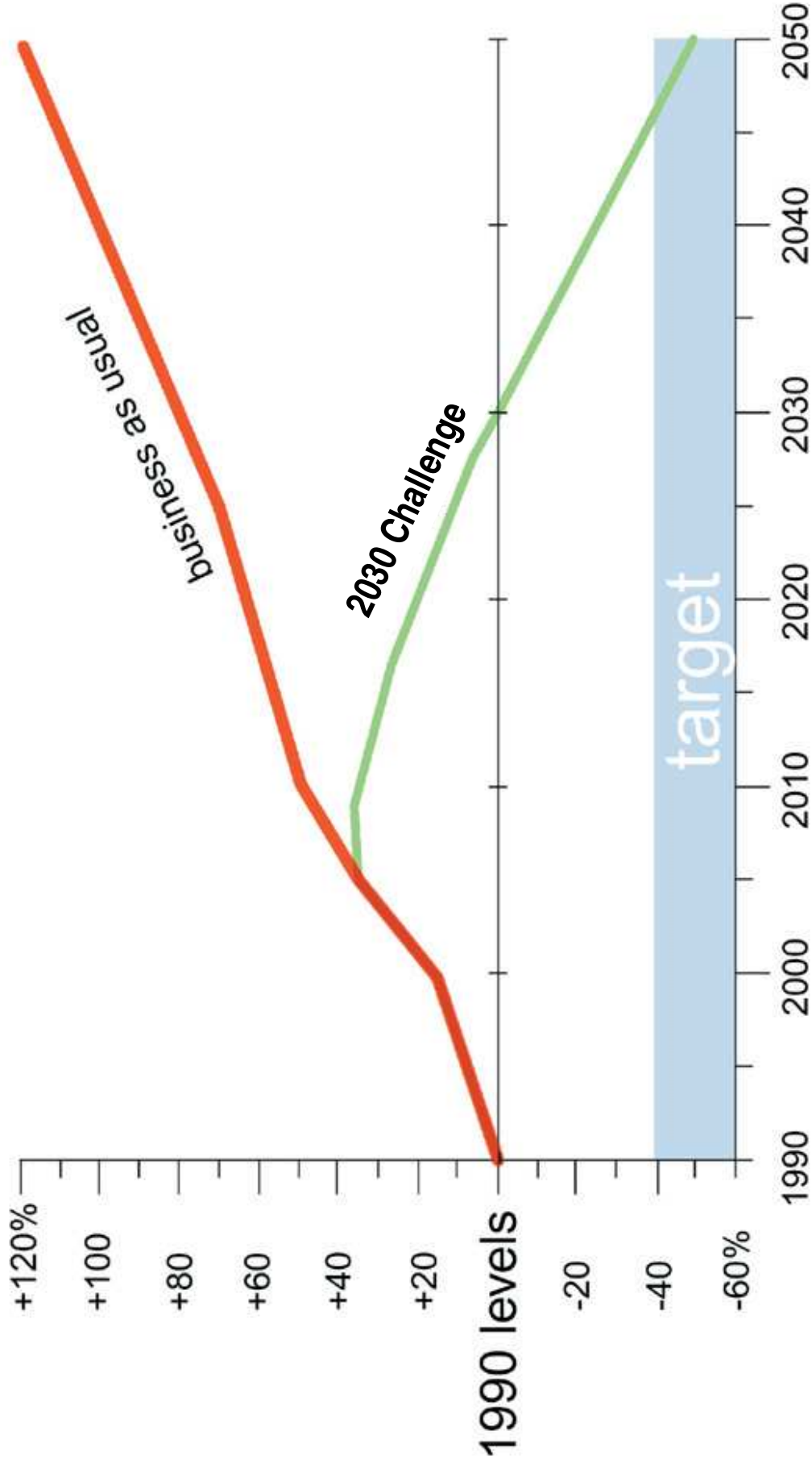
Zero Non-Renewable Energy Buildings



Oswego Cafeteria

Daylighting Levels (foot-candles)

Zero Non-Renewable Energy Buildings



Zero Non-Renewable Energy Buildings

Conclusions

- Those of us associated with buildings have been unknowingly responsible for a large part of our nations energy and production of carbon dioxide.
- We all need to do a much better job in the future and Ashley McGraw Architects has pledged to do our part.
- We must start **NOW**, not an arbitrary date in the future.