What is Green Building?
(and why should I care)

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through design llc

In accordance with the Department of Labor and Industry's statute 326.0981, Subd. 11,

"This educational offering is recognized by the Minnesota Department of Labor and Industry as satisfying **1.5 hours** of credit toward **Building Officials and Residential Contractors code /1 hour energy** continuing education requirements."

For additional continuing education approvals, please see your credit tracking card.

Learning Objectives

1. Review common marketing terms that sound good but may not really mean much.
2. Learn about the evolution of “green” as it relates to construction.
3. Define key ecological principles relevant to “green building.”
4. Explore the concept of critical thinking, used when attempting a more ecological (“green”) approach to residential construction.
5. Consider how ecological principles apply to green building.
6. Apply a critical thinking approach to specific examples of oft-considered “green” building materials and methods.
7. Understand why green building matters.

Common “green” terms

Environmentally Friendly

Non-Toxic

Eco-friendly

Healthy

Natural

Image from apexeco.com

Common Green Building Terms

Image from conserve-energy-future.com

- Energy efficient
- Resource efficient
- High Performance
- Sustainable
- Green
- Ecological

According to the WCED (c.1987)

"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

The report emphasized:

- Environmental protection
- Economic growth
- Social equity

Our Common Future, aka the Brundtland Report, from the World Commission on Environment and Development (WCED)

According to the USGBC (c.2015)

“Simply put, a green home uses less energy, water and natural resources compared to a standard home. It is more efficient, and so creates less waste. In addition, a green home can be a much healthier habitat for the people living inside.”

https://www.usgbc.org/articles/green-homes-101

According to the EPA (c.2016)

“Green building is the practice of creating structures and using processes that are environmentally responsible and resource-efficient throughout a building's life-cycle from siting to design, construction, operation, maintenance, renovation and deconstruction.”

https://archive.epa.gov/greenbuilding/web/html/about.html

According to the Whole Building Design Guide (c.2018)

"The main objectives of sustainable design are to reduce, or completely avoid, depletion of critical resources like energy, water, land, and raw materials; prevent environmental degradation caused by facilities and infrastructure throughout their life cycle; and create built environments that are livable, comfortable, safe, and productive."

https://www.wbdg.org/design-objectives/sustainable

Ecological Principles of Green Building

1. Preserve and protect health.
2. Reduce or prevent environmental degradation caused by buildings.
3. Reduce consumption of resources.
4. Reduce or eliminate use of fossil fuels.
5. Make the above a reality for everyone.

Using the Ecological Principles: Critical Thinking

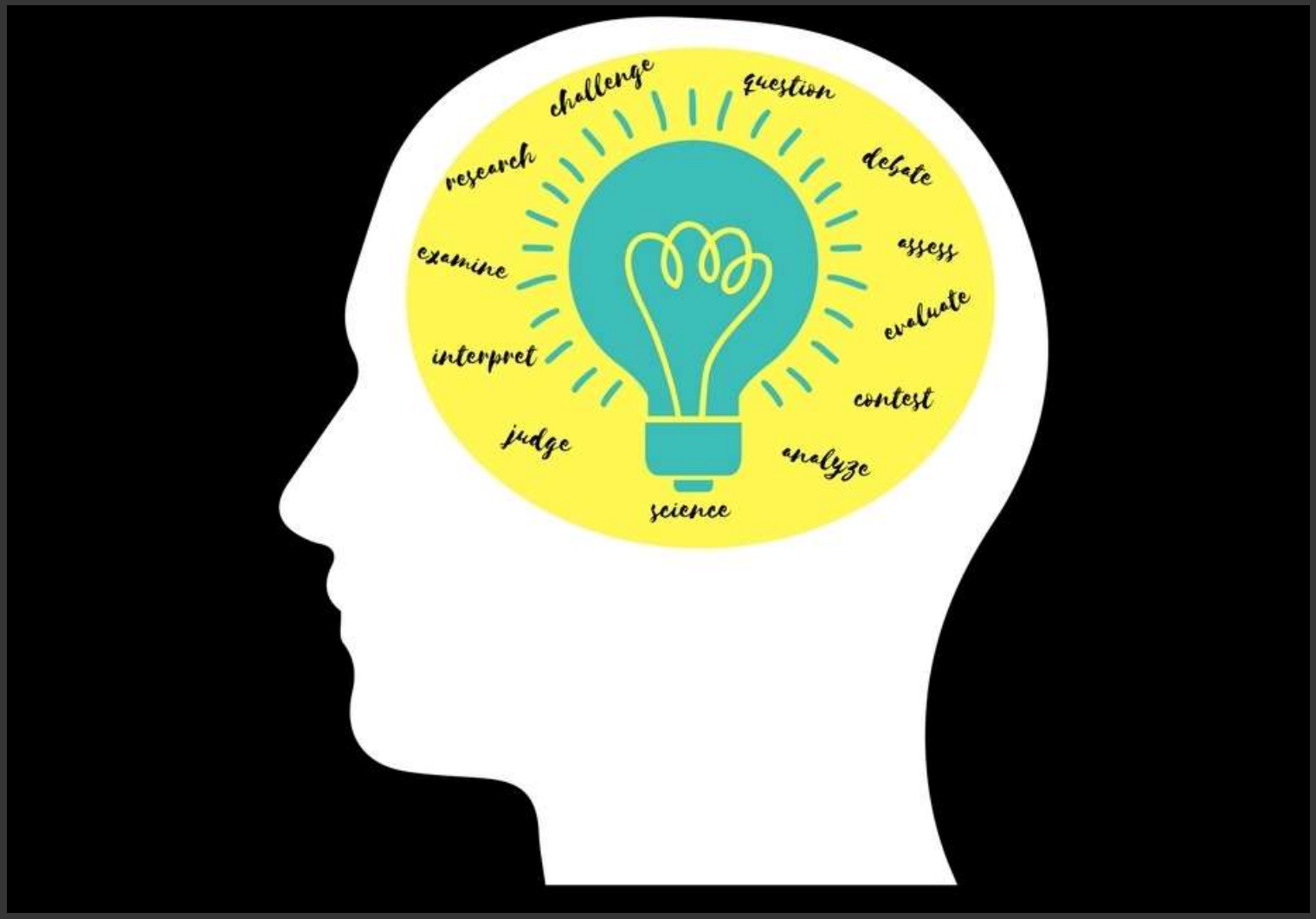


Image from cast-science.blogspot.com

Preserve and Protect Health

1. Responsible Sourcing, that protects land, water, air and people
2. Material Use that doesn’t harm installers
3. Material Use that doesn’t harm occupants
4. Combustion Safety
5. Proper Ventilation – active and passive
6. Proper Water Management to minimize risk of mold and other IEQ issues
7. Affordable to operate and maintain

Reduce or prevent environmental degradation

1. Reduce CO2 emissions from buildings.
2. Don’t build where the ecosystem is fragile.
3. Protect green space and agricultural lands.
4. Consider connectivity to existing infrastructure.
5. Make things that last.
6. Provide for the ability to be maintained.
7. Consider long-term relevance and implications of form, function and materials.
8. Ensure that the building and its systems can be adapted and/or upgraded.

Reduce Consumption of Resources

1. Build durably
2. Smaller homes, with more flexible spaces
3. Energy-conserving enclosure
4. Efficient plumbing layout
5. Water-conserving plumbing fixtures
6. Efficient lighting and appliances
7. Super-efficient mechanical systems
8. Reused or recycled materials and products
9. Recyclable or reusable materials and products

Reduce/Eliminate Use of Fossil Fuels

1. Passive solar design when possible.
2. Photovoltaics and/or solar thermal on site.
3. Offset purchased electricity with renewables.
4. Remove oil and gas from building operation.
5. Offset purchased gas/oil with renewables.
6. Create zero-net energy buildings.
7. Reduce use of oil- and gas-derived products, such as polystyrene, asphalt shingles, and “virgin” plastics.

Green Building Should be for Everyone

Healthy and comfortable

Affordable to maintain

Affordable to operate

*The answer to affordability is not to relax codes and other regulations.**

* Supporting meaningful regulation helps create social equity, supports green building and levels the playing field.

Applying Green Principles to Your Work

- Question the status quo.
- What can you change?
- Can you change how you think?
- Look through a different lens.
- Look more closely.
- Look further away.
- Think critically.
- Learn how much energy your buildings use.

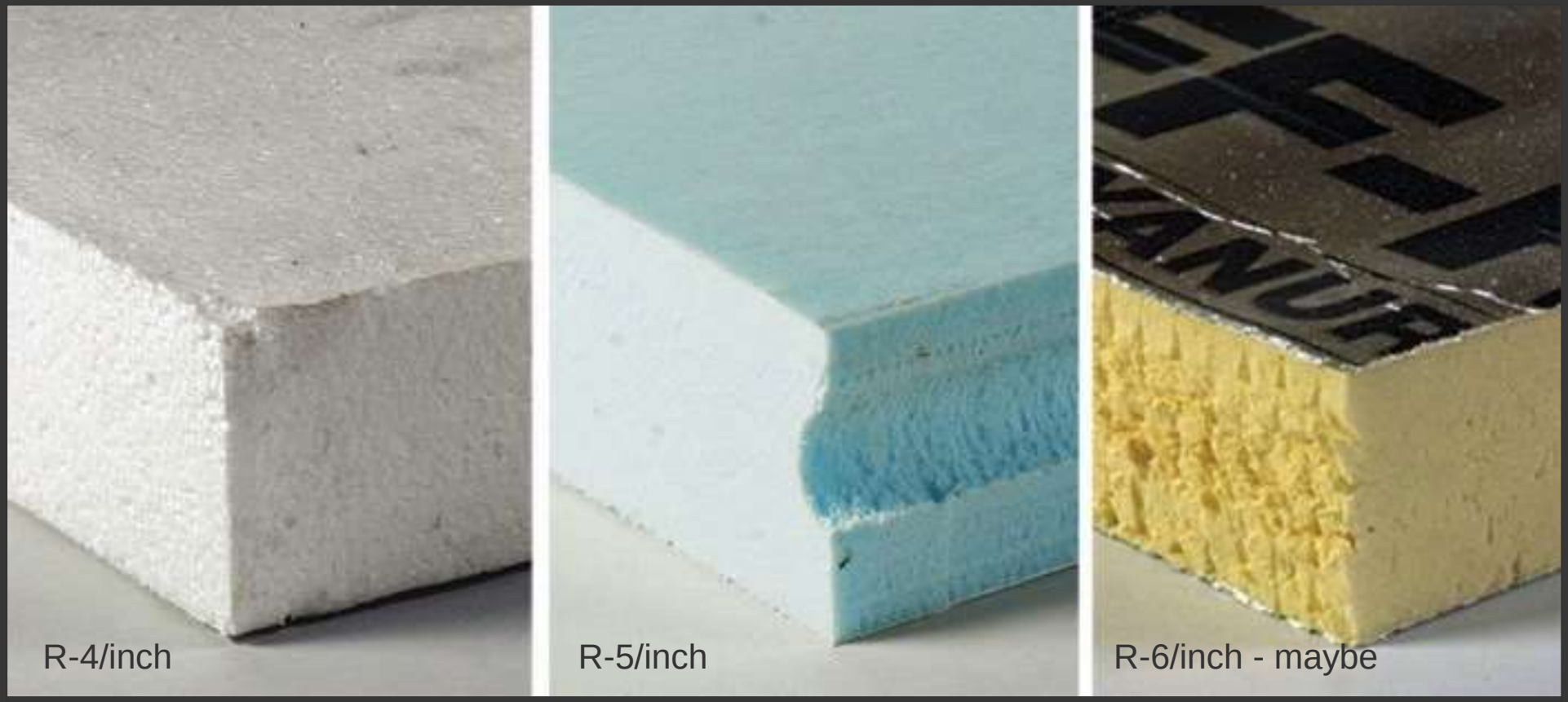
ecohomeduluth.com

Again, Critical Thinking

Get the habit of analysis - analysis will in time enable synthesis to become your habit of mind.

Frank Lloyd Wright

Green or Not-so-green?



The three most common types of rigid foam insulation

Image Source: greenbuildingadvisor.com

Often used as continuous insulation (c.i.) which improves thermal performance.

Derived from oil or gas (petroleum).

Produced using blowing agents which contribute greenhouse gas emissions.

Green or Not-so-green?

New Home with cellulose, open and closed cell spray foam.

Retrofit with cellulose, rigid polyisocyanurate foam and closed cell spray foam.

Green or Not-so-green?

Image from www.quinju.com

Green or Not-so-green?

New Construction

- ICF basement with EPS
  - Durable foundation
- Rigid mineral wool c.i.
  - Made from basalt rock
  - Fire resistant
  - R-4/inch
  - Water resistant but vapor open
  - Insects don’t like it

Green or Not-so-green?

https://www.ucsusa.org/clean-energy/coal-and-other-fossil-fuels/environmental-impacts-of-natural-gas

Image from neunyisights.wm.com

Fresh Energy's Beyond Gas:
Advocating the Adoption of Clean Electricity

https://fresh-energy.org/beyondgas19/

Ban gas boilers in new homes by 2025, says Committee on Climate Change

Government advisers suggest homes are heated using low-carbon energy instead

▲ The committee warned that UK homes are not fit for the future. Photograph: Alamy

www.theguardian.com/environment/2019/feb/21/ban-new-gas-boilers-by-2025-says-committee-on-climate-change

Don’t be Greenwashed

1. Sin of the Hidden Trade-off: suggesting a product is "green" based on an unreasonably narrow set of attributes without attention to other important environmental issues.
2. Sin of No Proof: an environmental claim that cannot be substantiated by easily accessible supporting information or by a reliable third-party certification.
3. Sin of Vagueness: a claim that is so poorly defined or broad that its real meaning is likely to be misunderstood by the consumer.
4. Sin of Worshiping False Labels: a claim, communicated either through words or images, gives the impression of a third-party endorsement where no such endorsement exists.
5. Sin of Irrelevance: an environmental claim that may be truthful but which is unimportant or unhelpful for consumers seeking environmentally preferable products.
6. Sin of Lesser of Two Evils: claims that may be true within the product category, but that risk distracting consumers from the greater environmental impact of the category as a whole.
7. Sin of Fibbing: environmental claims that are simply false.

http://sinsofgreenwashing.com/findings/the-seven-sins/index.html

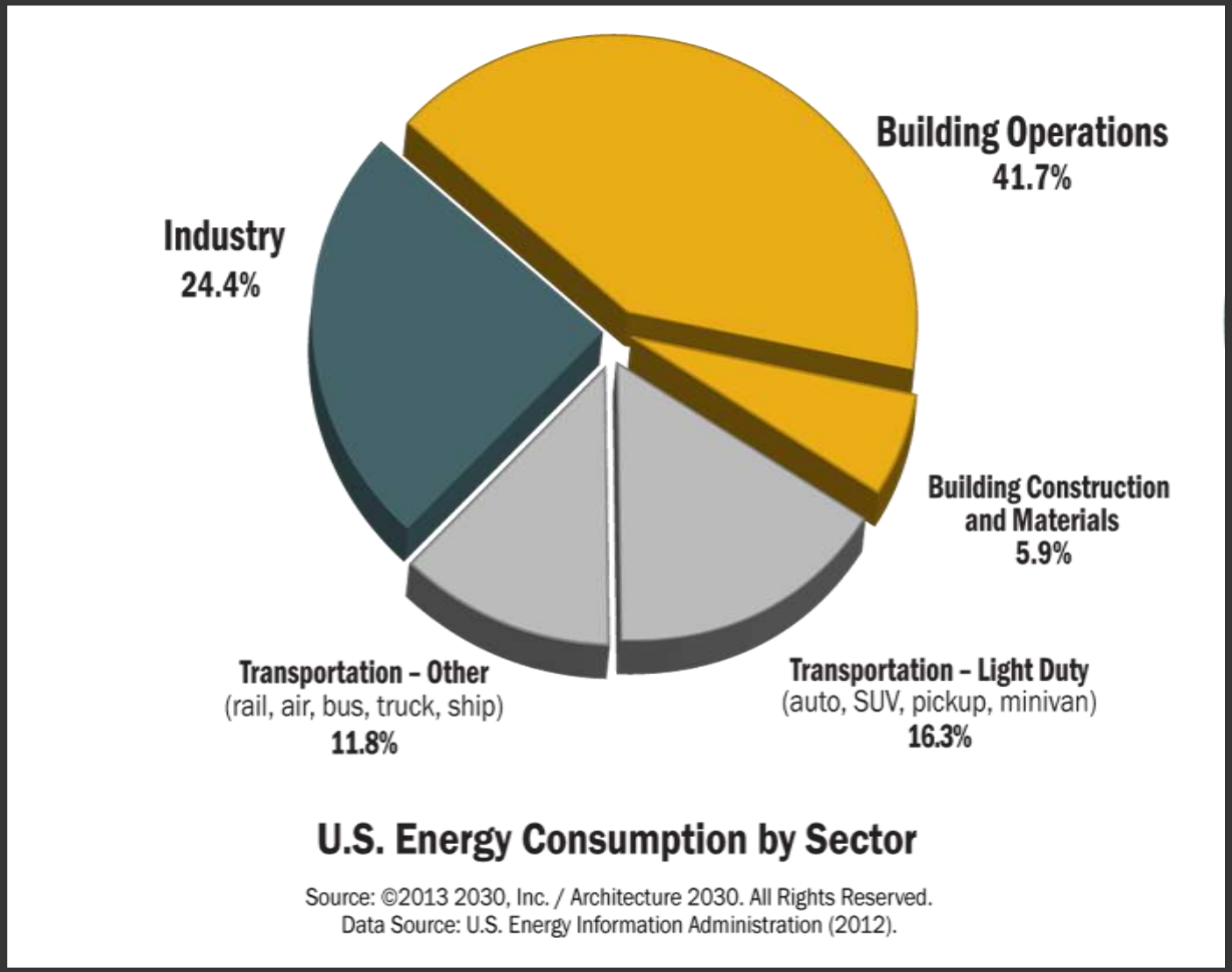
Green by Example

Image from St. Croix Valley Habitat for Humanity

Green by Example

Northside Net-zero Project with Lucas Alm, Dan Handeen, Habitat for Humanity, and U of MN and Century College students (Image from mpr.org)

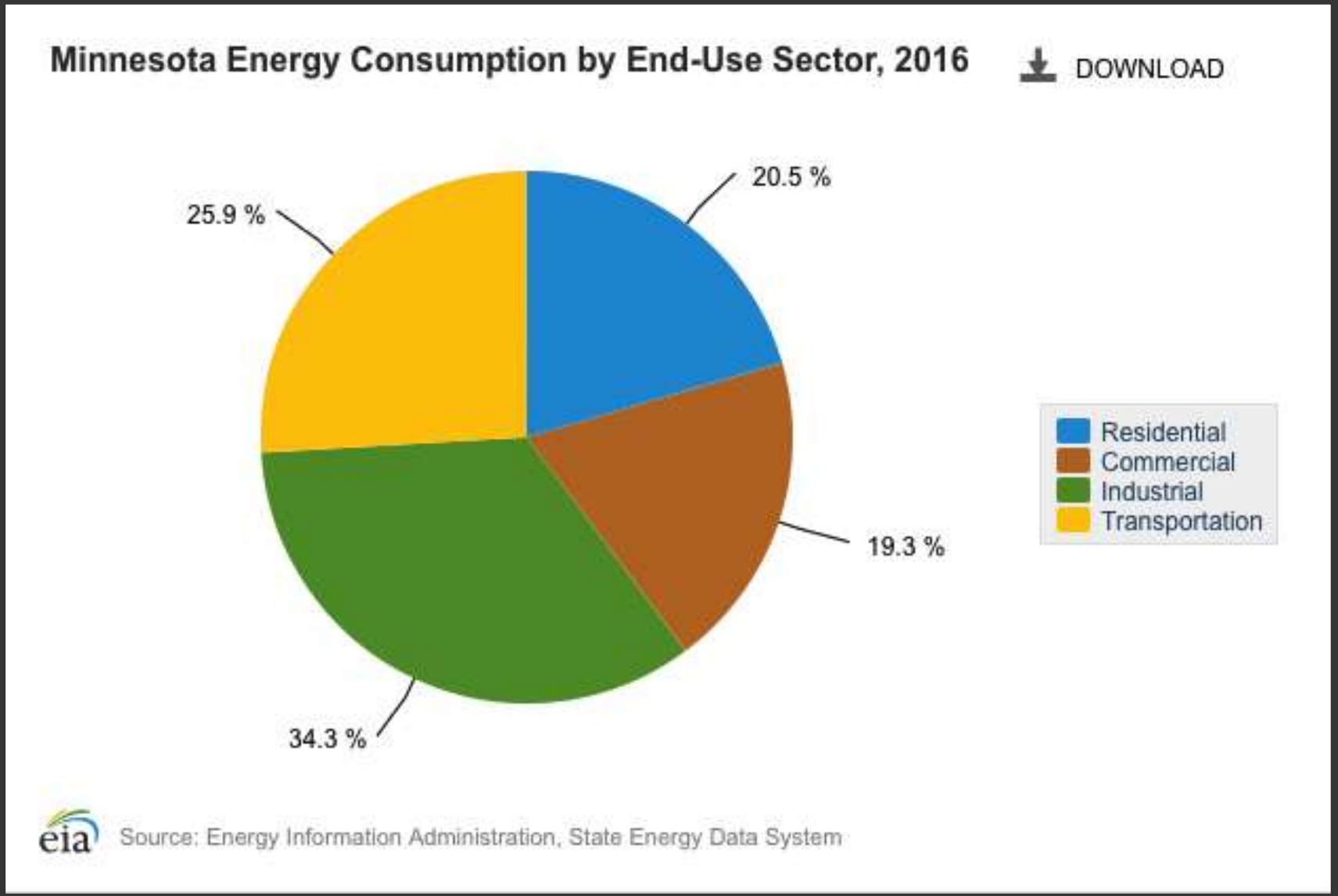
Why Should We Care?



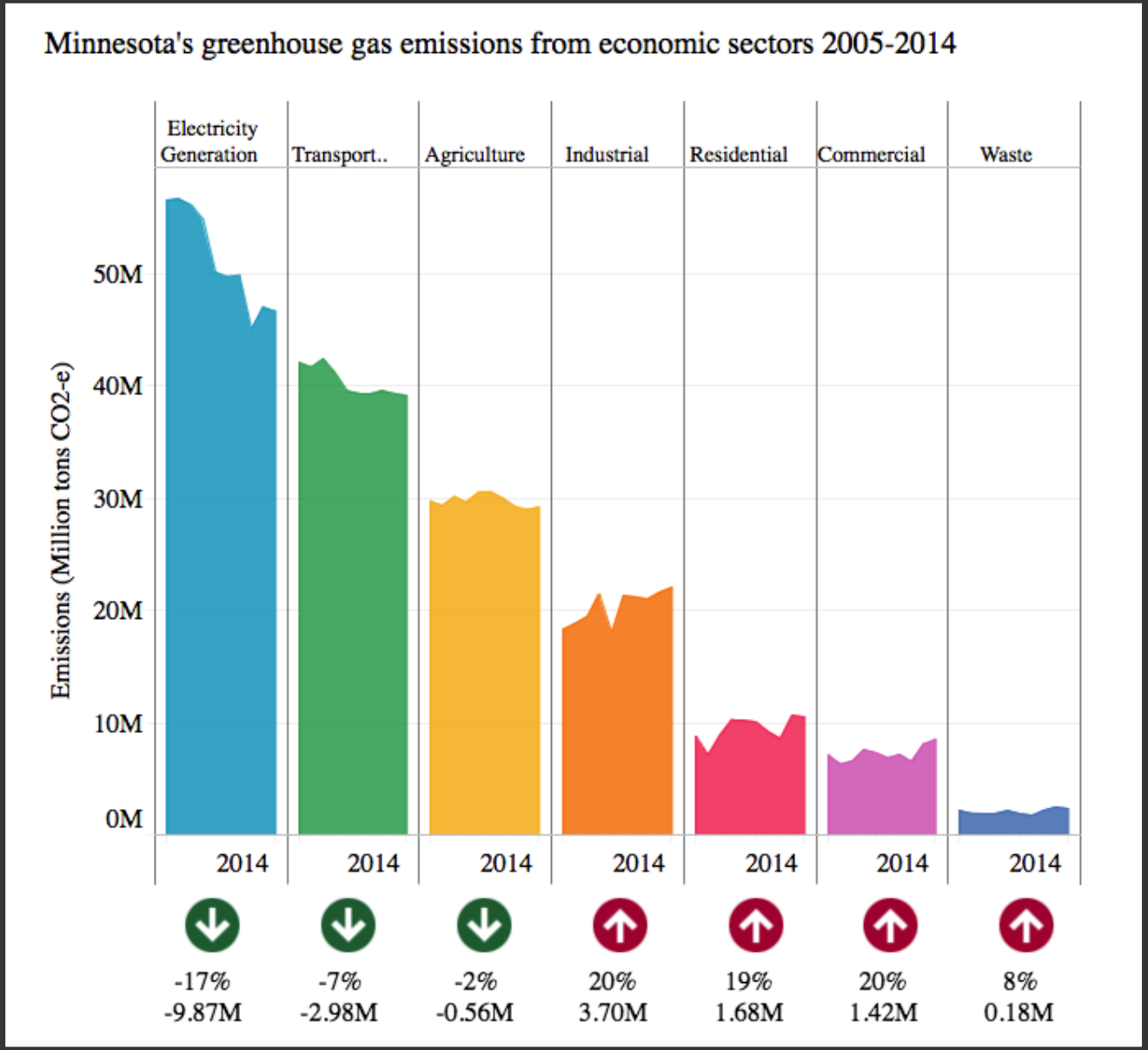
What's At Stake?

Image from climate.nasa.gov/effects

Energy and Emissions Matter



How We Build Matters!



Measuring “Green” Matters

“The only way to know if you’re using less, though, is actually to measure how much you’re using over time, and to note whether the trend line is heading in the right direction.

… If you don’t keep score, how can you possibly know if you’re winning?”

-Paul Eldrenkamp, Byggmeister

MN Average Household Energy Use

2016: average MN household uses 750 kWh/month of electricity or 9,000 kWh/year (about 31 MMBtu).

(Sources: www.mnpower.com and eia.gov)

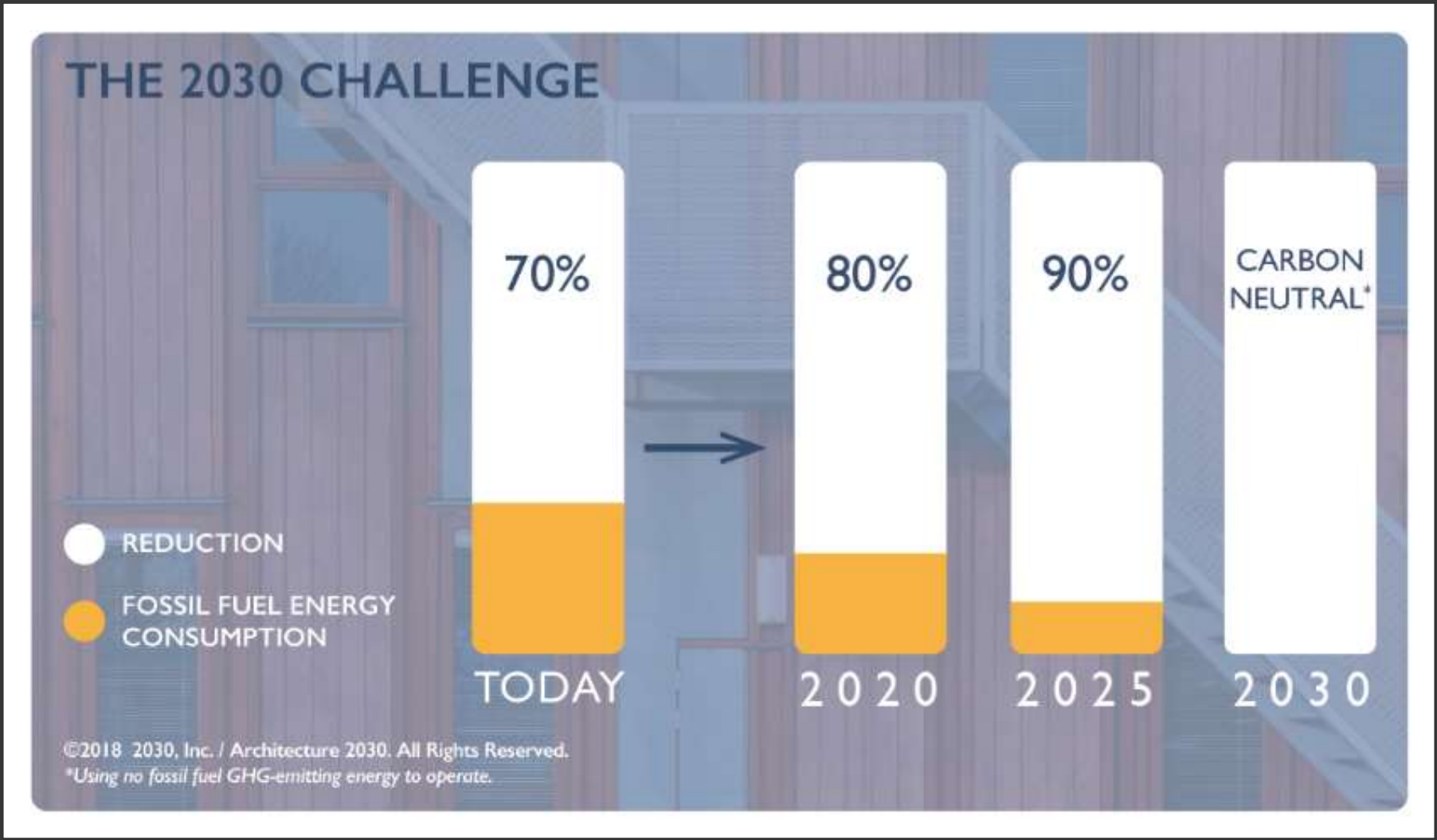
(800 kWh/month or 9600 kWh/year according to MPCA)

2015: average MN household uses 89 Therms/year of natural gas (about 89 MMBtu).

(Sources: mprnews.org, CenterPoint Energy)

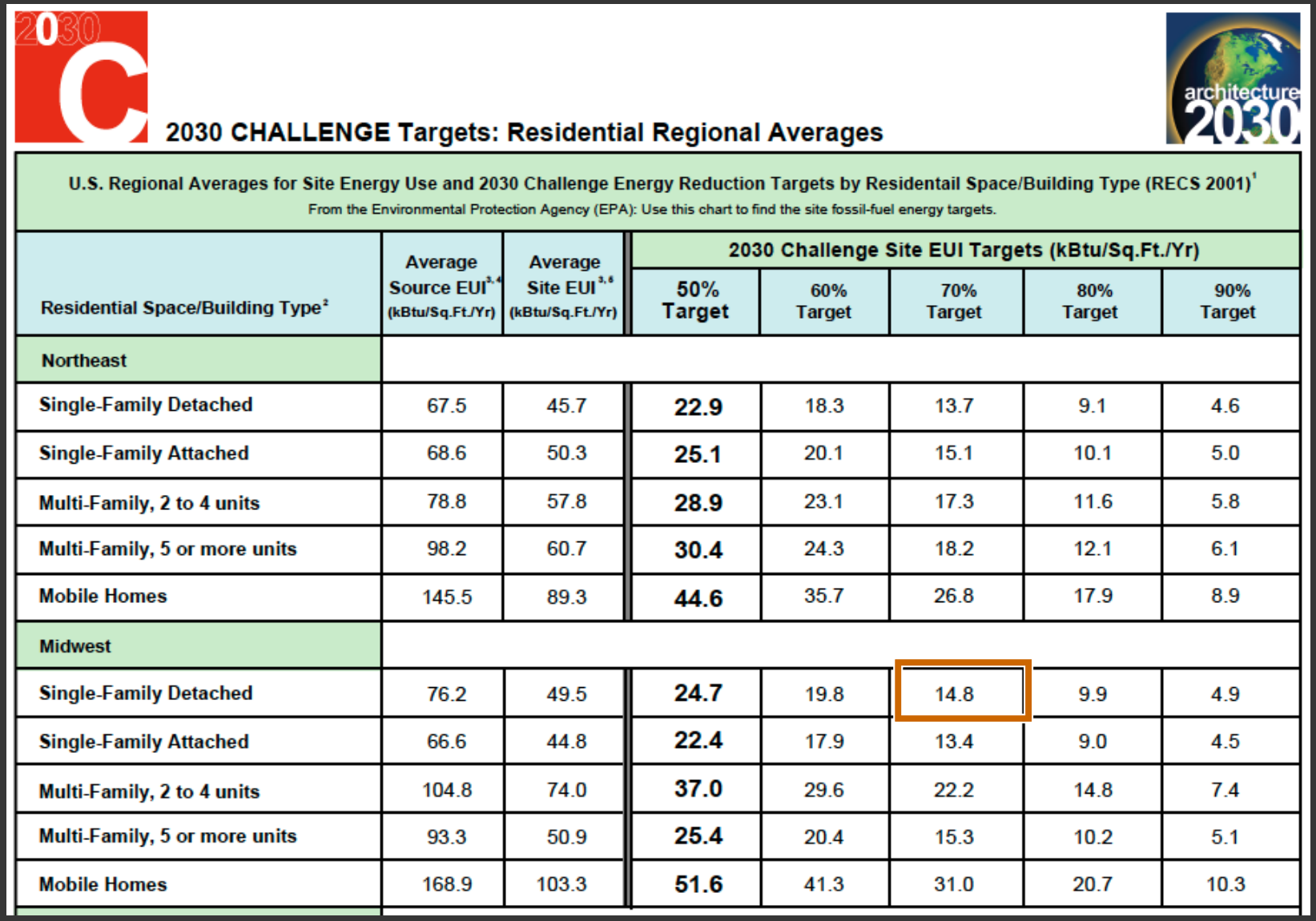
“Average” home size about 2600 ft2, so the average home uses about 46 kBtu/ft2/year.

A metric worth learning and using



www.architecture2030.org

Minnesota's 2030 Challenge Targets



2030 CHALLENGE Targets: Residential Regional Averages

U.S. Regional Averages for Site Energy Use and 2030 Challenge Energy Reduction Targets by Residentail Space/Building Type (RECS 2001)[1]

From the Environmental Protection Agency (EPA): Use this chart to find the site fossil-fuel energy targets.

Residential Space/Building Type[2]	Average Source EUI[3,4] (kBtu/Sq.Ft./Yr)	Average Site EUI[3,4] (kBtu/Sq.Ft./Yr)	2030 Challenge Site EUI Targets (kBtu/Sq.Ft./Yr)				
			50% Target	60% Target	70% Target	80% Target	90% Target
Northeast							
Single-Family Detached	67.5	45.7	**22.9**	18.3	13.7	9.1	4.6
Single-Family Attached	68.6	50.3	**25.1**	20.1	15.1	10.1	5.0
Multi-Family, 2 to 4 units	78.8	57.8	**28.9**	23.1	17.3	11.6	5.8
Multi-Family, 5 or more units	98.2	60.7	**30.4**	24.3	18.2	12.1	6.1
Mobile Homes	145.5	89.3	**44.6**	35.7	26.8	17.9	8.9
Midwest							
Single-Family Detached	76.2	49.5	**24.7**	19.8	14.8	9.9	4.9
Single-Family Attached	66.6	44.8	**22.4**	17.9	13.4	9.0	4.5
Multi-Family, 2 to 4 units	104.8	74.0	**37.0**	29.6	22.2	14.8	7.4
Multi-Family, 5 or more units	93.3	50.9	**25.4**	20.4	15.3	10.2	5.1
Mobile Homes	168.9	103.3	**51.6**	41.3	31.0	20.7	10.3

www.architecture2030.org

Energy Use Reality Check

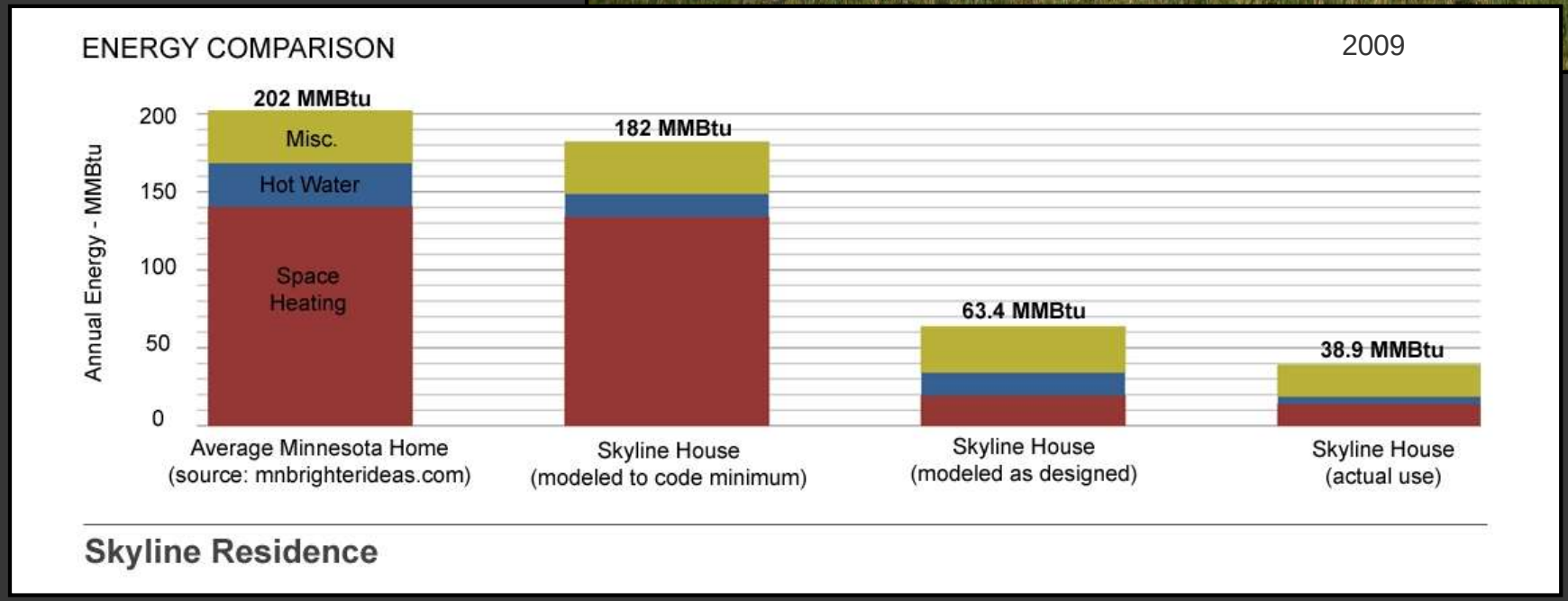
In 2016, the average MN home used about 46 kBtu/ft2/year.

The “average” MN household is using more than 3 times the energy of the current arch2030 goal of 14.8 kBtu/ft2/year.

Skyline House: Meeting the 2030 Challenge

13.2 kBtu/ft2 site energy without PV

Now appears to be Net Zero with new PV system.



Green Building Matters

“What we need to learn is to make not just any thing, but (to make) the right thing, and make it to last for as long as possible.”

John Ehrenfeld, “Flourishing – A Frank Conversation about Sustainability”

BedZED = Green for All

Green Building Resources

- Building Science Corporation https://www.buildingscience.com/
- Bioregional https://www.bioregional.com/bedzed/
- Green Building Advisor https://www.greenbuildingadvisor.com/
- Canada Green Building Council https://www.cagbc.org/
- U.S. Green Building Council https://new.usgbc.org/
- Building Green https://www.buildinggreen.com/
- Myths about Green Building https://www.byggmeister.com/our-world/blog/common-myths-about-green-building
- Union of Concerned Scientists https://www.ucsusa.org/

Good Books

- The Timeless Way of Building by Christopher Alexander
- How Buildings Learn/What happens after they're built by Stewart Brand

Thank you.

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