

Redefining Affordable Housing With Energy In Mind

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Learning Objectives

- Ways to evaluate relative impacts of various external costs of housing.
- Long range planning ideas for controlling energy costs.
- How to compare useful service life cycles of various building components and identify appropriate timing and depth of efforts.
- Ways to understand the difference in energy decisions in new development versus existing housing.
- Evaluation tools to differentiate between energy cost value and environmental impact value of fuel choices.
- How to compare existing building stock to prioritize for energy upgrades.

But First!

- Why?
- Why Now?
- How much?

A Road Map

- To plot a course from where you are to where you want to end up you need to know:
 - Where you are now.
 - Where you want to end up.
 - Why you want to get there.
 - What barriers are in your way.
 - How to get around them.

Background

- Energy costs as a percentage of operation are high now and increases are expected to accelerate.
- Building and renovation projects are relevant over a long time frame relative to energy costs.
- Greenhouse gas reduction recommendations are large over the life of current and newly built housing stock.
- The psychology of previous investment and financial realities defeats incremental change over time in building investments.

Energy Supply Picture

- Oil production is at or near all time peak.
- North American natural gas production is in decline despite record drilling.
- New environmental limits on coal burning and continued growth are increasing electric costs.
- Renewable energy will play a minor role at higher cost.
- Greatly increased efficiency is our only remaining abundant and affordable resource.

Buildings Last

- In 2050 60% of all current housing will still be in use.
- To address climate change we need to reduce CO2 emissions (energy use) by 80% by 2050.
- Resource depletion realities agree with this conclusion.
- Building and design decisions made today need to reflect our goals for our built environment for 2050.

Haven't we made big strides?

- Between 1990 and 2005 U.S CO2 emissions increased by 16%.
- In the same period Minnesota CO2 emissions increased 32%.
- Other emissions are also increasing.
- Energy cost increases have far exceeded any performance gains.
- Our efforts have not been nearly enough. We have a lot of catching up to do.

What are the risks of not enough?

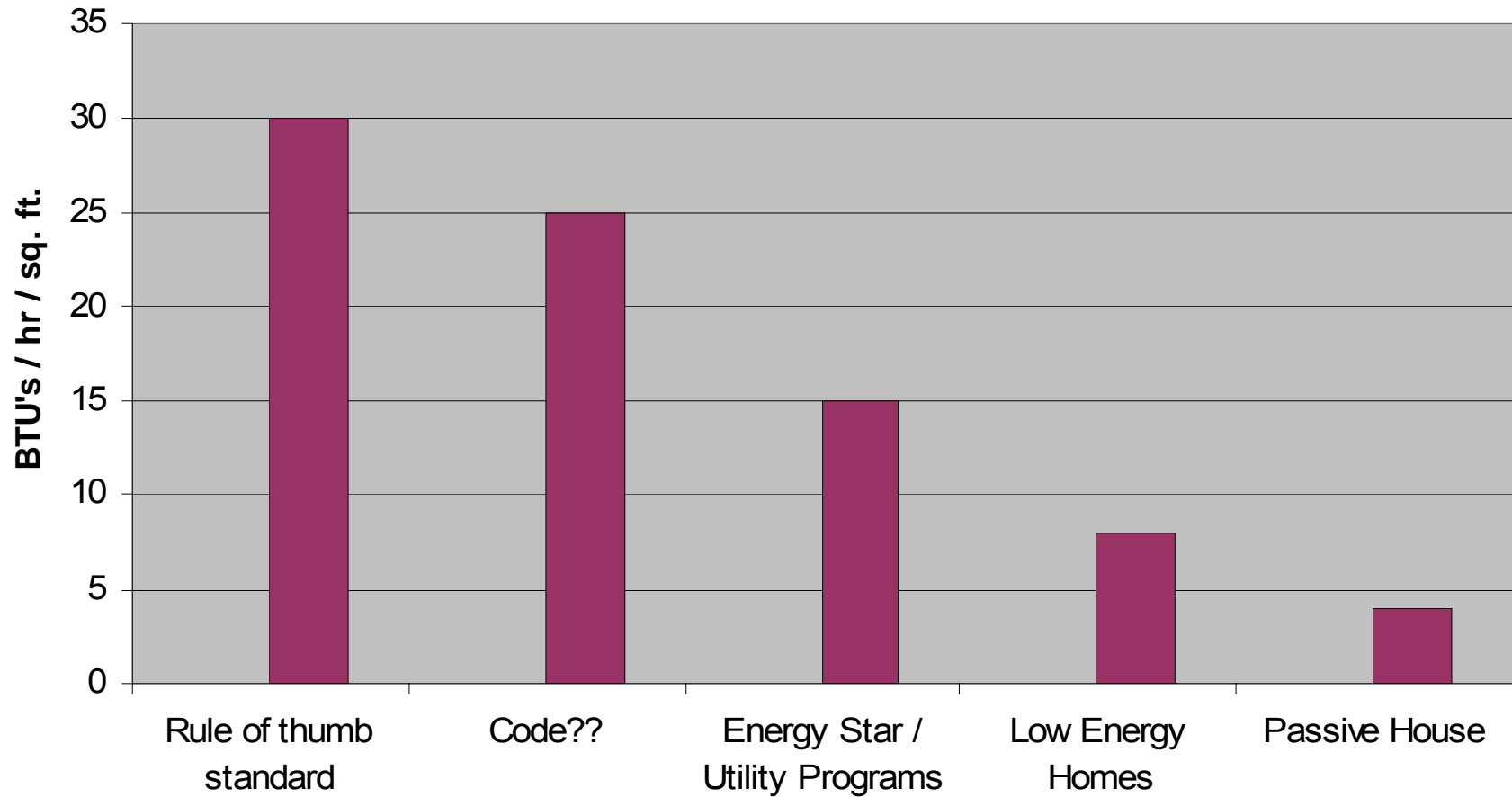
In our climate we could actually freeze to death in our “Green” buildings if they are not efficient enough to accommodate huge energy cost increases or supply interruptions.

Greatly increased efficiency is our only remaining abundant and affordable resource.

Energy Efficient: What does it mean?

- Achieving the same results with less energy input.
- Energy efficiency is not a yes or no question.
- How much less energy is what matters.
- Efficiency is a broad range for which we need to define a measuring stick.

Widening the Spectrum



Heating loads per square foot

Passive House Approach

- Started in Germany based on previous work in North America
- 15 KWH / M2 / yr (4.7 Kbtu / ft2) annual heating energy target
- Around 4.5 – 5 btu / ft2 peak load
- 120 kwh / m2 / yr primary energy (all inputs)
- .6 ACH / 50 minimum air tightness

Prioritizing Energy

- Standard such as MN Green Communities criteria do a good job of defining the range of issues facing housing.
- All of the issues are very important.
 - Healthy indoor environment
 - Reduced environmental impact
 - Reduced operating costs
 - Better land use and infrastructure integration.
- Energy is the moving target of the set.
- Energy cost increases are accelerating

Comparing Impacts of Building

- Occupant health and safety should be first
- Site impacts are controllable
- Durability will protect investment
- Material resource efficiency saves money also
- A good fit into community planning is key
- Larger environmental impacts of construction
- All mostly one time costs and impacts

Deep Energy Reductions Pay

- Energy use over the life of a building represents the largest environmental impact of all.
- Larger energy reductions are now cost effective and payback time will decrease as costs climb.
- Deep energy reductions result in deeper savings both financially and environmentally.
- It costs a great deal more to improve the performance of an existing building than during new construction.

Prioritizing our efforts

- Items we carry in and out through the door generally have a smaller impact over their lifespan than major building components that we may rarely or never replace.
- Get the best lighting and appliances available now and coming advances in efficiency can be integrated at replacement time.
- Build (or renovate) the building so that it makes sense 50 - 75 years from now.

Existing Stock

- As we consider energy upgrades to existing buildings we must accept the need to plan for additional and accelerating energy cost increases.
- We need to make long term planning decisions based on realistic and forward looking predictions of future operating costs.
- Lenders must lead the way in this transition in order to protect their capital investments and provide sound advice to developers.

Evaluating and Using Opportunities In Existing Buildings

- Otherwise needed upgrades to exterior
 - High performance window upgrade when replacing.
 - Foam insulation under new siding.
 - Enhanced foundation insulation plus grading and drainage improvements with new landscaping.
 - New layout and improved fixtures can improve lighting while saving energy.

Existing Opportunities

- Efficient ventilation can improve air quality and save energy.
 - Simple Heat Recovery Ventilation is affordable, quiet and efficient.
- Roofing replacement can include increased insulation.
 - Flat roofs as well as attics can hold much higher insulation levels than we are currently using.

Timing Upgrades

- Different building components have different life spans.
- Plan so that improvements don't lock out other opportunities.
- Invest in energy upgrades that will be relevant for the expected life of an improvement.
- Ask for higher performance and planned upgrades even if it isn't offered in designs and proposals.

New Projects

- It is time to step back and consider what is happening with energy costs, what is driving it, what will happen in the coming decades and what an appropriate response looks like.
- The current and coming energy crisis may greatly increase the number of families that need social housing.
- We will be challenged to create new housing that does not exacerbate this situation.
- We have never, ever been here before.

New Projects

- In addition to important other Green requirements we immediately need to update our energy standards for housing projects.
- The bar has been set too low regarding energy.
- To achieve a few percent better than a low standard, in buildings, is not progress.

New Projects

- Current energy standards are locking us into buildings that will be too expensive to operate well before they are in need of other renovations.

New Projects

- At a minimum, energy cost increases likely during the life of the initial loan products must be factored in and mitigated with higher building performance.

New Projects

- Energy cost increases and climate imperatives call for 80% reductions not 15% or 30%.

MN 2030 Sustainable Building Bill

- Architecture 2030 makes it to Minnesota
- Governor signed bill into law on May 8, 2008
- CO2 emission reduction targets:
 - 60% in 2010
 - 70% in 2015
 - 80% in 2020
 - 90% in 2025

Fuel Choices and Emissions

- With any given fuel, reducing consumption will reduce CO₂ and other emissions.
- Within a given energy consumption, fuel choice greatly impacts emissions.
- Availability of various fuels in coming years will change drastically.
- Depletion of one fuel will cause fuel shifting and price increases in other fuels.

Fuel Choices – The Quandary

- Natural gas
 - Production is being maintained by increased production of unconventional gas.
 - Much industrial demand (fertilizer, plastics, etc.) migrated elsewhere.
 - LNG imports have been declining as other markets outbid U.S. buyers.
 - Reliance on LNG will create dependence on foreign supplies... déjà vu.
 - Prices starting to follow oil more closely.

Fuel Choices (cont.)

- Fuel Oil

- Distillates (fuel oil, diesel, etc.) are rapidly becoming more scarce and expensive than other liquid fuels.
- Gasoline rules the markets – refiners oblige.
- Spreading electrical shortages around the world are increasing diesel use for generators.
- Fall / winter 2008 may bring shortages.
- Prices are reflecting supply problems.

Fuel Choices (cont.)

- Propane

- Production about 50/50 from Natural Gas and Oil production.
- Mid-term future of supplies is less clear right now.
- Prices have been following oil more closely than natural gas.
- Is losing market competitiveness to electric heat.

Fuel Choices (cont.)

- Electricity (MN context)
 - Becoming competitive for heating – for now...
 - Under increasing pressure to reduce CO₂ emissions from coal power plants.
 - Higher mercury, sulfur and particulate emissions.
 - Prices will have to rise to accommodate our need to drastically reduce emissions.
 - Prices are likely to rise as other fuels rise still higher and increase demand through fuel switching.

Fuel Choices (cont.)

- Ground source heat pumps
 - Not geothermal!
 - Only as Green as electric supply.
 - Recent studies by WI Focus on Energy and MN Office of Energy Security (Commerce) indicate large increases in emissions over gas and payback periods in excess of equipment life.
 - One study found CO₂ emission in residential applications increased by 40% and payback in the 25 + year range.
 - Example of effective hype and marketing.

Nuclear

Just try!

Oil hits record for third straight day, tops \$135

Thu 22 May 2008, 9:23 GMT Reuters

Note: These are not batting average statistics for new Twins slugger

Well then – what is there?

- The cleanest, cheapest, most abundant fuel of all is the fuel we don't use.
- Our only energy security lies in deep reductions in consumption.
- Deep reductions don't just happen.
- Higher standards for building projects come first.
- Much more than is currently in place is cost effective now.

Residential Construction

- All environmental impacts should be considered and mitigated in any project.
- Indoor environmental quality should always be optimized.
- An accurate projection of long term affordability should be balanced against first cost.
- Operating energy use represents multiple threats: to the environment, quality of life and affordability.

Building Bridges isn't enough (or Declaring "Greenness")

- Happily driving over it doesn't insure you won't land in the river some day.
- Not your department?
- Be damned sure that it's someone's.
- We have a crisis in the middle.



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Thank you

Questions?