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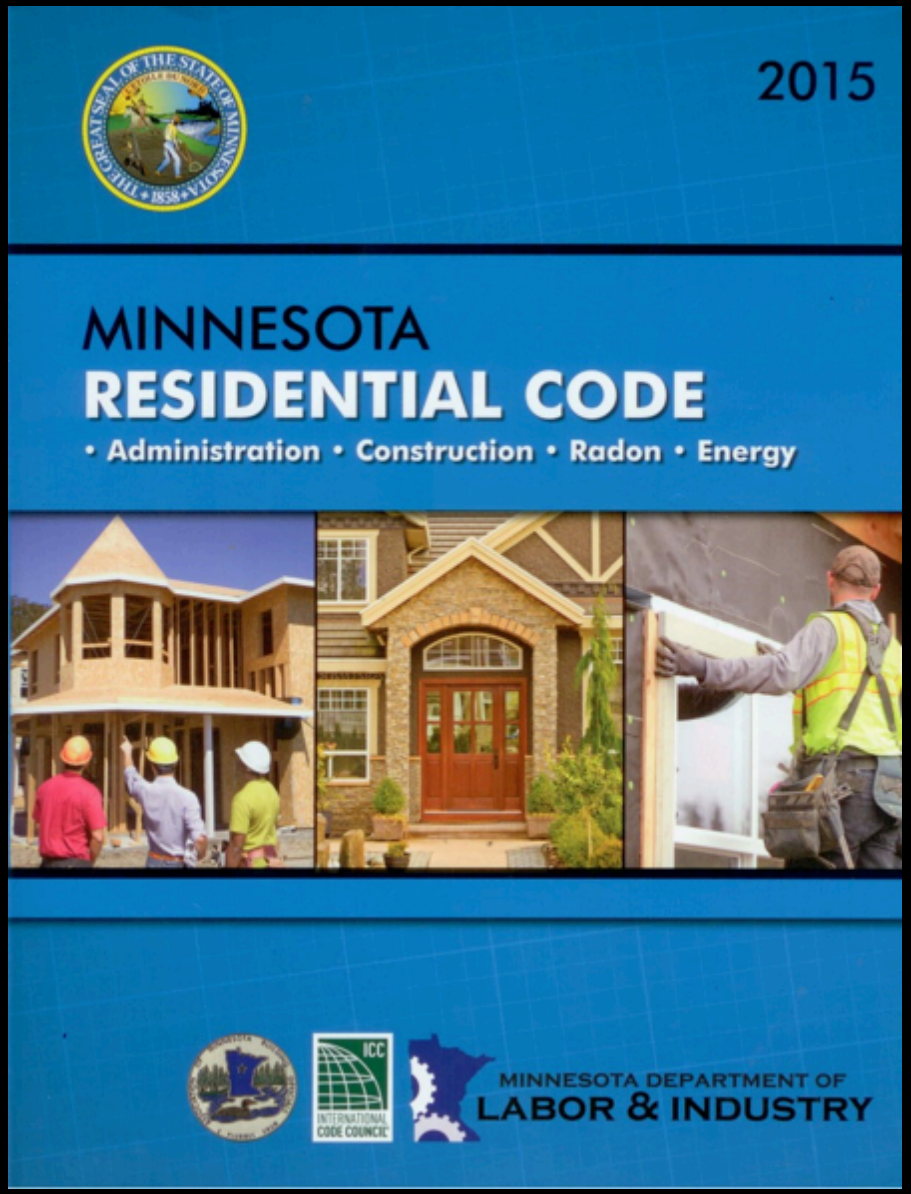
“The needs of an individual or family to experience security and safety, in all aspects of living, in an ongoing situation, be viewed and accepted as a basic human right. The elements of this need include dependence on clean water at all times, continually working sanitation facilities, thermally comfortable living environment, working and workable food preparation and cooking facilities, clean and efficient sleeping areas, fresh air and damp free living environments, durable and easily maintained systems, and most of all, a beautiful and nurturing place to call home.”

Paul Pholeros (2013)

Super Energy Efficiency

Should Always Be the Goal

Case Study : An Affordable, Low Tech, High Performance Home in an Urban Environment



Just because it is better, does not mean it is good.

DECISION MAKERS INFLUENCING THE BUILDING INDUSTRY

Researchers
Developers Architects, Engineers
Building Owners
Building Users/Tenants
Manufacturers
Federal/State/Local Government
Suppliers
Building Managers
Building Contractor/Sub Contractors
Code Officials
Zoning Officials
Lending Institutions
Insurance Companies
Trade Unions
Utilities
Realtors

How to look at the connections to the whole


ETHICS
CLIMATE
ENERGY
WATER
SHELTER
SOIL
FOOD

For any project
For any design
For any solution

One must understand the total impact of doing less than what is possible

Summary:

All things are connected.

Look for the free things first while investigating the project.

Construct the most energy efficient building imaginable. Make it good, not just better.

Surround yourself with clean water, fresh food and create possibilities.

What we use to know

"The primitive architect works in an economy of scarcity — his resources in materials and energy are severely restricted."

James Marston Fitch in *Shelter*

“This reveals a precise and detailed knowledge of local climatic conditions on the one hand and, on the other, a remarkable understanding of the performance characteristics of the sites and materials locally available.”

James Marston Fitch in *Shelter*

Have we made progress?

What knowledge have we lost?

Can you relearn and start to understand
the relationship between humans
and the earth before it is too later?

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Energy

What is the cheapest energy?

What is the most secure (nationally) energy?

What is the cleanest energy

What is the safest energy?

Energy Efficiency and Passive Strategies

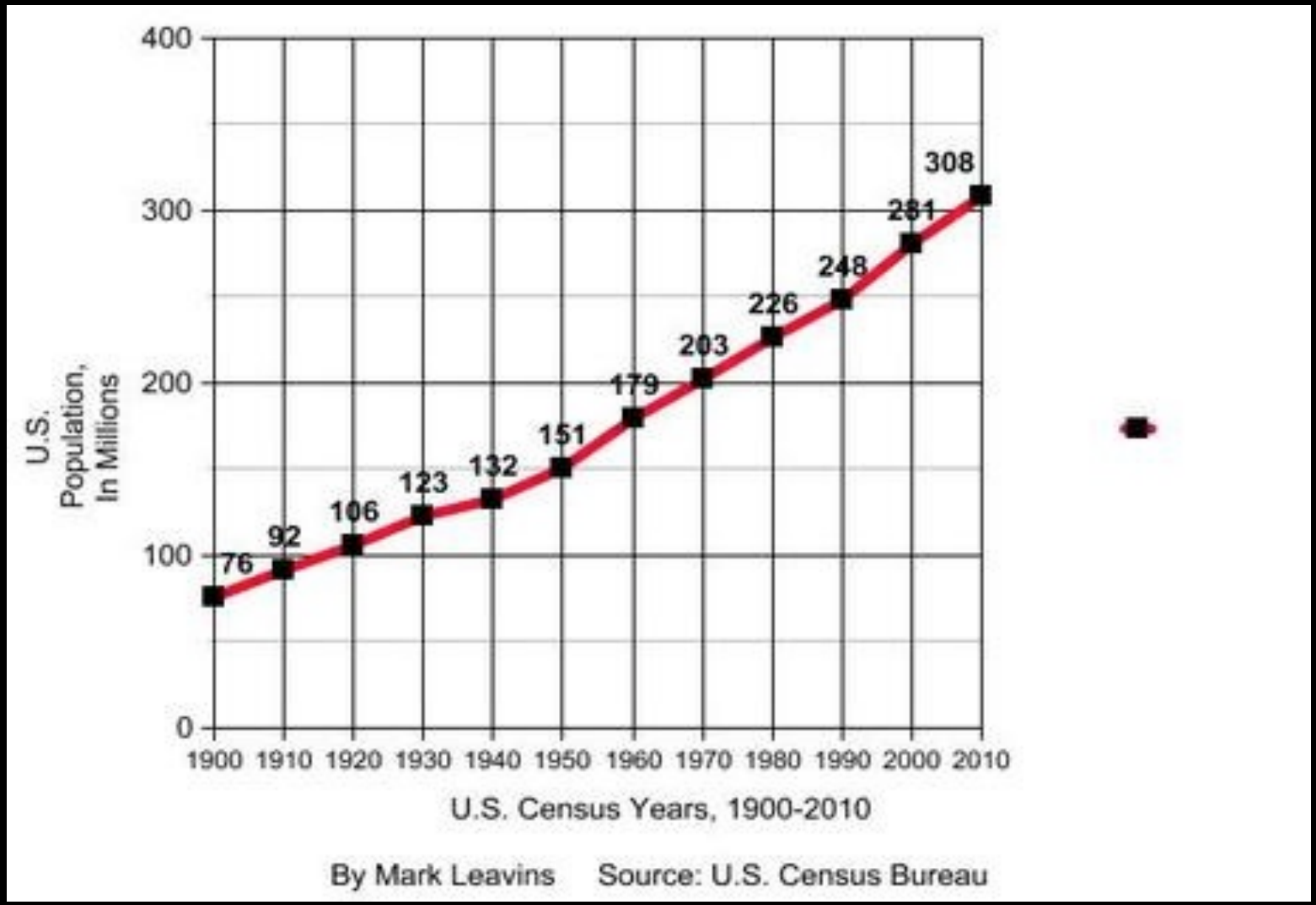
The cheapest energy is the energy you don't use.

The most secure (nationally) energy is the energy you don't use.

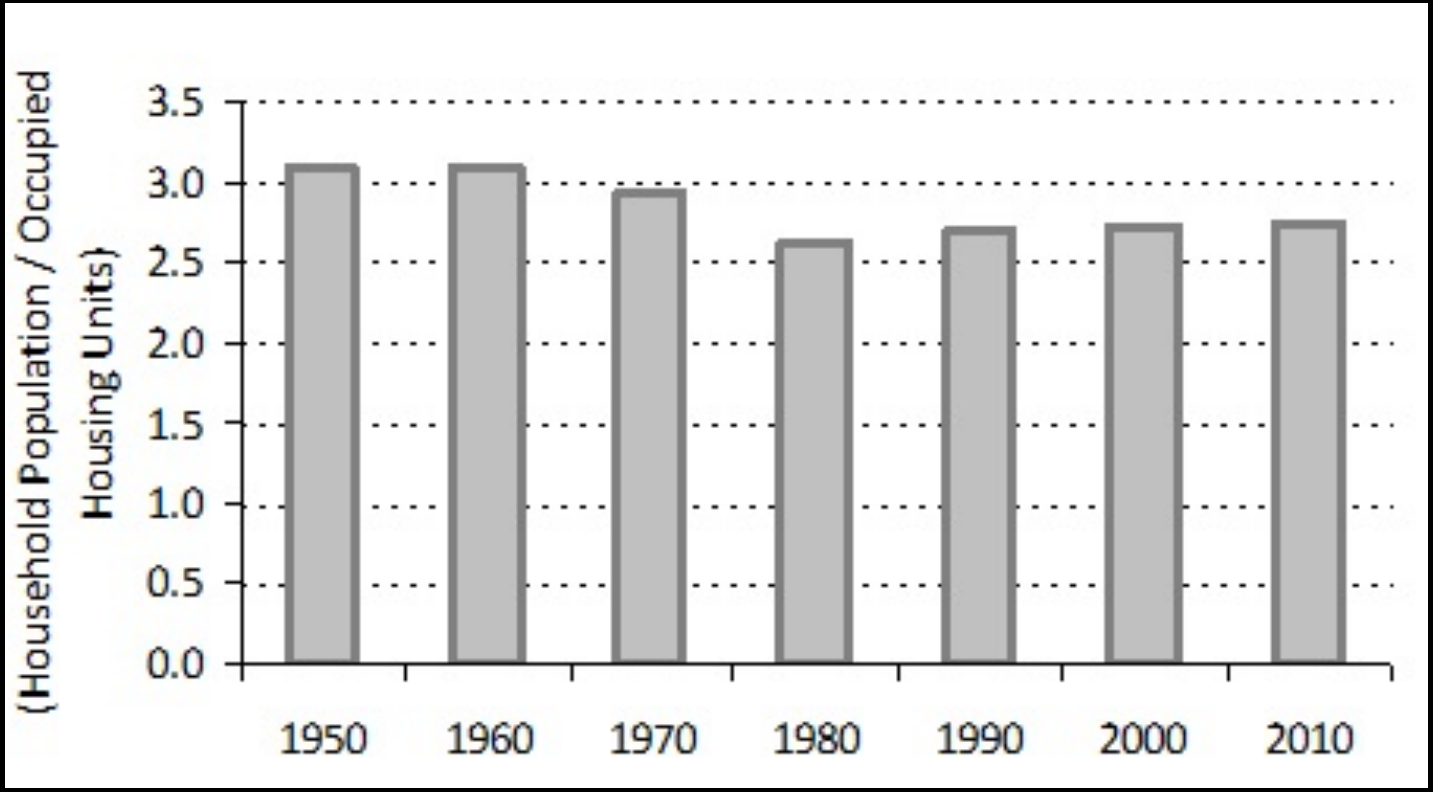
The cleanest energy is the energy you don't use.

The safest energy is the energy you don't use.

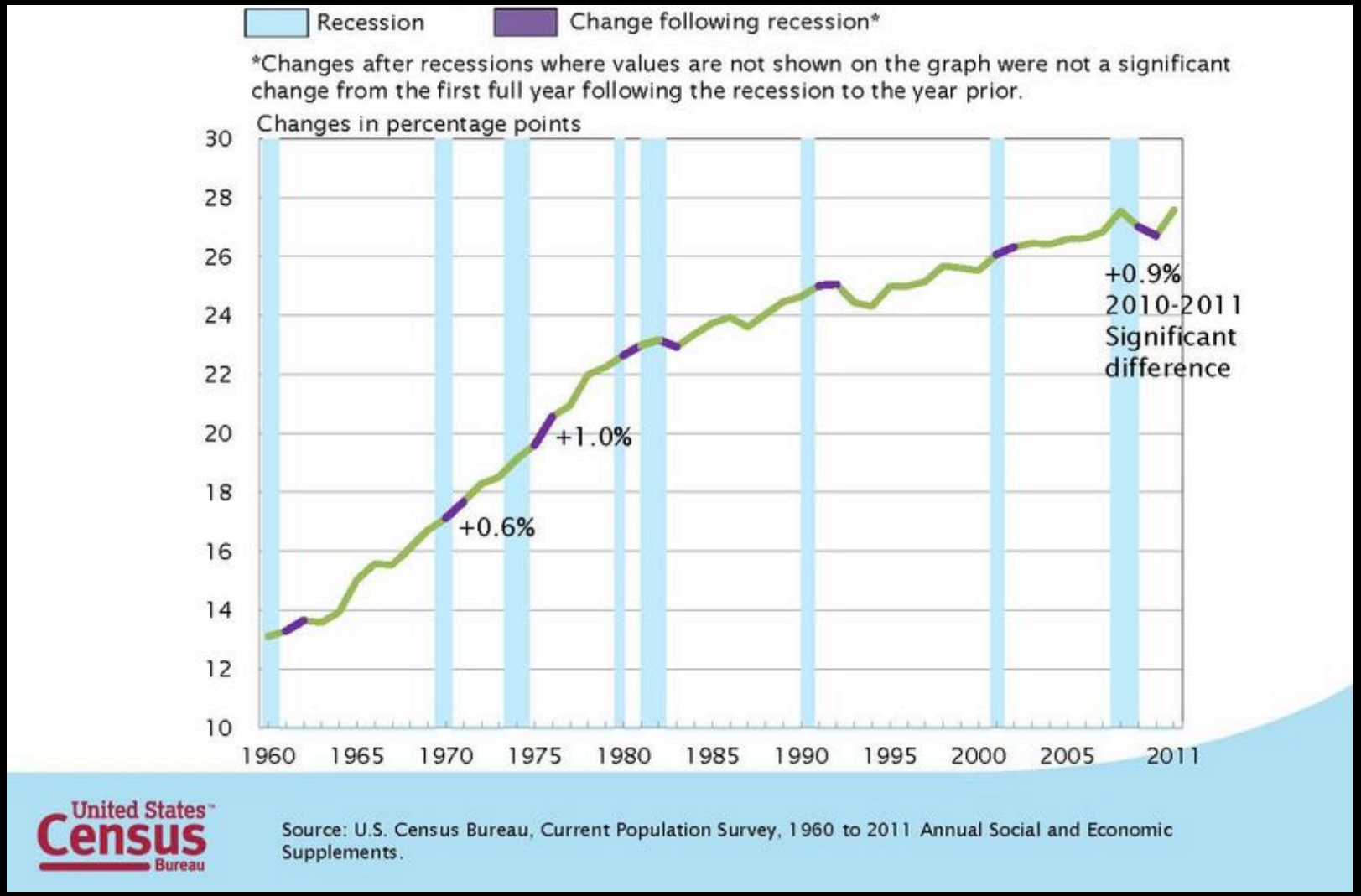
US Population Growth 1900 to 2010



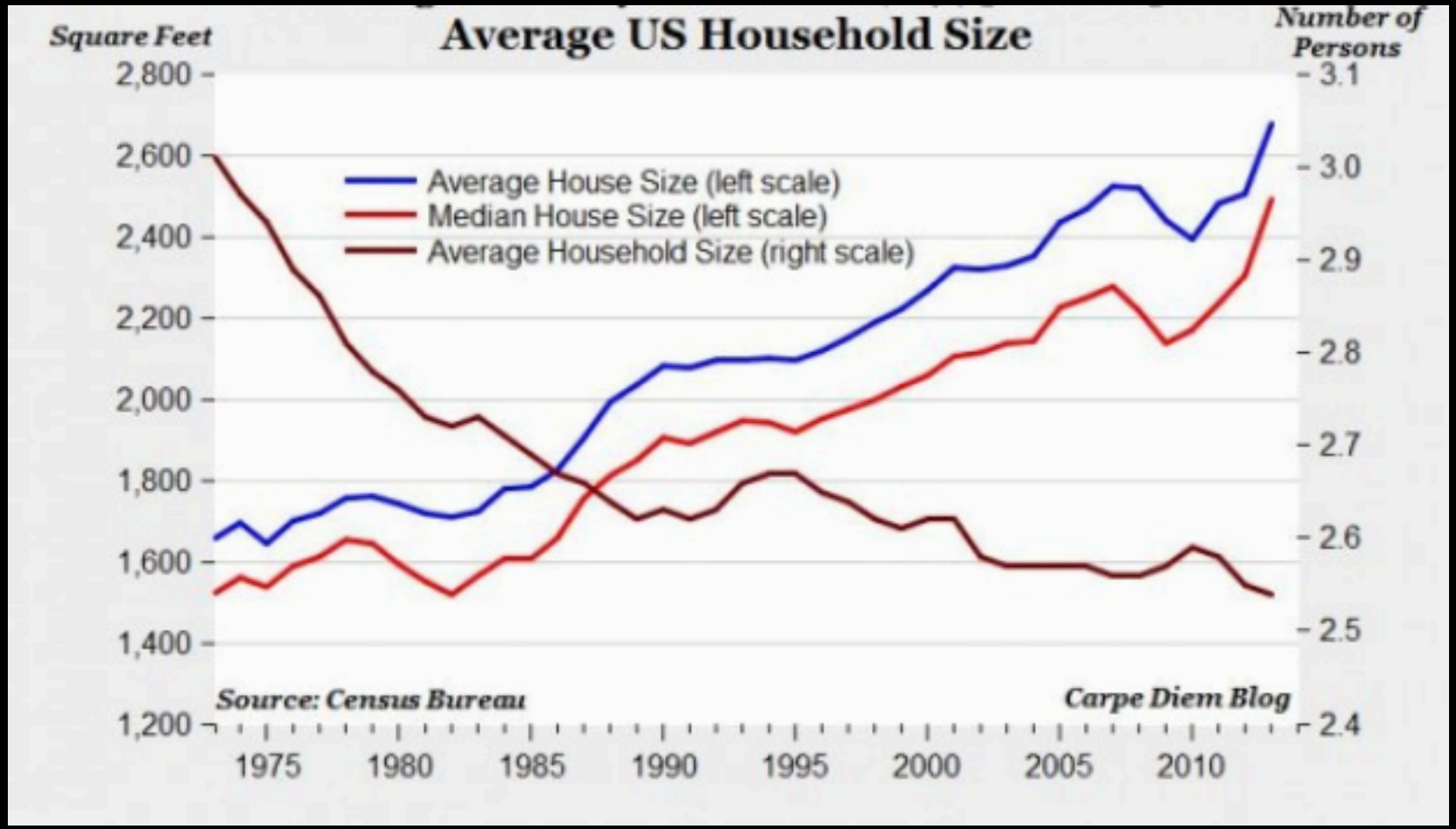
Average Household Size



Percent of Households with one person: 1960 - 2011



Average and Median Square Feet of Floor Area 1973 to 2013

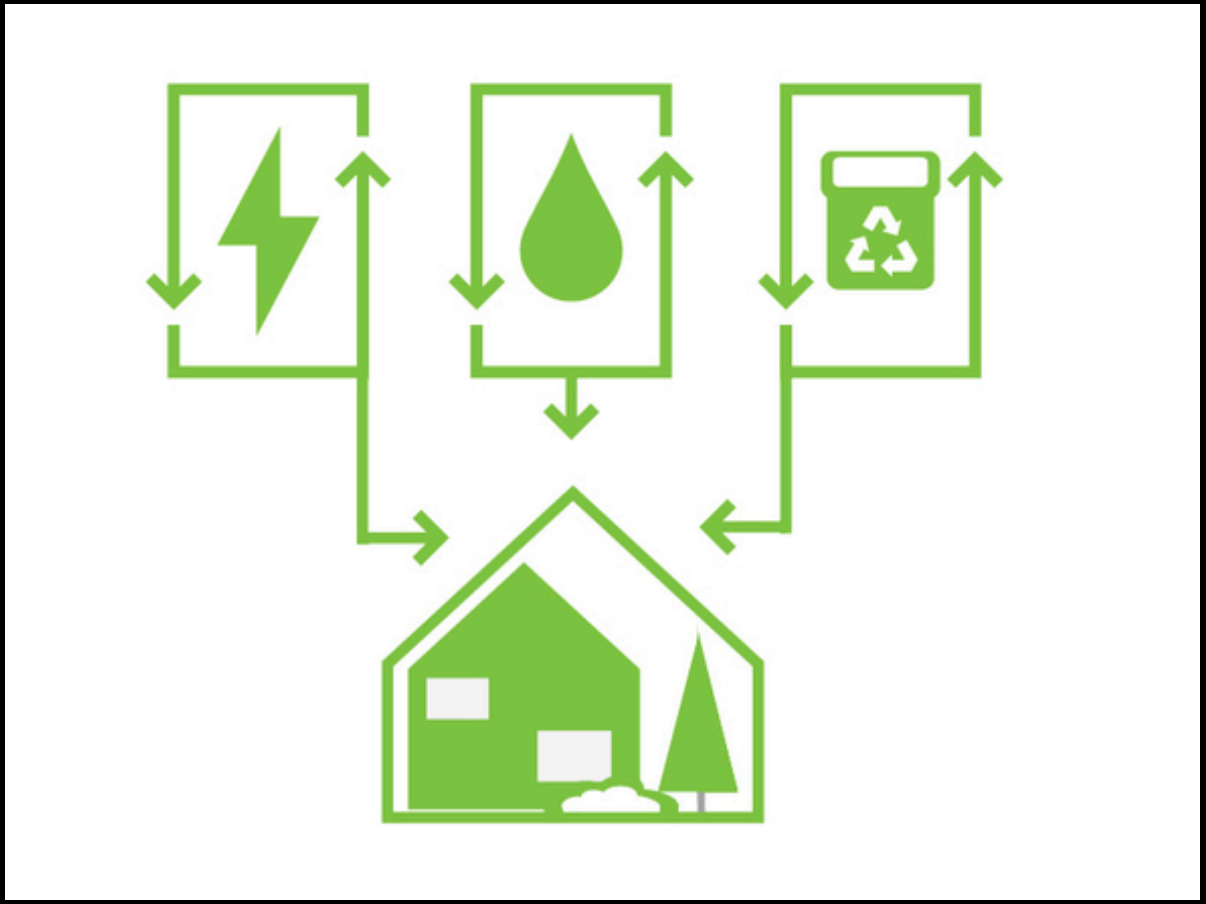


Instead of us working for our homes,

our homes work for us!

…producing an abundance of clean energy,

fresh healthy food and water for everyday



REGENERATIVE: where the outputs of one system are the inputs of another

Case Study

Passive solar design takes advantage of a building's site, climate, and materials to minimize energy use.

ENERGY EFFICIENCY

A well-designed passive solar home first reduces heating and cooling loads through energy-efficiency strategies and then meets those reduced loads in whole or part with solar energy.

Passive design reduces or eliminates the need for auxiliary heating or cooling, lighting and ventilation which accounts for about 40% (or much more in some climates) of energy use in the average home.

Passive design, thus, results in ultra-low energy buildings that require little energy to perform which results in many other benefits.

PAY BACK

AVERAGE PRICE OF A CAR: $33,000

Would you pay me $3,600 more for the same car if I told you that you would never have to pay for gas again?

PAY BACK

AVERAGE PRICE OF A HOME IN MINNESOTA: $260,000

Would you pay me $286,000 for the same house if I told you that you would never have to pay for energy again?

ROI : measures the benefit of an investment relative to the cost of the investment.

AVERAGE RETURN ON INVESTMENT FOR $26,000

Money @ 3.5% (average over 10 years)

ROI = (Gain from investment − Cost of investment)

$ 2,172 (gas) + $1,080 (electric) - $900 (average 3.5%)

$ 2352 more

ROI

AVERAGE RETURN ON INVESTMENT FOR $26,000

Money @ 10%

$$\text{ROI} = \frac{(\text{Gain from investment} - \text{Cost of investment})}{\text{Cost of Investment}}$$

$ 2,172 (gas) + $1,080 (electric) - $2,600 = $652 more

12% annually with a guarantee without adding in the benefits of comfort, safety and health

References for “show me the money”

http://www.greenbuildingadvisor.com/blogs/dept/musings/payback-calculations-energy-efficiency-improvements

http://smartenergy.illinois.edu/pdf/Presentations/Fournier%20ComEd%20EE%20Expo.pdf

ENERGY UPGRADES

THE MOST SECURE INVESTMENT YOU CAN MAKE

They are not effected by economic conditions or energy prices.

And as energy prices go up, the percentage return is greater.

$$

The return on investment for insulation/windows is much greater than the ROI of solar panels.

The payback for insulation and windows is twice that of solar panels.

HOW TO GET THERE

HERS SCORE

After the original design at 2015 Minnesota Building Code	***HERS 45***
After the redesign with the super energy efficient upgrades and NO PV	***HERS 23***
After the redesign with the super energy efficient upgrades and with PV	***HERS 17***
After all of the movable insulation is installed and with PV.	***HERS : 0***
After a PV supplied water heater is installed.	***HERS : -8***

HERS SCORE

HERS Index Score of 150

This house is a **50% LESS ENERGY EFFICIENT** than a standard new home. It could be a significant financial drain on the bank account and to the environment in general. A house like this has high energy bills and will be hot in the summer and cold in the winter.

HERS Index Score of 100

The same level as a standard new home, which meets the current industry standard for home energy efficiency.

HERS Index Score of 50

This home is 50% more energy efficient than a standard new home and 80% more efficient that the average resale home, which already puts it in a better bracket than a standard new home.

HERS Index Score of 0 (Net Zero)

This home is a Net Zero Energy Home. This means that this home produces as much energy through renewable resources, such as solar panels, as it consumes. Only a Net Zero Energy Home can score 0 on the RESNET HERS

WHERE TO START

SITE EVALUATION

DESIGN FOR THE FREE STUFF FIRST :
PASSIVE STRATEGIES

THEN WALLS AND WINDOWS

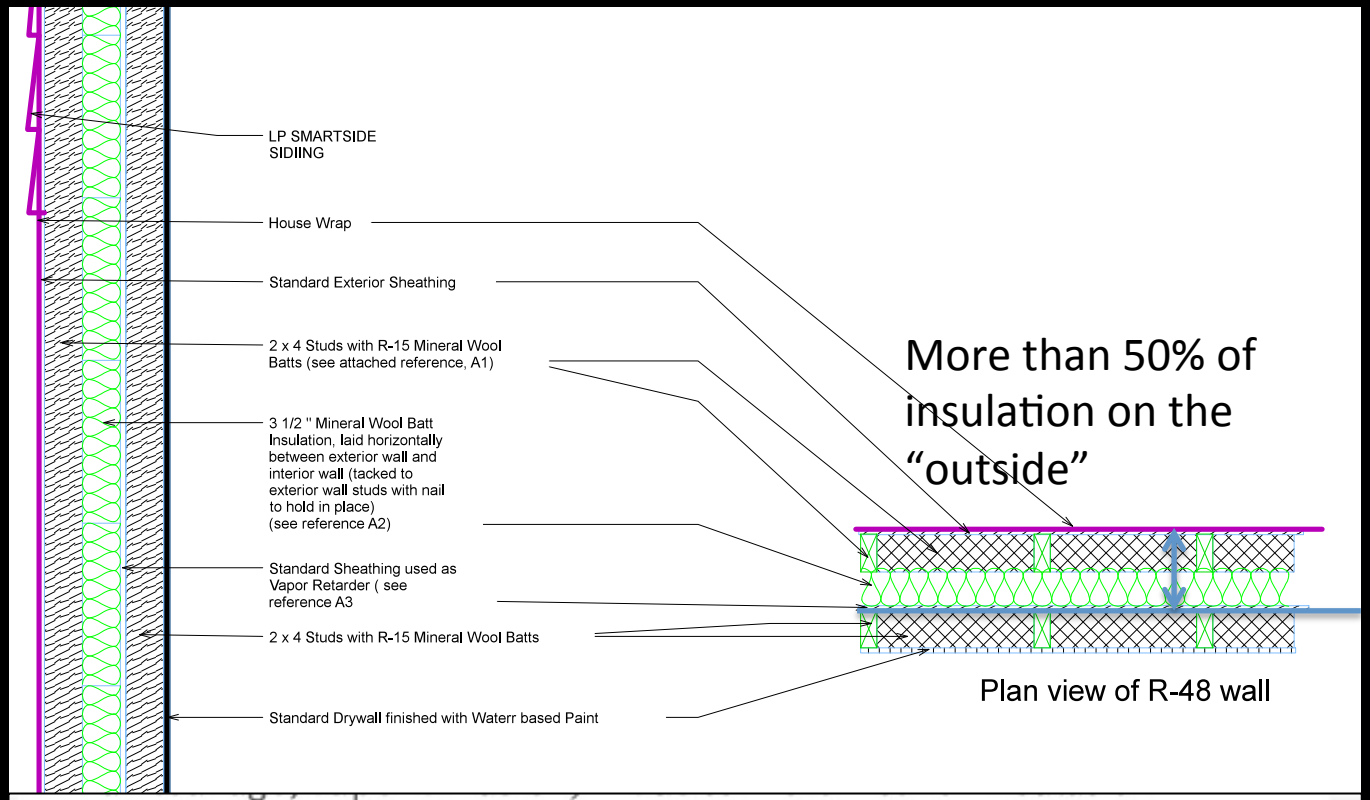
PV

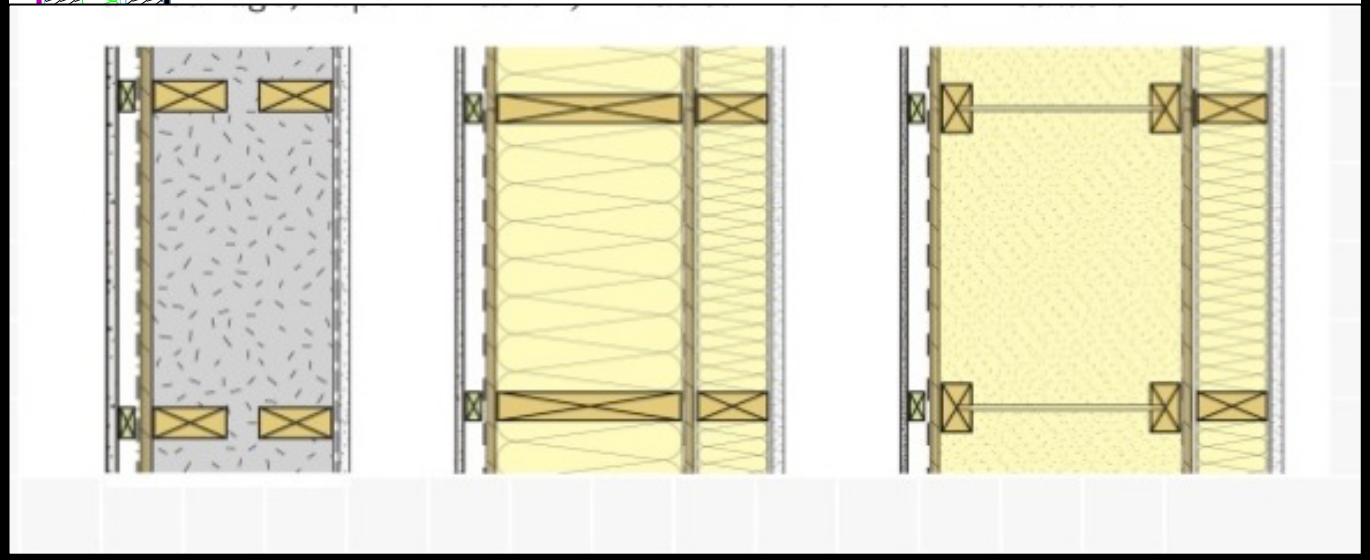
PASSIVEHAUS STANDARDS WHEN

PASSIVE SOLAR ACCESS IS LIMITIED OR

NON-EXISTENT.

FIND A SYSTEM THAT WORKS FOR YOU


LP SMARTSIDE
SIDIING
House Wrap
Standard Exterior Sheathing
2 x 4 Studs with R-15 Mineral Wool
Batts (see attached reference, A1)
3 1/2 " Mineral Wool Batt
Insulation, laid horizontally
between exterior wall and
interior wall (tacked to
exterior wall studs with nail
to hold in place)
(see reference A2)
Standard Sheathing used as
Vapor Retarder (see
reference A3
2 x 4 Studs with R-15 Mineral Wool Batts
Standard Drywall finished with Waterr based Paint
More than 50% of
insulation on the
“outside”
Plan view of R-48 wall



HERS SCORE

After the original design at 2015 Minnesota Building Code ***HERS 45***

After the redesign with the super energy efficient upgrades and NO PVHERS ***HERS 23***
At this level, the house qualified for $11,000 more towards a mortgage.

After the redesign with the super energy efficient upgrades and with PV ***HERS 17***
At this level, the qualified the house qualified for $22,000 more towards a mortgage.

After all of the movable insulation is installed and with PV. ***HERS : 0***

After a PV supplied water heater is installed. ***HERS : -8***

EEM

Energy Efficient Mortgage : enables homebuyers to finance and include cost-effective energy saving measures as part of their mortgage. They are used towards purchasing a new home that is already deemed an energy efficient home, and allow borrowers to qualify for larger loans to upgrade to more energy efficient homes. Homebuyers must first get an energy rating on the home in order to qualify for an energy efficient mortgage.

EEM

Energy Improvement Mortgage are targeted towards homeowners wanting to make energy efficiency improvements to their existing homes. The costs for these improvements are accounted for in the mortgage so borrowers aren't confronted with the prospect of a larger down payment. Qualification for an energy improvement mortgage also requires an energy rating.

Energy Star Mortgage

ENERGY STAR mortgages are similar to EEMs and offer consumers lower borrowing costs for financing ENERGY STAR certified homes, or for energy efficiency improvements being made to existing homes through a Home Performance with Energy Star rating

EEM

How to Get an Energy Mortgage
Energy mortgages are available through any number of conventional lenders. In order to qualify, an energy rating needs to be done on the home first.

The Federal Housing Administration (FHA) and Veterans Administration (VA) also offer EEM's. In the Case of the FHA, the maximum amount of the portion of the EEM for energy efficient improvements is the lesser of 5% of:

The value of the property, or
115% of the median area price of a single family dwelling, or
150% of the conforming Freddie Mac limit.
VA EEMs are available to qualified military personnel, reservists and veterans for energy improvements when purchasing an existing home. The VA EEM limits energy improvements to $3,000–$6,000.

Just because it is better

does not mean it is good.

Make good homes!