

Preservation: The Green Imperative

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Midcoast Regional Planning Commission

Union, Maine
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3 Topics:

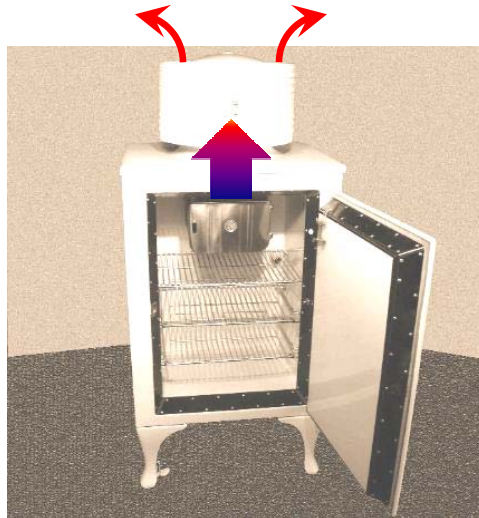
1. **Geothermal**—great, but not easy.
2. **Aggressive** Weatherization?
3. **Embodied energy** for conservation.



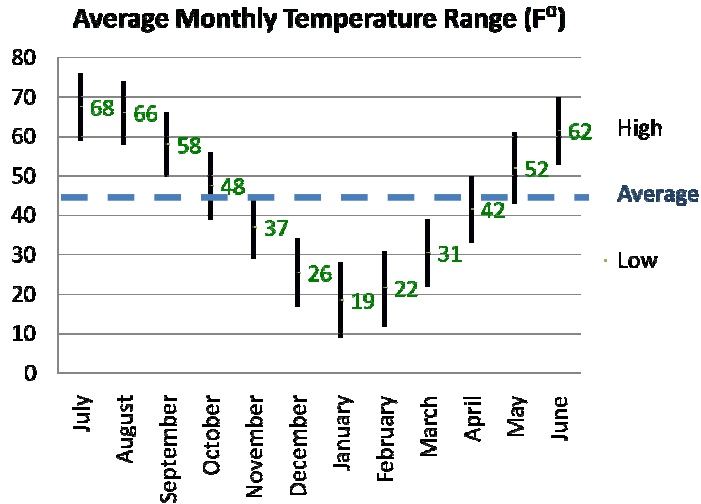
How does **Geothermal** work?



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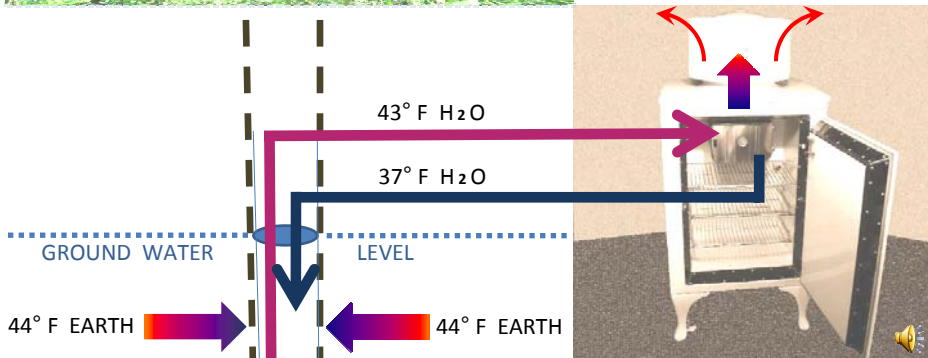
Rockland Climate = 44° F



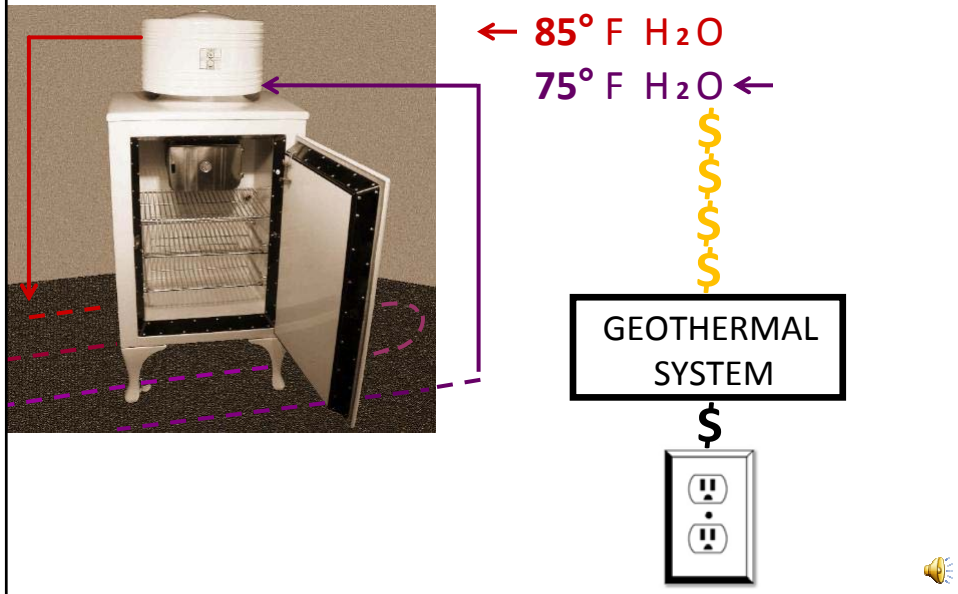
What is Geothermal **Heat**?



Average Annual
Temperature

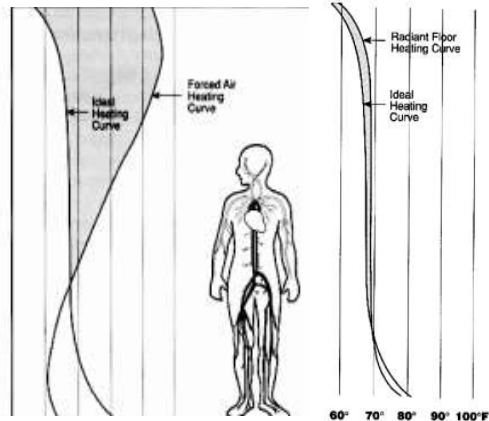


Is Geothermal **efficient**?



Maintain a radiant field!

Radiant floors improve comfort & save \$\$\$



Preservation = Persistent Reuse...why?

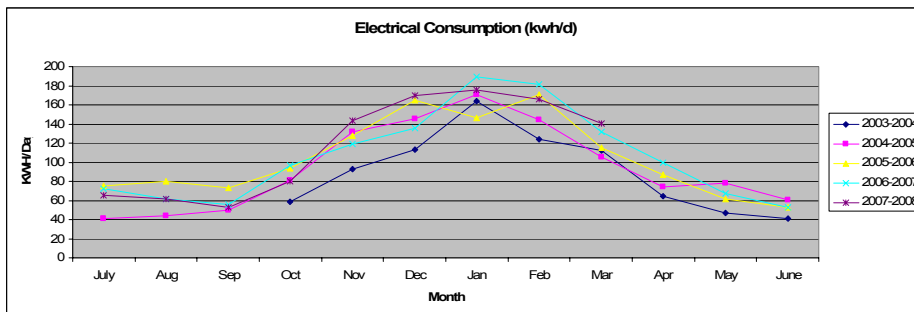


Coburn House, Rockland, Maine, 2007

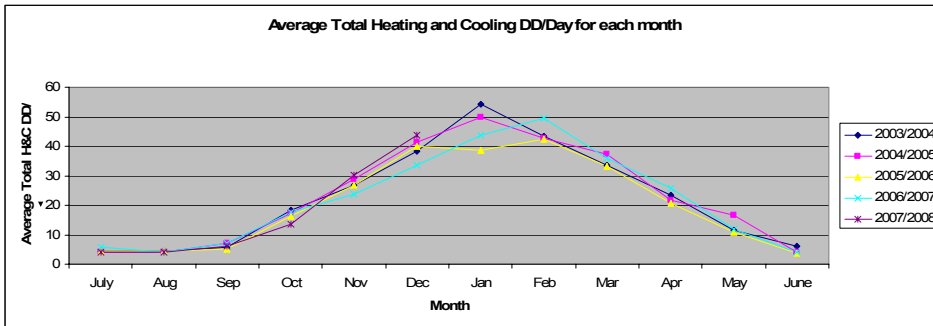




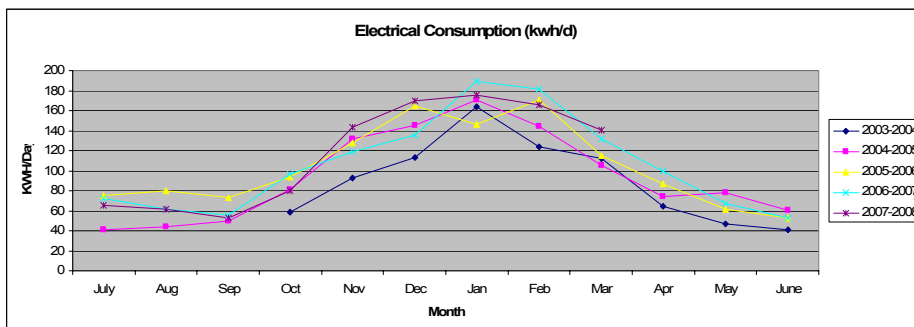
Electrical Consumption



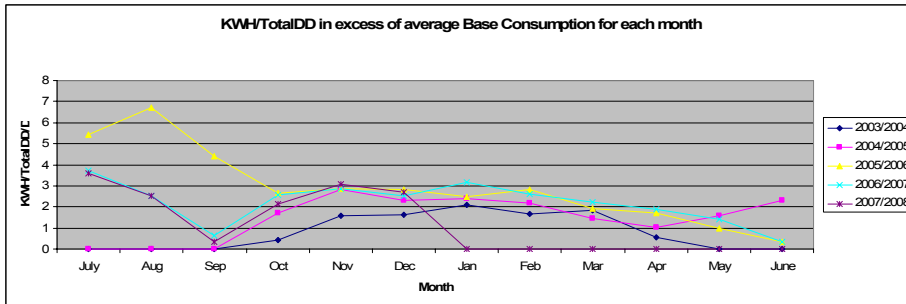
HVAC Load



Electrical Consumption for HVAC



Electrical Consumption / Degree Day



Geothermal \$\$\$

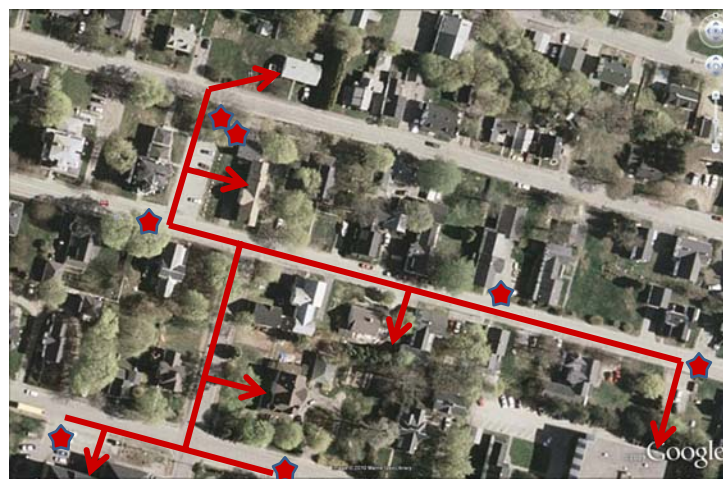
ITEM	COST
Net geothermal system \$\$	\$26,100
Debt service / year	\$1,876
Maintenance & replacement reserve / year	\$1,000
Electricity / year	\$2,160
TOTAL COST / year	\$5,040
Oil use per year avoided	3,763 gallons
Break-even cost of oil / gallon	\$1.34



A Neighborhood Approach to Geothermal



Geothermal by Neighborhood



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1. Geothermal—great, but not easy.

2. **Aggressive** Weatherization?

3. Embodied energy and conservation



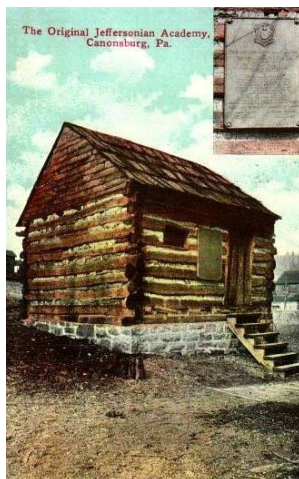
$R \approx 7$



History of R-chitecture



R=6



$R=8$



$R=2.5$



R=7



LEED Silver R=7



LEED Platinum R=10



Lessons?

R=10

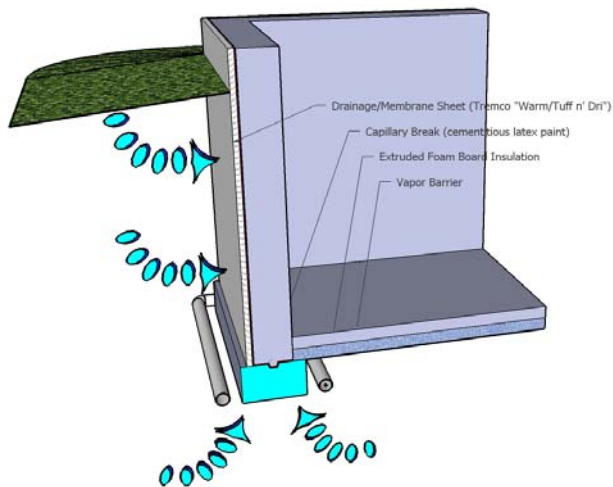


R=7

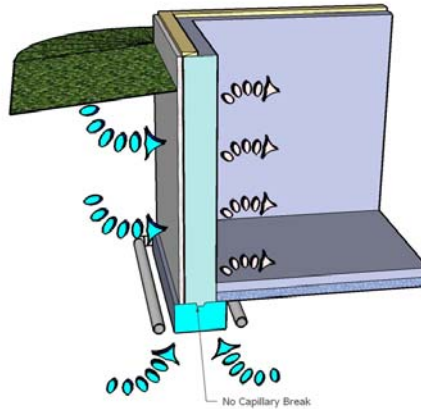




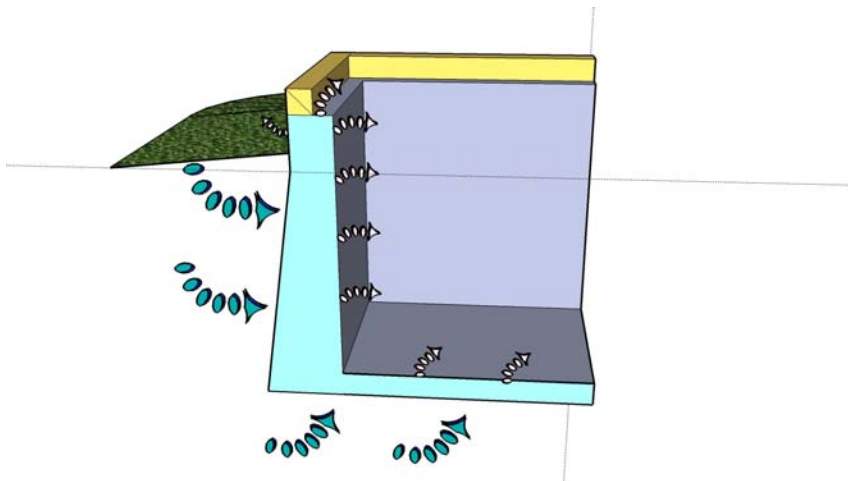
Dry Foundation



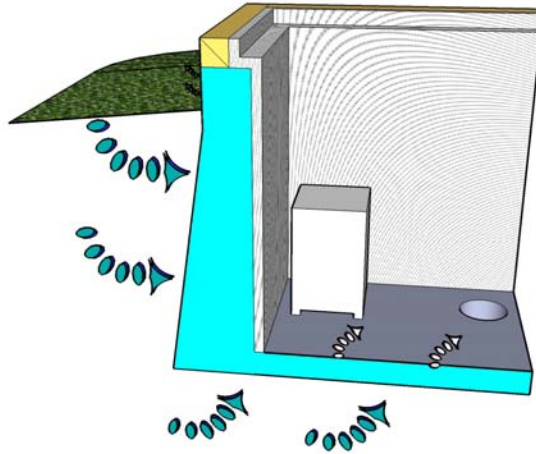
Damp Foundation



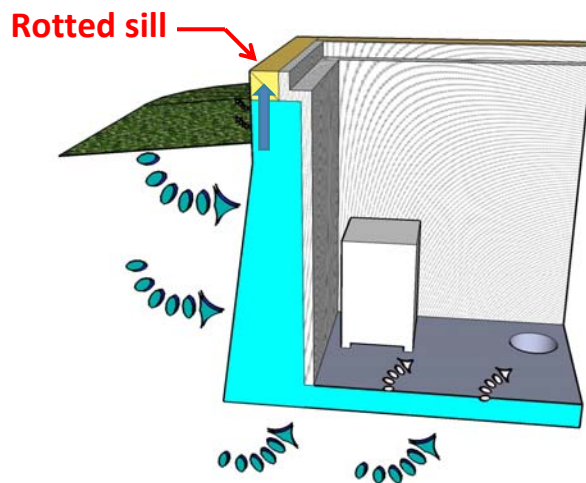
Traditional Foundation



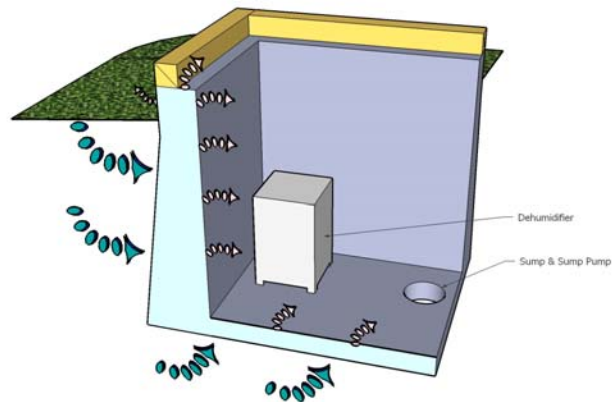
Perils of Insulating Cellar on Inside



Perils of Insulating Cellar on Inside



Rockland Compromise



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Residential Energy Use

University of Michigan

1998 Life Cycle Energy Analysis of a House

TWO CASES ANALYZED:

- Actual “Developer-Type” House
- Identical House Modeled with Energy Efficient Upgrades

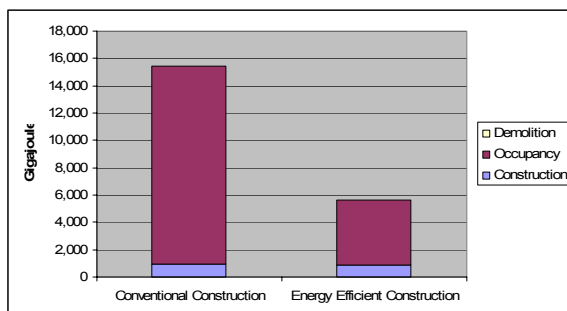


Residential Energy Use

Comparison : 50 Year Life Cycle Consumption

Two, Single Family Houses, northern Climate

Good “builder” quality vs. “upgrade” conservation



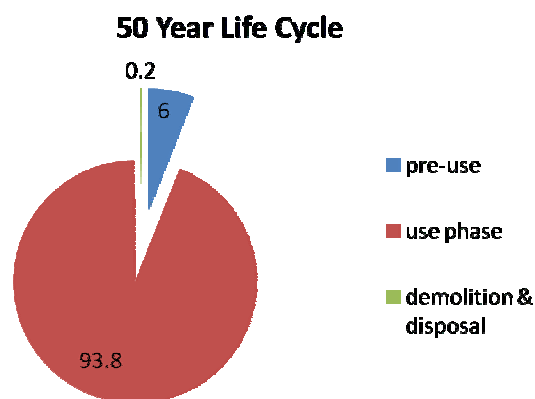
Residential Energy Use



Parameters	Conventional Construction	Energy Efficient Construction
Walls	R-15	R-35
Ceilings/Roof	R-23	R-49
Windows	Double-Glazed	Double-Glazed Low-E
Air Changes / Hour	2/3	Controlled Ventilation



Residential Energy Use Percentage of Total Consumption



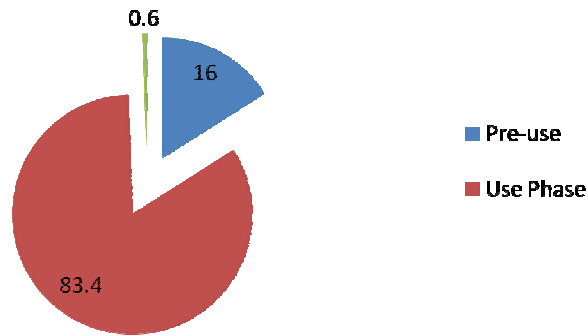
Conventional House

University of Michigan Study



Residential Energy Use Percentage of Total Consumption

50 Year Life Cycle

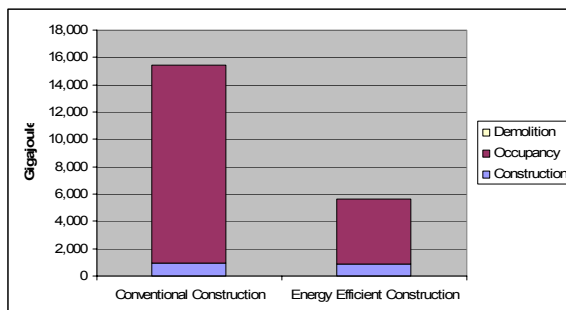


Energy Efficient House
University of Michigan Study



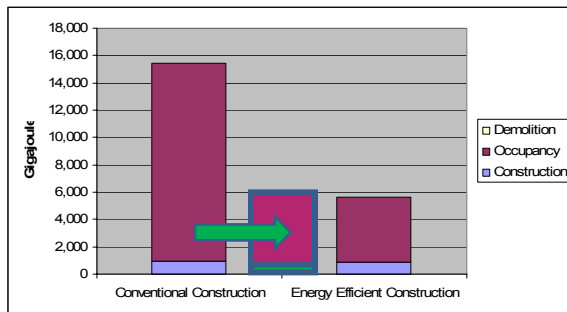
Residential Energy Use

- Good “builder” quality uses 15 times construction
- “Upgrade” conservation uses 5 times construction



Residential Energy Use

- Energy for Renovation—a fraction of...
- New construction energy



Renovation of Existing Construction

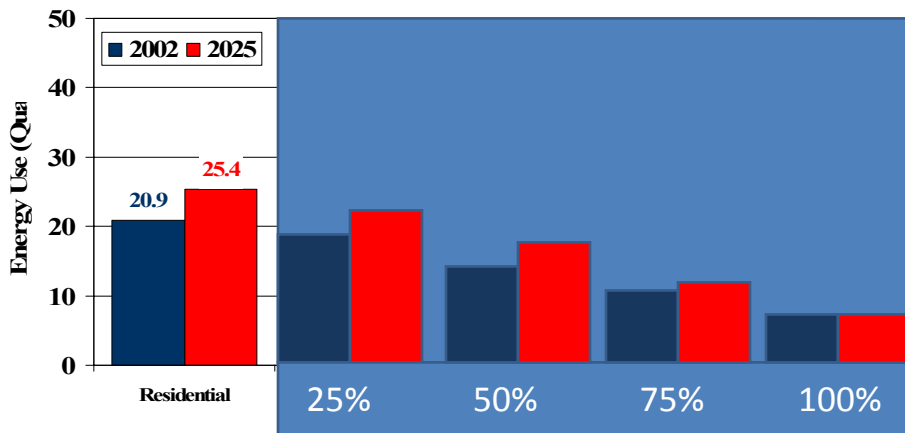


Embodied Energy



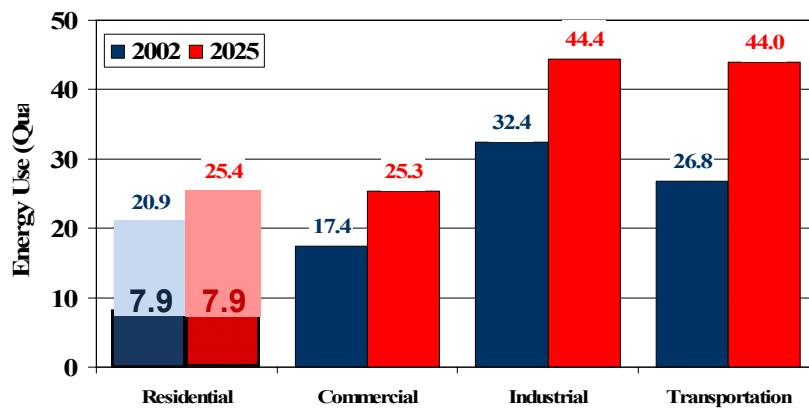
Energy Use in the U.S.

Potential savings from rehabilitation of dwellings
(% rehabilitated of buildings that are older than 30 years)



Energy Use in the U.S.

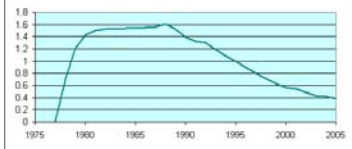
Potential savings from rehabilitation of dwellings
(older than 30 years)



ONE HALF Prudhoe Bay



Alaska's Prudhoe Bay



Millions of Barrels extracted per day



One Half Prudhoe Bay
would fill 20 Moosehead Lakes

