Near term actions to protect the climate and environment

Lexington, MA
October 29, 2009
Bill Moomaw
Tufts university

US households

- US Households produce 38% of carbon dioxide emissions – 626 Million tons of carbon
- This is 8% of global emissions
- It exceeds the emissions of every other country except for China

Major strategies

- First change behavior
- Second reduce waste
- Third find most efficient means for providing energy, transportation and other services
- Fourth utilize low carbon renewable energy
- Fifth utilize low carbon and low polluting food and products

Changing behavior

- A set of 17 actions that can be taken by individuals that require direct action has been found to be capable of reducing total household emissions by 20% within 10 years
- This is 123 million tons C or 7.4% of US total emissions
- This slightly exceeds the total emissions of France

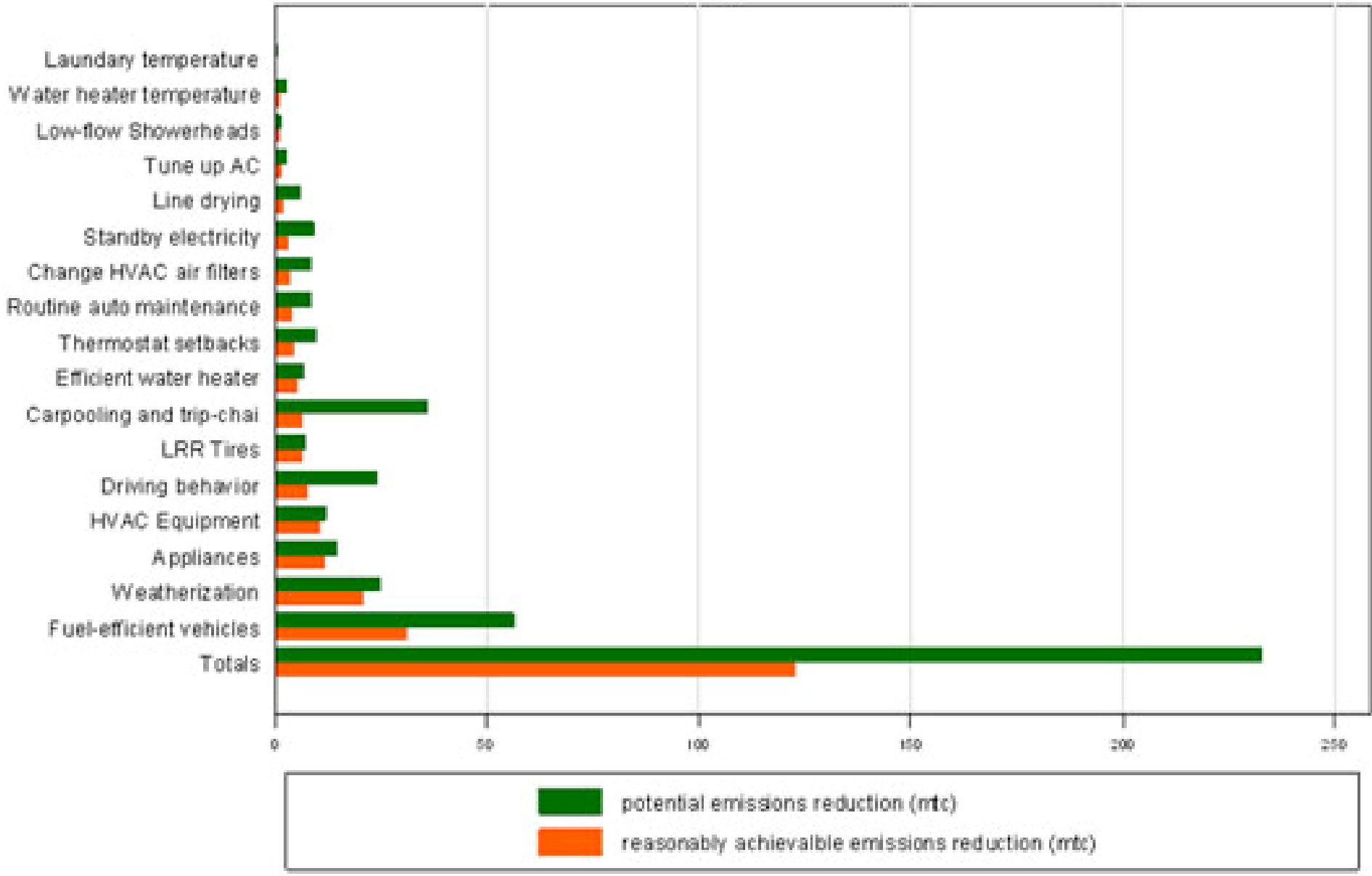
Reasonably Achievable Reduction Potential Top cases

- More fuel efficient car - 31.4 Mt C
- Weatherization of home – 21.2 Mt C
- Appliances – 11.7 Mt C
- HVAC equipment – 10.7 Mt C
- Driving behavior – 7.7 Mt C
- Carpooling and trip chaining – 6.4 Mt C
- Efficient water heater – 5.4 Mt C
- Thermostat set backs – 4.5 Mt C

But potential is even greater

- More fuel efficient car - 31.4 Mt C (56.3)
- Weatherization of home – 21.2 Mt C (25.2)
- Appliances – 11.7 Mt C (14.7)
- HVAC equipment – 10.7 Mt C (12.2)
- Driving behavior – 7.7 Mt C (24.1)
- Carpooling and trip chaining – 6.4 Mt C (36.1)
- Efficient water heater – 5.4 Mt C (6.7)
- Thermostat set backs – 4.5 Mt C (10.1)

Potential and reasonably achievable emissions reductions



Source: Dietz et al. 2009

Reduce waste

- Natural gas leaks are huge and methane is a significant sources of global warming
- Check your home and ask the natural gas company to check for leaks in the distribution system and in their storage and transmission pipelines

Take advantage of free audits and tax credits

- If you have not done so, get a free energy audit, and take advantage of subsidized weatherization programs by your utility
- Take on additional opportunities to improve the energy performance by installing efficient doors, windows and even solar hot water systems or solar electric panels and take a tax credit next April 15

New study on potential for renewable energy

- the potential for wind energy production is 5 to 15 times greater than what is needed to power the entire world. For solar energy, the comparable calculation found that solar could produce about 30 times the amount needed.
- the most significant barrier to the implementation of their plan is the competing energy industries that currently dominate political lobbying for available financial resources.
- Jacobson and Delucchi Scientific American November 2009

Purchase green electricity

- By paying a small extra fee each month, you can buy renewably generated electricity from National Grid or N-Star
- This drives the market for building more renewable energy capacity
- Avoid coal based electricity and destructive mining practices

Mountain Top Removal West Virginia Coal Production

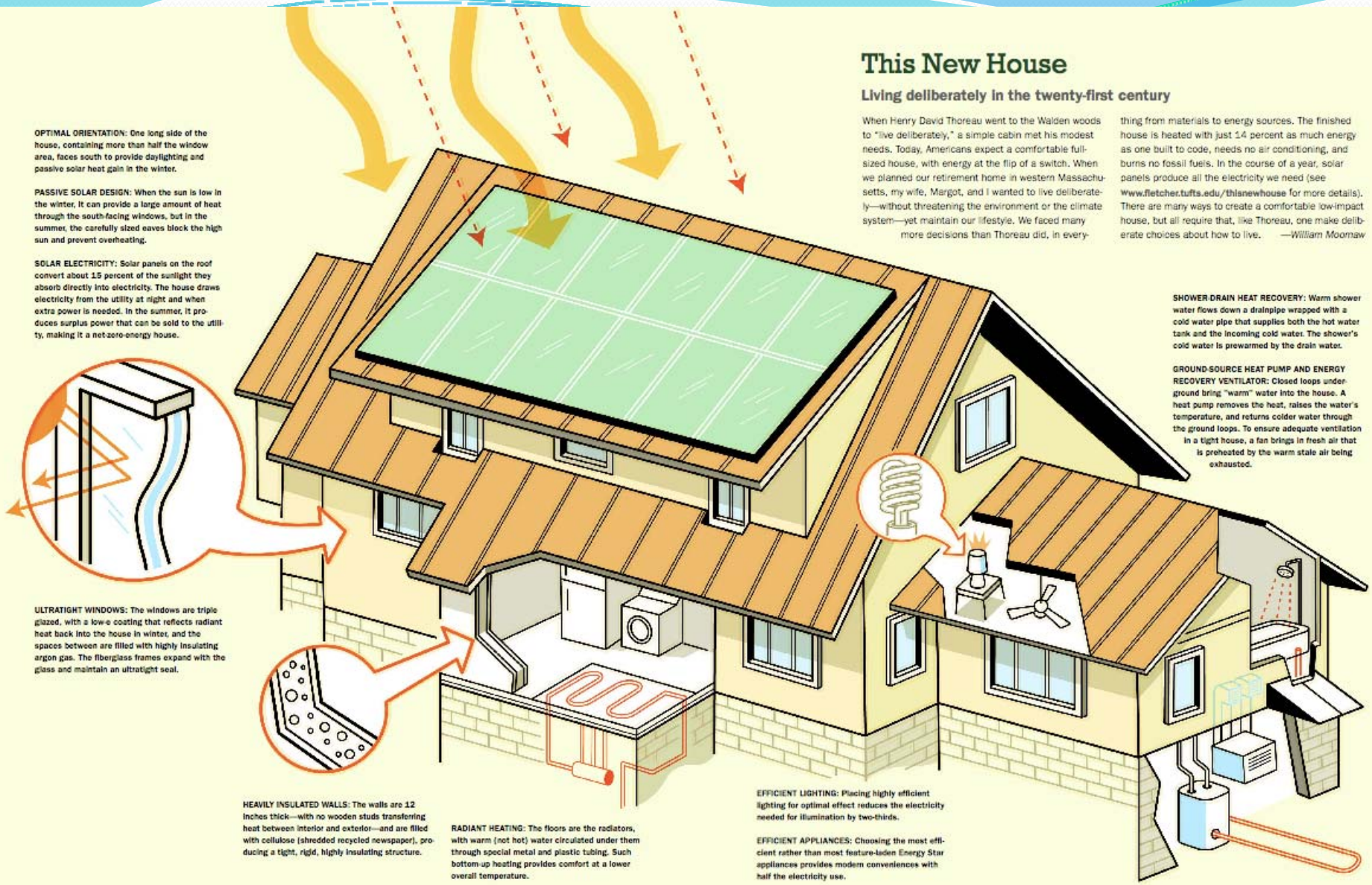
Tufts/BAC
Entry in DOE
Solar Decathlon
October 2009

Team Germany Solar Decathlon House

This New House

Living deliberately in the twenty-first century

When Henry David Thoreau went to the Walden woods to "live deliberately," a simple cabin met his modest needs. Today, Americans expect a comfortable full-sized house, with energy at the flip of a switch. When we planned our retirement home in western Massachusetts, my wife, Margot, and I wanted to live deliberately—without threatening the environment or the climate system—yet maintain our lifestyle. We faced many more decisions than Thoreau did, in everything from materials to energy sources. The finished house is heated with just 14 percent as much energy as one built to code, needs no air conditioning, and burns no fossil fuels. In the course of a year, solar panels produce all the electricity we need (see **www.fletcher.tufts.edu/thisnewhouse** for more details). There are many ways to create a comfortable low-impact house, but all require that, like Thoreau, one make deliberate choices about how to live. —*William Moomaw*



OPTIMAL ORIENTATION: One long side of the house, containing more than half the window area, faces south to provide daylighting and passive solar heat gain in the winter.

PASSIVE SOLAR DESIGN: When the sun is low in the winter, it can provide a large amount of heat through the south-facing windows, but in the summer, the carefully sized eaves block the high sun and prevent overheating.

SOLAR ELECTRICITY: Solar panels on the roof convert about 15 percent of the sunlight they absorb directly into electricity. The house draws electricity from the utility at night and when extra power is needed. In the summer, it produces surplus power that can be sold to the utility, making it a net-zero-energy house.

ULTRATIGHT WINDOWS: The windows are triple glazed, with a low-e coating that reflects radiant heat back into the house in winter, and the spaces between are filled with highly insulating argon gas. The fiberglass frames expand with the glass and maintain an ultratight seal.

HEAVILY INSULATED WALLS: The walls are 12 inches thick—with no wooden studs transferring heat between interior and exterior—and are filled with cellulose (shredded recycled newspaper), producing a tight, rigid, highly insulating structure.

RADIANT HEATING: The floors are the radiators, with warm (not hot) water circulated under them through special metal and plastic tubing. Such bottom-up heating provides comfort at a lower overall temperature.

EFFICIENT LIGHTING: Placing highly efficient lighting for optimal effect reduces the electricity needed for illumination by two-thirds.

EFFICIENT APPLIANCES: Choosing the most efficient rather than most feature-laden Energy Star appliances provides modern conveniences with half the electricity use.

SHOWER DRAIN HEAT RECOVERY: Warm shower water flows down a drainpipe wrapped with a cold water pipe that supplies both the hot water tank and the incoming cold water. The shower's cold water is prewarmed by the drain water.

GROUND-SOURCE HEAT PUMP AND ENERGY RECOVERY VENTILATOR: Closed loops underground bring "warm" water into the house. A heat pump removes the heat, raises the water's temperature, and returns colder water through the ground loops. To ensure adequate ventilation in a tight house, a fan brings in fresh air that is preheated by the warm stale air being exhausted.

ILLUSTRATION: HARRY CAMPBELL

Write to governor and officials on stalled renewable energy projects

- Cape Wind could be generating enough electricity to meet two-thirds of the needs of Cape Cod and the Islands with no carbon dioxide emissions
- The 100 kW wind turbine in Woods Hole is a lawn ornament at the Woods Hole Research Center because N-Star will not grant them a license to hook up to the grid
- The installation of wind towers on Brodie Mtn has been halted by a frivolous law suit

Change food habits

- American Cheeseburgers consumed annually are responsible for as much global warming as 6.5 million SUVs – 20 million t C
- Shifting away from beef to chicken reduces emissions by several hundred fold
- It also reduces deforestation in the Amazon

Carbon Facts

Product Size 1 Cheeseburger (130g)

Amount Per Serving

Kilograms *CO_2 Equivalent* 3.08

Kilograms CO_2 .243 Kilograms CH_4 .123

Total C: Energy Sources	243g
Transportation	
Fossil Fuel (Diesel)	120g
Fossil Fuel (Gasoline)	48g
Electricity Production	
Fossil Fuel (Natural Gas)	75g
Fossil Fuel (Coal)	0g
Other	

Total C: Non-Energy Sources	2840gCO_2E
Enteric Fermentation	81.0g (1864gCO_2E)
Manure	25.8g (656gCO_2E)
Other	5.2g (120gCO_2E)

Carbon/Product Ratio	23.7
Localism Rating	C+
Sustainable Production Rating	D+

overall carbon code: orange

Let your elected officials know

- Let your elected officials know that you care about global warming and environmental degradation – and are taking personal action
- Insist that they act now to approve a climate change bill that contains the real reductions in emissions that are required to stave of irreversible climate change – engage your friends in other states
- Tell President Obama that he has your support to negotiate a tough agreement on climate change in Copenhagen and copy your members of Congress

Spaceship Earth

Source: Smithsonian Air & Space Museum