Zero Energy Homes

A Growing Market

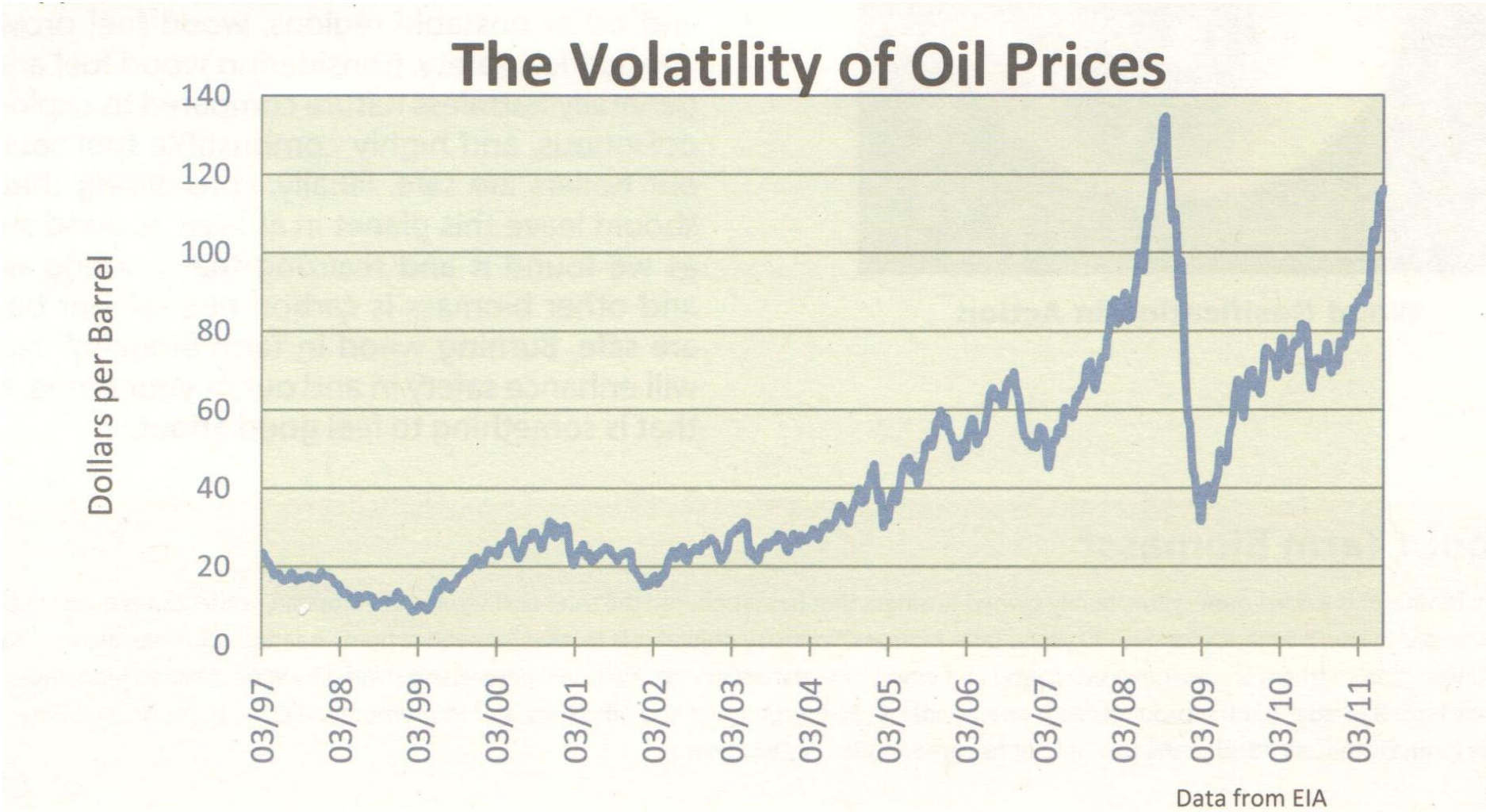
Alaska Center for Appropriate Technology

November 21 & 22, 2014

2014 Alaska Housing Assessment

- Average **Energy Use Intensity** for housing in AK is **2.7X greater** than that of "cold/very cold" climate regions of U.S.
- When energy costs normalized for home size, Alaskans spend $3,000-8,000 annually, compared with national average of $2,000

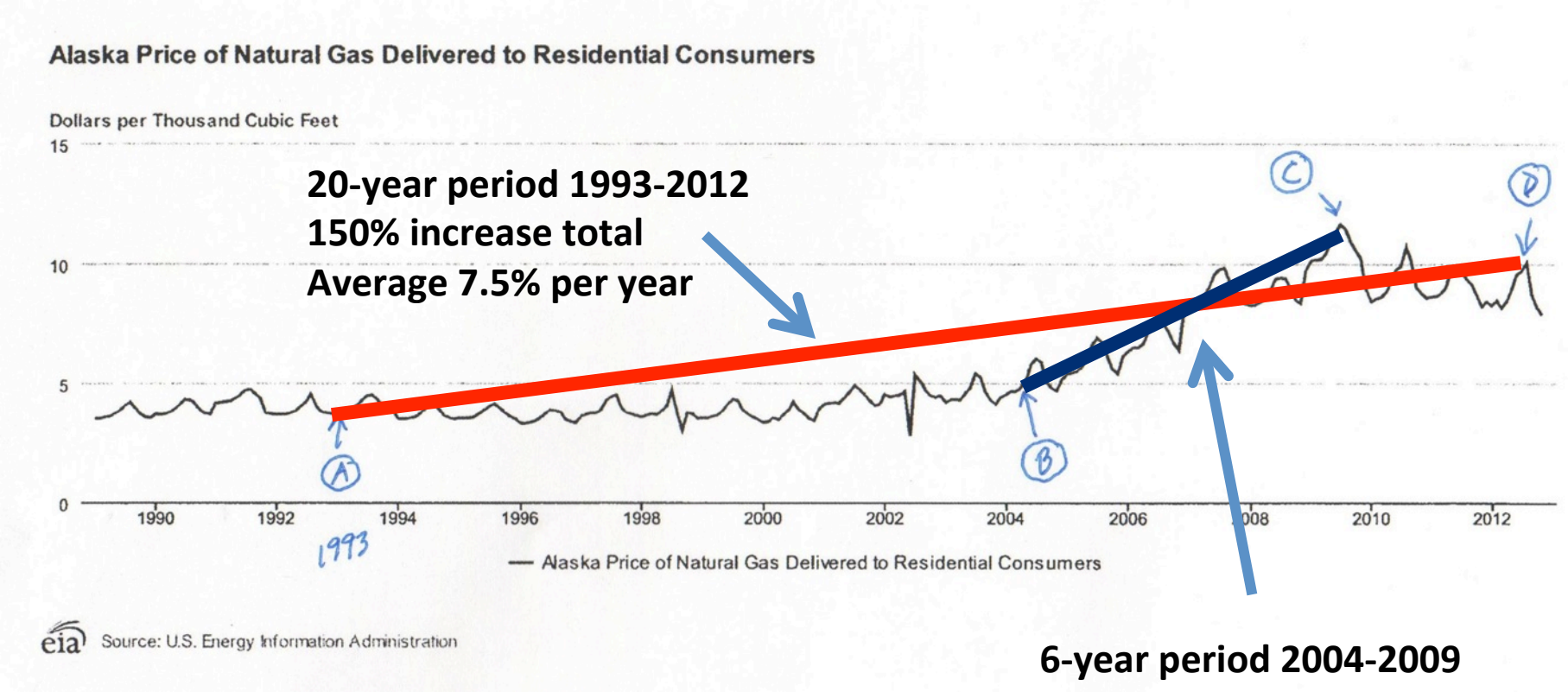
Motivation - the future of fossil energy



Motivations – fossil energy costs

Motivations - Energy Inflation Rates

Example - Cook Inlet Natural Gas



20-year period 1993-2012
150% increase total
Average 7.5% per year

6-year period 2004-2009
140% increase total
Average 23% per year

Motivations – NZE Building Trends

We've seen trends in other parts of North America

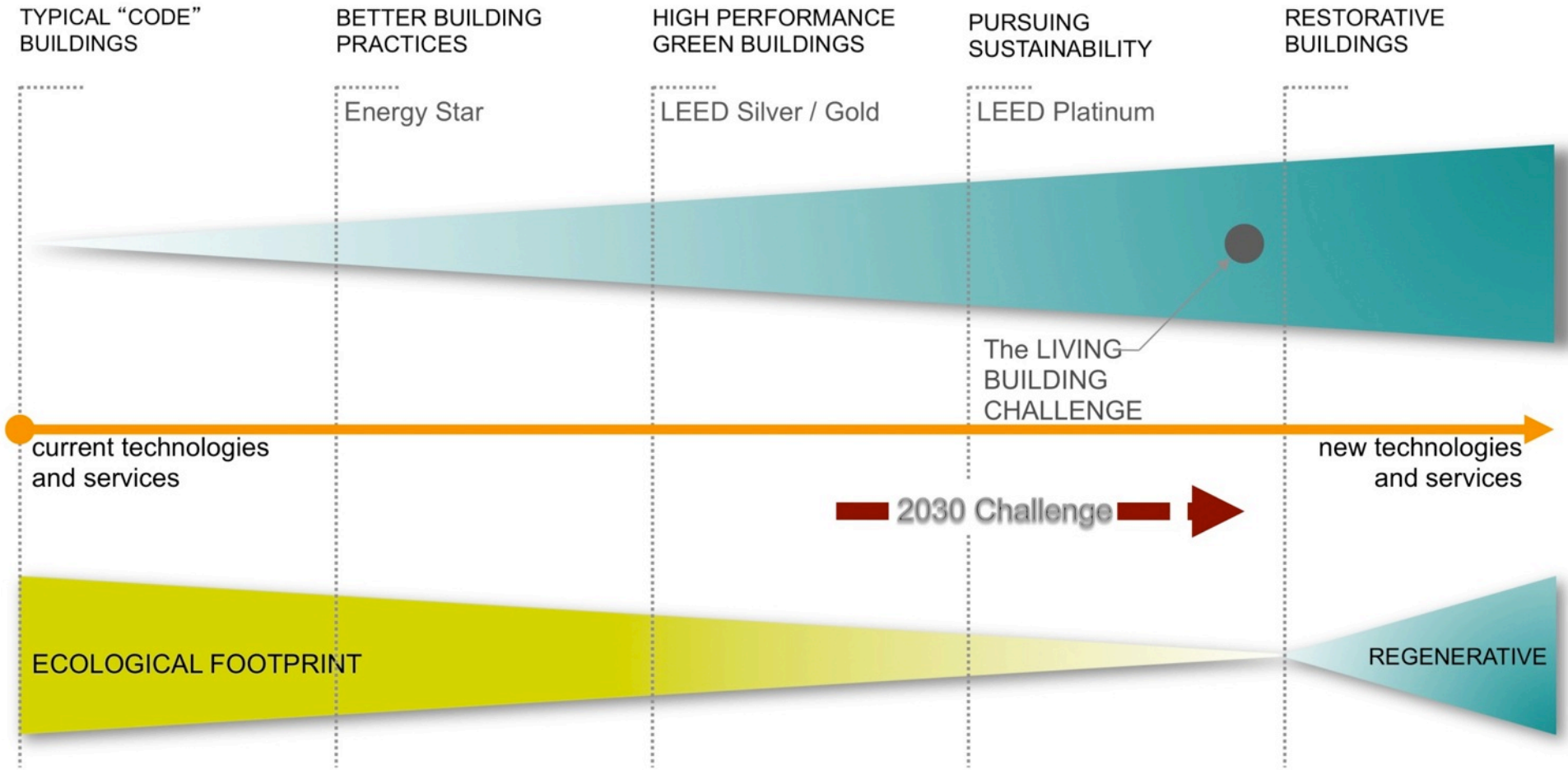
- 143 organizations and 100 builders involved with NZE Coalition (netzeroenergycoalition.com)
- Several states have adopted NZE plans

Increased interest/inquiries in Alaska

- From both homeowners and builders
- Not just DIY builders

GREEN BUILDING

SHADES OF GREEN



Adapted from SERA Architects

Motivations – Early Adopters

NZE Basic Concepts

- Use energy conservation and efficiency measures to “radically” reduce energy demand, such that energy supplied can come from clean sources
- Reduce carbon pollution
- Improve individual, local and regional energy security
- Use stably-priced clean fuel – get away from volatile fuel prices that trend up

Energy Conservation & Efficiency First!

Understand impacts of Envelope/Air sealing on building energy demand

General rule of thumb:

For every $1 spent on Energy Efficiency you save $3-5 in system costs

Great Resources Available

- Cold Climate Housing Research Center
- Canada Mortgage Housing Corporation
- Alaska Housing Finance Corporation
- Publications like:
  - Fine Homebuilding
  - Journal of Light Construction
  - Solar Today
  - Home Power

ENERGY EFFICIENCY BUILDING ENVELOPE RETROFITS

- Exterior Retrofit for 1960s and 1970s Two-Storey Houses
- >75% Space Heating Energy Savings

EXTERIOR RETROFIT

The building envelope can be retrofitted from either the exterior or the interior. The choice will largely depend on the house's interior and exterior finishes, layout and construction, lot line setback requirements, other renovation needs and whether or not the house will be occupied during the renovation. There are several advantages to insulating and air tightening from the exterior. An exterior retrofit covers cracks, holes and thermally conductive materials (called 'thermal bridges'); it allows you to detect and repair water entry problems; it doesn't affect interior finishes or reduce room sizes, it makes it easier to ensure the insulation and air-barrier system is continuous; it keeps the structure at a more uniform temperature; and it provides an opportunity to update the appearance of the house.

Figure 1: Two-storey detached house

RETROFIT FOR ENERGY SAVINGS

One of the best ways to reduce the energy consumption of an existing house is to add insulation to the roof, walls and basement, upgrade windows and doors, and seal cracks, leaks and holes. These improvements, called "energy efficient building envelope retrofits," help to reduce heat losses in the winter and heat gains in the summer, and should result in lower energy bills, improved comfort and reduced outside noise intrusion.

This fact sheet provides guidance for exterior energy efficient building envelope retrofits to 1960s and 1970s two-storey houses that can reduce space heating energy consumption by 75 per cent or more. It describes the starting point (what you have now), air-sealing and insulation options to achieve the targeted energy savings, technical considerations to keep in mind in the planning of the retrofit project, and general precautions.

What You Have Now

The pre-retrofit construction of a 1960s or 1970s two-storey house will vary depending on its age and location and on whether any upgrades have already been completed. The building envelope of a typical 250-m² (2,691-sq.-ft.) house of this vintage with a finished basement will likely be clad with masonry, siding or stucco. Figure 2 illustrates common materials, insulation RSI-values (R-values), and assemblies for this type of building, subject to regional variations. Houses such as these are generally quite leaky with measured airtightness values averaging above 6.0 air changes per hour (ACH_{50}).

Houses built in the 1960s and 1970s also tend be lightly insulated. It is common to find attics with a single layer of insulation and walls with insulating values that are half that required in new homes. Basements usually have modest levels of insulation, if any at all. Fortunately, there are many opportunities to improve the energy efficiency of the building envelope. Insulation, air sealing and window technology have evolved significantly. For example, higher RSI-value (R-value) insulation is now available; low-emissivity coatings, gas fills and superior seals and spacers improve the thermal performance of windows considerably; and airtightness techniques are better understood.

To achieve over 75-per-cent space heating energy savings, air tightening and insulation values should be increased in all of the critical areas of the building envelope: roof or attic, above-grade walls, windows and doors, below-grade walls and basement floor slab. Figure 3 shows a general approach to retrofitting the same wall shown in figure 2—from the attic to the basement.

Canada

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HOME TO CANADIANS

Great Resources Available

- Zero Net Energy Homes - Videos
- https://www.youtube.com/playlist?list=PLWEDhgZofcHSUdws6o2uD5jb3OjO73CKX

Our Role at ACAT

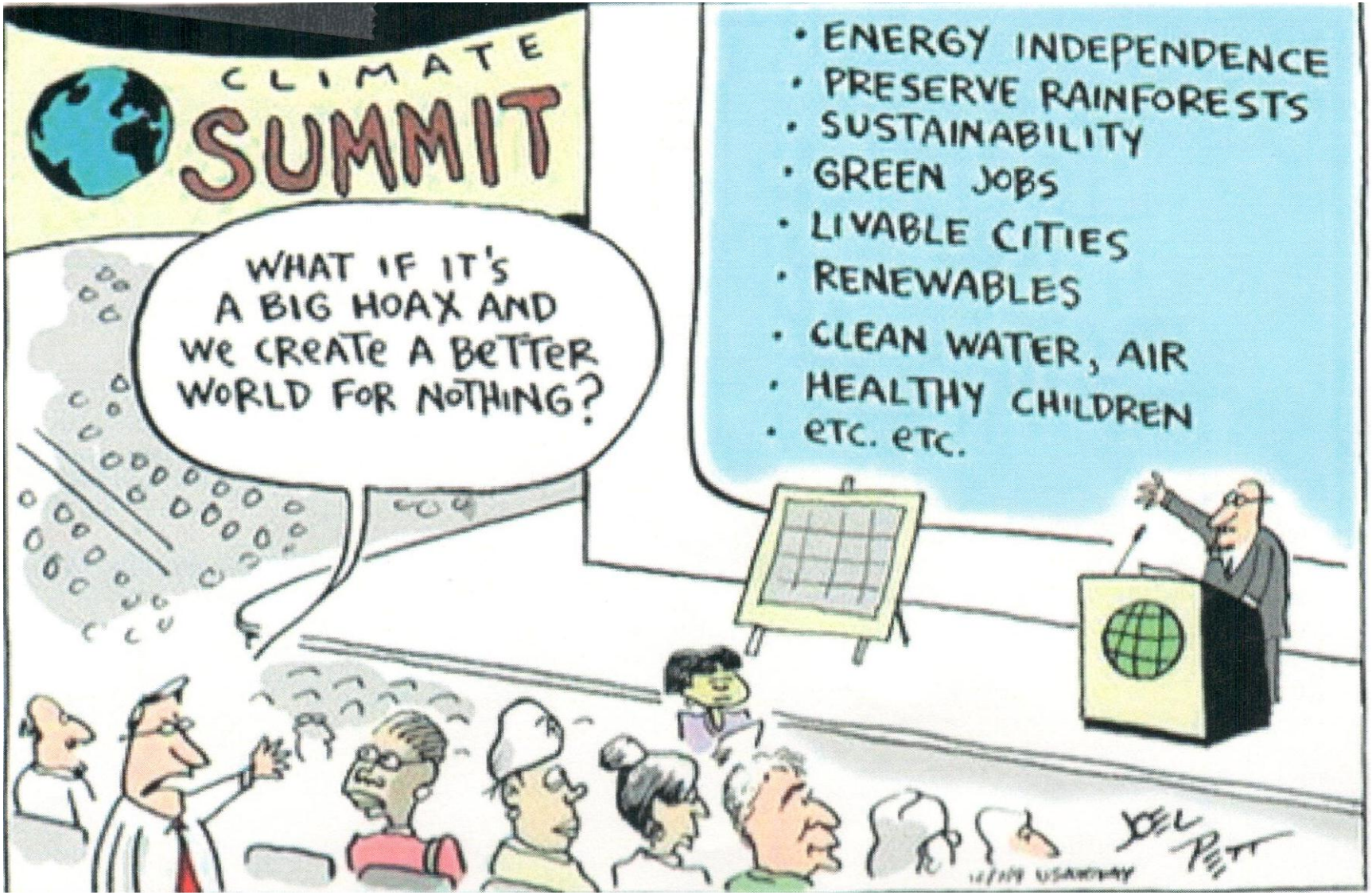
Educate and connect various “stakeholders”

- Builders
- Homeowners
- Policy-makers

ALASKA CENTER FOR APPROPRIATE TECHNOLOGY

Introductions

- Name
- Organization
- What brought you here today?


CLIMATE
SUMMIT
WHAT IF IT'S A BIG HOAX AND WE CREATE A BETTER WORLD FOR NOTHING?
• ENERGY INDEPENDENCE
• PRESERVE RAINFORESTS
• SUSTAINABILITY
• GREEN JOBS
• LIVABLE CITIES
• RENEWABLES
• CLEAN WATER, AIR
• HEALTHY CHILDREN
• ETC. ETC.
JOEL PETT