

# Renewable Energy for Tribal Community Development -- California --

# **Renewable Energy for Tribal Community Development -- California --**

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**Manager  
State, Local & Tribal  
Integrated Application Group**

**National Renewable Energy Laboratory**

**January 21-24, 2008**

# Major DOE National Laboratories



# Major NREL Technology Thrusts

## Supply Side

Wind Energy

Solar Photovoltaics

Concentrating Solar  
Power

Solar Buildings

Biomass Power

Biofuels

Geothermal Energy

Hydrogen

Superconductivity

Distributed Power



## Demand Side

Hybrid Vehicles

Fuels Utilization

Buildings Energy  
Technology

Federal Energy  
Management

Advanced Industrial  
Technologies

## Cross Cutting

Basic Energy Science

Analytical Studies

International Programs

**Tribal Energy Program**



# DOE's Tribal Energy Program

## Website

- Features
- Program Brochure
- Upcoming Workshops
- Financial Opportunities
- Projects on Tribal Lands
  - Project Overviews
  - Status and Reports
  - Contacts
- Information Resources
- Contacts

The screenshot shows a web browser window titled "EERE: Tribal Energy Program Home Page - Windows Internet Explorer provided by U.S. DOE Golden Field Office". The address bar shows "http://www.eere.energy.gov/tribalenergy/". The website header includes the U.S. Department of Energy logo and the text "Energy Efficiency and Renewable Energy" with the tagline "Bringing you a prosperous future where energy is clean, abundant, reliable, and affordable". The main heading is "Tribal Energy Program". Below this is a navigation menu with links for "About the Program", "Information Resources", "Financial Opportunities", and "Deployment". The main content area features a large banner image with Native American symbols and a search bar. The text on the page includes a welcome message, a description of the program's goals, and a link to a "Printable Version". On the right side, there is a sidebar with a search box, a "FEATURES" section, and links to a "Tribal Energy Program Brochure" (PDF 2.3 MB) and a "Guide to Tribal Energy Development".

[www.eere.energy.gov/tribalenergy](http://www.eere.energy.gov/tribalenergy)

# DOE's Tribal Energy Program

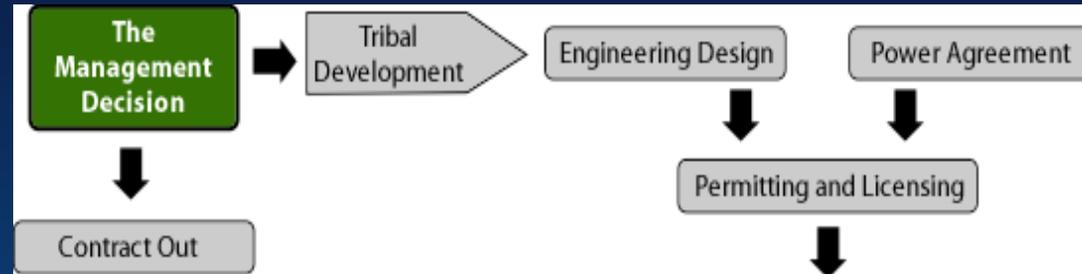
## Guide to Tribal Energy Development

### Development Processes

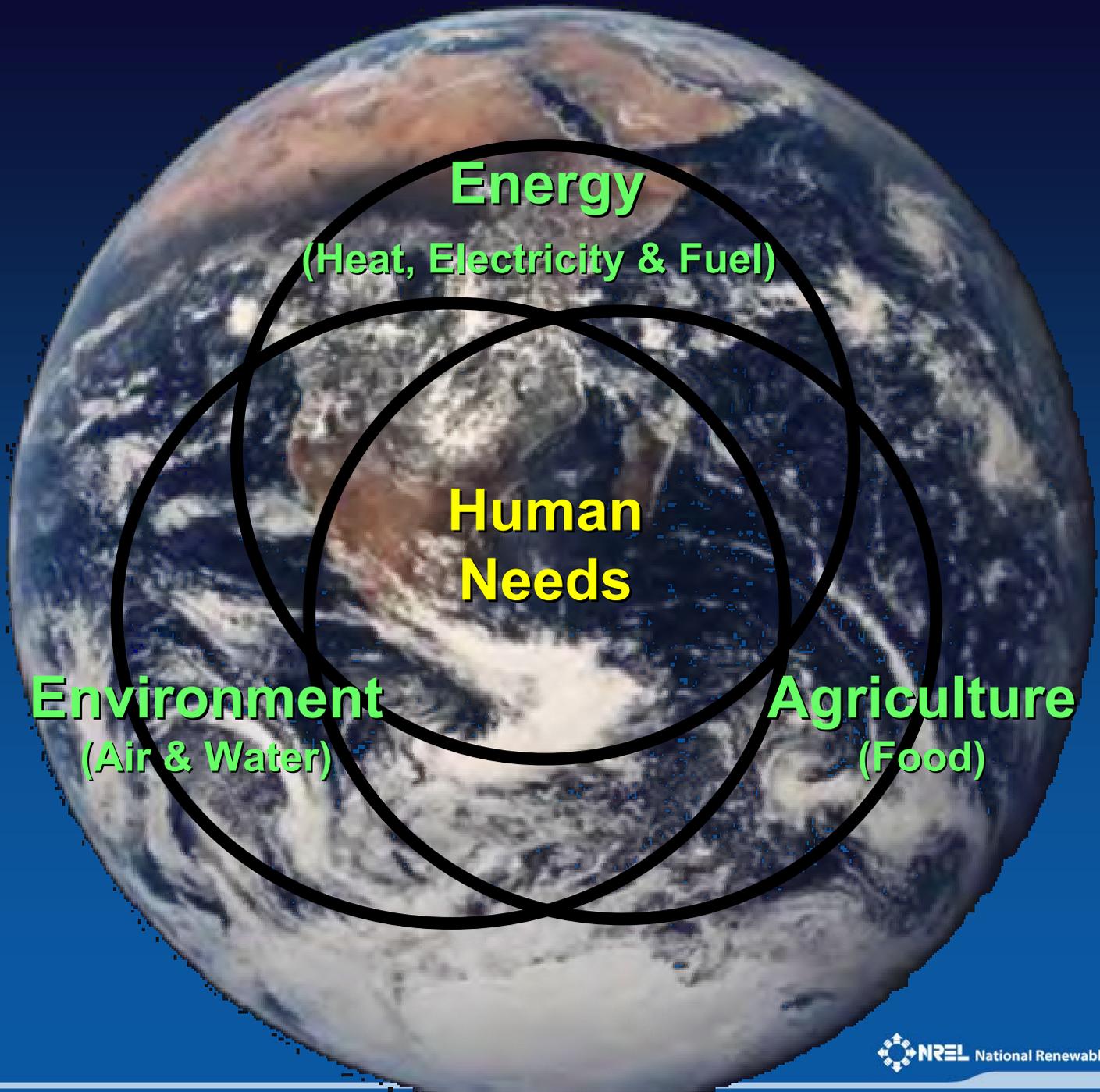
- Strategic Planning
- Options Analysis
- Organizational Development
- Project Development

### Resource Library

- Energy Resources
- Technologies
- Costs
- Risk Factors
- Legal Issues
- Financing Options
- Contacts



[www.eere.energy.gov/tribalenergy/guide](http://www.eere.energy.gov/tribalenergy/guide)



**Energy**

(Heat, Electricity & Fuel)

**Human  
Needs**

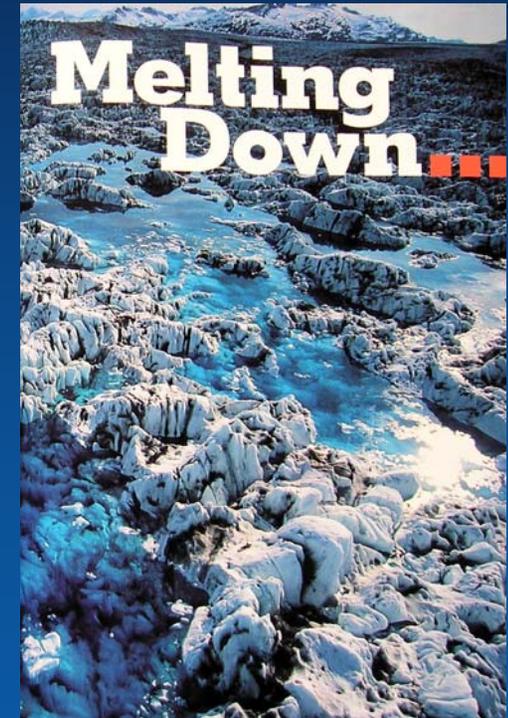
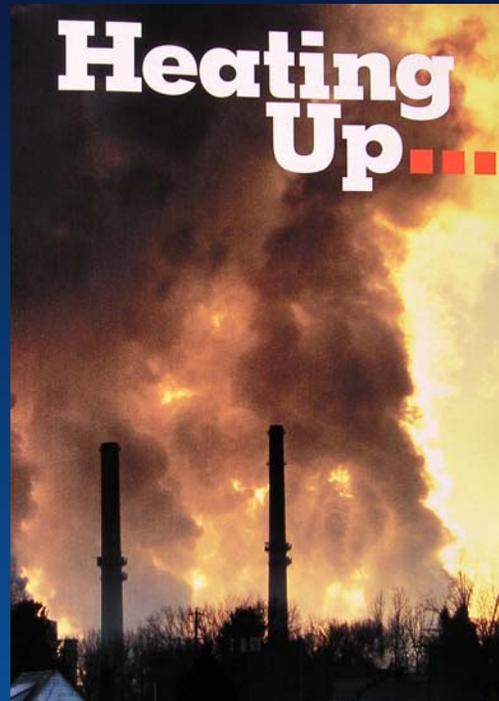
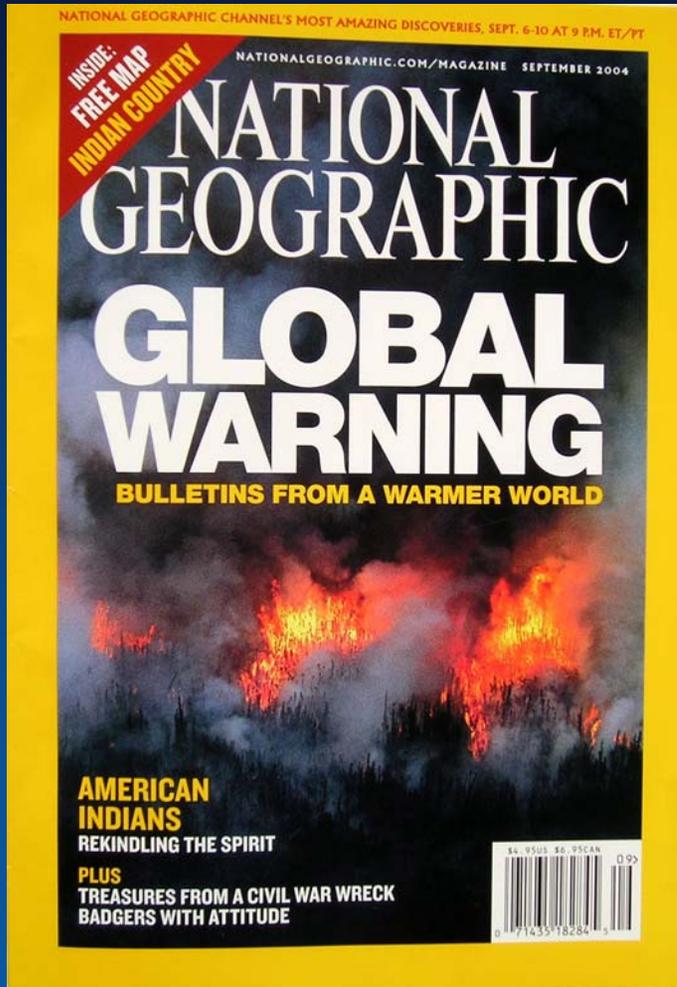
**Environment**

(Air & Water)

**Agriculture**

(Food)

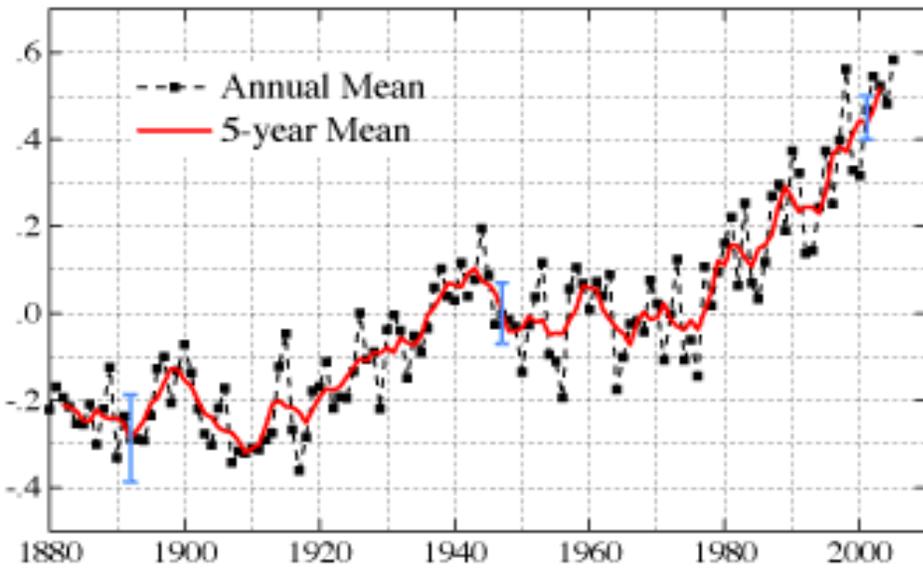
# We Live in a Changing World



# Where Carbon Reduction is a Requirement

## 2005 Warmest Year on Record

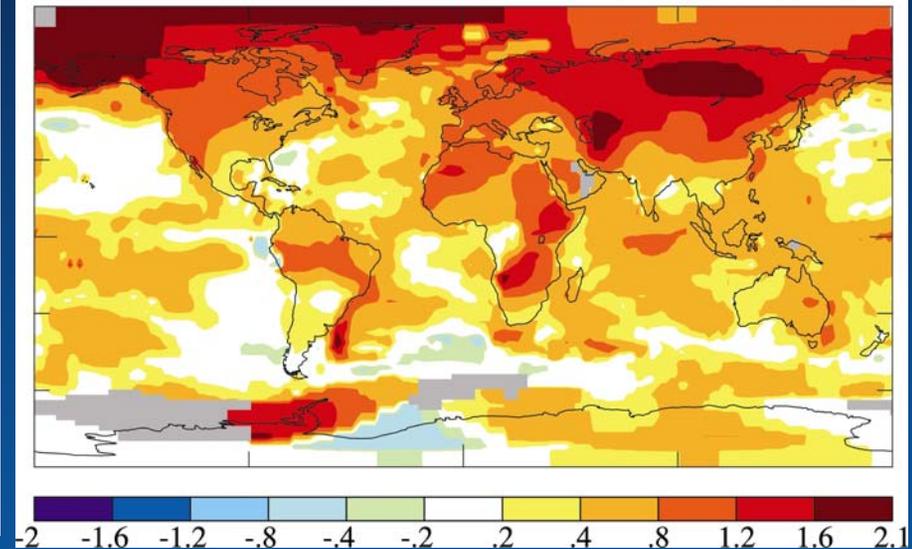
(a) Global-Mean Surface Temperature Anomaly ( $^{\circ}\text{C}$ )



2001-2005 Mean Surface Temperature Anomaly ( $^{\circ}\text{C}$ )

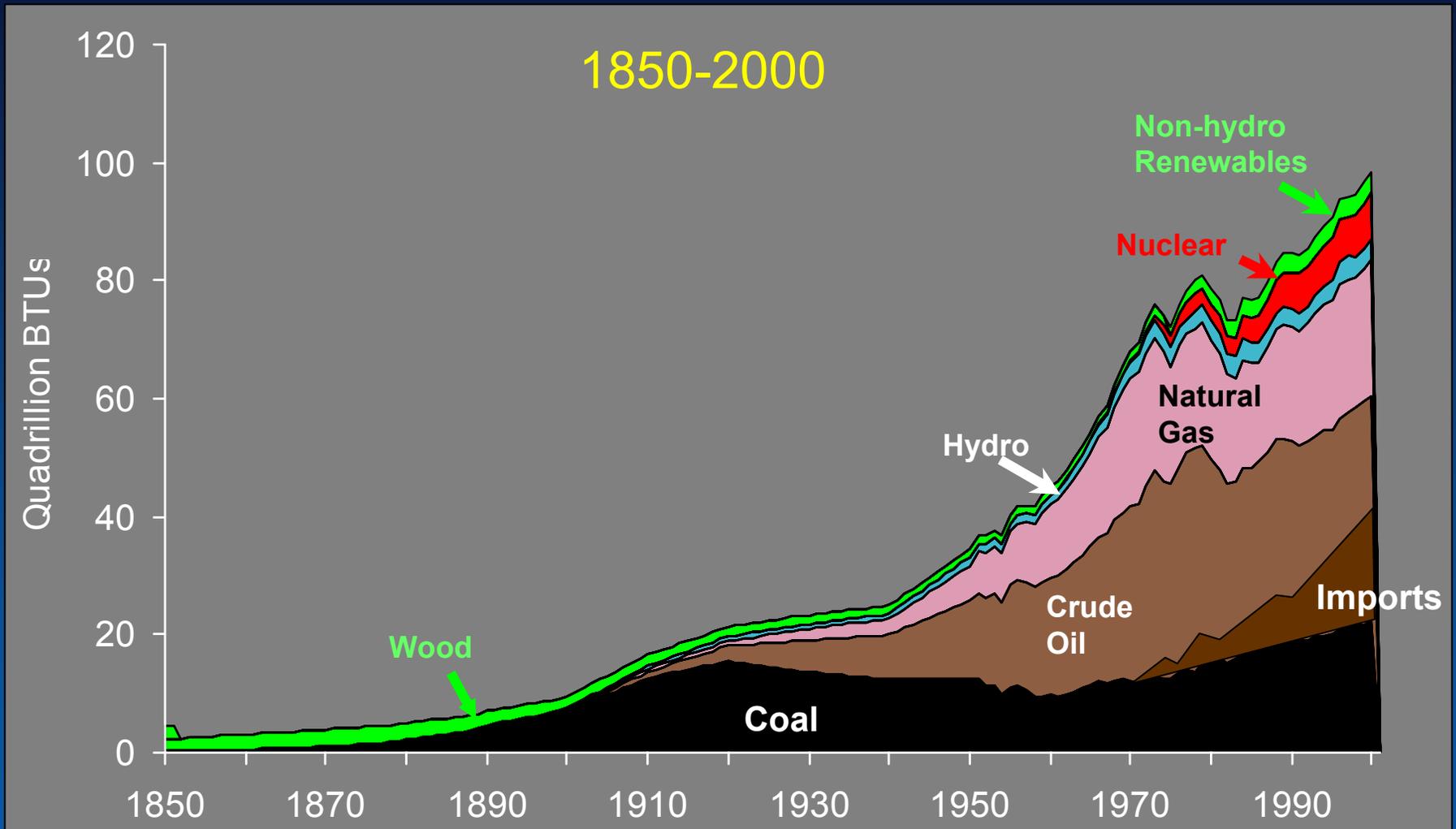
Base Period = 1951-1980

Global Mean = 0.53



Warming of  $0.2^{\circ}\text{C}/\text{decade}$  over last 30 years

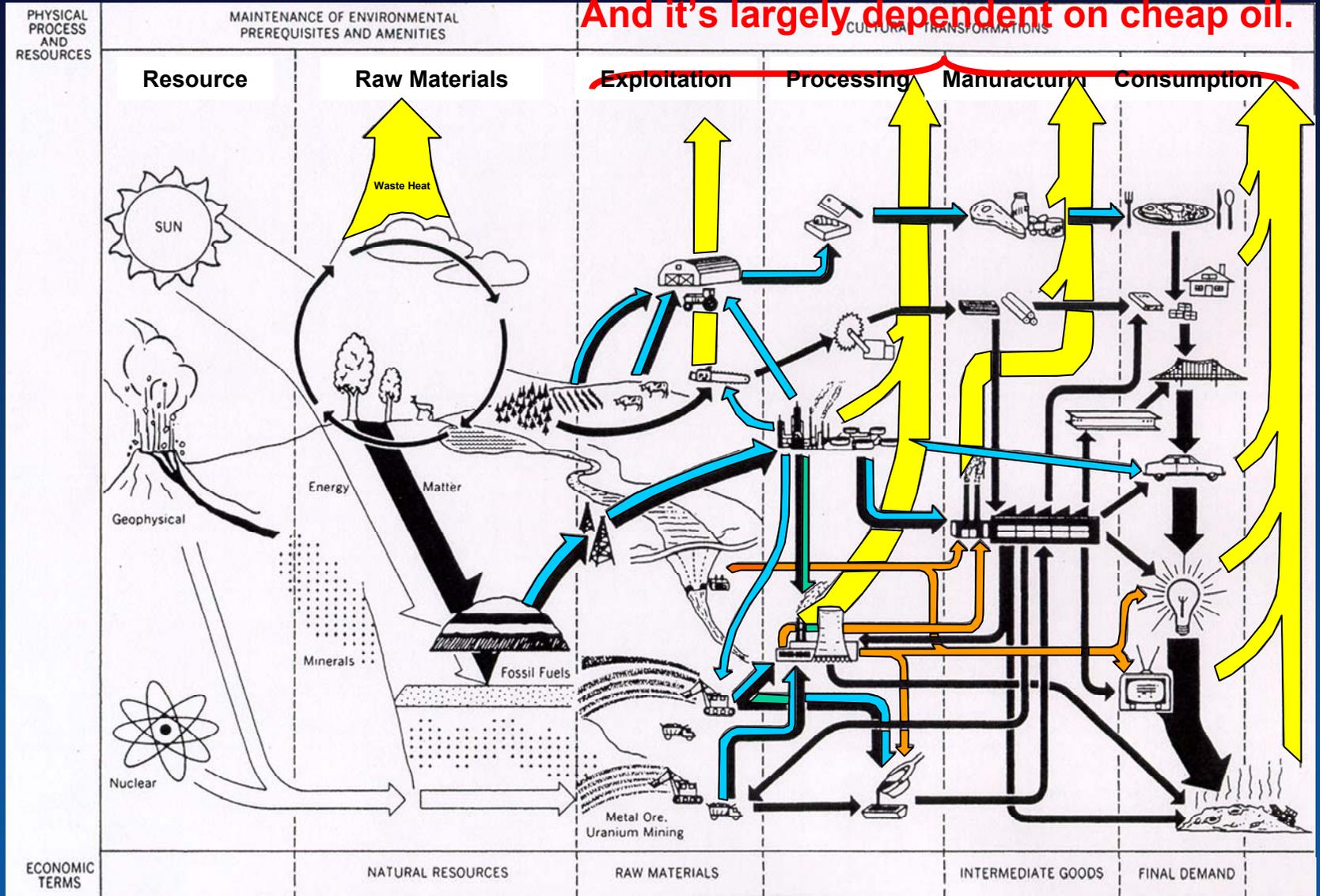
# Where U.S. Energy Consumption Continues to Grow



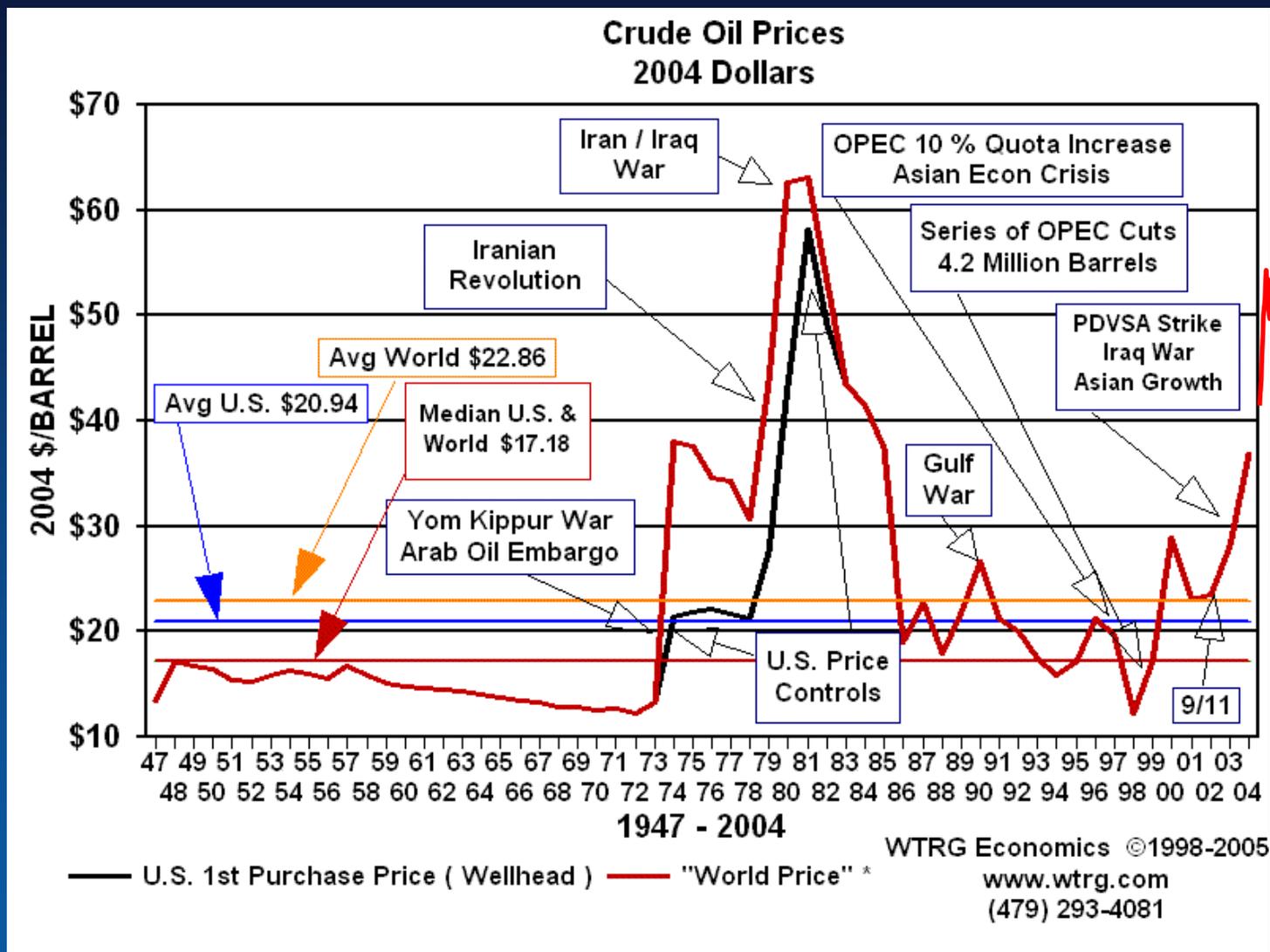
Source: 1850-1949, Energy Perspectives: A Presentation of Major Energy and Energy-Related Data, U.S. Department of the Interior, 1975; 1950-2000, Annual Energy Review 2000, Table 1.3

# Where the global economy is very complex

And it's largely dependent on cheap oil.



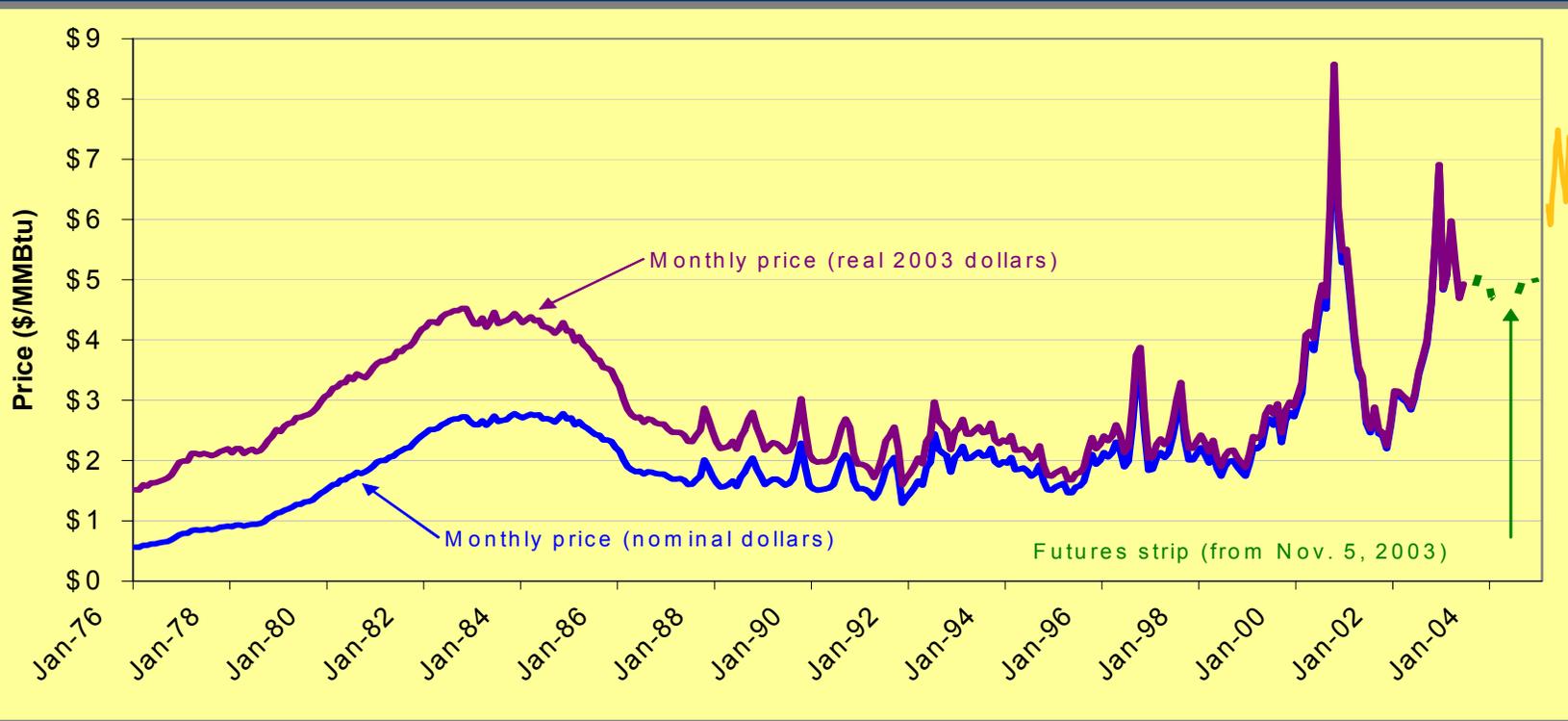
# Increasingly volatile, increasingly upward ~\$95/bbl



# After a decade of low prices, natural gas prices are now more volatile at a higher level.

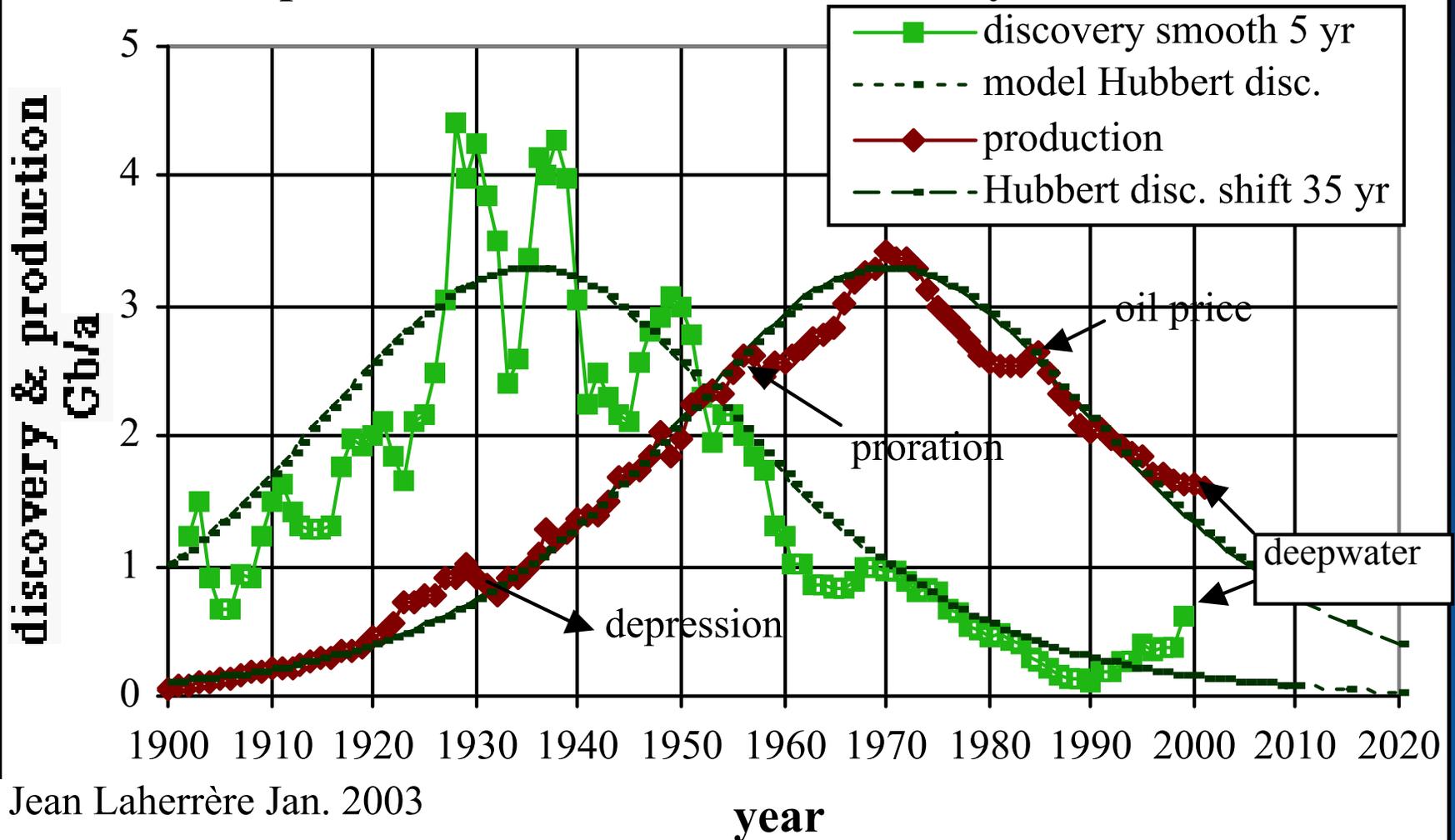
~\$15  
MMBTU  
Henry  
Hub

~\$8.00  
MMBTU



# US Lower 48 Oil Discovery & Production

US Lower 48: annual oil "mean" discovery & production with Hubbert discovery model



Jean Laherrère Jan. 2003

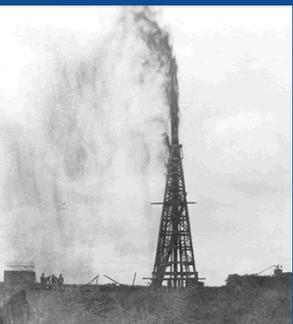
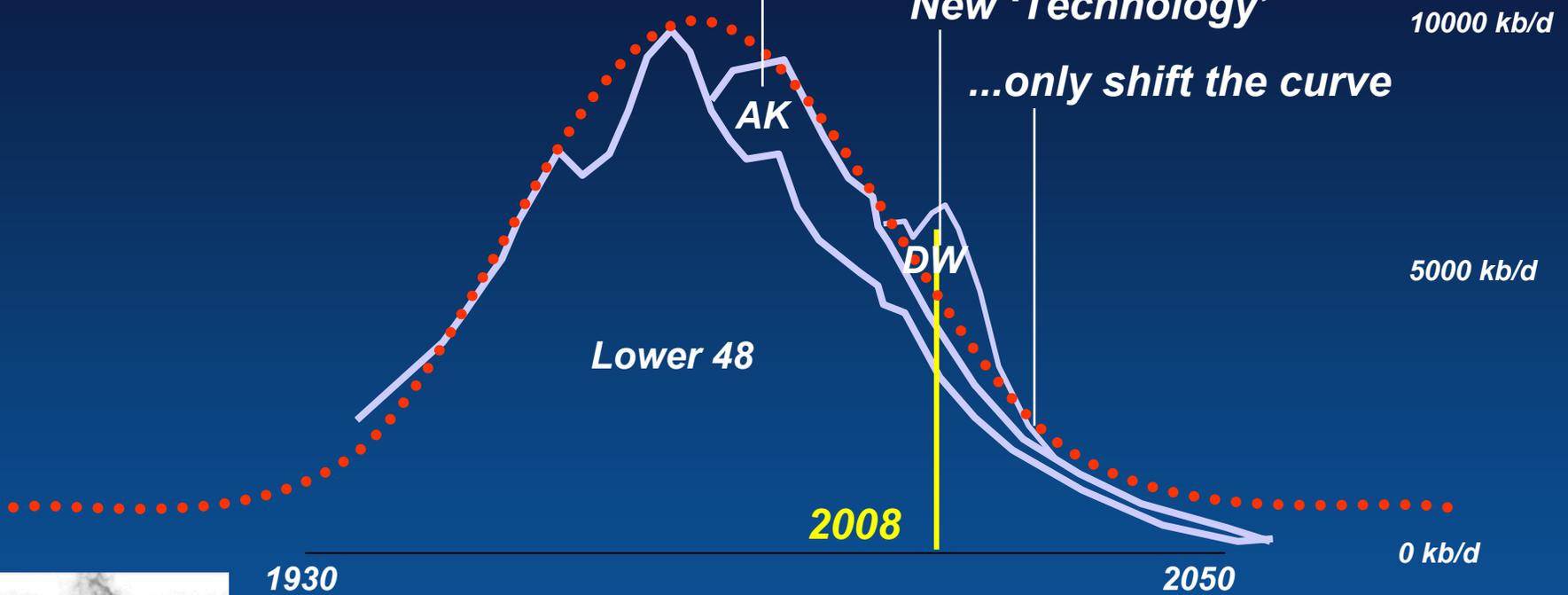
# Total U.S. Oil Production

## U.S. Oil Production

*Big, New Discoveries &*

*New 'Technology'*

*...only shift the curve*



**Lower 48**

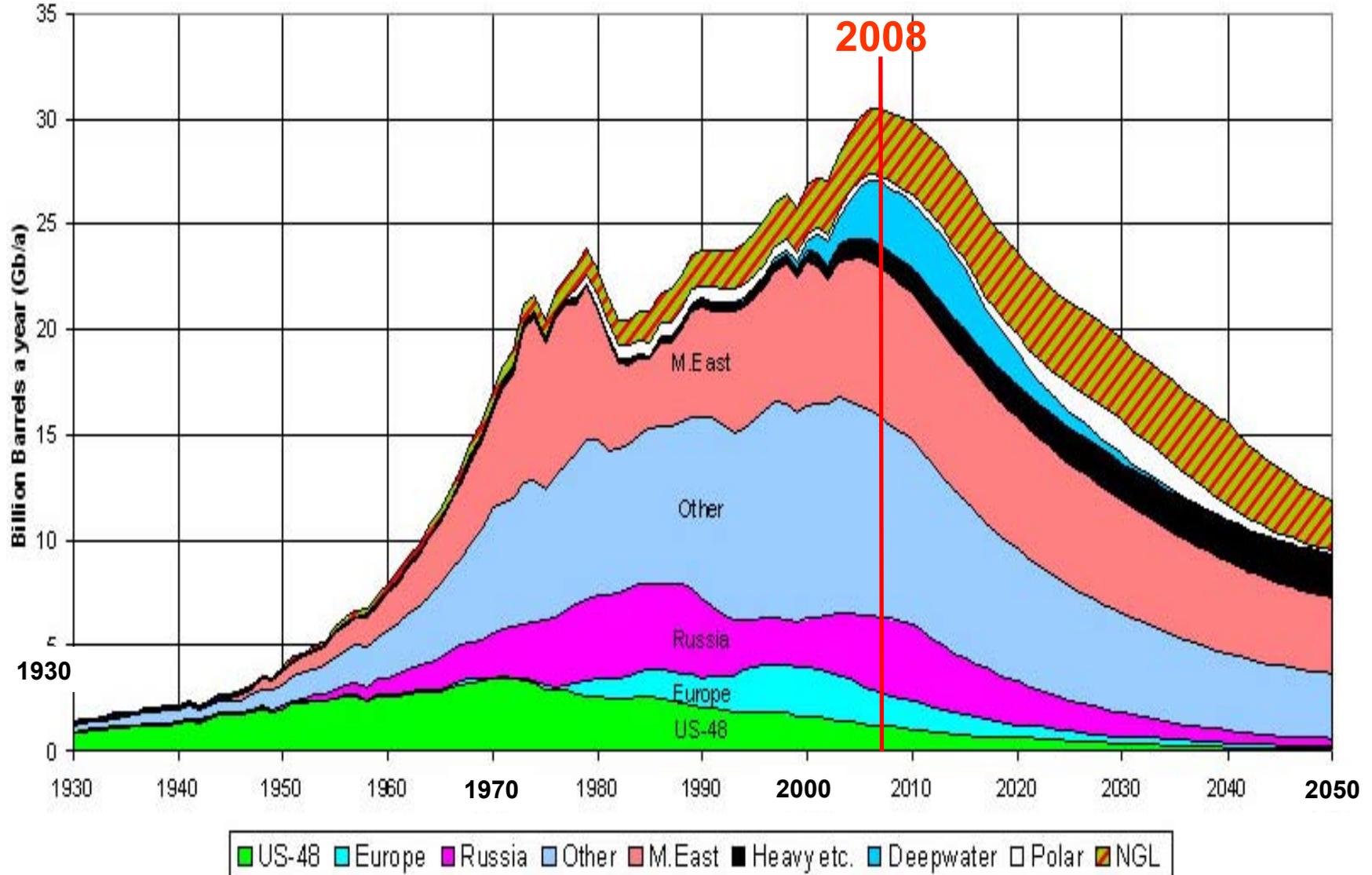


**Alaska**



**Deepwater**

# The Age of Oil



# 7 Generations Span The Age of Oil

Our Grand Parents

Our Parents

Our Generation

80

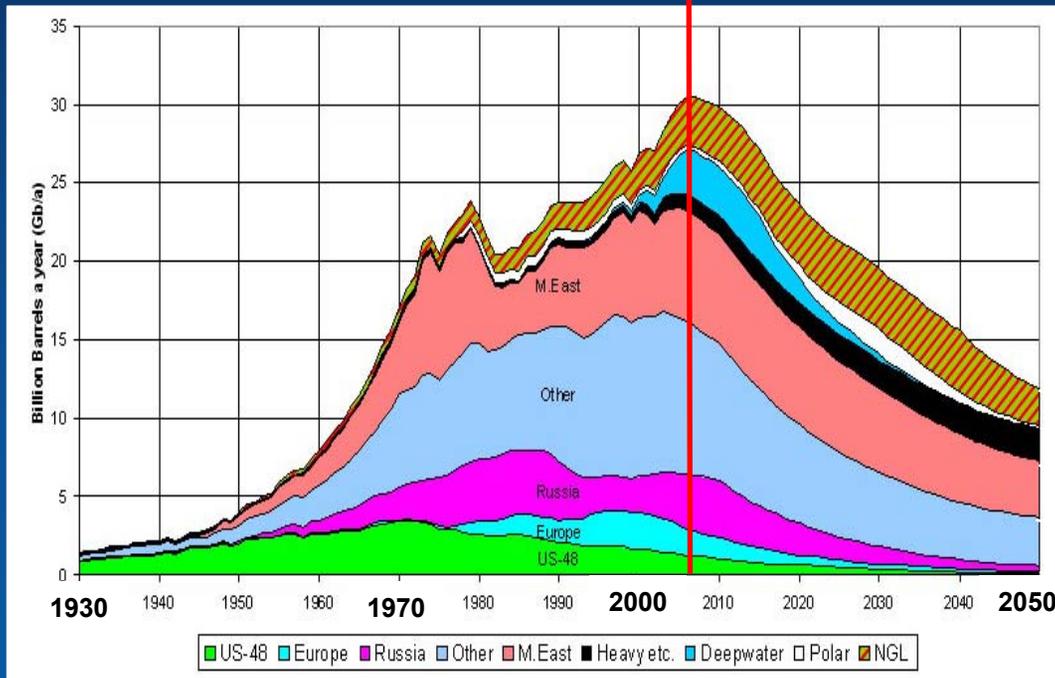
30

Our Children

Our Grand Children

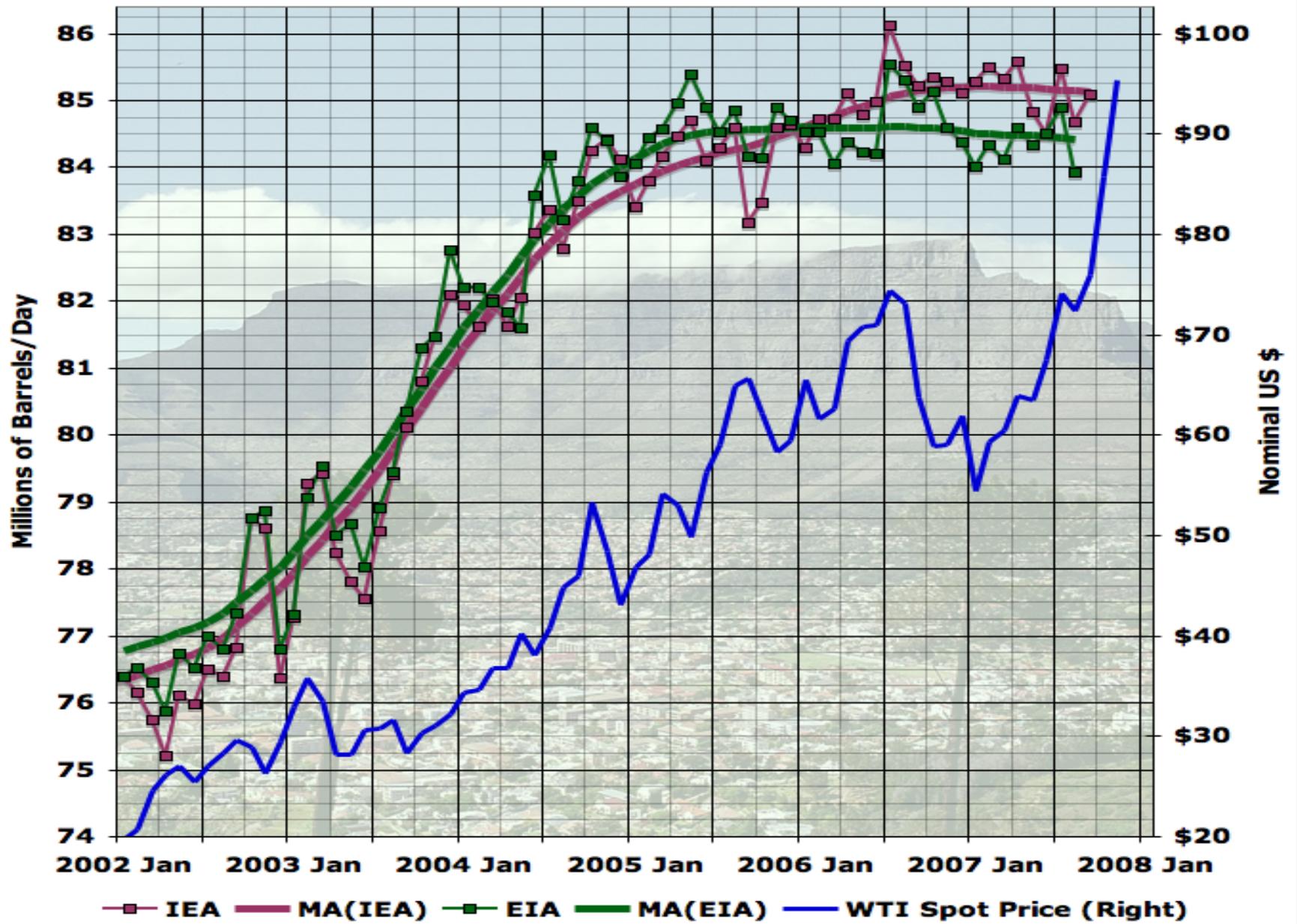
Our Great Grand Children

Our Great-Great  
Grand Children



2100

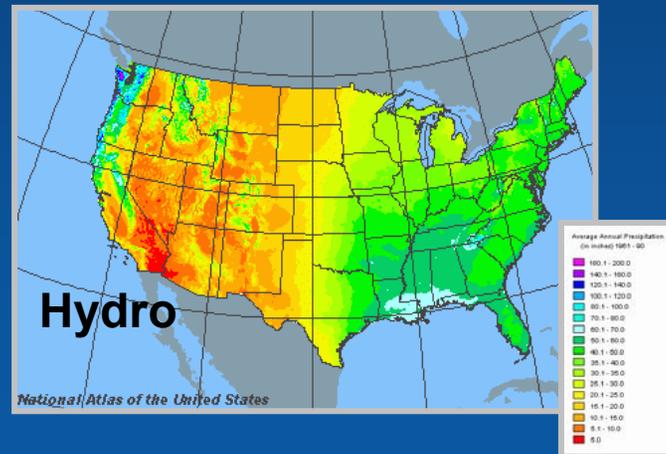
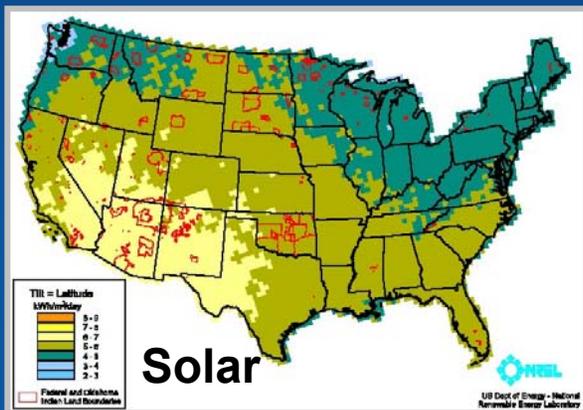
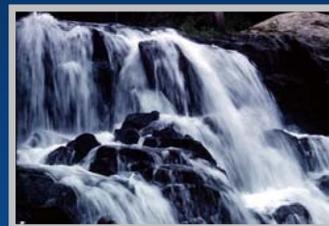
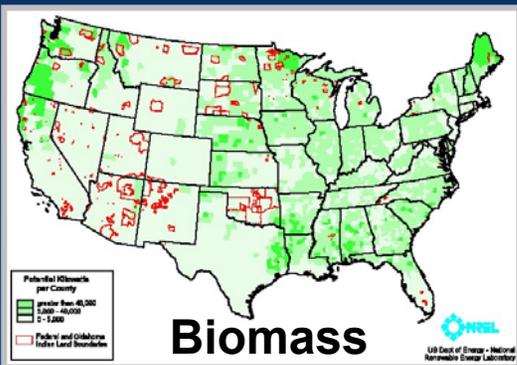
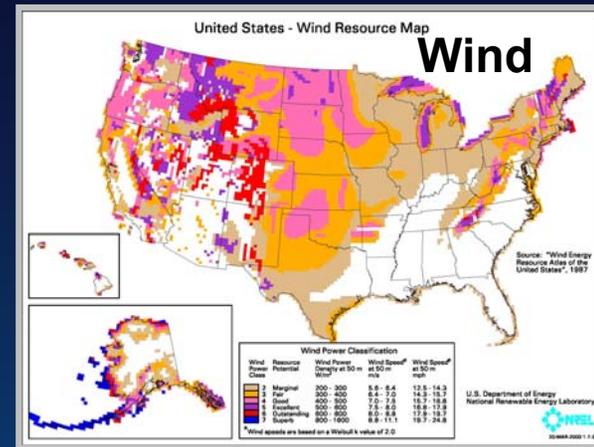
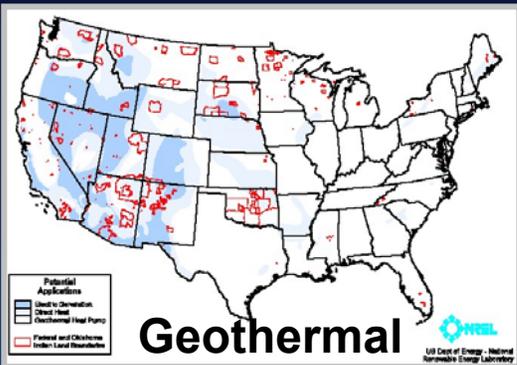
Peak Oil Graph from: ASPO.com - Colin Campbell 2004



## Some Challenging Questions:

- Where have we come from, and where are we going?
- What can we learn from the past?
- How do we shift from individualism to partnerships?
- How do we improve communication and coordination?
- How do we shift from modernism (new, bigger, faster) to community?
- How do we reduce consumption and produce locally?
- Civilizations are built on surplus. How do we shift from surplus to enough?
- A goal of communities is to provide and protect.
  - How do we move to more local production?
  - How do we shorten the supply chains?
  - How do we move from fuel to food?
- How do we develop our local sources of energy?
  - Heat, power, liquid fuels at a community scale, vs. commercial scale
  - What are our local opportunities for energy efficiency and renewables?
- How do we plan for contraction and avoid collapse?

# Renewable Resource Options

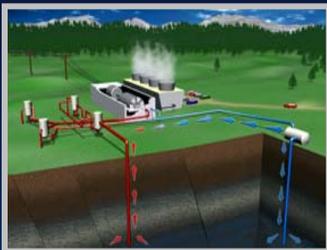


# Renewable Technology Options

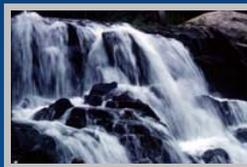
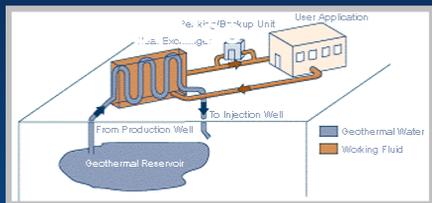
## Small Modular Power



Power



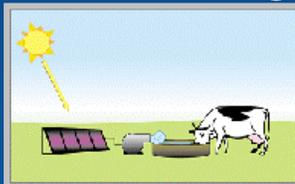
Direct Use



## PV - Remote Homes



## Stock Watering



## Diesel Hybrids



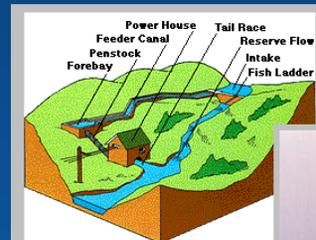
## Small Wind



## Big Wind



## Small Hydro



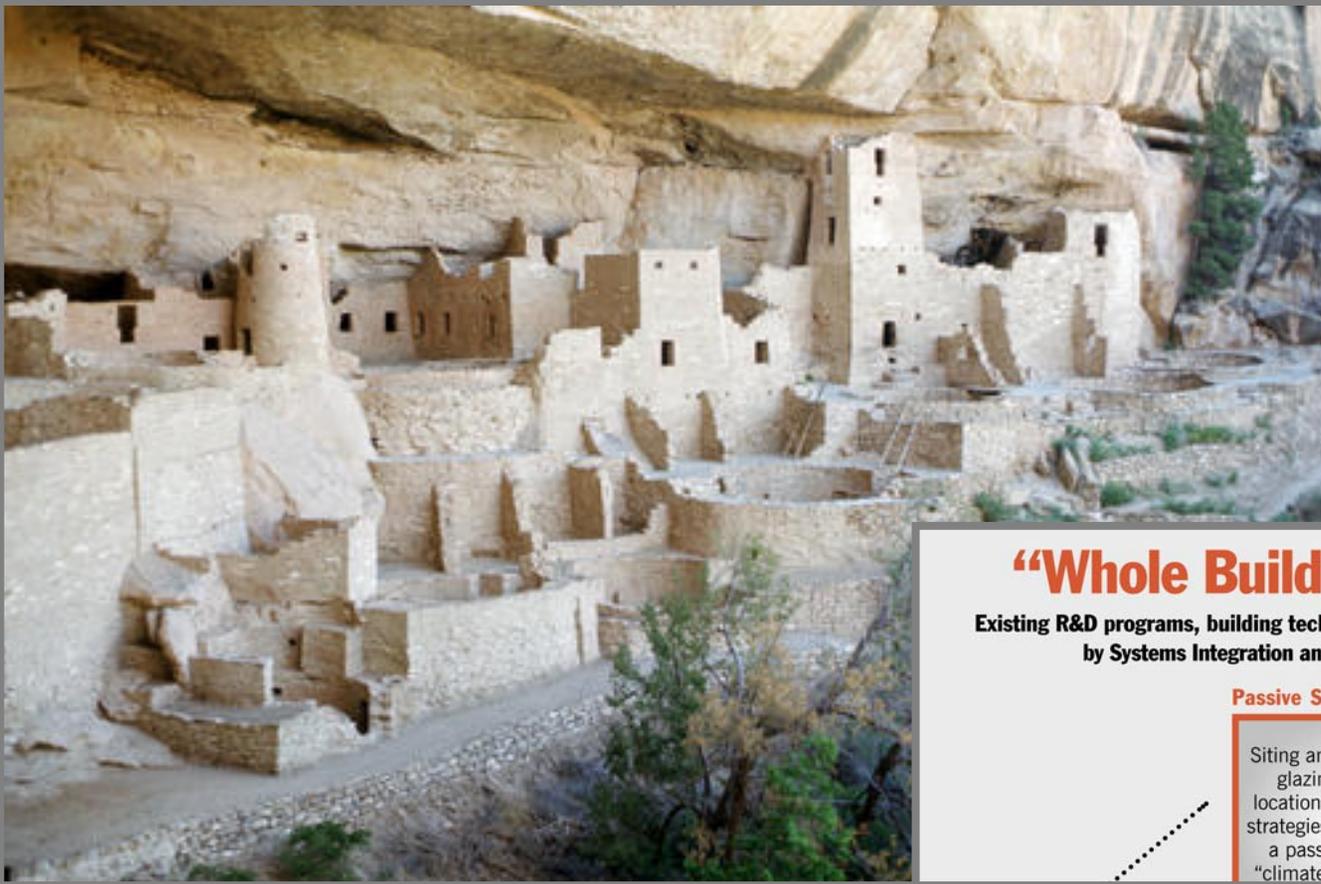
## Process Heat



## Buildings



# Building Design



## “Whole Buildings” Strategy:

Existing R&D programs, building technologies, and components tied together by Systems Integration and Computerized Design Tools.

### Passive Solar Strategies

Siting and orientation, glazing, size and location, and shading strategies contribute to a passive solar, or “climate-responsive,” building.

### Advanced Technologies

Energy-saving appliances, advanced energy controls and thermostats, efficient heating and cooling systems, photovoltaics, and solar water heating systems.

### Energy-Efficient Materials

Superior building materials, including high-efficiency windows, insulation, brick, concrete masonry, and interior finish products.



# Energy Efficiency



## Energy Star Appliances

Refrigerators – Half as much energy



Clothes Washers – Save up to \$110 per year



Oil & Gas Boilers – Save up to 10%



Programmable Thermostats – Save up to \$100 per year



## Efficient Lighting



If every American changed out 5 lights, we'd save \$6 billion/year and the equivalent of 21 power plants.



# Wind Turbine Sizes and Applications



## Small ( $\leq 10$ kW)

Homes

Farms

Remote Applications  
(e.g. water  
pumping, telecom  
sites, icemaking)



## Intermediate (10-250 kW)

Village Power

Hybrid Systems

Distributed Power

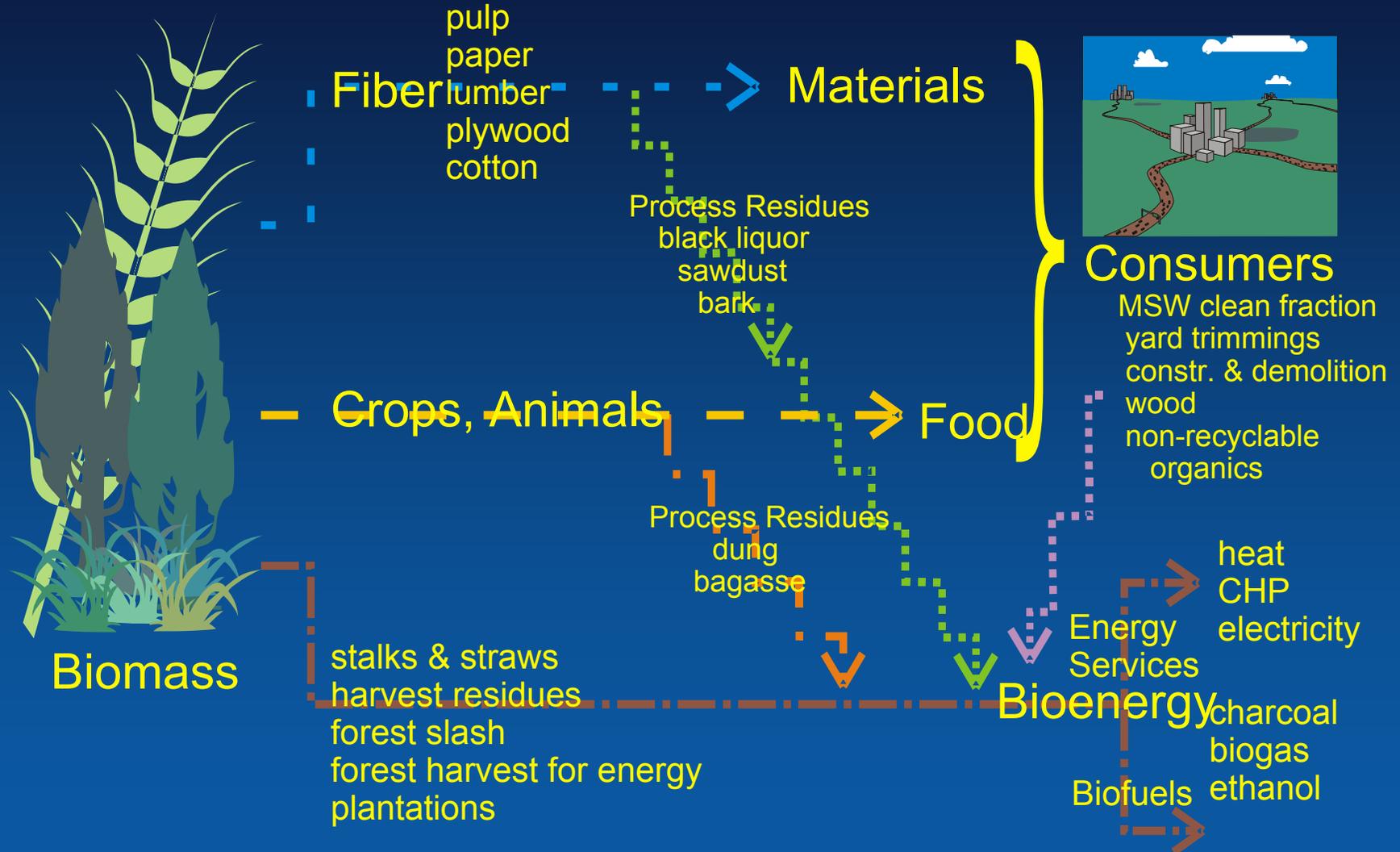


## Large (250 kW – 2+ MW)

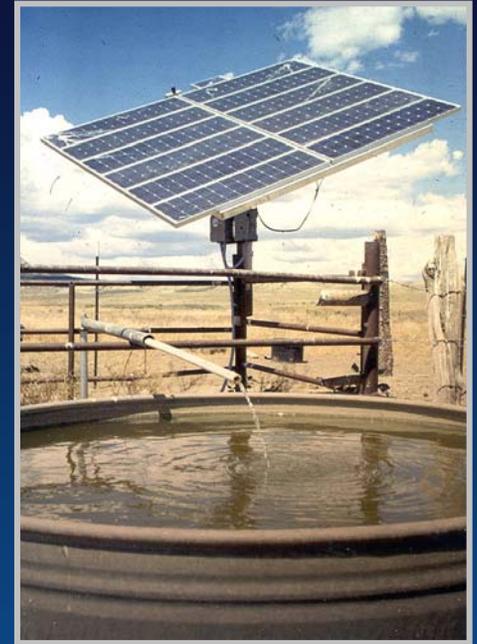
Central Station Wind Farms

Distributed Power

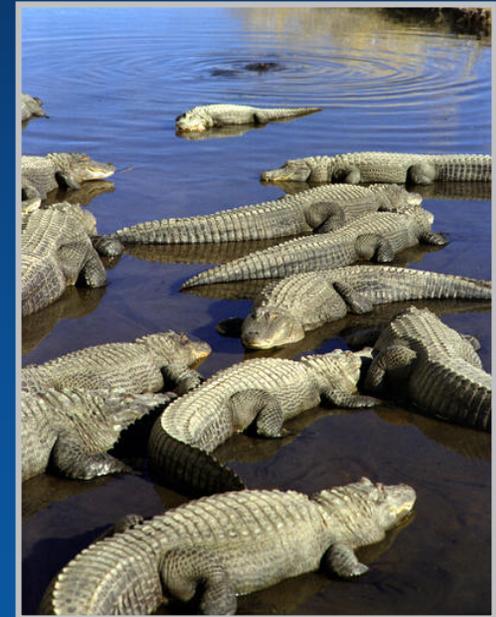
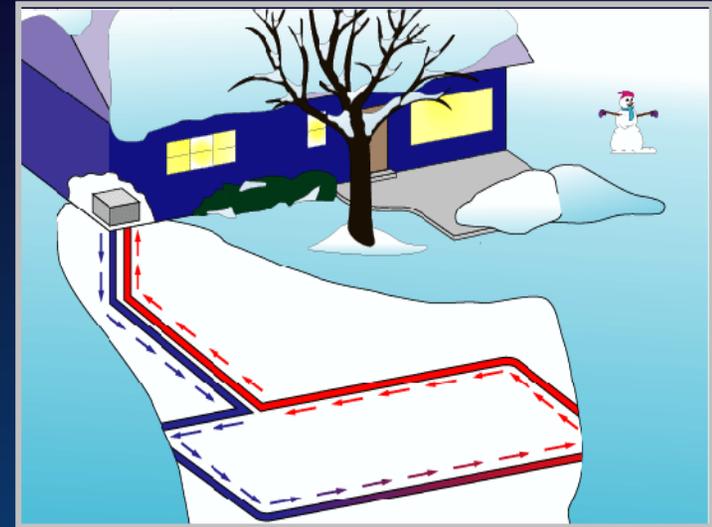
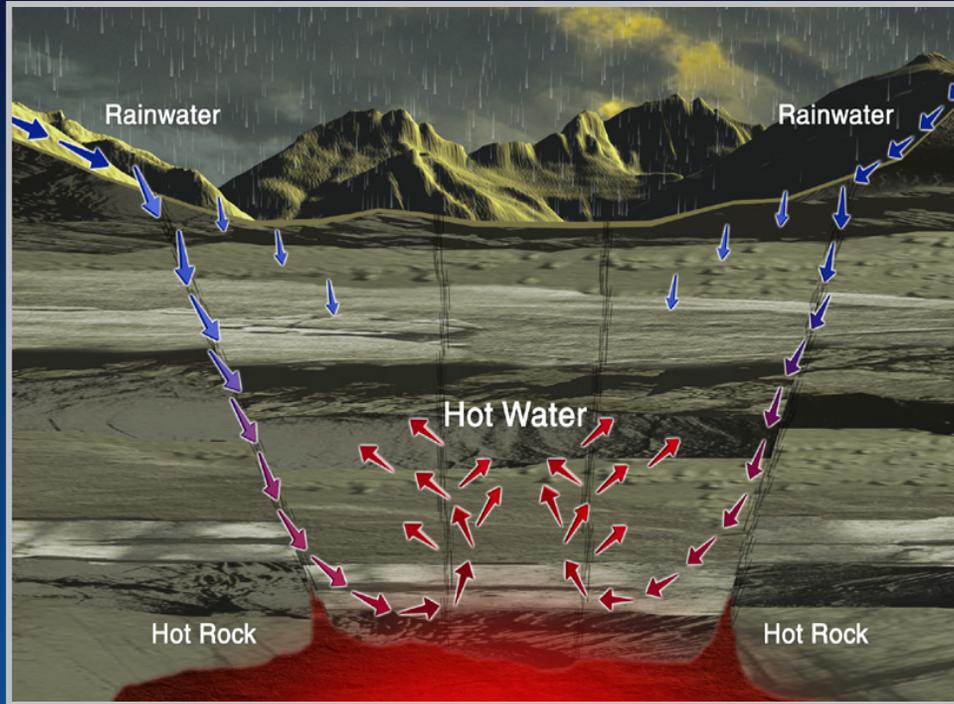
# Biomass & Bioenergy Flows



# Solar Options



# Geothermal Options



# Small Hydro Power

**INL** Idaho National Laboratory Search

Home > [Renewable Energy](#) > [Hydropower](#) > [Virtual Hydropower Prospector](#) >

## Virtual Hydropower Prospector

### Region Selector

Click on a region to access the VHP desktop



WA 17, OR 18, CA 15, AZ 13, NV 16, UT 14, NM 11, TX 12, OK 10, AR 8, MS 7, AL 6, GA 3, FL 2, NC 5, VA 4, MD 1, PA 2, NY 1, MA 1, CT 1, RI 1, NJ 1, DE 1, MD 1, VA 4, NC 5, SC 6, TN 7, KY 8, OH 9, MI 10, IN 11, WI 12, IL 13, IA 14, MO 15, NE 16, SD 17, NB 18, MN 19, WI 20, ME 21

Alaska 19, Hawaii 20

**Region Selector**  
User Guide (PDF 4.3 MB)  
Pop Enabling  
Data Sources  
Disclaimers

Document Archive  
Related Links  
Contacts

A-Z Index  
Contact Information  
Staff Directory

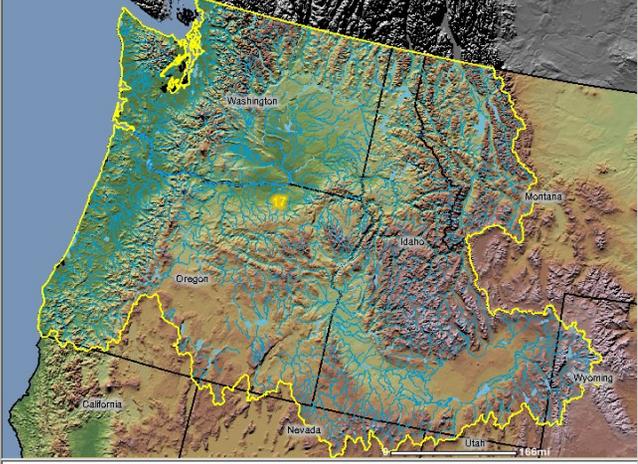
Idaho Cleanup Project

The Idaho National Laboratory is operated for the U.S.

**Refresh Map**

**Legend**

- Water Energy Resource Sites
- Hydrography
- Power System
- Transportation
- Areas & Places
- Land Use



Washington, Oregon, Idaho, California, Nevada, Utah, Montana, Wyoming

168mi

Thumbnail Map On/Off

Zoom In  
Zoom Out  
Pan  
Zoom to Previous  
Full Extent

Identify  
Find  
Select By Rectangle  
Select By Distance  
Buffer  
Query  
Clear Pins  
Clear Select  
Measure

<http://hydropower.inl.gov/prospector/>

# Tribal Energy Security & Sovereignty Through Local Self-Sufficiency

## Economic Dependence

Oil Imports  
Fuel at the Pump  
National Grid  
Coal-based Power  
Water Transport  
Foreign Manufacturing  
Agro-Industry

“He who has the gold,  
makes the rules.”



## Community Independence

Self sufficiency  
Food  
Energy  
Water

Skill Rebuilding  
Local Production  
Regional Sourcing

Sufficiency & Enoughness  
Human Satisfaction

“Community of Cooperation”

# The Community Energy Development Challenge



**These 4 days provide a unique opportunity to learn  
from your colleagues and others.**

**Enjoy the presentations.**

**Have fun.**

**Return home with some new ideas.**