

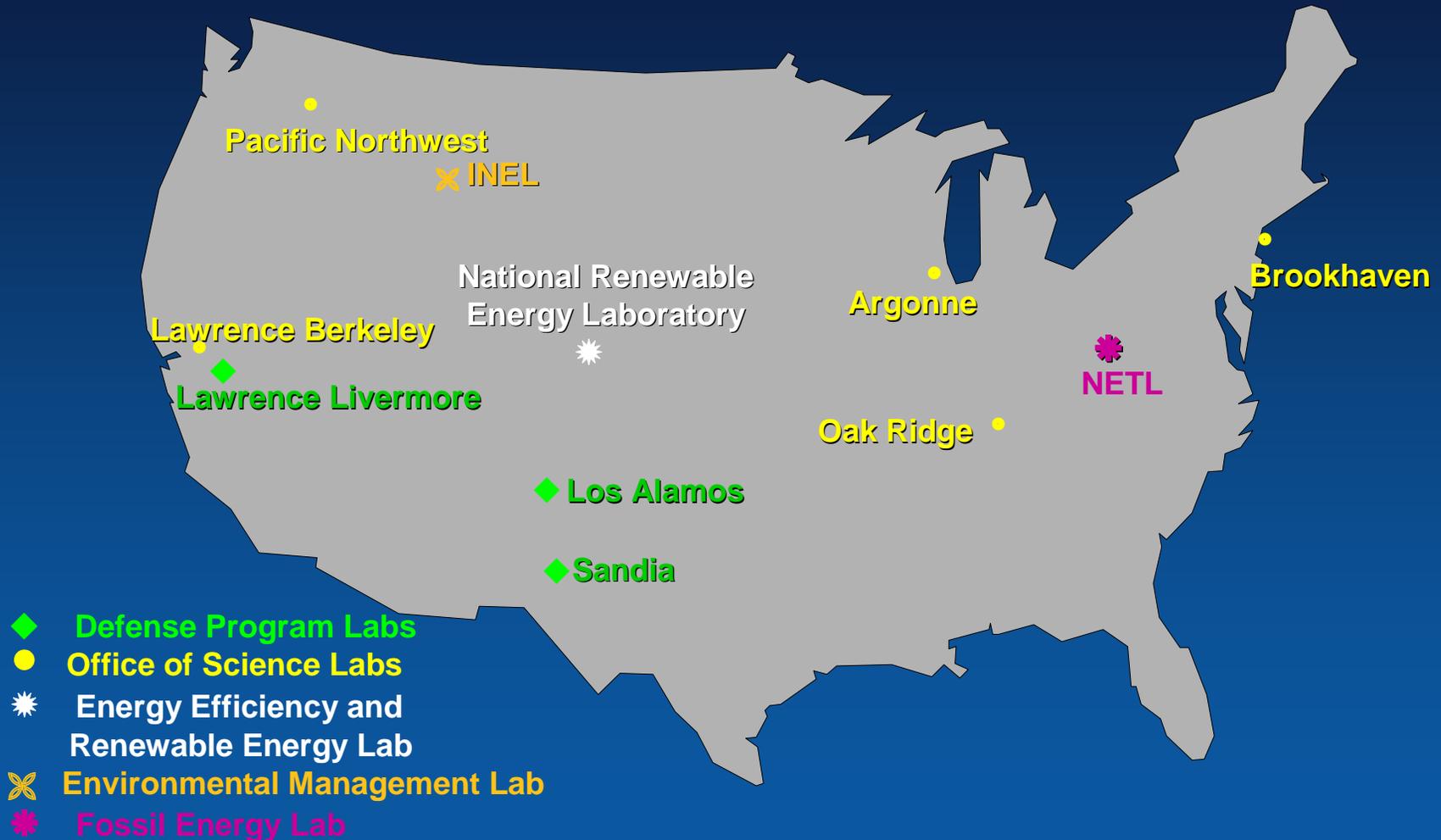
2006 DOE Tribal Energy Program Review

Roger Taylor
TEP Manager
National Renewable Energy Laboratory

October 23-27, 2006



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

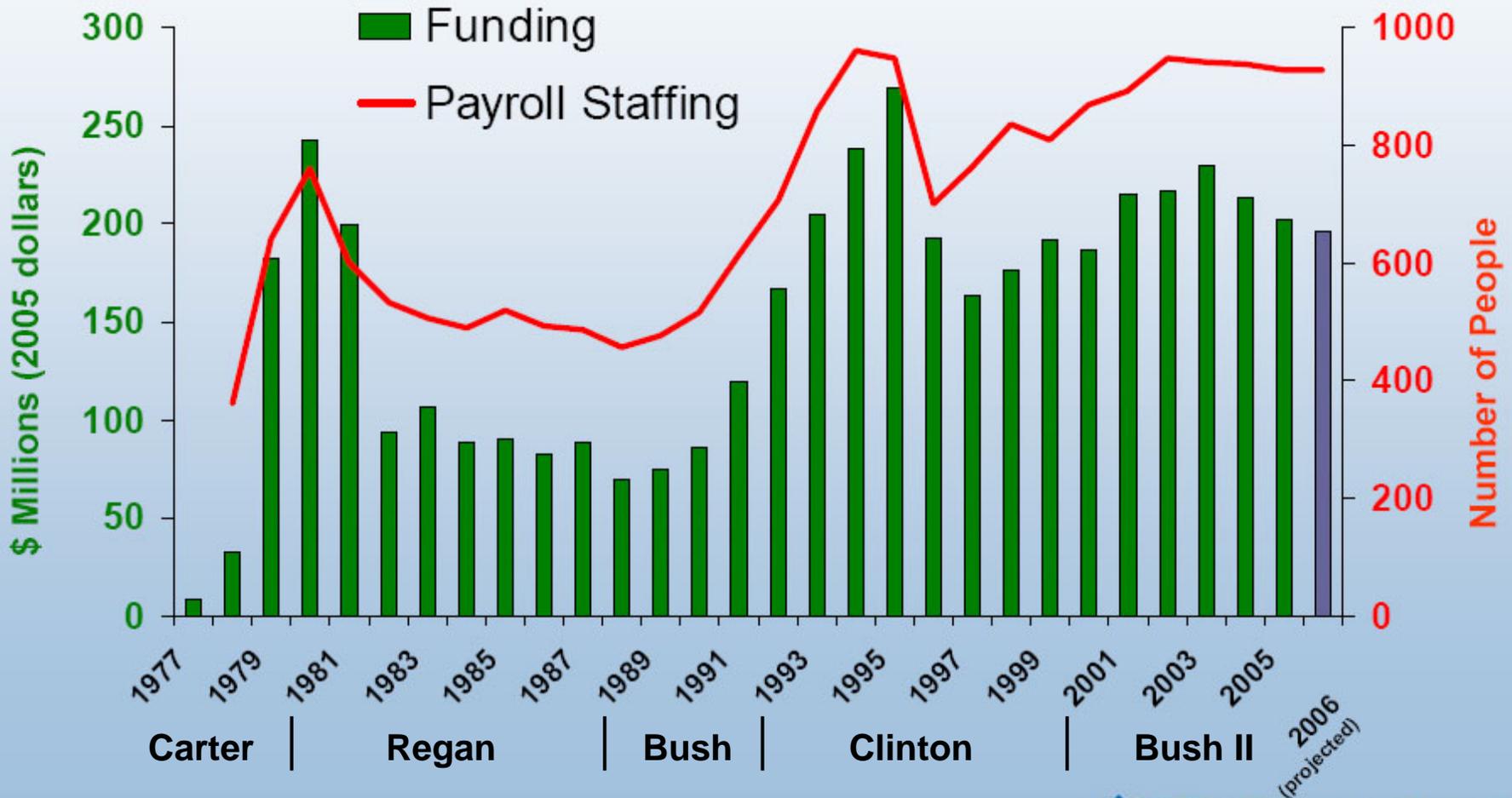
Analytical Studies

International Programs

Tribal Energy Program

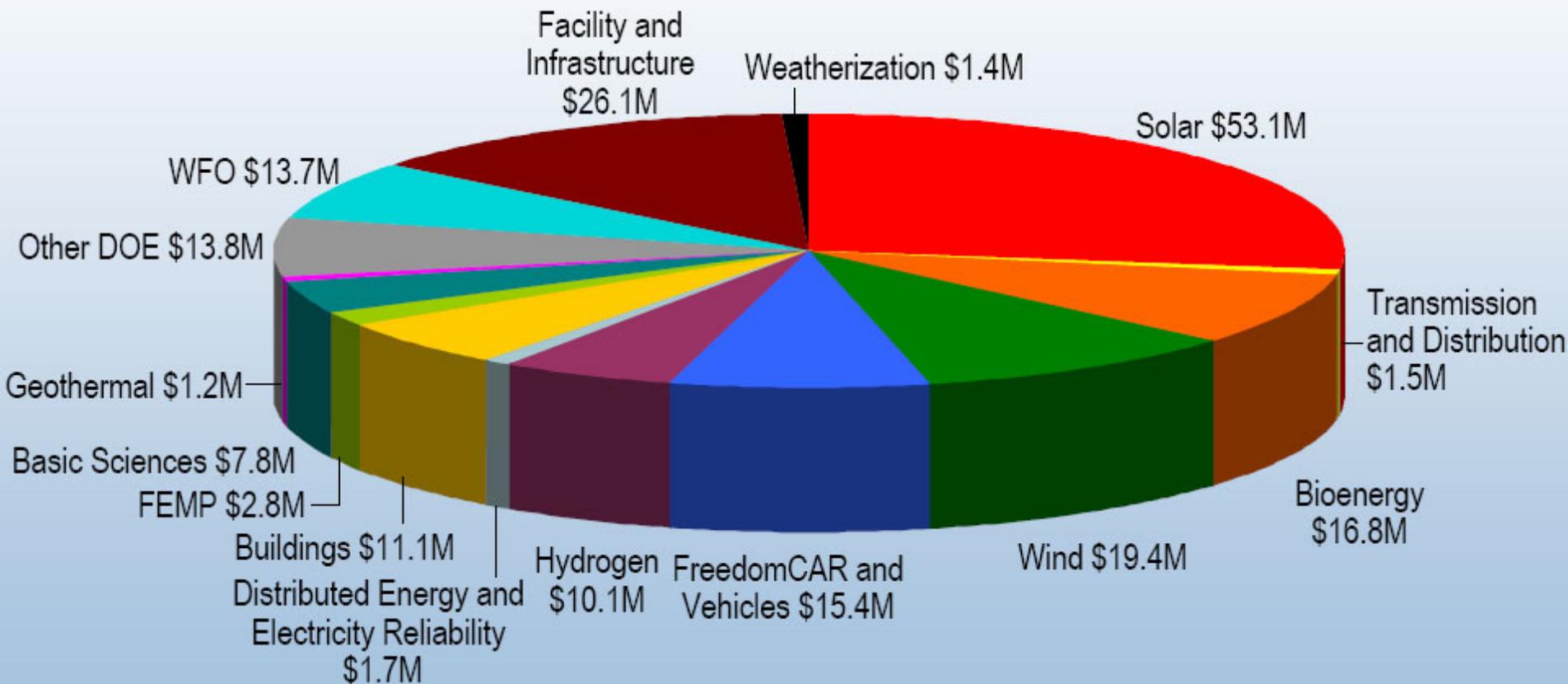
NREL Funding and Staffing

Funding in 2005 Dollars

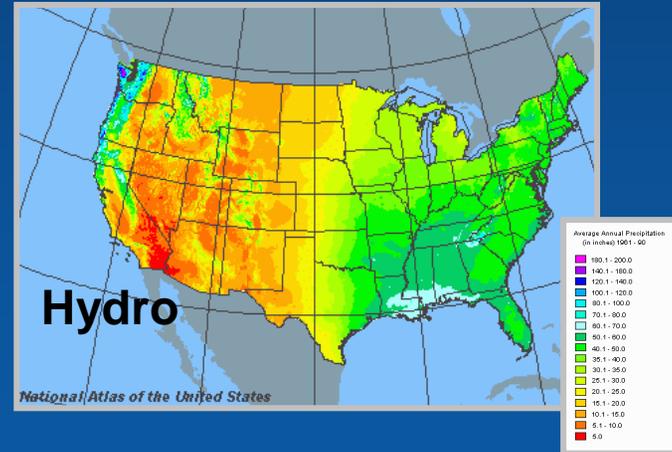
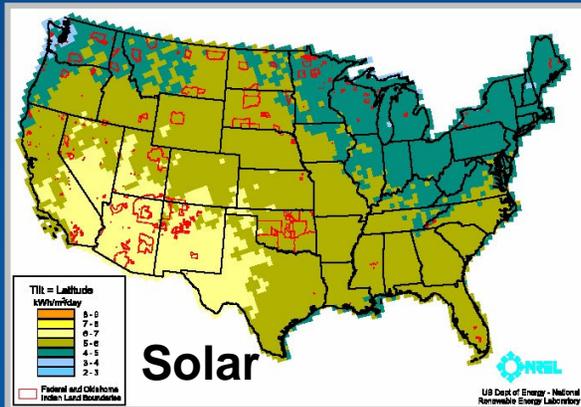
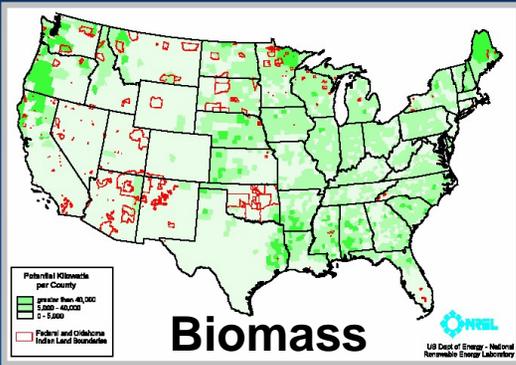
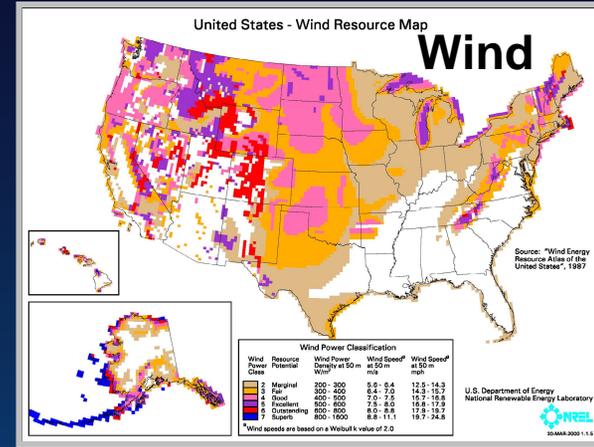
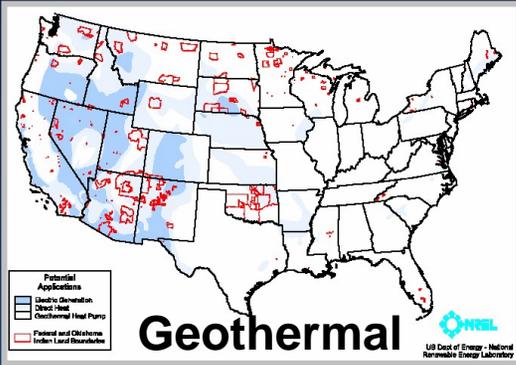


NREL FY 2006 Program Portfolio

Estimated \$195.9 Million



Renewable Resource Options

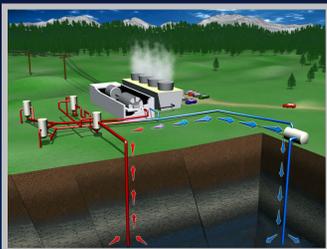


Renewable Technology Options

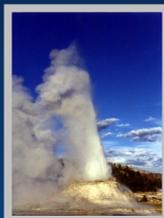
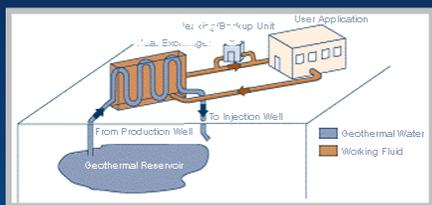
Small Modular Power



Power



Direct Use



Diesel Hybrids



Small Wind



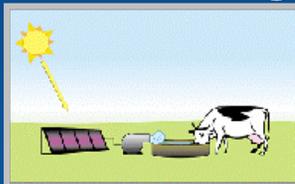
Big Wind



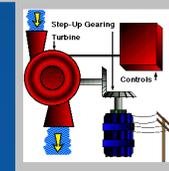
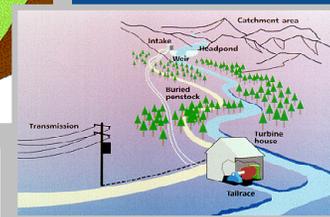
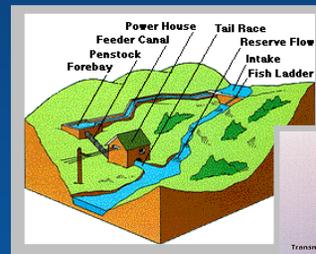
PV - Remote Homes



Stock Watering



Small Hydro



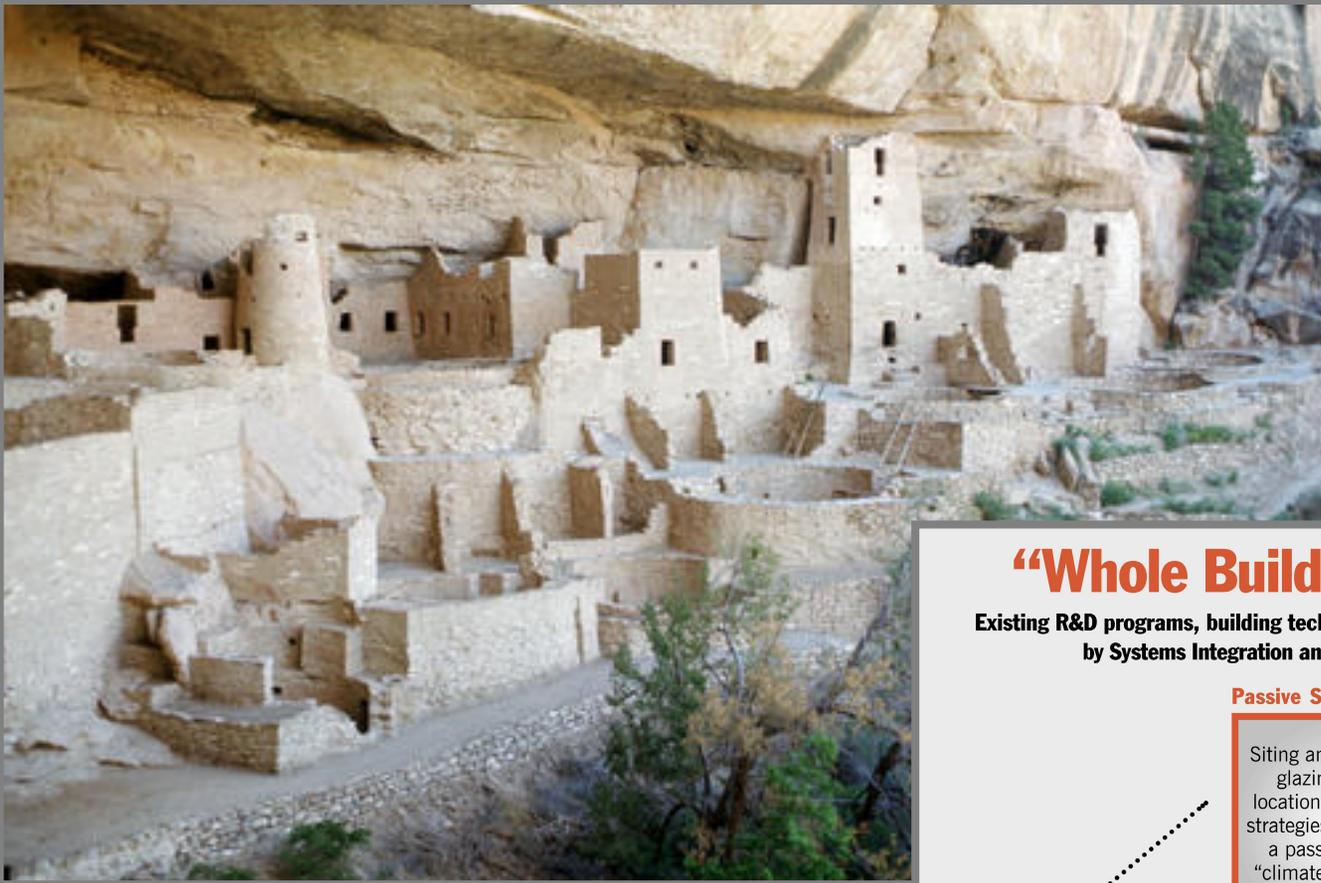
Process Heat



Buildings

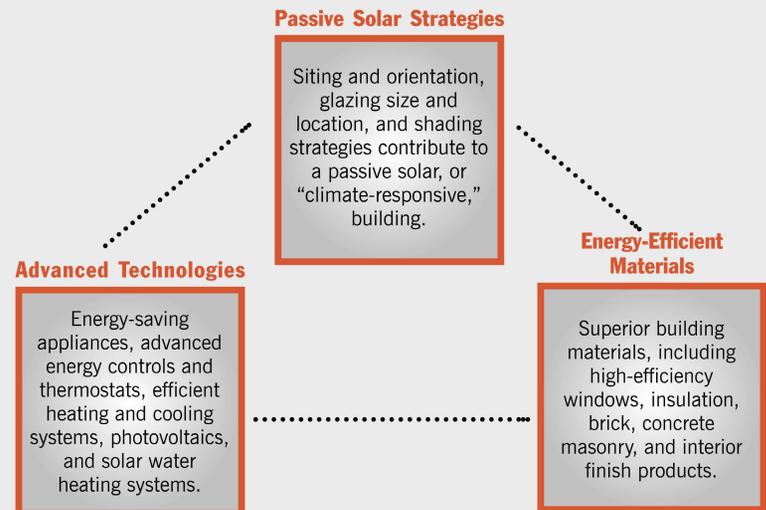


Building Design



“Whole Buildings” Strategy:

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



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 (≤ 10 kW)

Homes

Farms

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



Intermediate (10-250 kW)

Village Power

Hybrid Systems

Distributed Power

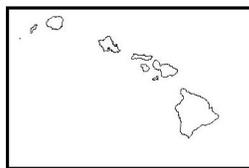
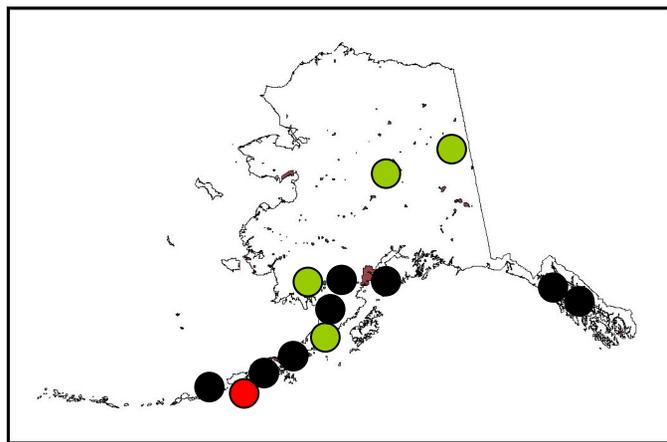
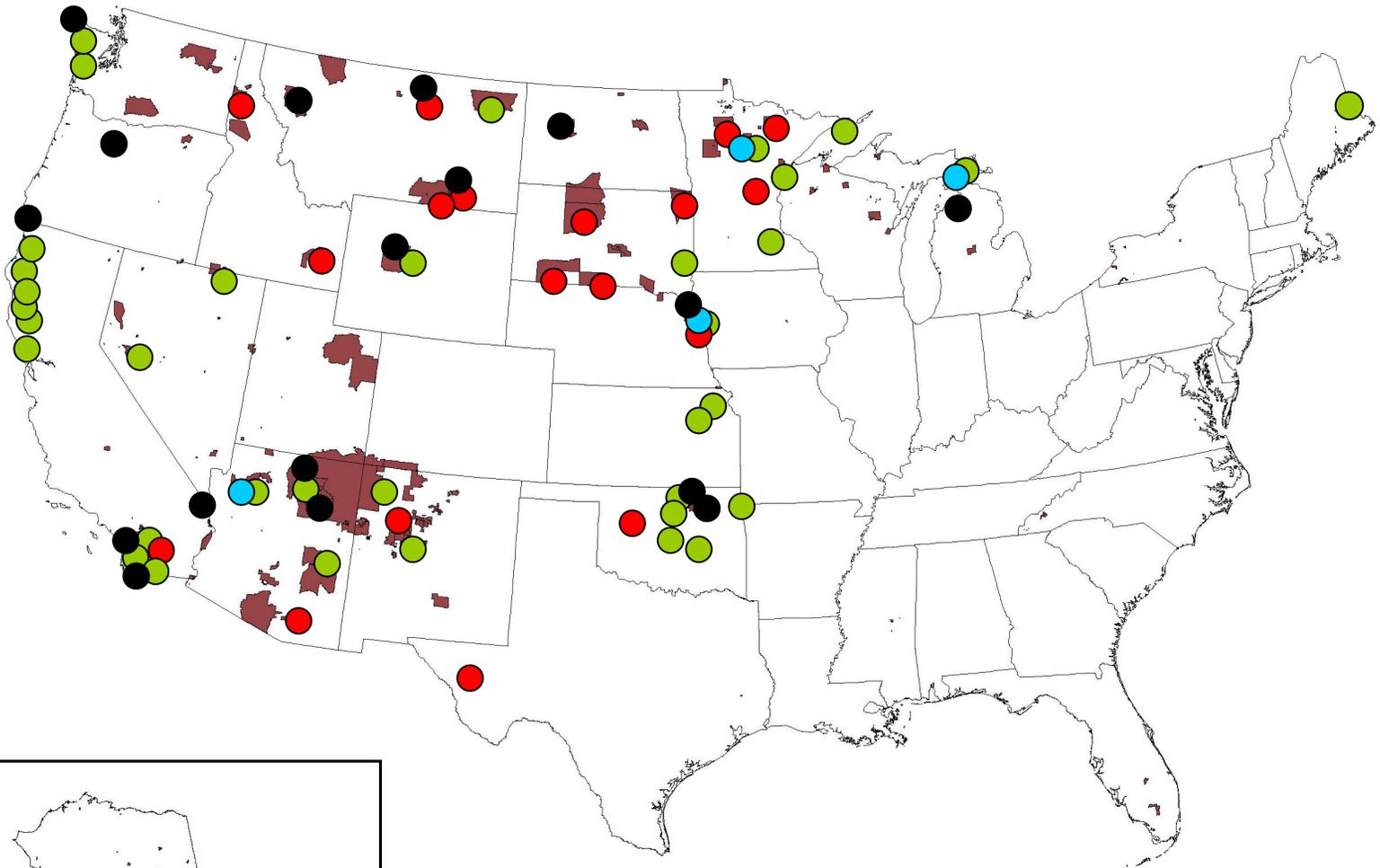


Large (250 kW – 2+ MW)

Central Station Wind Farms

Distributed Power

Tribal Wind Monitoring Sites

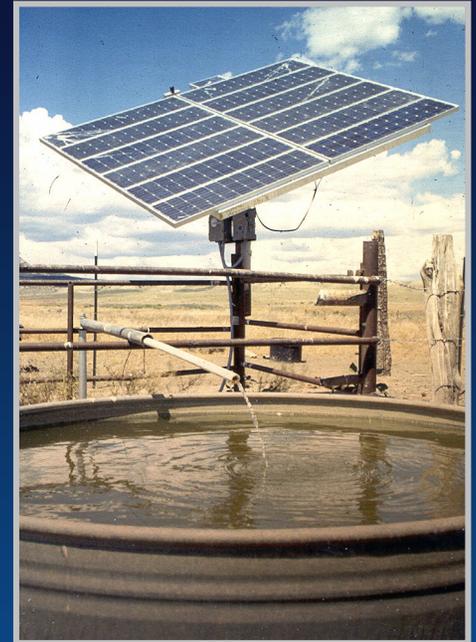


-  20m WPA Monitoring Completed
-  20m WPA Anemometer
-  50m WPA Anemometer
-  50m TEP Anemometer

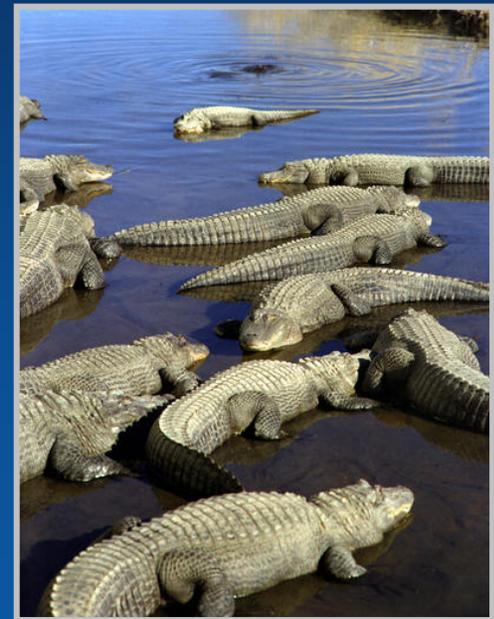
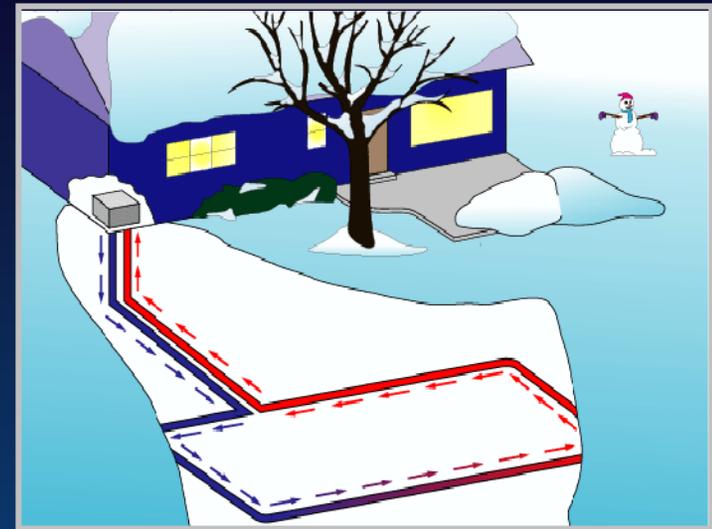
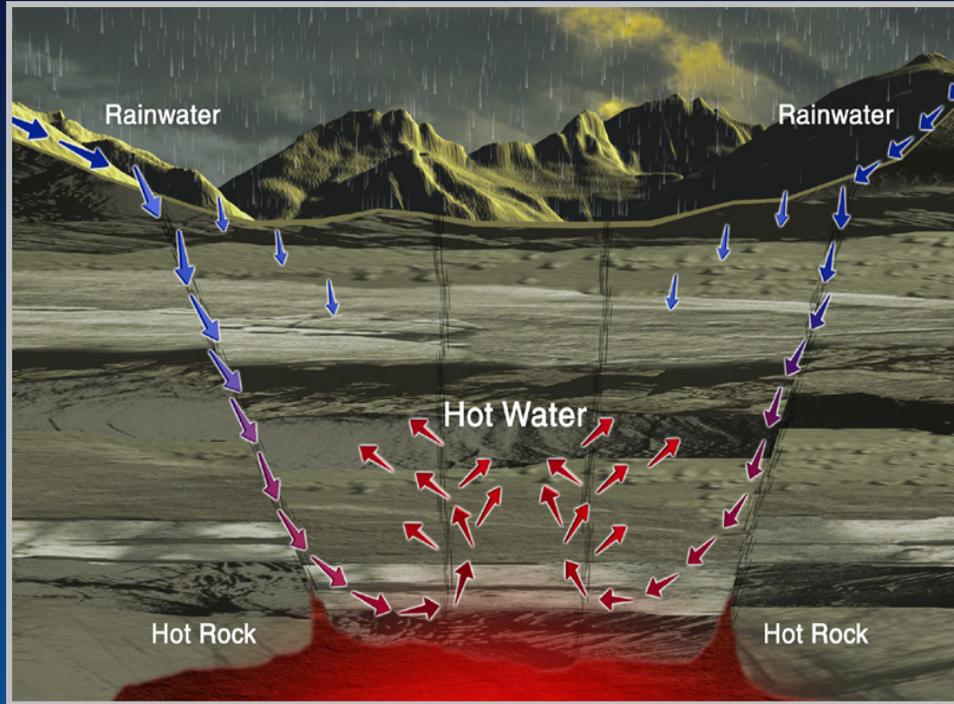
Bioenergy Criteria for Success



Solar Options



Geothermal Options



Refresh Map

Legend

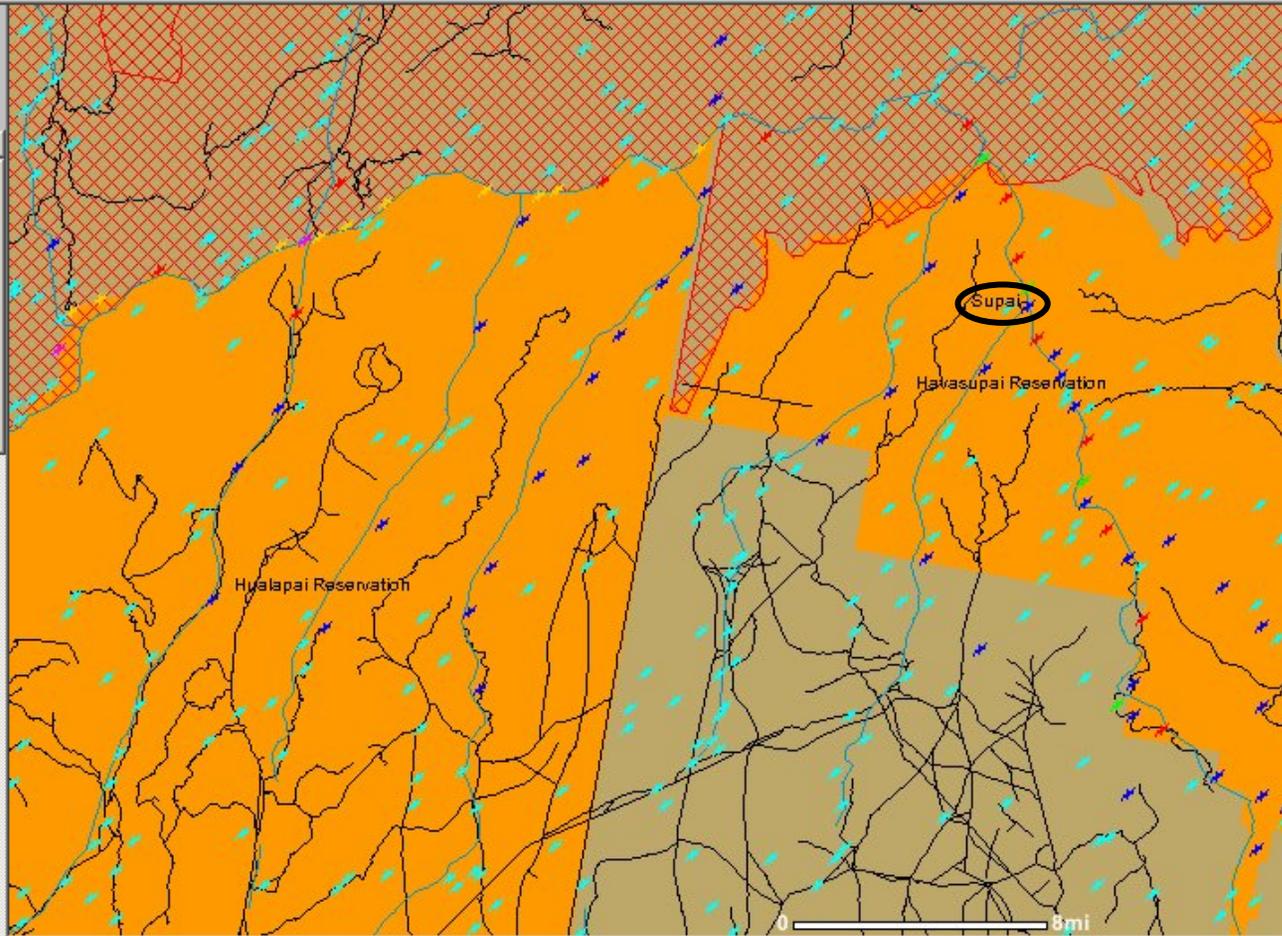
Water Energy Resource Sites

Feature Active
Select Feature

- High Head High Power
- Low Head High Power
- High Head Low Power
- Low Power Conventional
- Low Power Unconvention
- Microhydro

Hydrography Power System

Feature Active



Active Layer - High Head/Low Power

Rec	Power Class	Power Potential (MW)	Hydraulic Head (ft)	Flow Rate (cfs)	Federally Excluded	Environmentally Excluded	Nearest Rd. (mi)	Nearest RR (mi.)	Nearest Population (mi)	Nearest Powerline (mi)	Nearest Substation (mi)	Neas Power (r
1	High Head/Low Power	0.463	34.91	156.44	N	N	1.611	999999	0.073	999999	999999	999

Information
Map On/Off

Zoom In

Zoom Out

Pan

Zoom to Previous

Full Extent

Identify

Find

Select By Rectangle

Select By Distance

Buffer

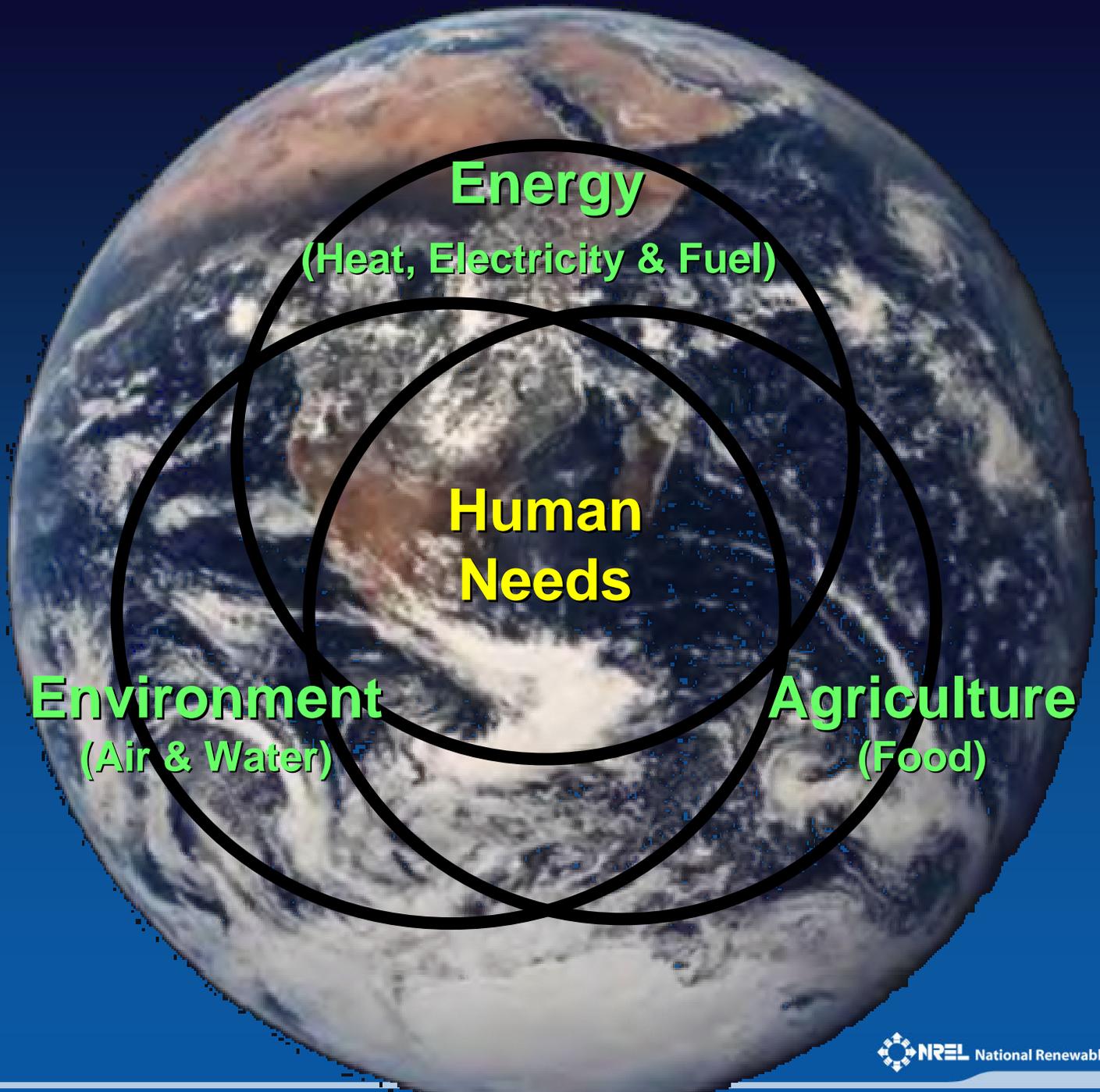
Query

Clear Pins

Clear Select

Measure

Print



Energy

(Heat, Electricity & Fuel)

**Human
Needs**

Environment

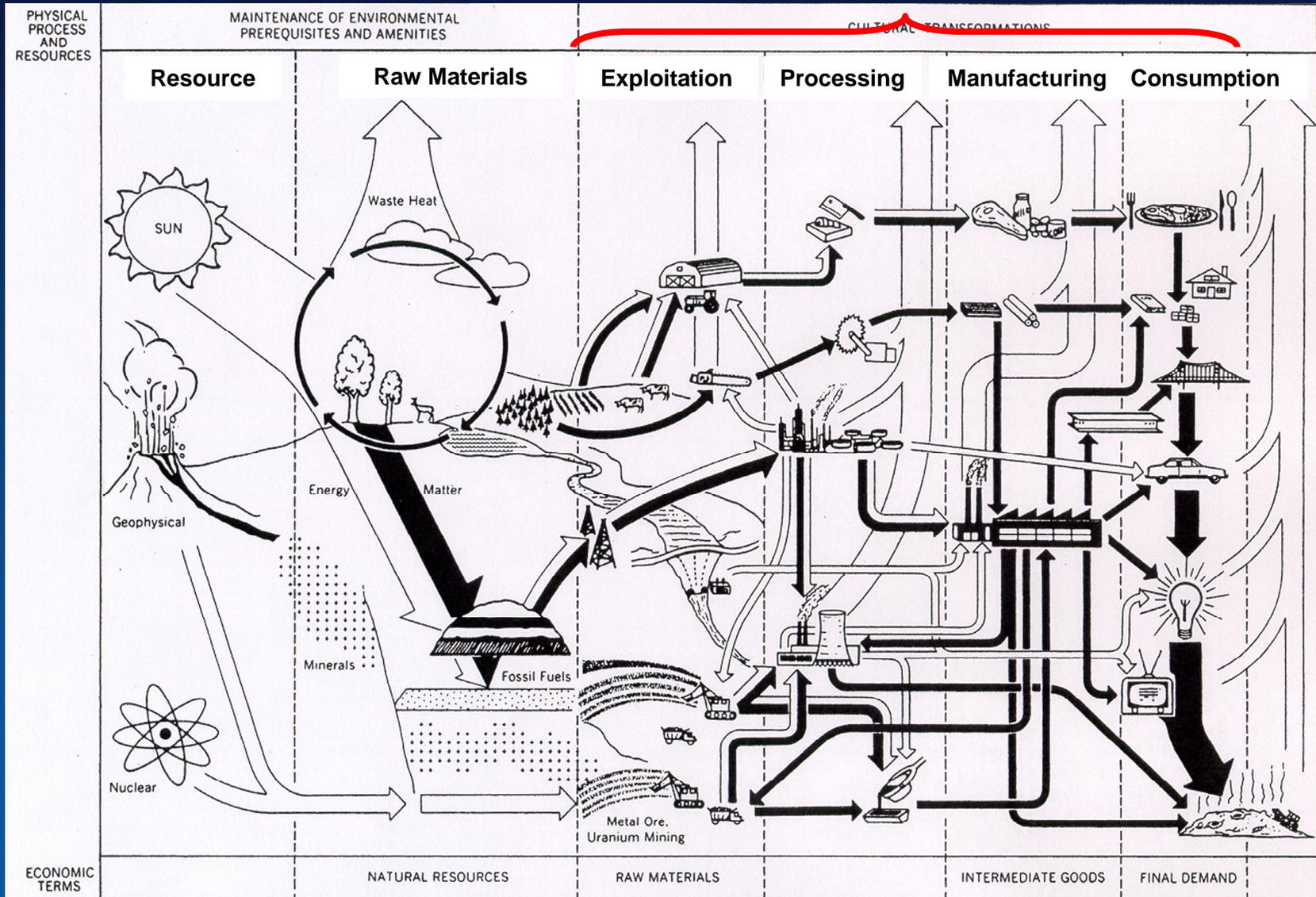
(Air & Water)

Agriculture

(Food)

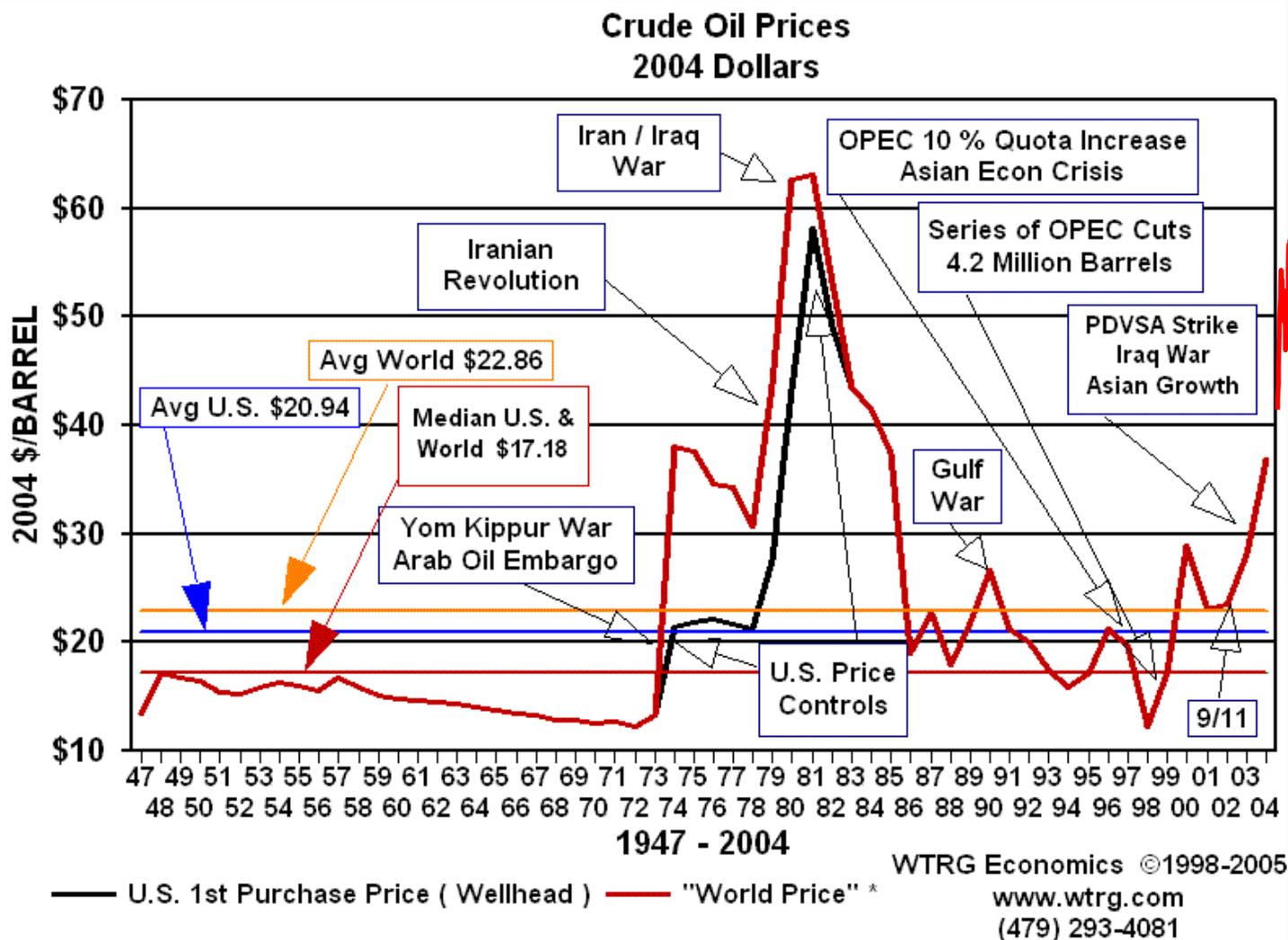
The global economy is very complex

And it's, almost entirely, dependent on cheap oil.



After: Charles Hall, SUNY Syracuse, 2005

Increasingly volatile, increasingly upward



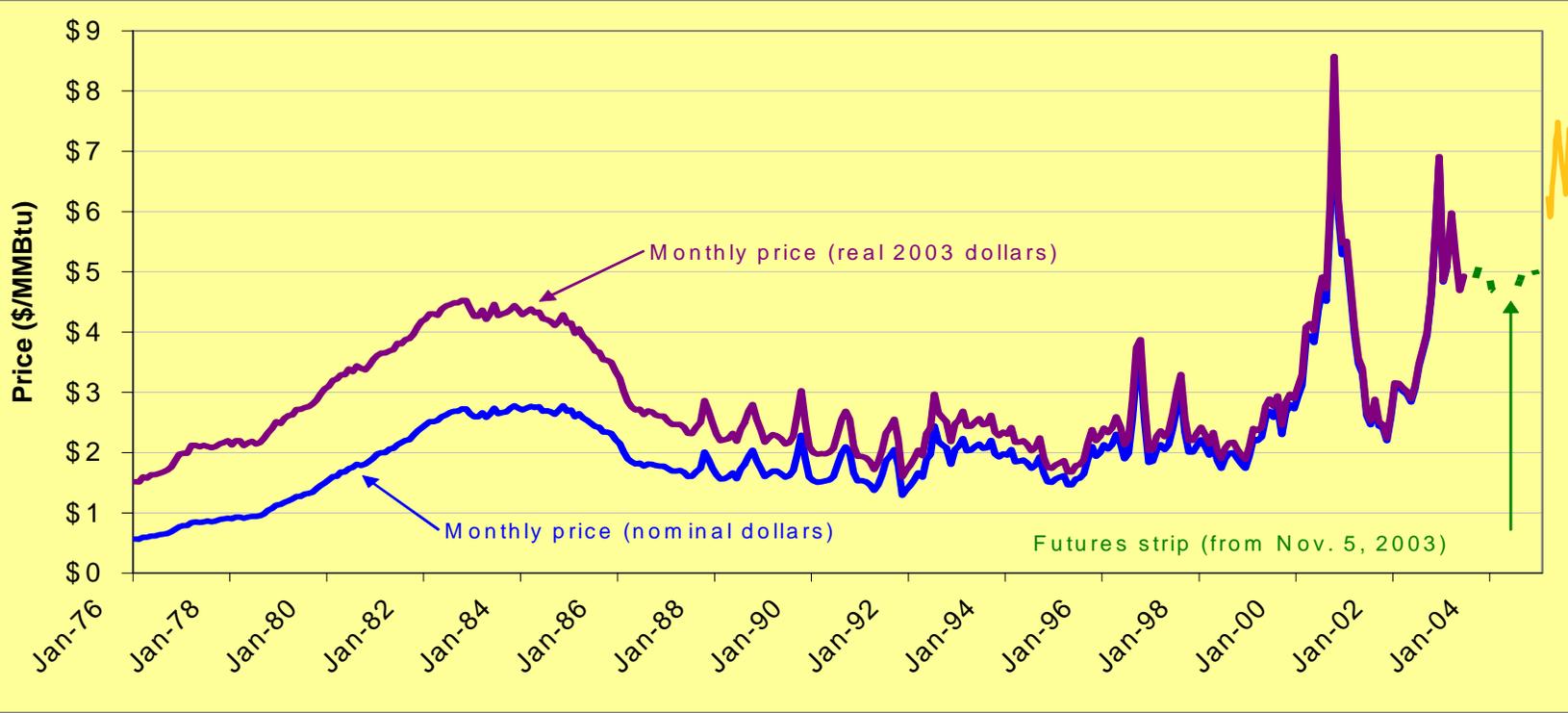
~\$77/bbl

~\$60/bbl

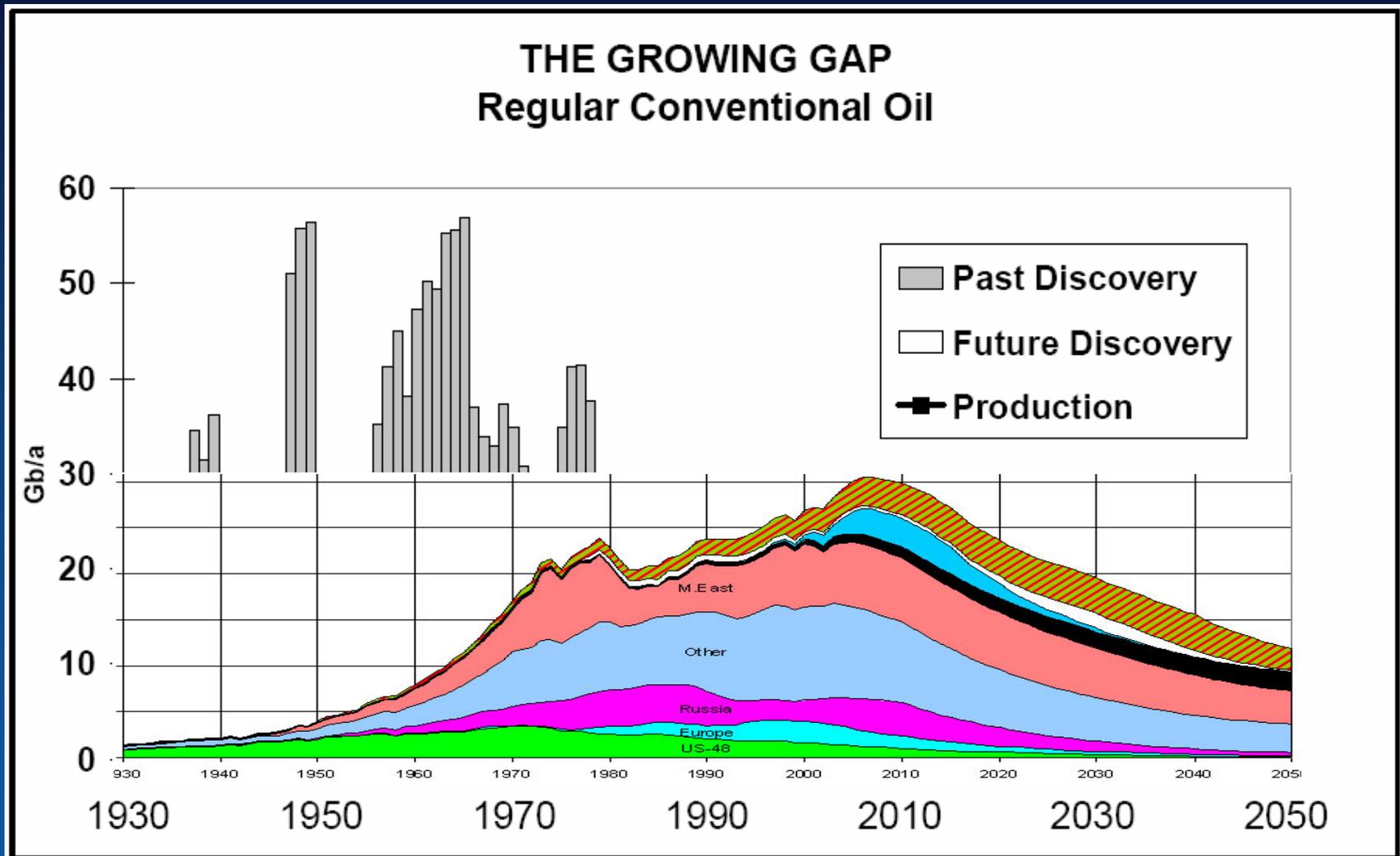
After a decade of low prices, natural gas prices are now more volatile at a higher level.

~\$15
MMBTU
Henry
Hub

~\$6.50
MMBTU



Worldwide Discovery Trend



Source: Campbell, September 2006

7 Generations Span The Age of Oil

Our Grand Parents

Our Parents

Our Generation

80

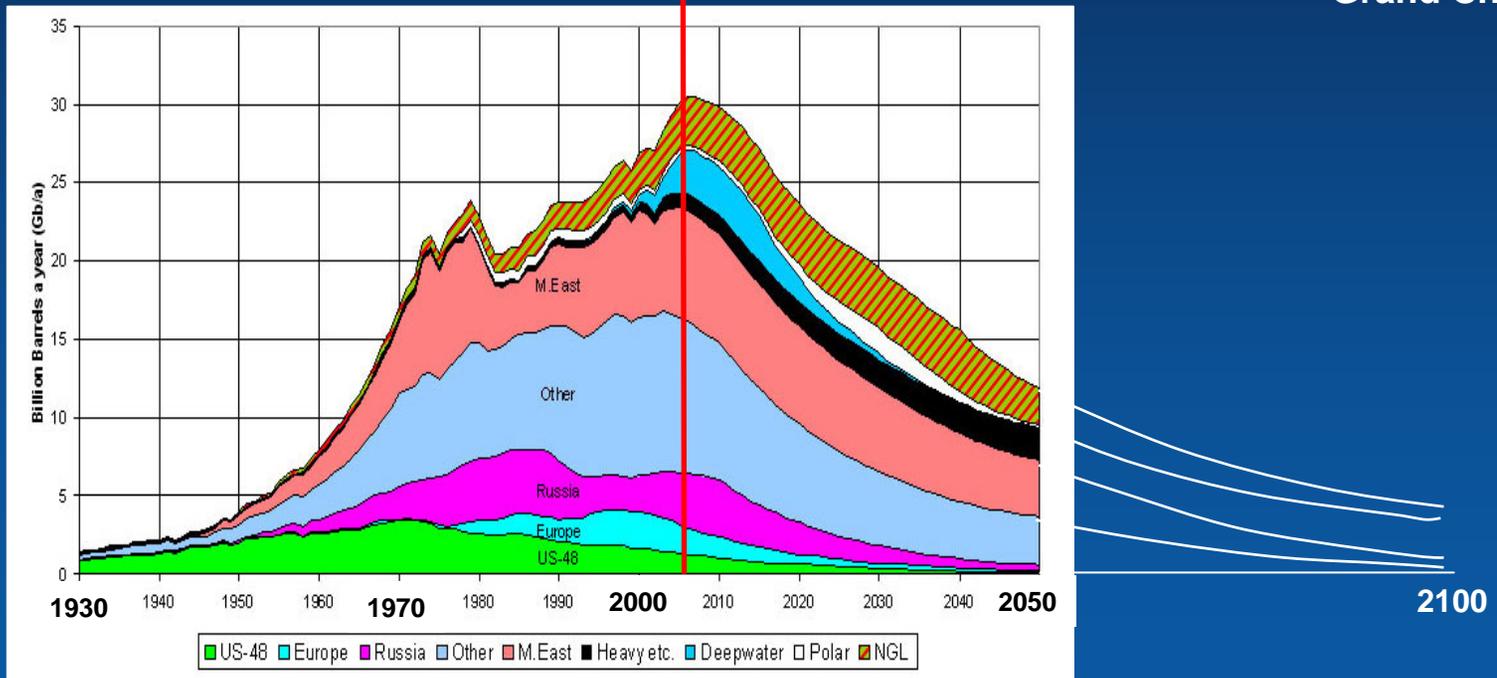
30

Our Children

Our Grand Children

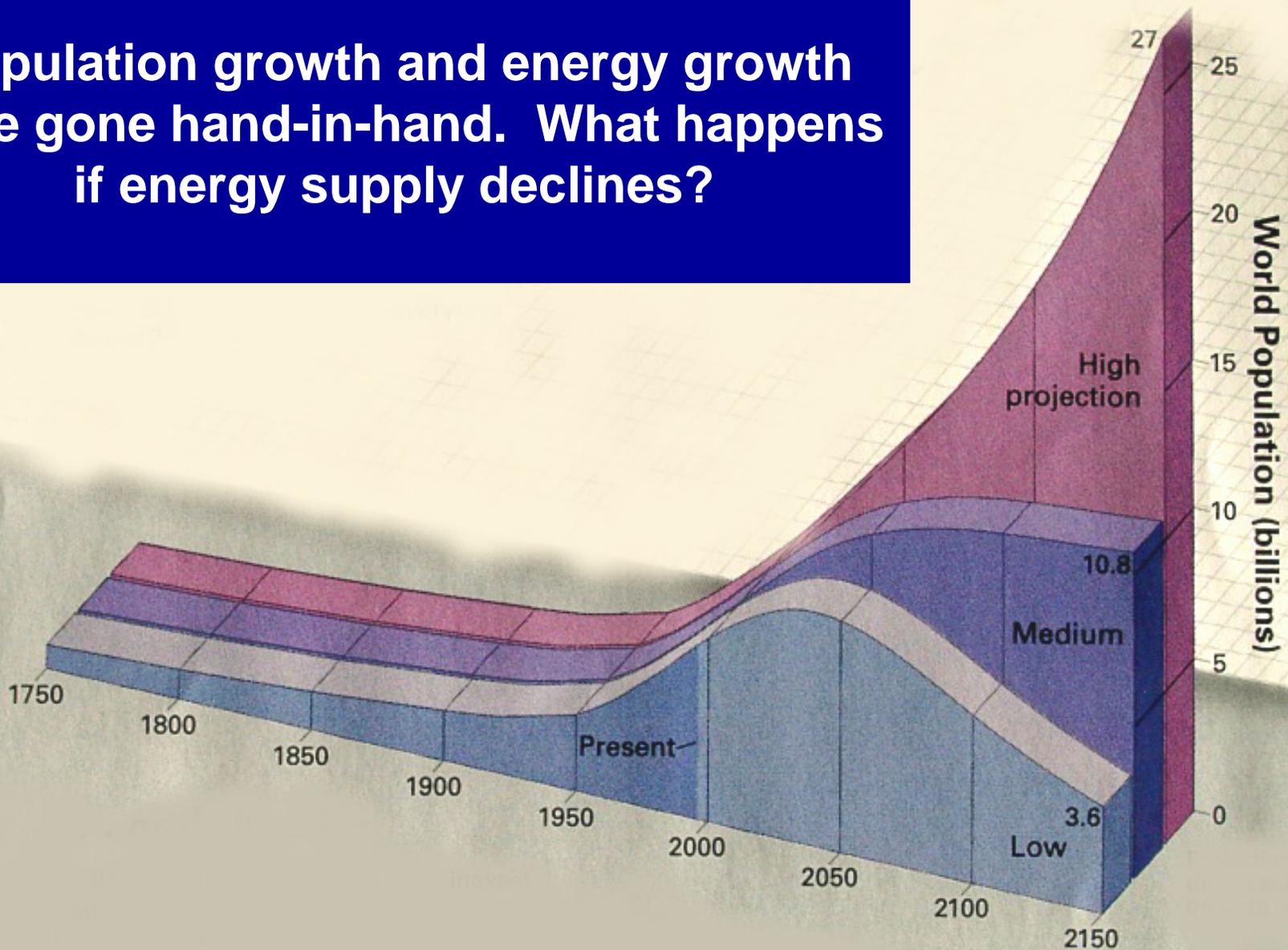
Our Great Grand Children

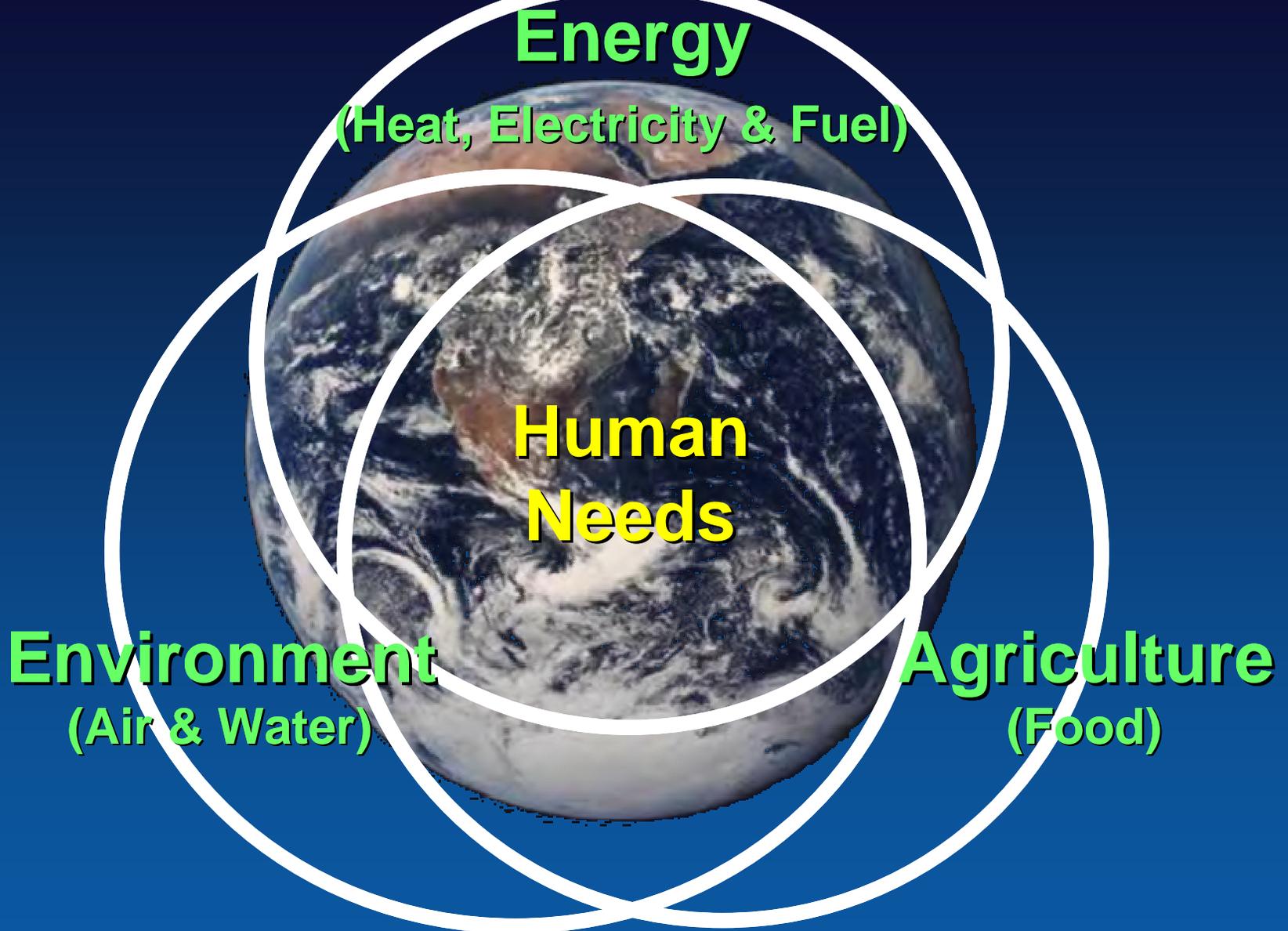
Our Great-Great
Grand Children



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

Population growth and energy growth have gone hand-in-hand. What happens if energy supply declines?





Are we already exceeding the carrying-capacity of the planet?

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





Energy
(Heat, Electricity & Fuel)

**Tribal
Community
Solution**

Environment
(Air & Water)

Agriculture
(Food)