

October 18, 2005

Montana's Energy Future: **Renewable Energy Resources**

National Center for Appropriate Technology



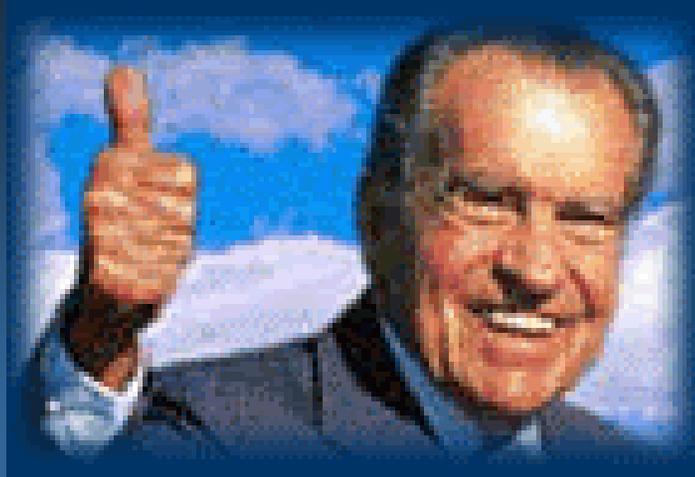
National Center for Appropriate Technology
3040 Continental Drive
Butte, Montana 59703



For 25 years NCAT has been serving people—particularly economically disadvantaged people—and bettering lives by promoting and demonstrating appropriate technologies.



National Center for Appropriate Technology

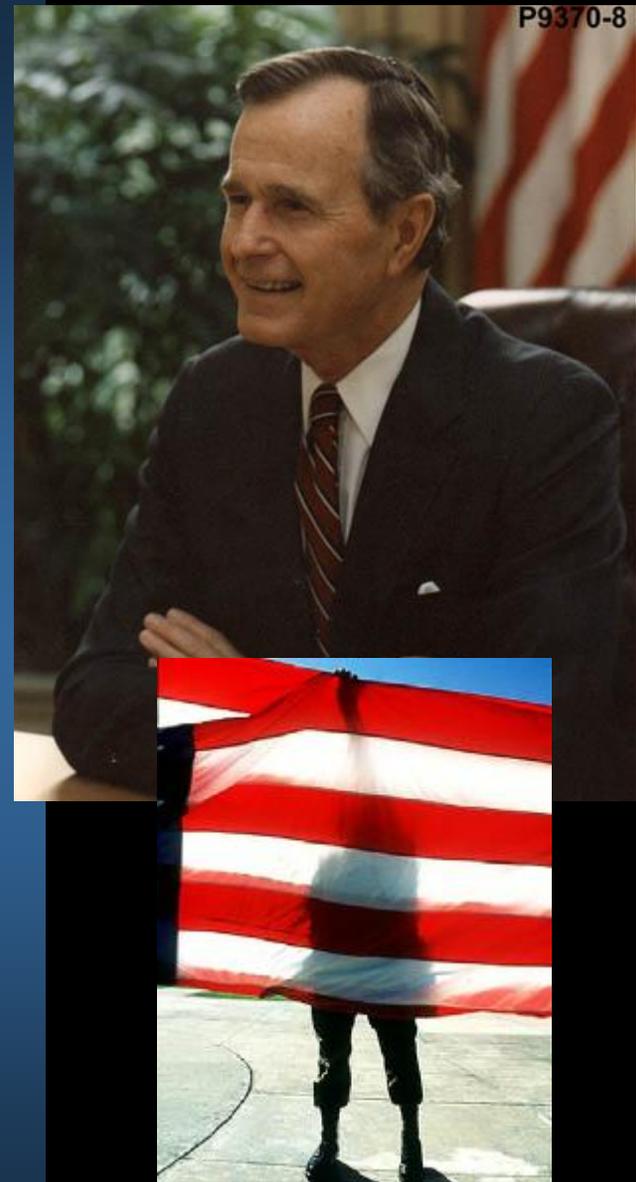


1973 Arab Oil Embargo – Richard Nixon promised that “Project Independence” would free America from energy imports by 1980.



In **1977** Jimmy Carter introduced his energy program as the “**moral equivalent of war**”.

“Our jobs, our way of life, our own freedom and the freedom of friendly countries around the world would all suffer if control of the world’s great oil reserves fell in the hands of Saddam Hussein.”





NR 492 2 Cents

FAME & FORTUNE WEEKLY

Stories of
BOYS WHO MAKE MONEY.

STRUCK OIL!

OR, THE BOY WHO MADE A MILLION.

By J. J. ...

Published by ...

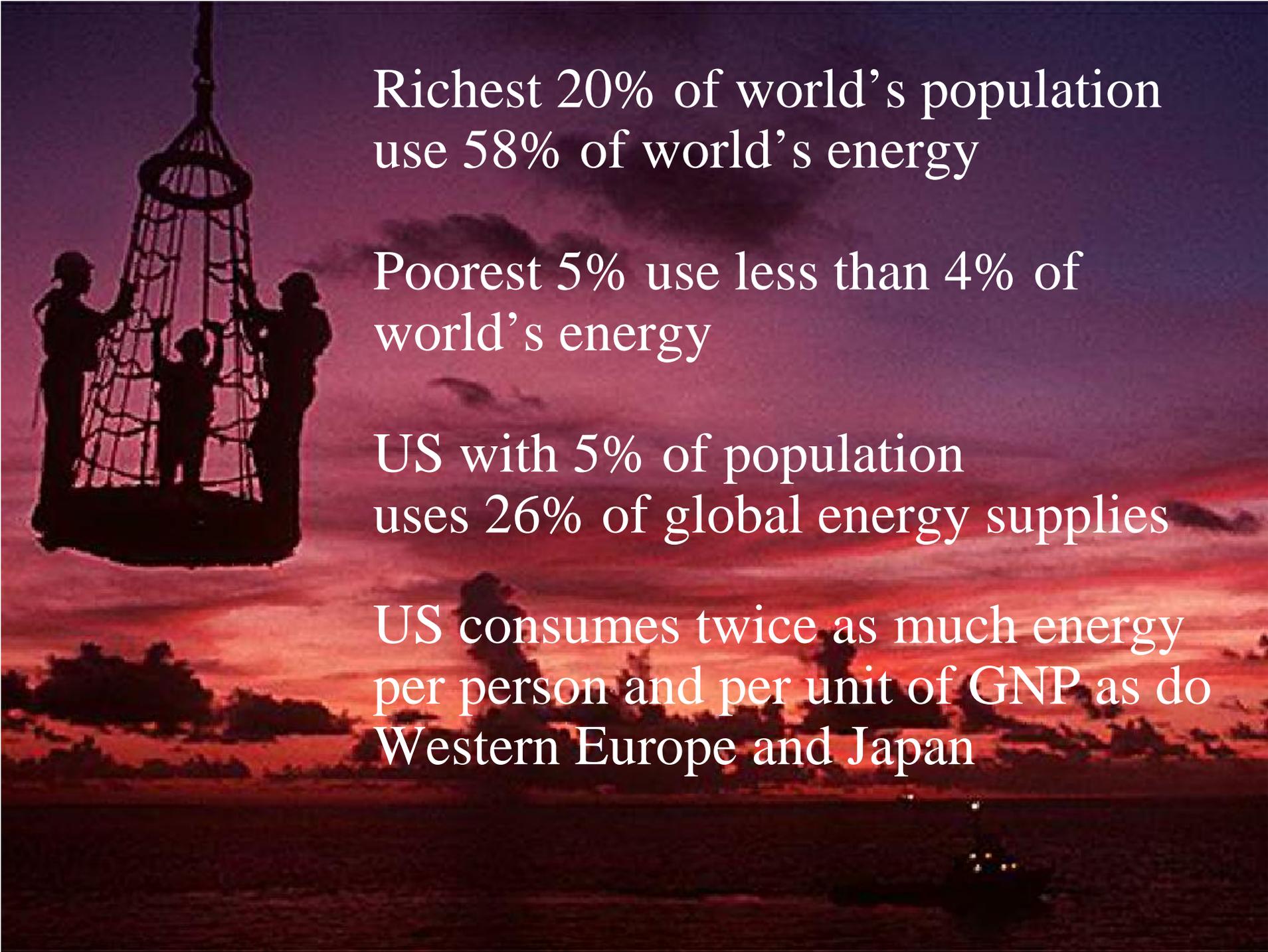
Photo of the 1860's in Pennsylvania



1900-2000

- world population quadrupled
- life expectancy doubled
- world economy expanded by a factor of 17



The background of the slide is a photograph of a hot air balloon basket suspended in the air. Three people are visible inside the basket, their forms silhouetted against a vibrant sunset sky. The sky transitions from a deep purple at the top to a bright orange and red near the horizon. The overall mood is one of quiet observation and contrast.

Richest 20% of world's population
use 58% of world's energy

Poorest 5% use less than 4% of
world's energy

US with 5% of population
uses 26% of global energy supplies

US consumes twice as much energy
per person and per unit of GNP as do
Western Europe and Japan

**"[It's] time for the human race to enter
the solar system."**

...George W. Bush



Marcellus Jacobs:



Marcellus "M.L." Jacobs, wind pioneer and founder of the Jacobs Wind Electric Co., died on July 15, 1985 after an aviation accident. He was an avid member of the Aviation Club. Jacobs' passion for aviation was shared by an aviator's wife who was killed in a crash in the same week he died. A pilot's license was one of his passions as well. He often said, "You can't fly a plane unless you know the ground." *Photo courtesy of Marcellus.*

Wind pioneer and inventor Marcellus "M.L." Jacobs died on July 15, 1985 as a result of fatal injuries suffered in an automobile accident in Minneapolis, Minnesota on June 28th. He was 82 years old. He was widely known in the field and his career in wind power spanned some 83 years.

By: Donald Maier

Jacobs was an Air Force member. He built his first wind generator in the early 1930s near Fort Polk, Missouri. In 1962, they moved the Jacobs Company to Minneapolis. In 1960, when they produced their famous 1.8 KW, 2.8 KW, and 3.0 KW Jacobs wind generators. These generators added to thousands of farmers and ranchers in the U.S. and abroad the world. The company was built in three blocks, one block at a time. Bill Saba, Jacobs' vice president, was the person for Jacobs well known for its success.

Jacobs was most proud of the tower which Adlai Stevenson took on his expedition to Antarctica in 1935 and which was still in operation and still being used over 50 years later. Even though the tower was placed across the tower within several feet of the blades.

In addition to wind systems, he sold Jacobs' turbines and other 2500 units. In the 1960's, he gave away 2500 Jacobs' turbines to the Navy and the "Four Corners" and "Queen of the Day" to be used as a power.

In 1950, the factory was shut down, a victim of the spread of wind distribution and rising electricity prices. Jacobs then moved to Florida, where he developed the Jacobs Wind Electric plant.

1903-1985



son of Fred Stevens and was a wind turbine collector. By the late 1930s, Jacobs' wind power was picking up again and Jacobs began developing a modern version of his wind turbine, keeping the three-bladed, variable pitch design. In 1972, Jacobs' new wind turbine plant was built in the Jacobs Wind Electric plant.

Electric Company, Columbia, Missouri, the Central Data Corp. of Minnesota and separately Jacobs' partner in the company and a manufacturer. It was divided in Plymouth, Minnesota in 1980.

In 1981, the company acquired the Jacobs Energy Services Inc. of Lincoln, Neb., a wind turbine developer. In 1988, the company purchased Data Technology Inc. of Lincoln, Missouri, the manufacturer of WMEC wind turbines and wind generator sets. The company was recently reformed. Jacobs Energy Systems Inc. will have the Jacobs name has been kept on the wind products. As the time of the death, while no longer active in the day-to-day operations of the company, Jacobs continued to consult in the construction.

Jacobs held over 30 patents on wind systems, including the first protection patent on wind turbine generator, a new turbine, the Jacobs' four-bladed turbine for the Navy and a number of others. He was a past member of the National Association of Certified Engineers, a former member of the American Wind Energy Association, and a member of two aviation pilot groups. The Jacobs Wind Electric plant was built in 1972.



JACOBS' 2.8 KW UNIT - 1940's 40901



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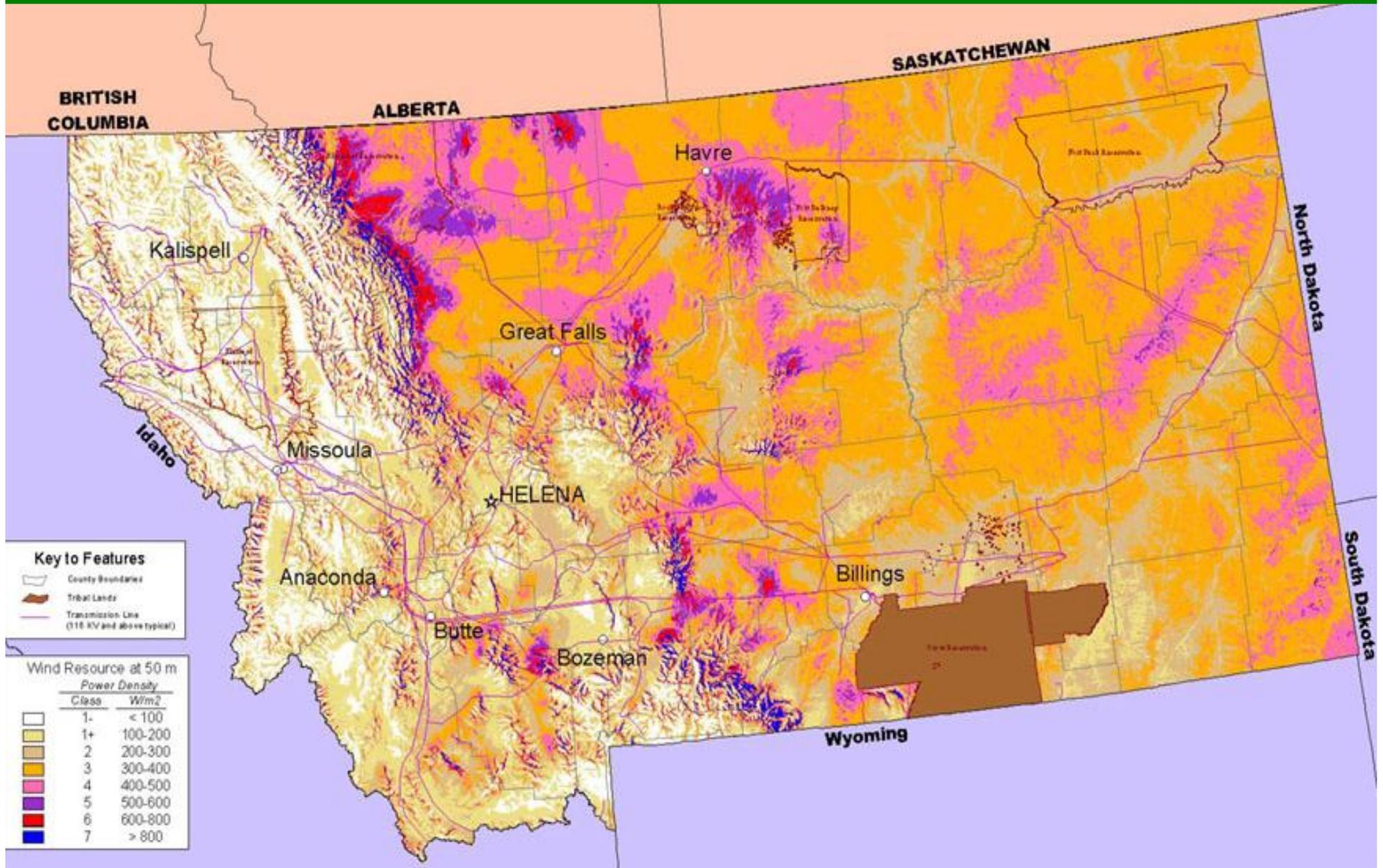
Lodgegrass School, Chester Co.

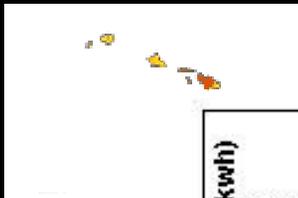
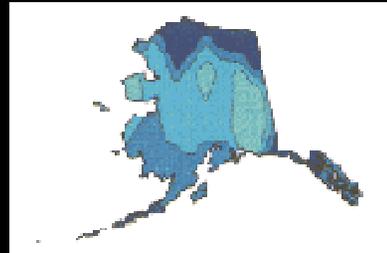
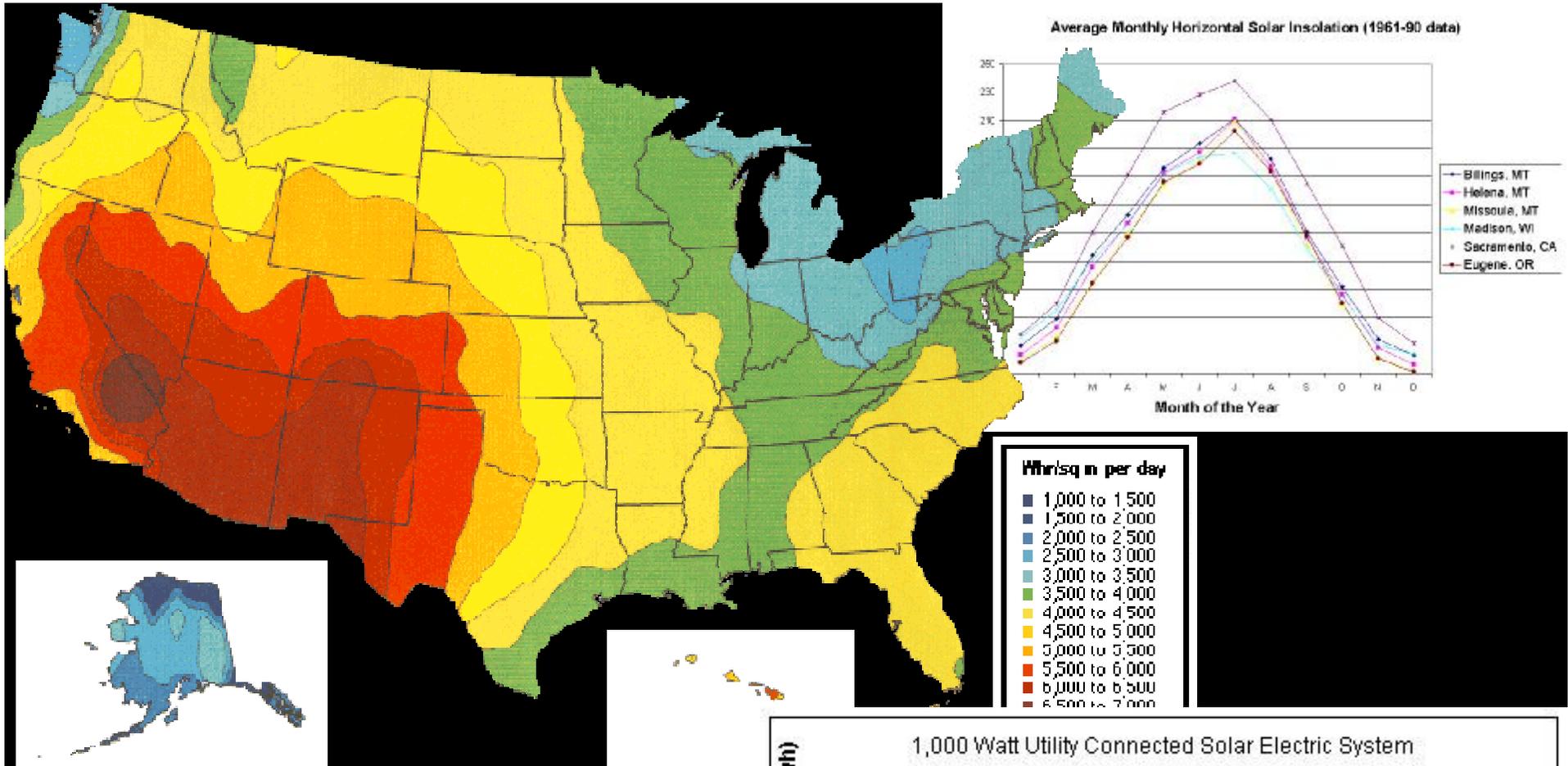


Liberty Co Shop, Chester

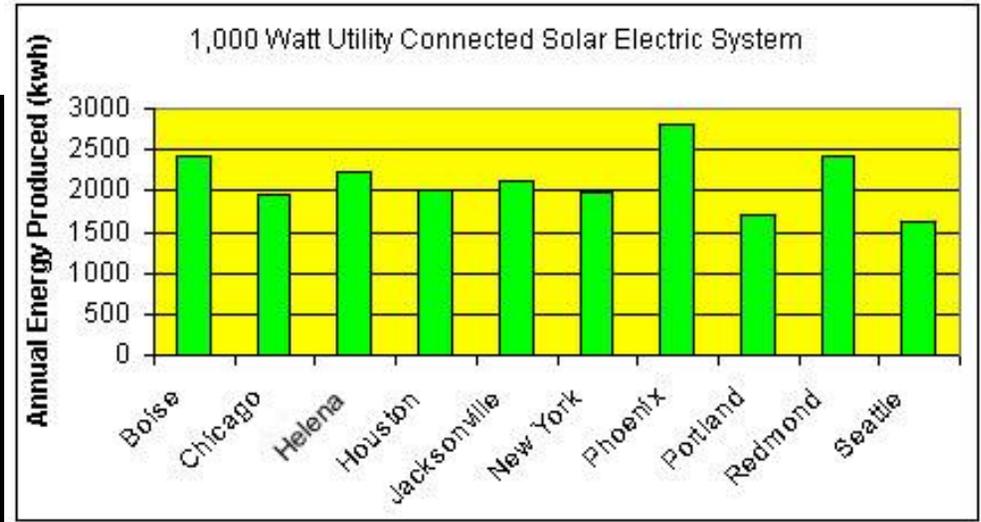


Montana Wind Resource Map

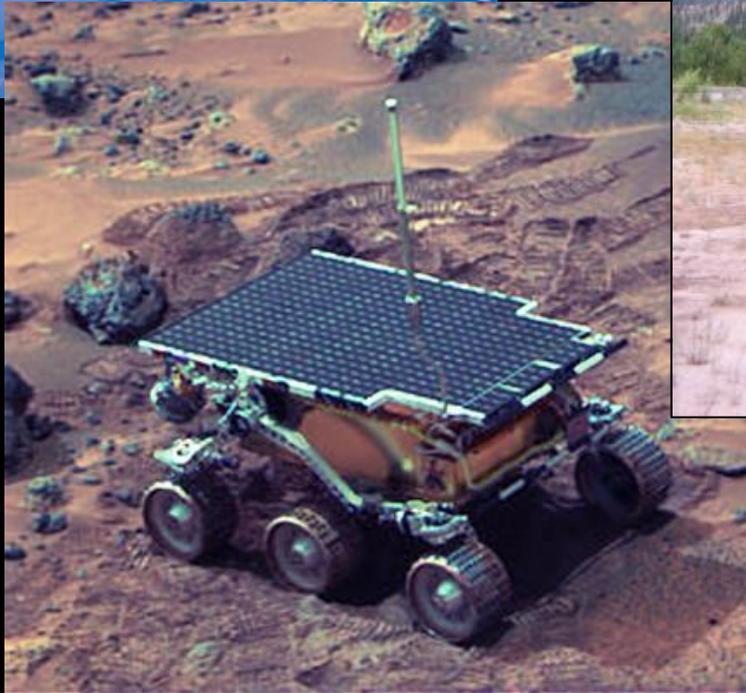


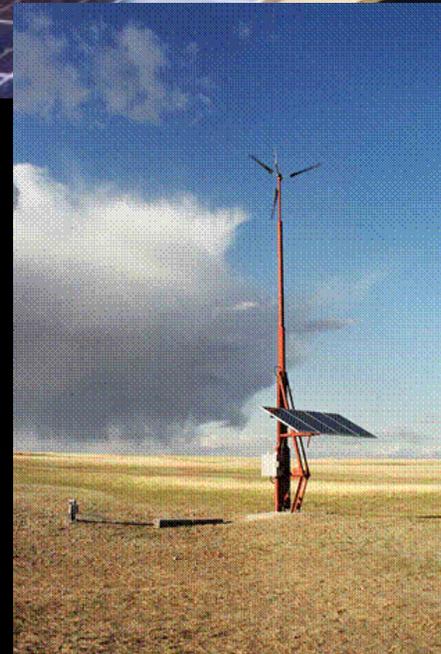


Montana's Solar Resource











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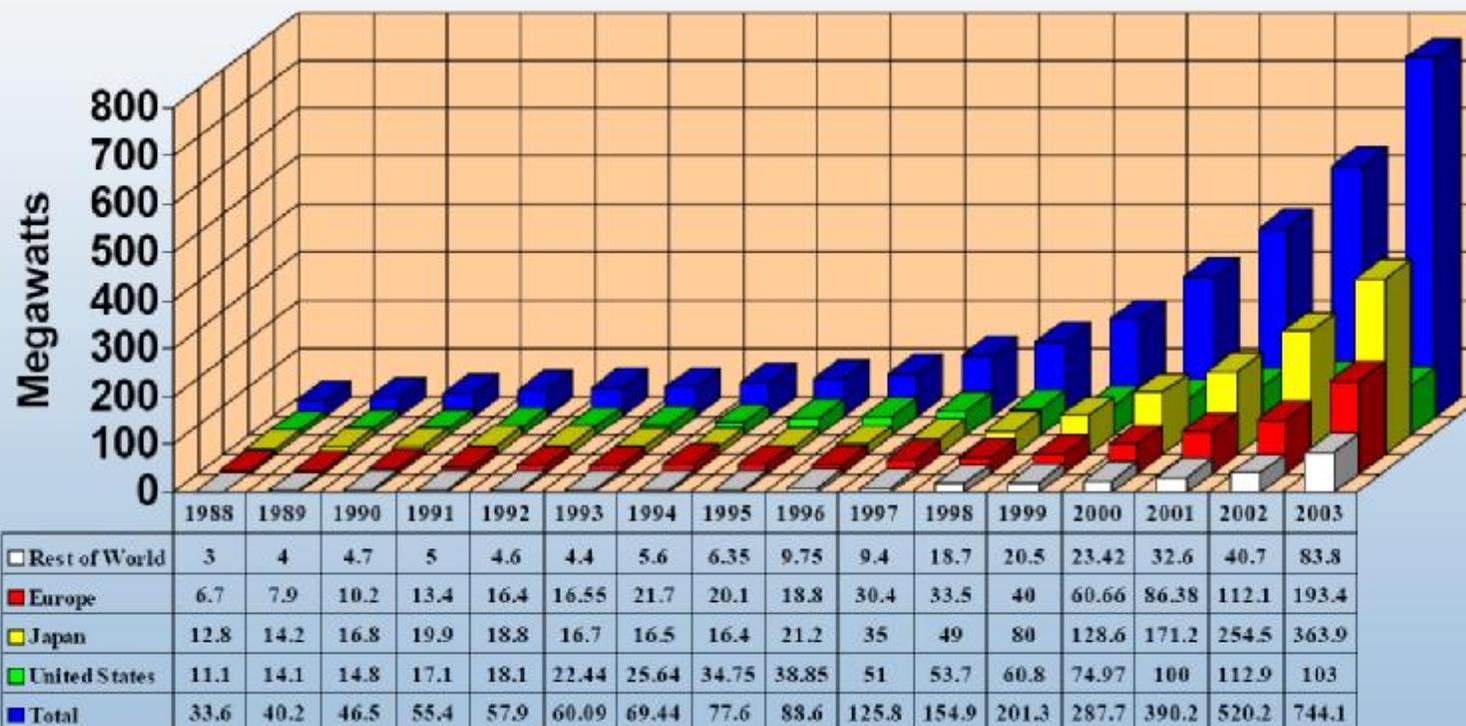
Installed PV Grid-Connected Market 2004

Germany: 320 MW

Japan: 250 MW

US: 65 MW

World PV Cell/Module Production



From PV News, Paul Maycock, editor; yearly February editions.



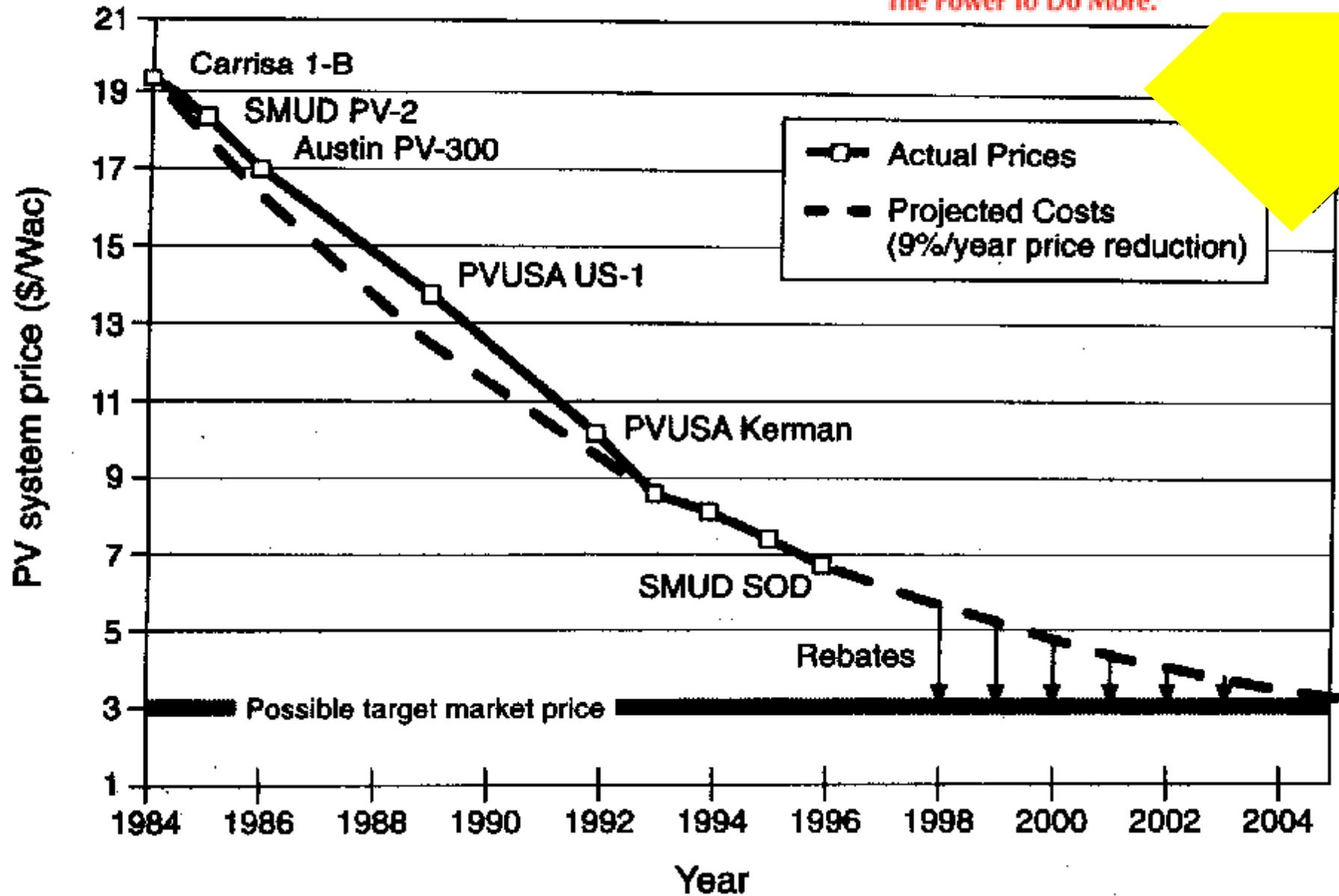
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SMUD

SACRAMENTO MUNICIPAL UTILITY DISTRICT

The Power To Do More.™

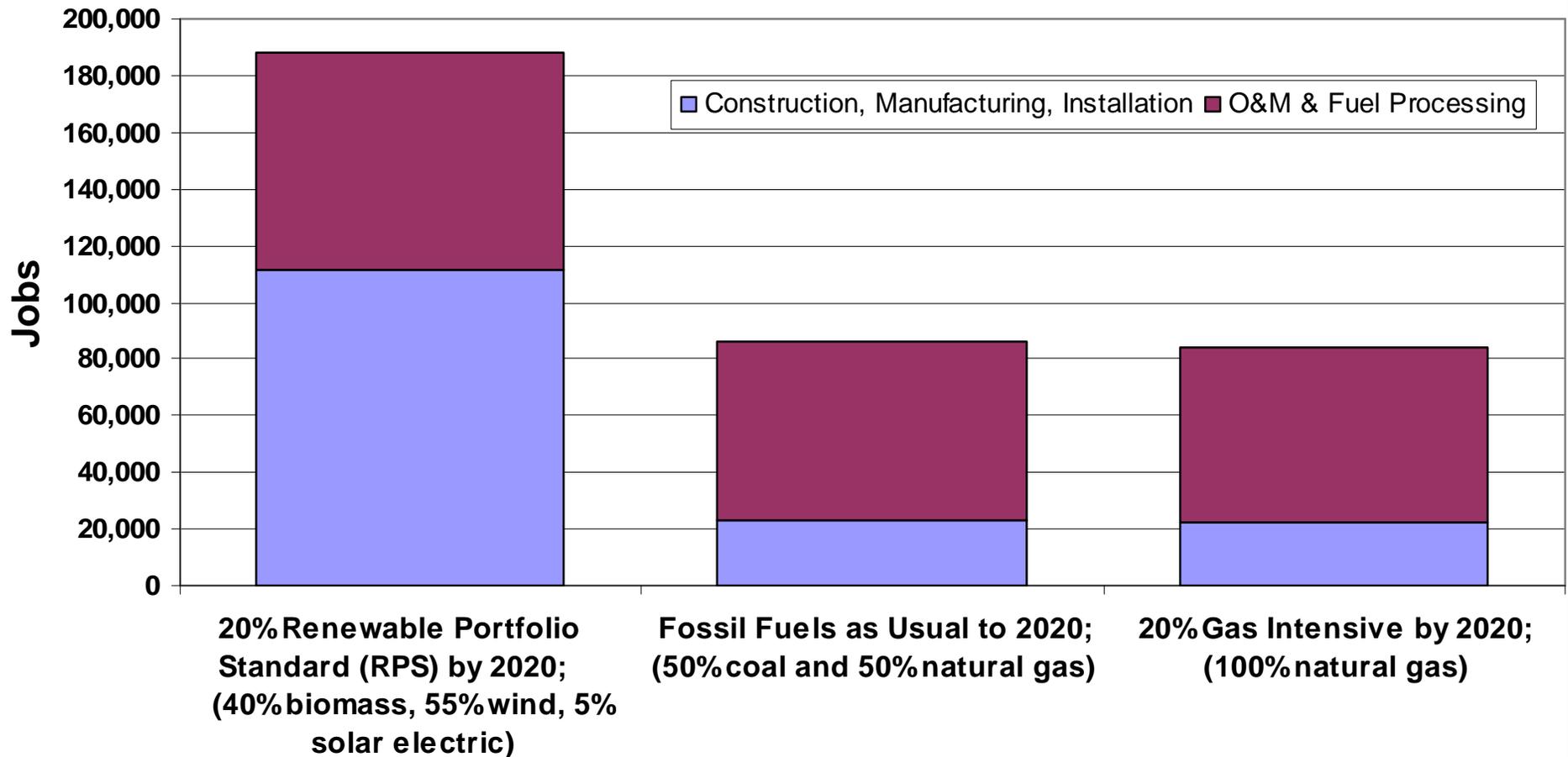








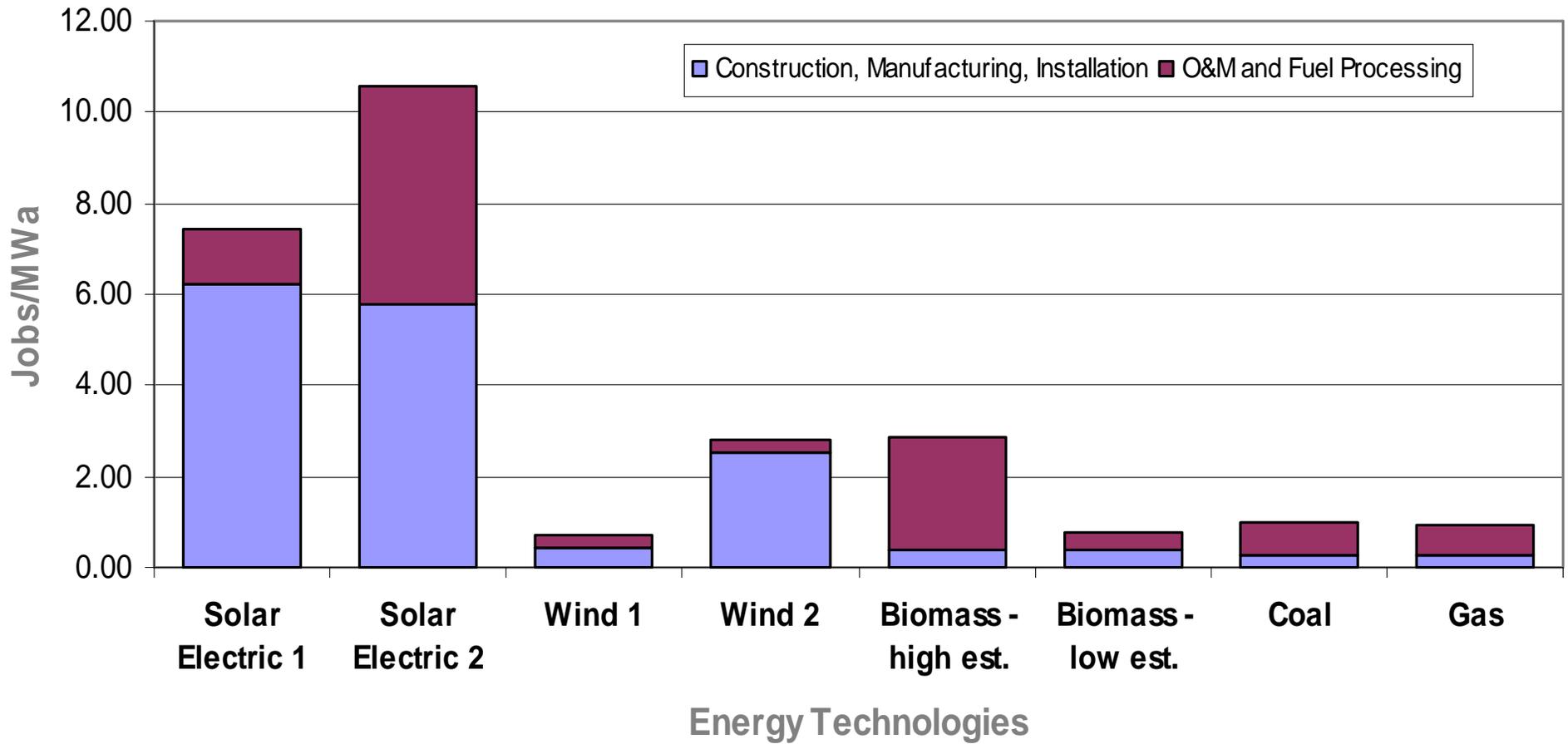
Estimated Employment by Meeting 20% of Current US Electricity Demand



Credit: Table ES-2, [Putting Renewables to Work: How Many Jobs Can the Clean Energy Industry Generate?](#), Energy Resources Group, Goldman School of Public Policy, UC Berkley, April 2004



Average Employment for Different Energy Technologies





WESTERN
GOVERNORS'
ASSOCIATION

Serving the Governors of 18 States and 3 US-Flag Pacific Islands



Solar Task Force Consensus Report

- § achieve 8 GW of solar power by 2015
- § power 4 million homes
- § generate 32,500 new well-paying jobs in manufacturing, construction and installation.



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WESTERN
GOVERNORS'
ASSOCIATION

Serving the Governors of 18 States and 3 US-Flag Pacific Islands



Solar Task Force Consensus Report

“During the next 50 years, the population of the Western States is likely to double, creating the need for over 200 GW of new energy supply. The only environmentally compatible resource that can provide energy on that scale is solar energy.”

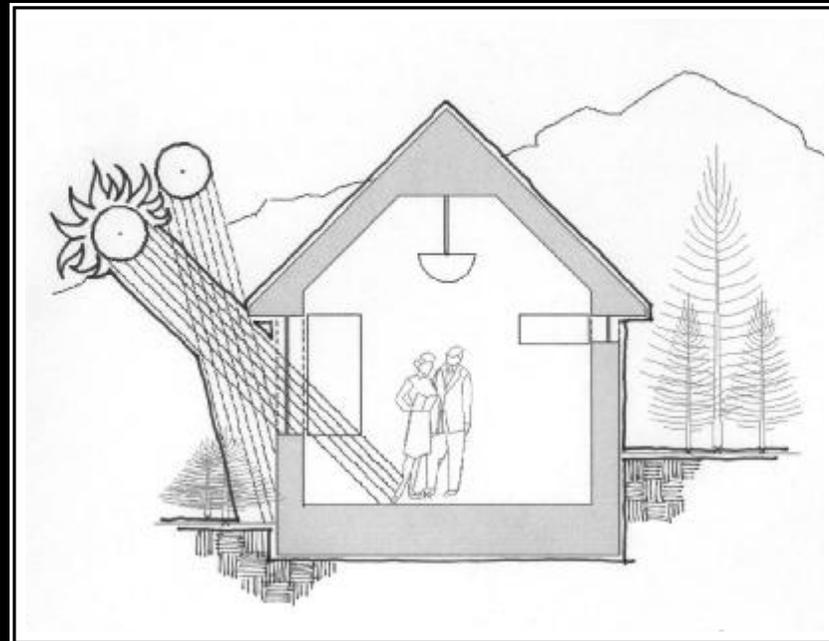
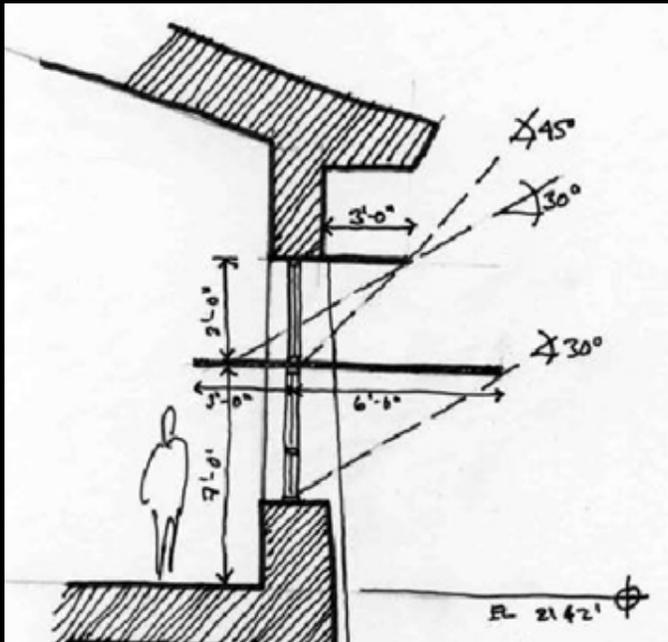


Solar Tempering

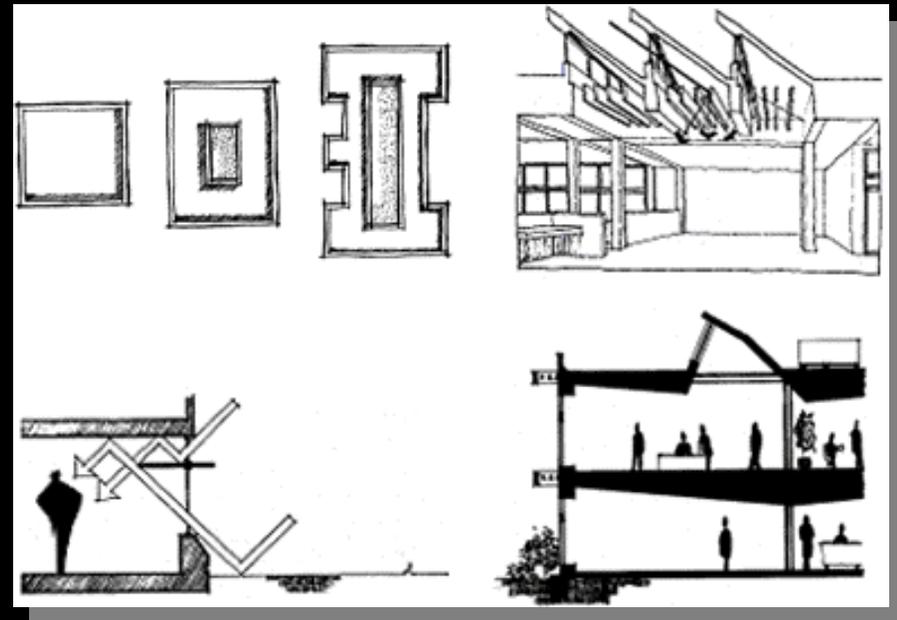
Daylighting

Natural Ventilation

Solar Geometry



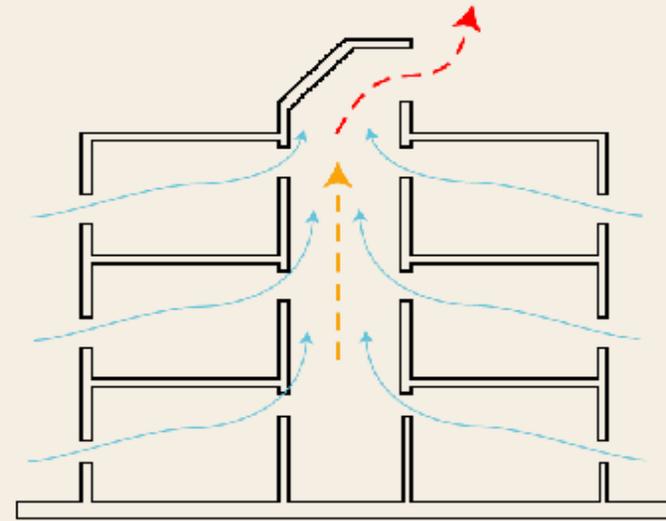
Solar Tempering
Daylighting
Natural Ventilation



Solar Tempering

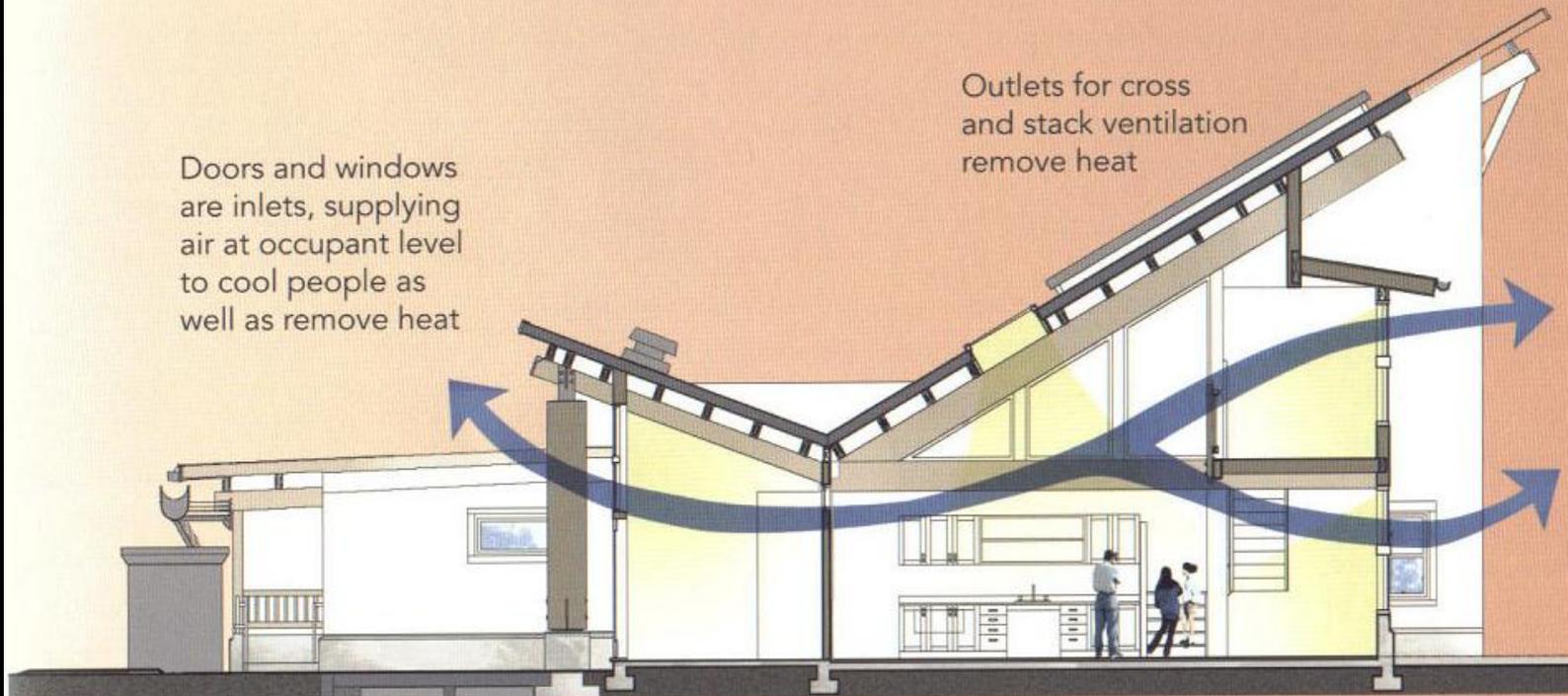
Daylighting

Natural Ventilation



Doors and windows are inlets, supplying air at occupant level to cool people as well as remove heat

Outlets for cross and stack ventilation remove heat



Renewable Energy (Point of Use)

§ **Safer** (Secure and Clean)

Renewable Energy (At a Self-generation Scale)

§ Safer (Secure and Clean)

§ **More Democratic** (Empowering Consumer Choice)

Renewable Energy (At a Self-generation Scale)

§ Safer (Secure and Clean)

§ More Democratic (Empowering Consumer Choice)

§ Cost Effective (In the Long-term)

The Zero-Energy Concept

- Produced “82%” of energy onsite in first year
- Expect to achieve ZEB status in 2003



Habitat House

- Photovoltaics
- Energy-saving Windows
- High Efficiency HVAC
- High Efficiency Appliances
- Heat Pump Water Heater
- Waste Heat Recovery

How to Promote Renewable Energy:

- § **Uniform, User Friendly, Interconnection Policies Across All Utilities**

How to Promote Renewable Energy:

- § Uniform, User Friendly, Interconnection Policies Across All Utilities
- § **Uniform and Progressive Net Metering**

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- § Uniform, User Friendly, Interconnection Policies Across All Utilities
 - § Uniform and Progressive Net Metering
 - § **Provide Long-term Tax Credits**
-

How to Promote Renewable Energy:

- § Uniform, User Friendly, Interconnection Policies Across All Utilities
 - § Uniform and Progressive Net Metering
 - § Provide Long-term Tax Credits
 - § **Provide Low-interest Financing**
-

How to Promote Renewable Energy:

- § Uniform, User Friendly, Interconnection Policies Across All Utilities
 - § Uniform and Progressive Net Metering
 - § Provide Long-term Tax Credits
 - § Provide Low-interest Financing
 - § **Professional/Consumer Education & Training**
-

How to Promote Renewable Energy:

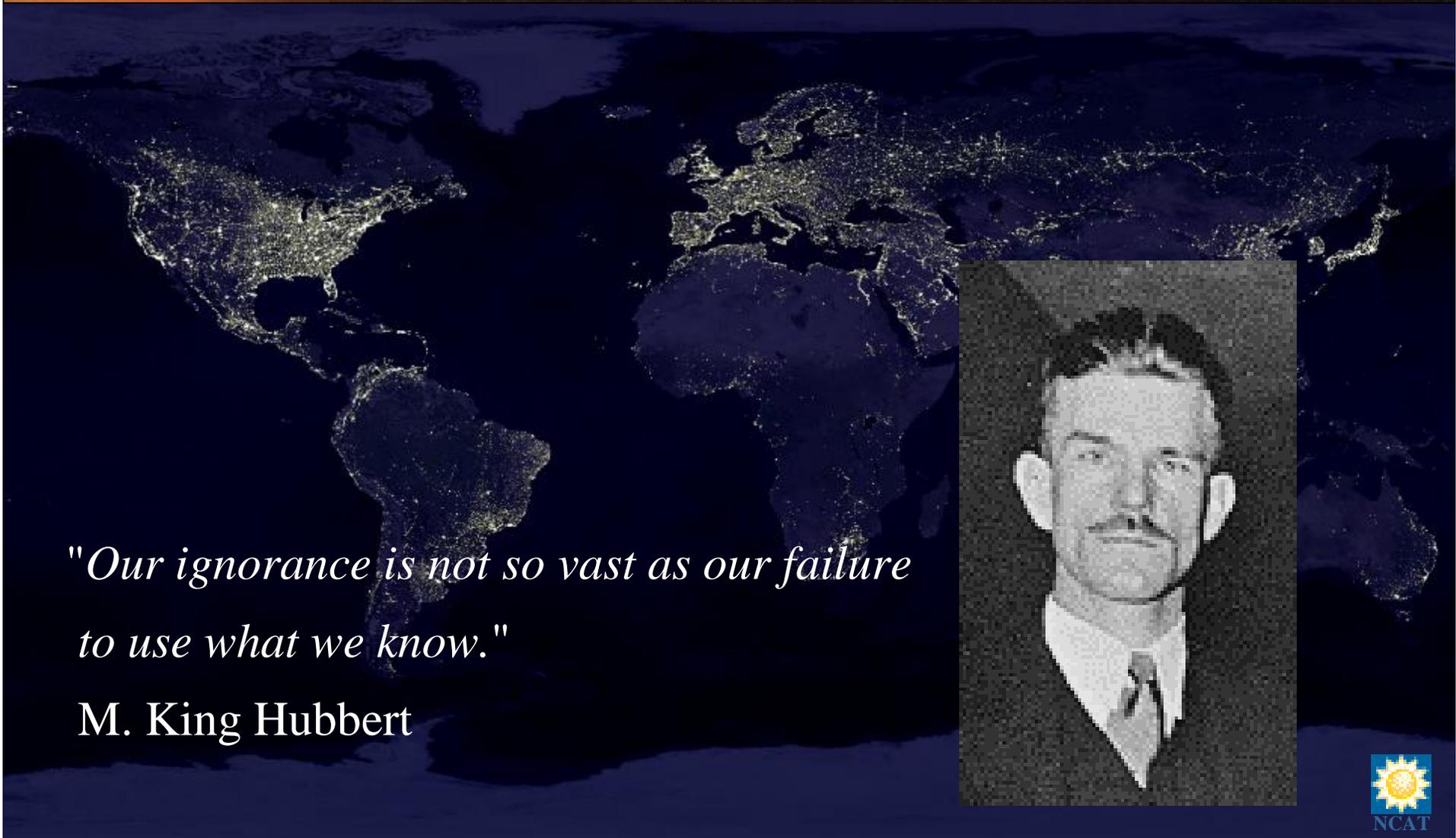
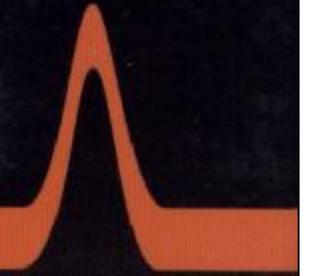
- § Uniform, User Friendly, Interconnection Policies Across All Utilities
 - § Uniform and Progressive Net Metering
 - § Provide Long-term Tax Credits
 - § Provide Low-interest Financing
 - § Professional/Consumer Education & Training
 - § **Efficiency/Solar/Wind-Friendly Rate Schedules**
-

How to Promote Renewable Energy:

“Our basic and most difficult question is how to raise the price of scarce energy with minimum disruption of our economic system and greater equity in bearing the financial burden.”



Hubbert's Peak



"Our ignorance is not so vast as our failure to use what we know."

M. King Hubbert



www.montanagreenpower.com

State Incentives Database:

<http://www.dsireusa.org/>

Montana Incentives:

<http://www.deq.state.mt.us/energy/Renewable>

Draft Report of the WGA Solar Task Force

<http://www.westgov.org/wga/initiatives/cdeac/solar.htm>

Thank You.



2005 Energy Policy Act

30% Residential and Business Tax Credits for Two Years

- Fuel Cells (\$500/kW cap)
- Photovoltaics (\$2,000 cap)
- Solar Thermal (\$2,000 cap)

After available state or utility incentives are taken.

Utility Incentives Tax Exemption (Likely)

Production Tax Credit for Wind and Biomass (\$.018/kWh)

Montana

Corporate 5-Year Property Tax Exemption

Corporate Tax Credit

Geothermal Tax Credit (\$1500)

Personal Tax Credit (\$500)

Residential Property Tax Exemption

State Loan Program (Max \$40,000 at 5% interest)



Business Credit vs. Residential Credit

	Old Incentive	New Incentive	Credit window	Cap	Eligible technologies
Business credit	10%	30%	1/1/06 - 12/31/07 at 30%; reverts to permanent 10% thereafter	No cap	PV, CSP, solar hybrid lighting, solar domestic water heating (excluding pool heating)
Residential credit	None	30%	1/1/06 - 12/31/07	\$2,000 per system/ for each solar technology	PV, solar domestic water heating (excluding pool heating)

How to Make Energy Finding Energy Solutions Easier?

- § Take a Short Term Point of View (4 to 8 Years).
 - § Ignore the Geopolitical Ramifications of Current Energy Policy.
 - § Ignore Global Climate Change.
 - § Ignore the Environmental Impacts of Energy Options.
 - § Ignore Trends in World Energy Supply and Demand.
 - § Ignore the Vulnerability of Centralized Energy Supply Systems.
 - § Ignore the Plight of the Disadvantaged.
 - § Fail to plan for a Sustainable Energy Economy
-