

# Office of Energy Efficiency and Renewable Energy U.S. Department of Energy



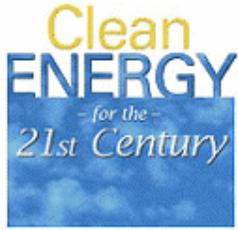
## *Green Power Initiatives at the U.S. Department of Energy*

—Remarks for the 5<sup>th</sup> Annual Green Power  
Conference

**August 7, 2000**

**Dan W. Reicher**  
**Assistant Secretary**



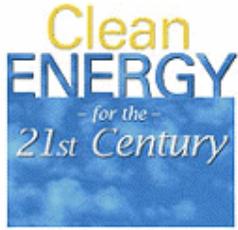


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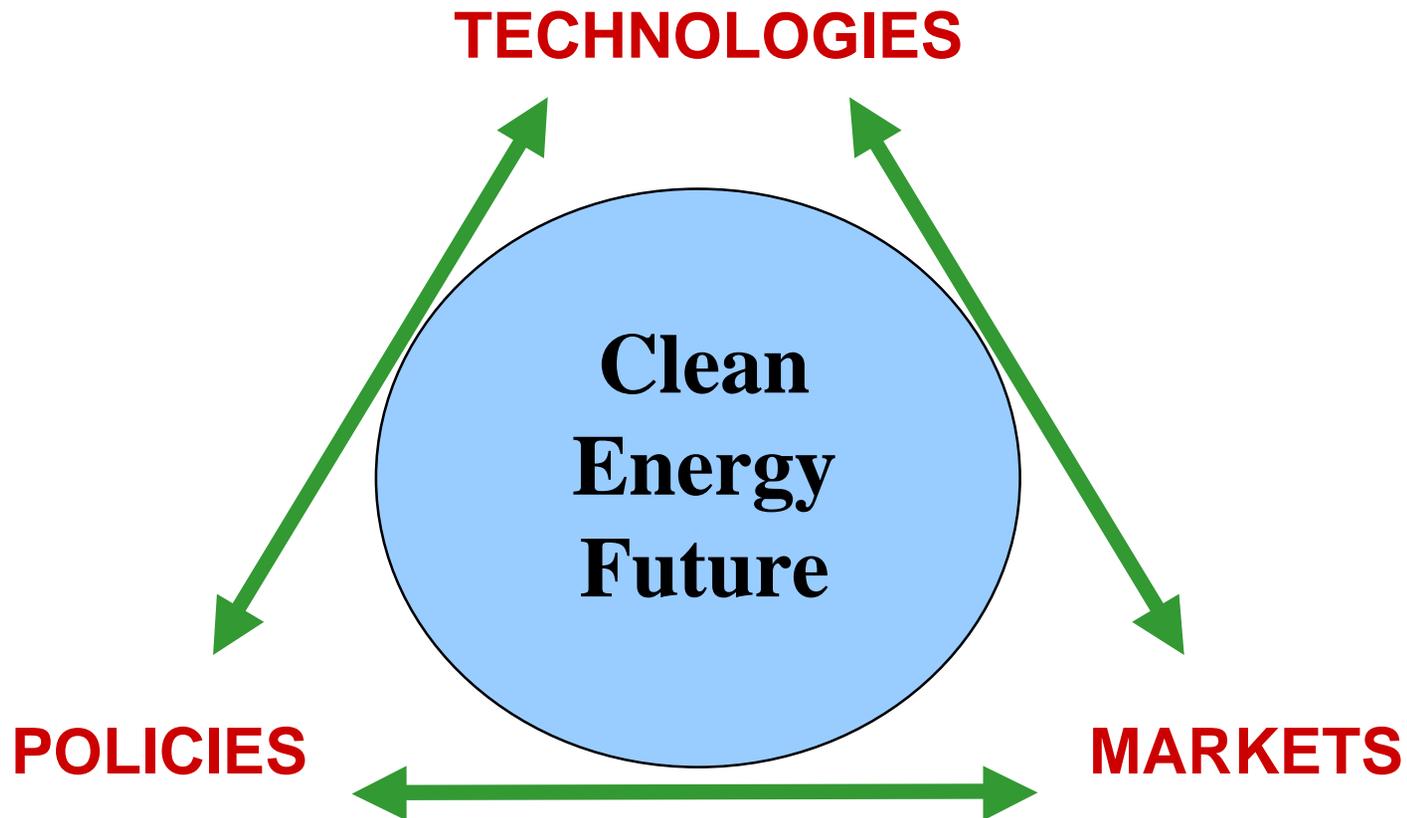
## 5 Years Ago...

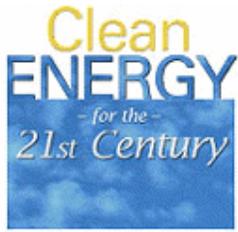
- First Green Pricing Workshop
- Only a Handful of Utilities Had Green Pricing
- No State Electricity Competition or Choice
- No Substantial Green Power Purchases



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# THE ELEMENTS OF SUCCESS





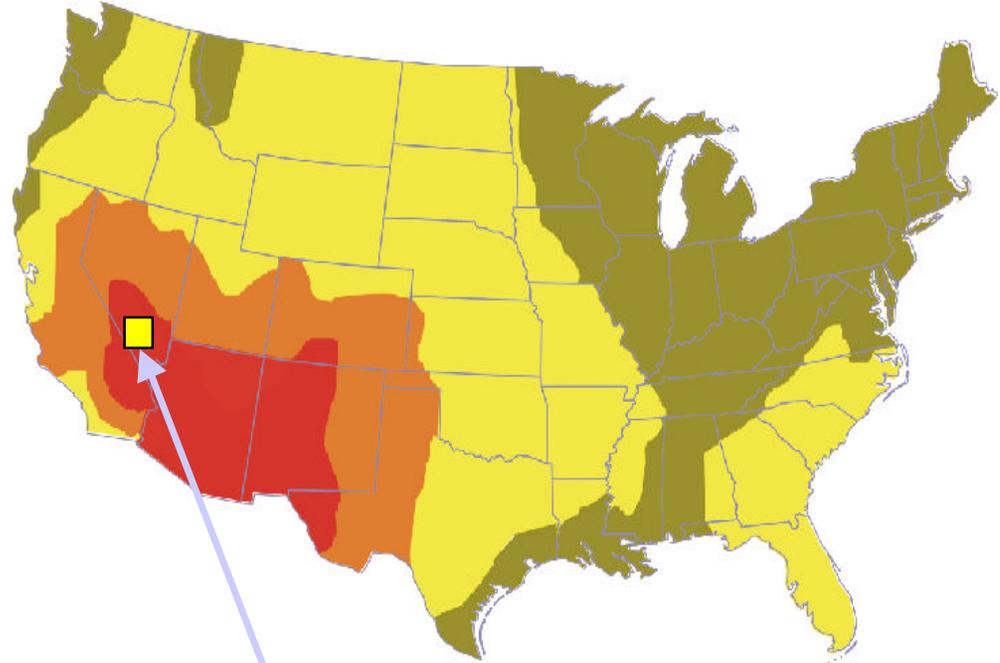
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# Photovoltaics

**1980:  
\$1.00/kWh**

**2000:  
~20¢/kWh**

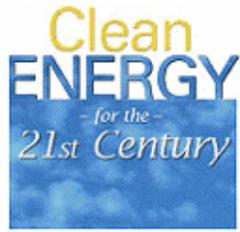
**2005:  
~10¢/kWh**



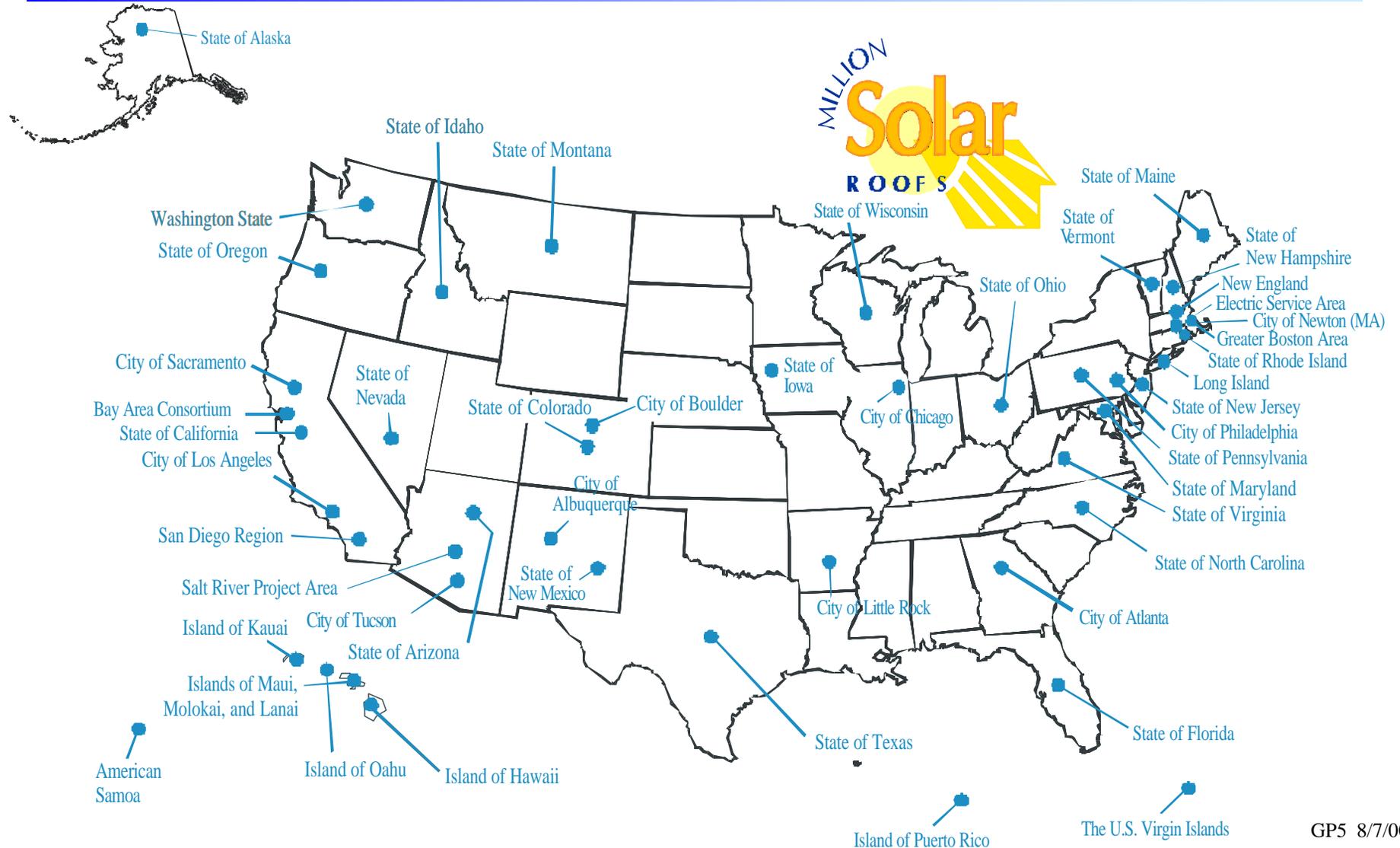
Solar can supply all electricity for the U.S. using this area (100x100 mi.) in the SW\*

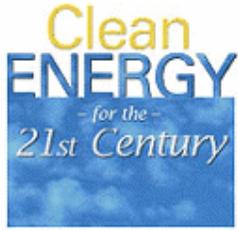
Using a distributed approach with systems installed on buildings, vacant land, and parking lots the same result could be achieved with PV in every state.

\*SOURCE: A Realizable Renewable Energy Future, Science Magazine, July 30, 1999



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**1979: 40 cents/kWh**

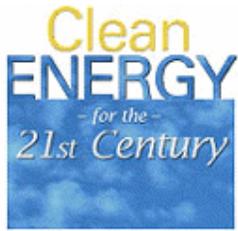
**2000: 4-6  
cents/kWh**

- Increased
- R&D Advances
- Manufacturing

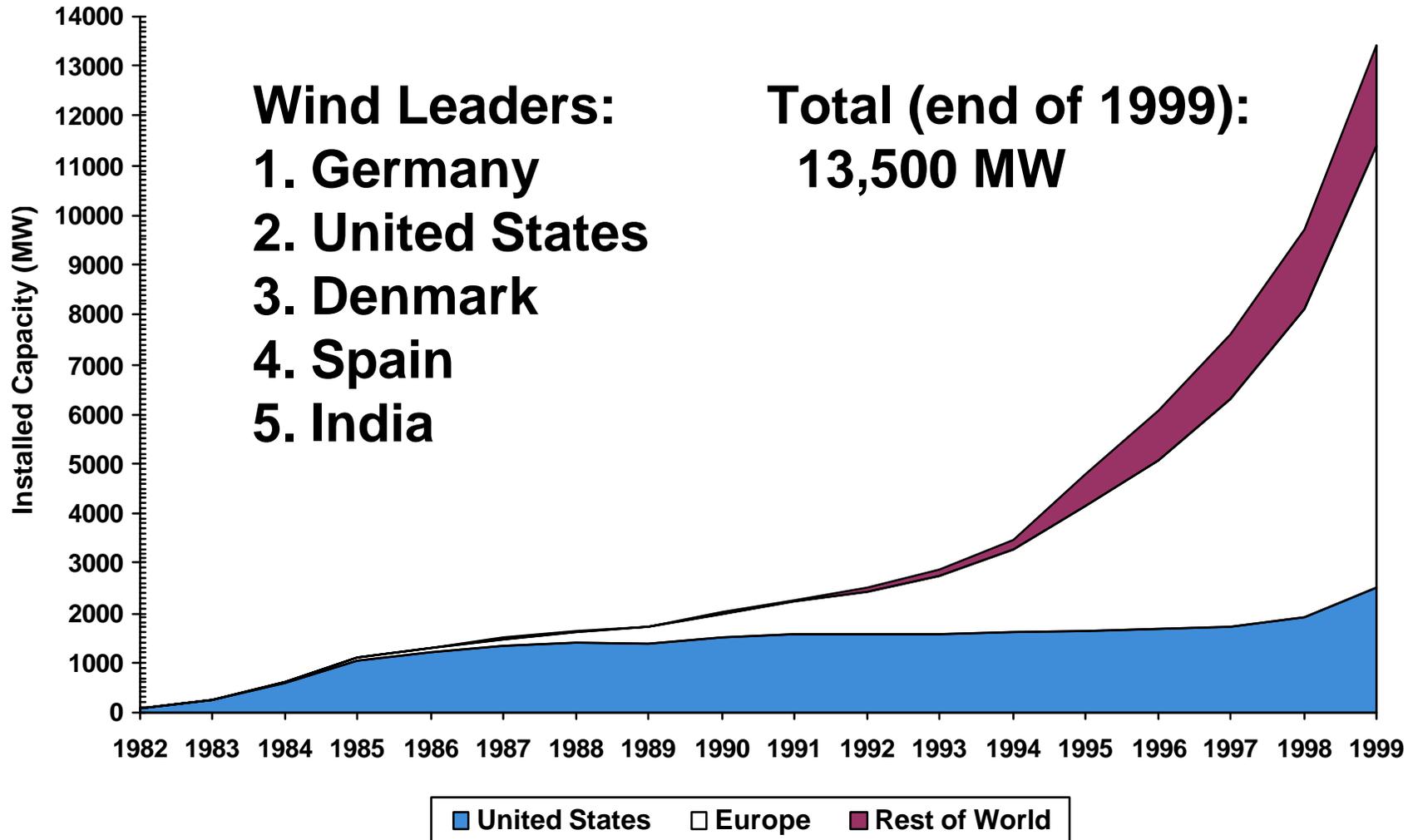


NSP 107 MW Lake Benton wind farm  
4 cents/kWh (unsubsidized)

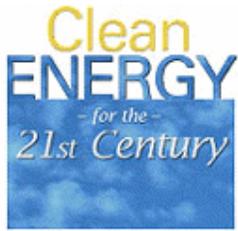
**2007 Goal: 2-4 cents/kWh**



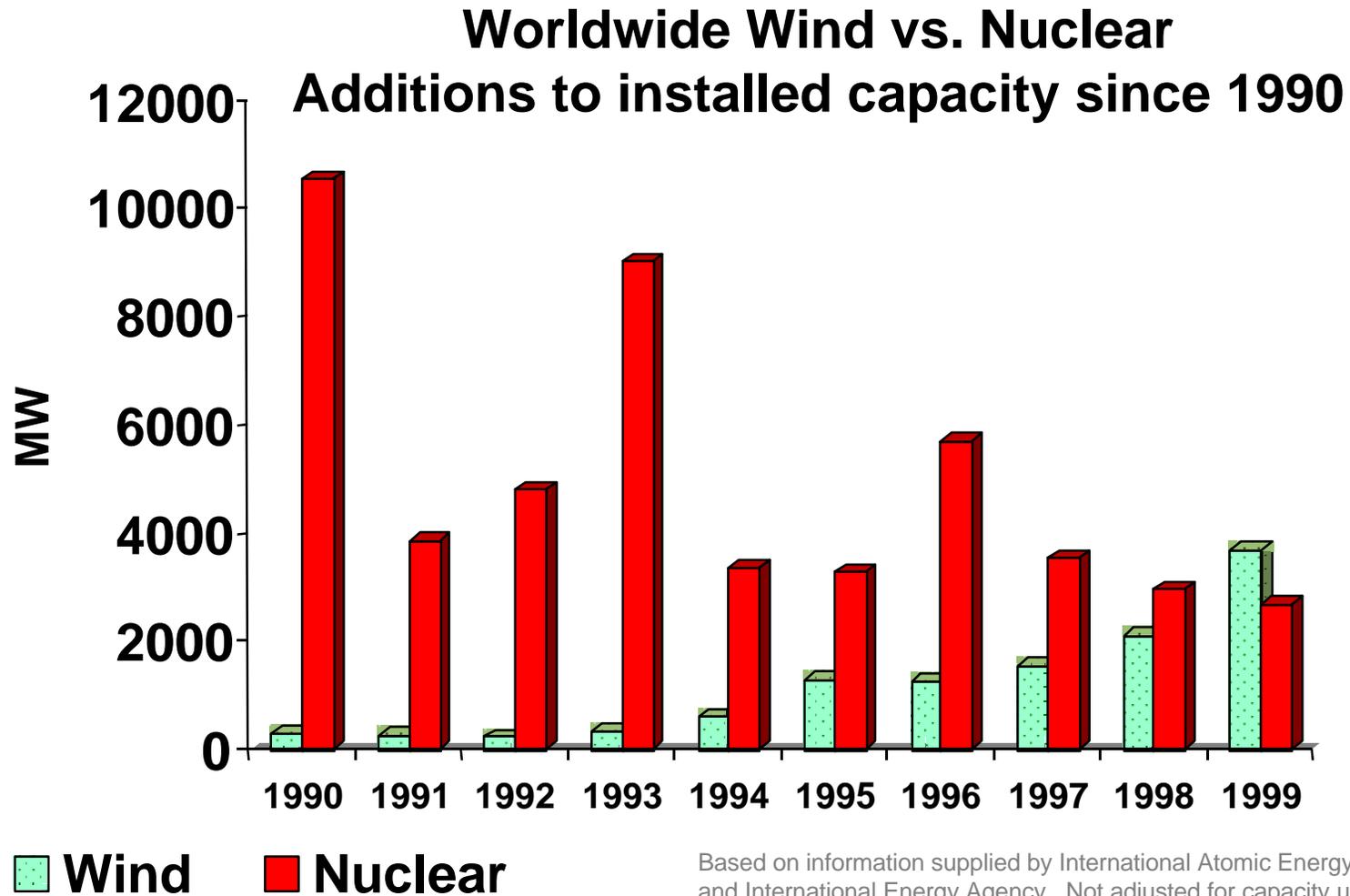
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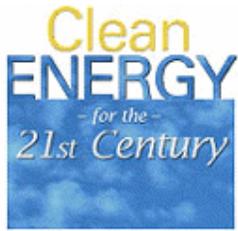
Based on information supplied by International Energy Agency.



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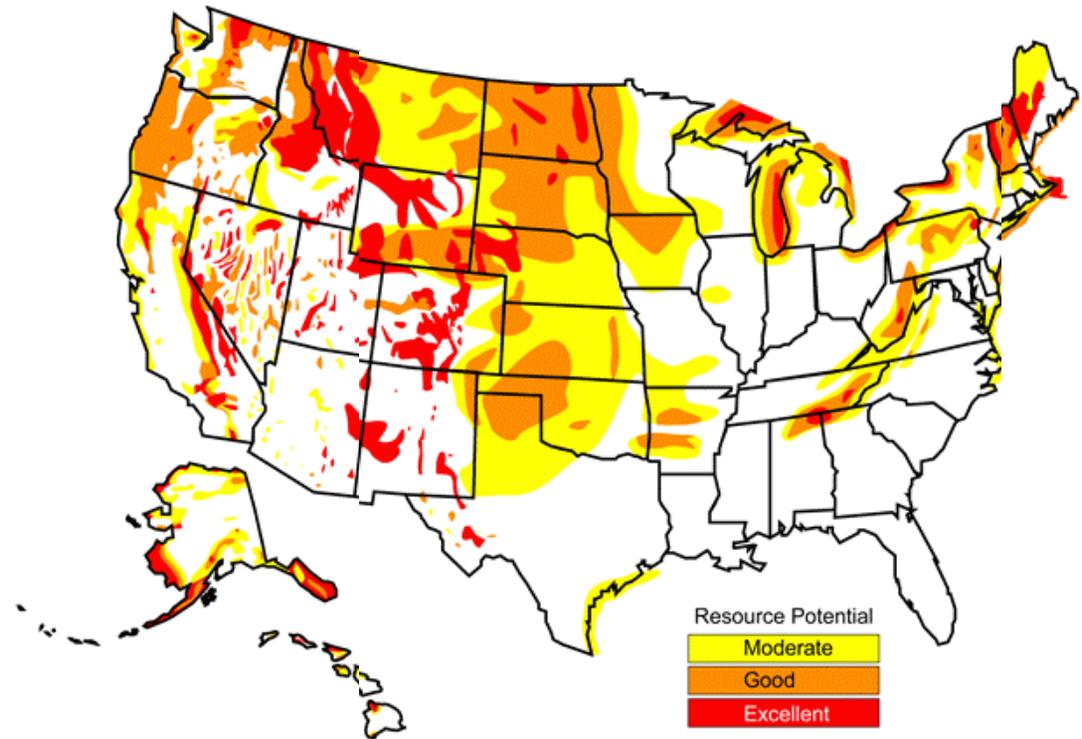
Based on information supplied by International Atomic Energy Agency and International Energy Agency. Not adjusted for capacity utilization.



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Rank	State
1	North Dakota
2	Texas
3	Kansas
4	South Dakota
5	Montana
6	Nebraska
7	Wyoming
8	Oklahoma
9	Minnesota
10	Iowa
11	Colorado
12	New Mexico
13	Idaho
14	Michigan
15	New York
16	Illinois
17	California

**Wind: An All American Resource**

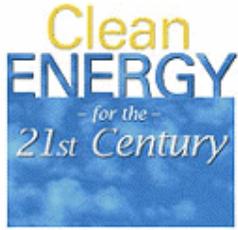


**World Class Wind Potential**

Germany's Potential: 100 GW  
North Dakota's Potential: 250 GW

Source: AWEA





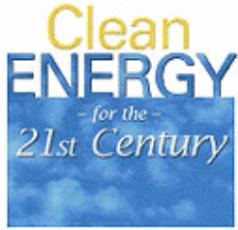
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### GOALS

- **5% of nation's electricity by 2020**
- **Double the states with >20 MW installed to 16 by 2005, and then to 24 by 2010**
- **5% of Federal electricity use by 2010 (1,000 MW)**





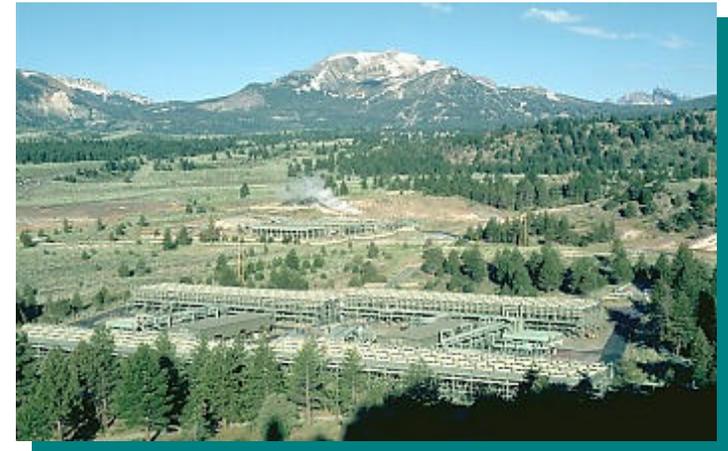
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## Geothermal Energy

1985: 15-16 cents/kWh

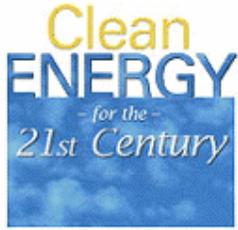
- More industry experience
- Improved drilling technology
- Economies of scale
- Reduced cost of finance

2000:  
5-8 cents/kWh

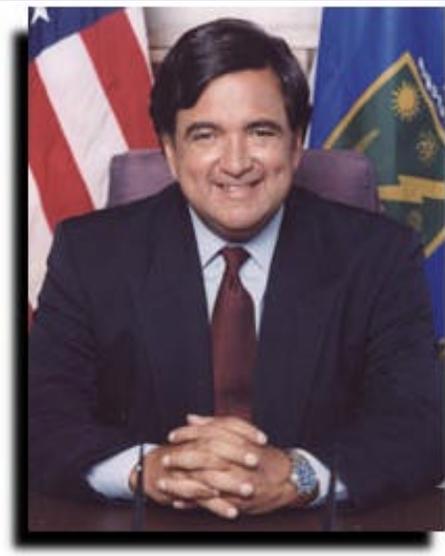


Mammoth Pacific  
Geothermal Facility

2003:  
4-6 cents/kWh



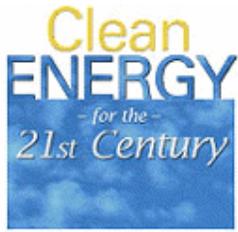
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*“Geothermal power is a clean, reliable and renewable energy source available in all western states.... We are confident that this initiative will help to increase the power produced by this existing resource and make it a major contributor to our clean energy mix.”*

**Bill Richardson, Secretary of Energy**

- **Announced January 2000 with Senator Reid**
- **Double the states with geothermal facilities to eight by 2006**
- **Seven million homes using geothermal energy by 2010**
- **10% of the electricity use of 19 Western states by 2020**



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## Biobased Products and Bioenergy Initiative

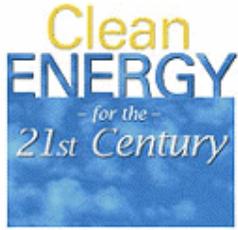


- USES**
- Fuels:
    - Ethanol
    - Renewable Diesel
  - Electricity
  - Heat
  - Chemicals
    - Plastics
    - Solvents
    - Pharmaceuticals
    - Chemical Intermediates
    - Phenolics
    - Adhesives
    - Furfural
    - Fatty acids
    - Acetic Acid
    - Carbon black
    - Paints
    - Dyes, Pigments, and Ink
    - Detergents
    - Etc.

- Biomass Feedstock**
- Trees
  - Grasses
  - Agricultural Crops
  - Agricultural Residues
  - Animal Wastes
  - Municipal Solid Waste

### Conversion Processes

- Enzymatic Fermentation
- Gas/liquid Fermentation
- Acid Hydrolysis/Fermentation
- Gasification
- Combustion
- Co-firing



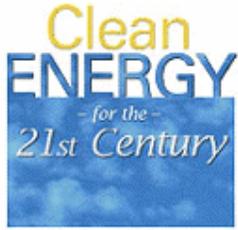
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## **Goal**

**To triple U.S. use of  
biobased products and  
bioenergy by 2010**

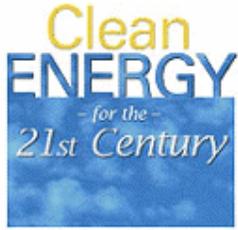
**President Clinton  
Executive Memorandum  
August 12, 1999**



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- **Landfill gas is not only renewable, but also avoids emission of methane**
- **50% of landfill gas is methane - a powerful greenhouse gas**





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**Gasification Cost of Electricity**

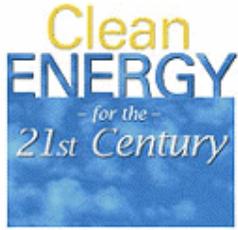
**1995:  
8¢/kWh**

**2000:  
7¢/kWh**

**2010:  
6¢/kWh**



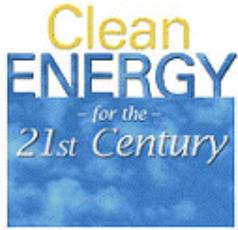
- ❖ Combined gas-turbine with steam cycle
- ❖ Hot-gas clean-up
- ❖ Increased types of biomass fuels



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- Million Solar Roofs
- Wind Powering America
- Bioenergy Initiative
- GeoPowering the West



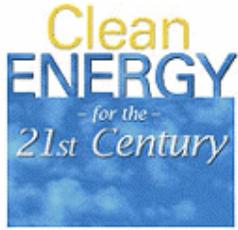


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## Today ... !

- Fifth Green Power Conference
- More than 80 Utilities with Green Pricing
- 24 States with Competition/Choice
- 22 Green Power Products
- Major Green Power Purchases by Industry and Government

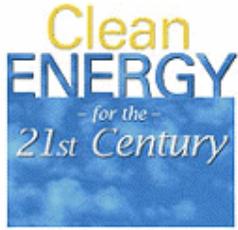


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## EERE Mission

*Lead the Nation in research, development & deployment of advanced energy efficiency and clean power technologies and practices, providing Americans with a stronger economy, healthier environment and more secure future.*

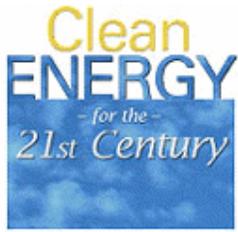


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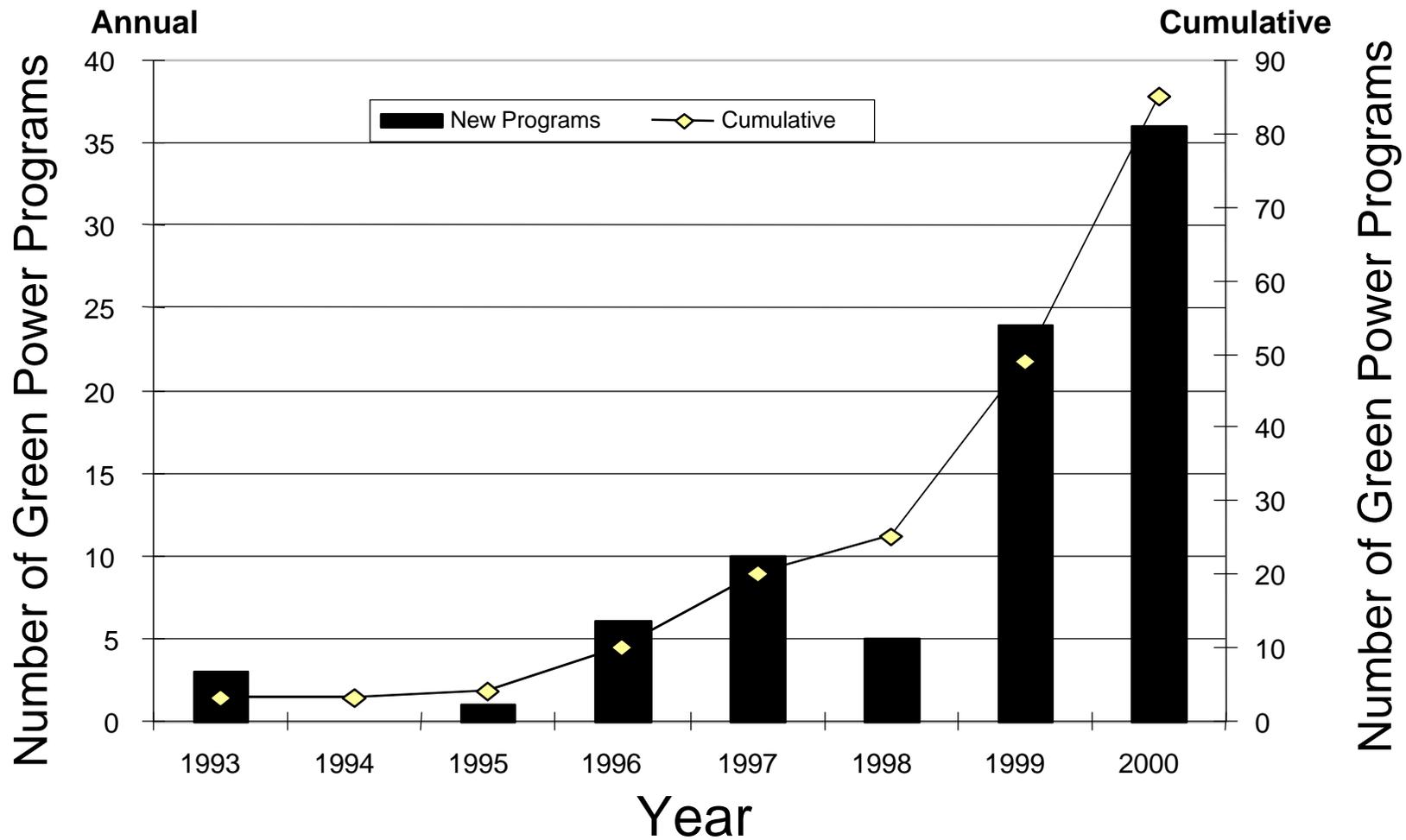
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## Today ... !

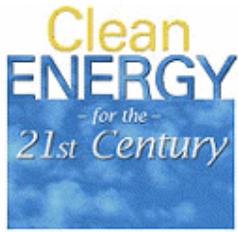
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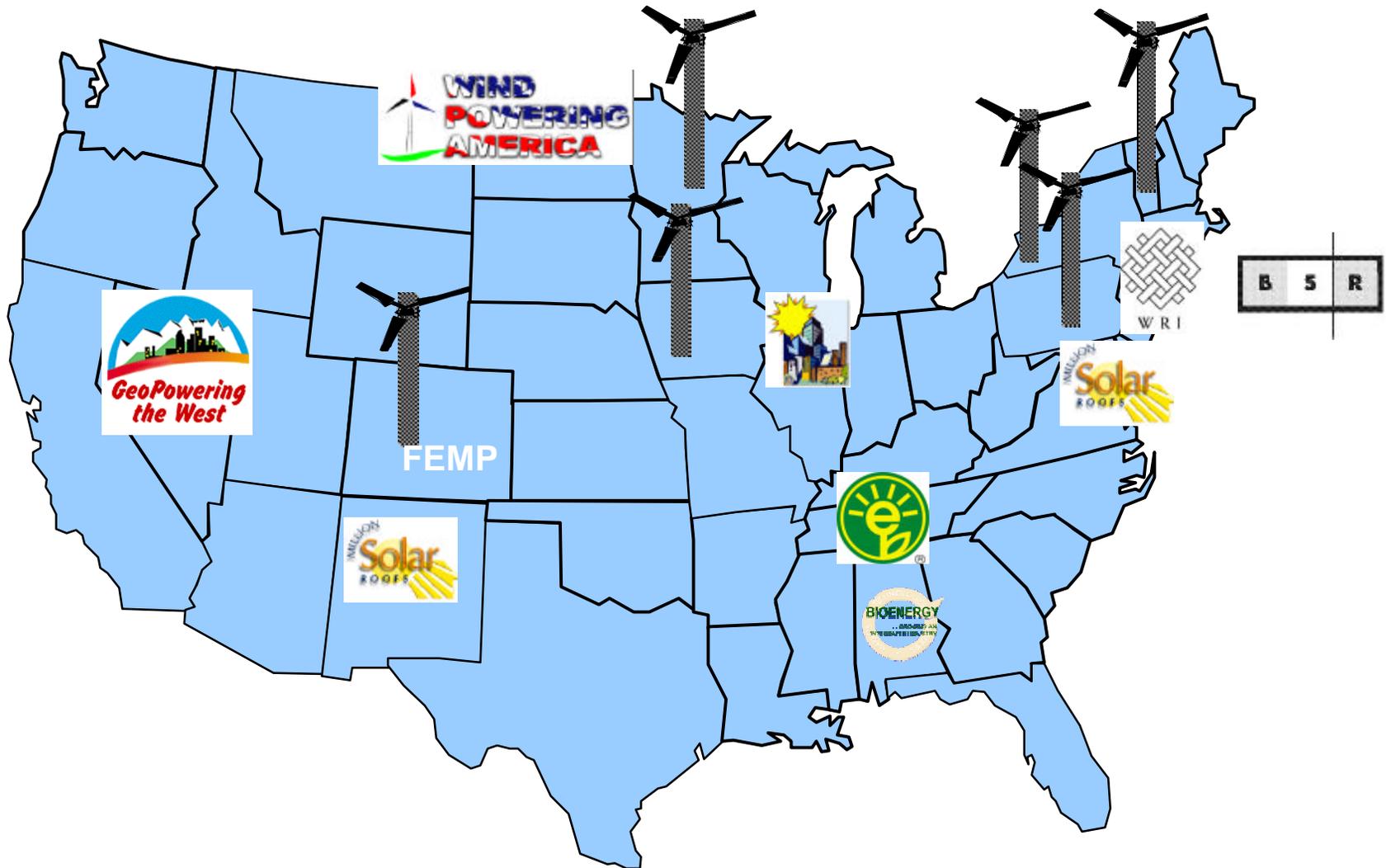
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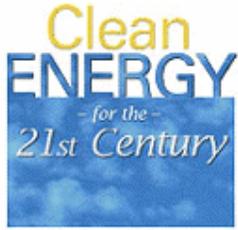






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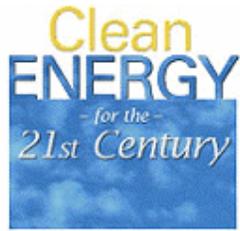


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## **CHICAGO GOES GREEN!**

- **400 MW Competitive Procurement**
- **20% Renewable by 2005**
- **Must also reduce CO<sub>2</sub>, NO<sub>x</sub>, SO<sub>2</sub> in other ways**

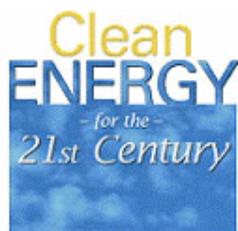




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# Brightfields



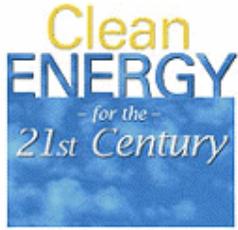


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## **Green Power for a Green LA**

*Our goal is to replace electricity generated from polluting power plants with green power*

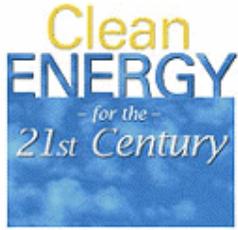




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## *Greening the Government* Executive Order : Major Goals

- 35% improvement in buildings energy efficiency by 2010
  - Build on 30% goal for 2005
- 25% improvement in industrial/laboratory facilities by 2010
  - Builds on 20% goal for 2005
- 30% reduction in greenhouse gas emissions by 2010
- Expand use of renewable energy
  - Greater number of renewable systems at Federal facilities
  - Enhanced purchase of green power
  - Meet million solar roofs goals at Federal facilities
- Enhance water conservation

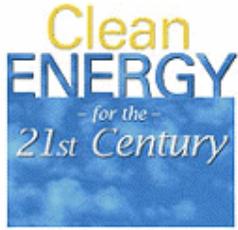


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## **DENVER GREEN POWER PURCHASE**

### **Participating Federal Agencies**

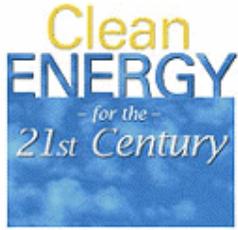
**Bureau of Land Management ❖ Defense Contract Management Agency ❖  
Department of Air Force ❖ Department of Agriculture ❖ Department of  
Army ❖ Department of Education ❖ Department of Energy ❖ Department  
of Health and Human Services ❖ Department of Housing and Urban  
Development ❖ Department of Interior ❖ Department of Justice ❖  
Department of Labor ❖ Department of Veterans Affairs ❖ Environmental  
Protection Agency ❖ Federal Emergency Management Agency ❖ General  
Services Administration ❖ Government Printing Office ❖ National Institute  
of Standards and Technology ❖ National Oceanic and Atmospheric  
Administration ❖ National Park Service ❖ National Renewable Energy  
Laboratory ❖ Office of Personnel Management ❖ Social Security  
Administration ❖ U.S. Geological Survey ❖ U.S. Marshal Service ❖ U.S.  
Mint ❖ Western Area Power Administration**



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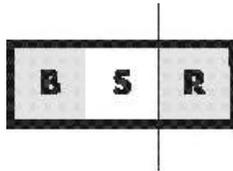
## DOE Commits to More Green Power

- First Federal agency Department-wide commitment to Green Power
- 3% of electricity needs from non-hydro renewables by 2005
- Rising to 7.5% of electricity needs by 2010
- In deregulated states, DOE will competitively select suppliers
- No increase in utility bill expected



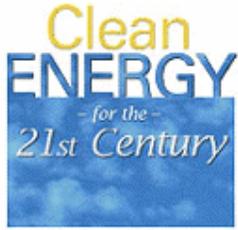
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**Green Power Market Development Group**



<b>Alcoa</b>	<b>GM</b>
<b>Cargill-Dow</b>	<b>Oracle</b>
<b>Delphi</b>	<b>Interface</b>
<b>DuPont</b>	<b>IBM</b>
<b>Kinkos</b>	<b>Pitney Bowes</b>
<b>Johnson &amp; Johnson</b>	

**Account for 7% of  
industrial energy use  
1,000 MW of Green  
Power by 2010**

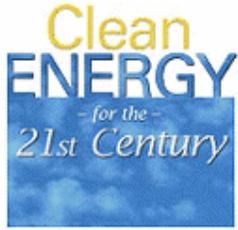


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## 5 Years From Now...?

- Green Power Is Mainstream Power
- Thousands of Green Power Products Offered
- Name Your Price for Green Power from Priceline.com
- Federal Electricity Restructuring Legislation
- Convergence of Renewables and Natural Gas

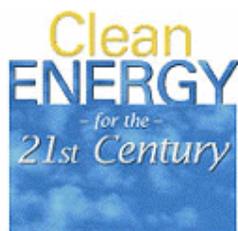


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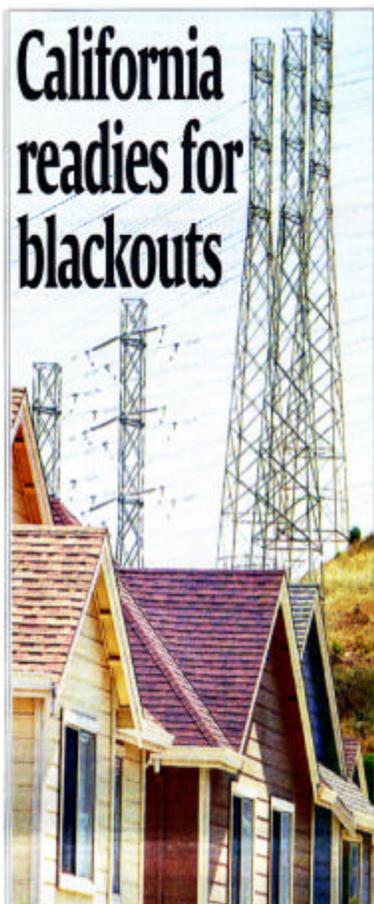
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## Green Power Issues

- Electric Industry Restructuring
- Environmental Regulation
- Climate Change
- Information Technology and Telecommunications
- Cost and Value of Green Power



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Wednesday, August 2, 2000



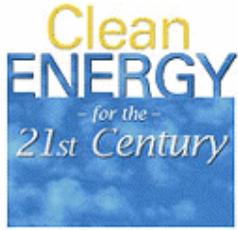
Wednesday, August 2, 2000

## Heat wave, high-tech demands straining power grids — and not just in one state

By Fred Bayles  
USA TODAY

Cover story

nia Independent System Operator,  
which coordinates the state's elec-

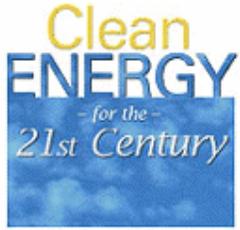


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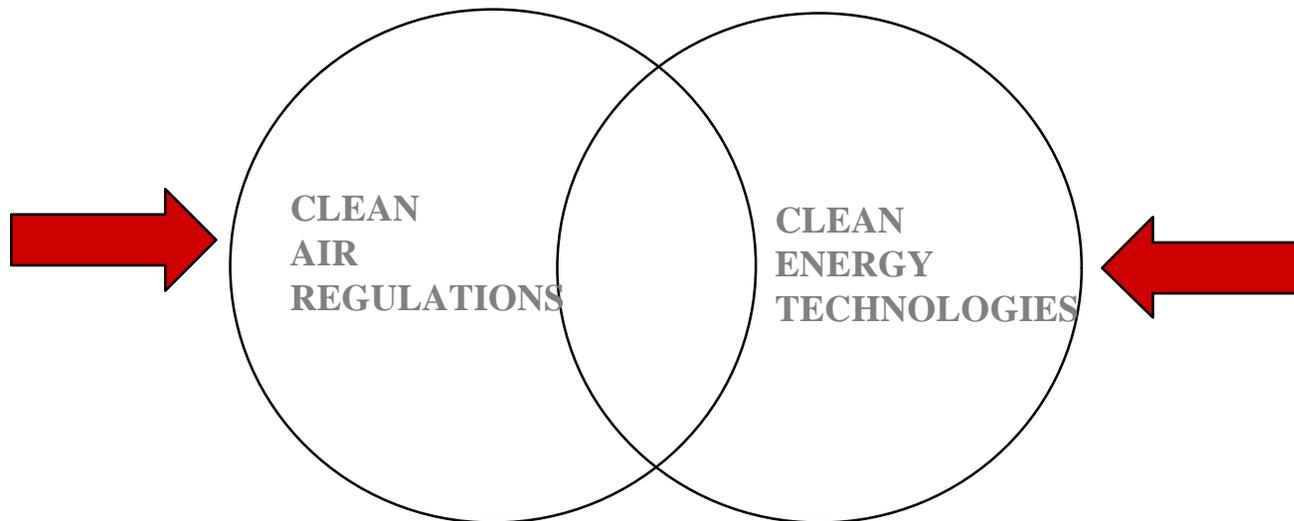
## Comprehensive Electricity Competition Act

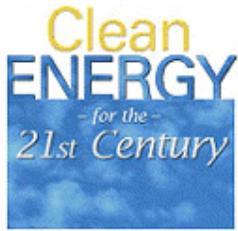
- Renewable Portfolio Standard (RPS) @ 7.5%
- Public Benefits Fund (\$3 billion per year)
- Increased Information Disclosure
- Net Metering
- National Interconnection Standards



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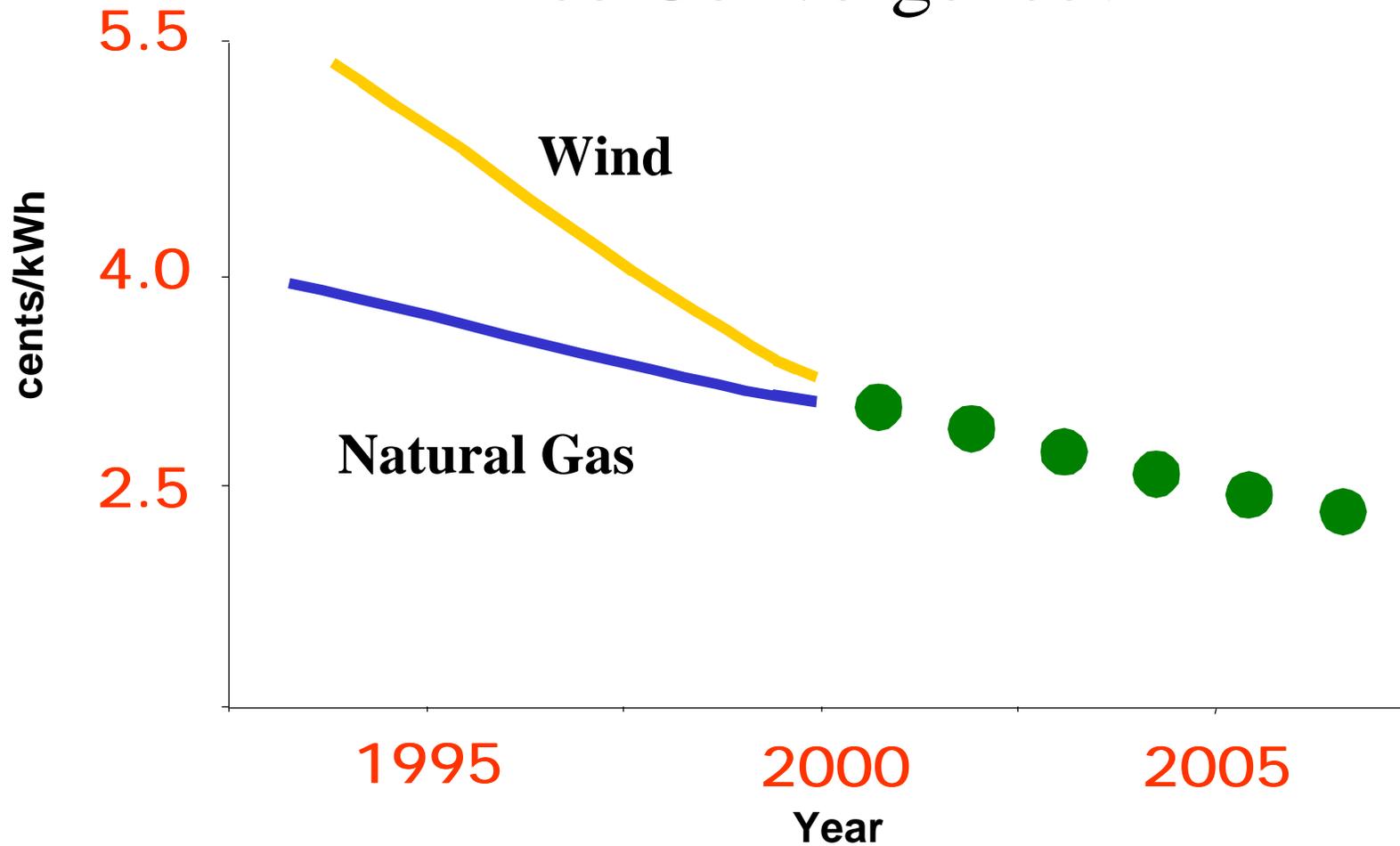
## **OUR CHALLENGE:**

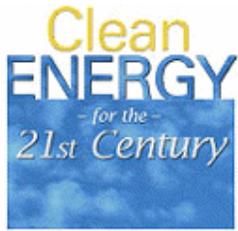




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# Price Convergence?

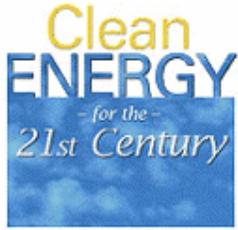




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## Natural Gas and Renewable Energy Alliance

- 
- |   |   |   |   |
|---|---|---|---|
| American Bioenergy Association          | Coalition for Gas-Based Environmental Solutions | Future Energy Resources Corporation           | National BioEnergy Industries Association |
| American Gas Association                | Columbia Energy Group                           | Gas Technology Institute                      | Plug Power                                |
| American Wind Energy Association        | DCH Technology                                  | Geothermal Energy Association                 | Sempra Energy                             |
| BP Amoco                                | Enron Corporation                               | Interstate Natural Gas Association of America | Solar Turbines                            |
| Battelle Commercial Operations          | Distributed Power Coalition of America          | Keyspan Energy                                | Solar Energy Industries Association       |
| Business Council for Sustainable Energy |   |   | Spire Corporation                         |



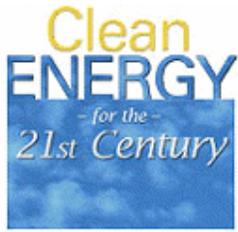
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### Distributed Energy Resources

- **20-40% new generating capacity**
- **Critical for reliability and power quality**
- **Environmental and economic benefits**
- **Systems approach**
  - **electricity, heating, cooling, and mechanical drive**



World's First Residential Fuel Cell - New York



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Heating  
&  
Cooling  
Guarantee

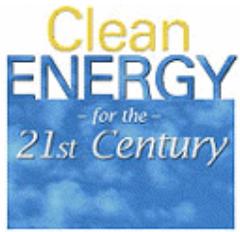


Less than  
**94¢**  
per day

Tortolita Plan

**Carborne Home  
Rochester, New York**

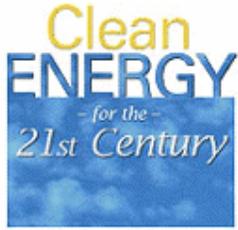
**The Civano Community  
Tucson, Arizona**



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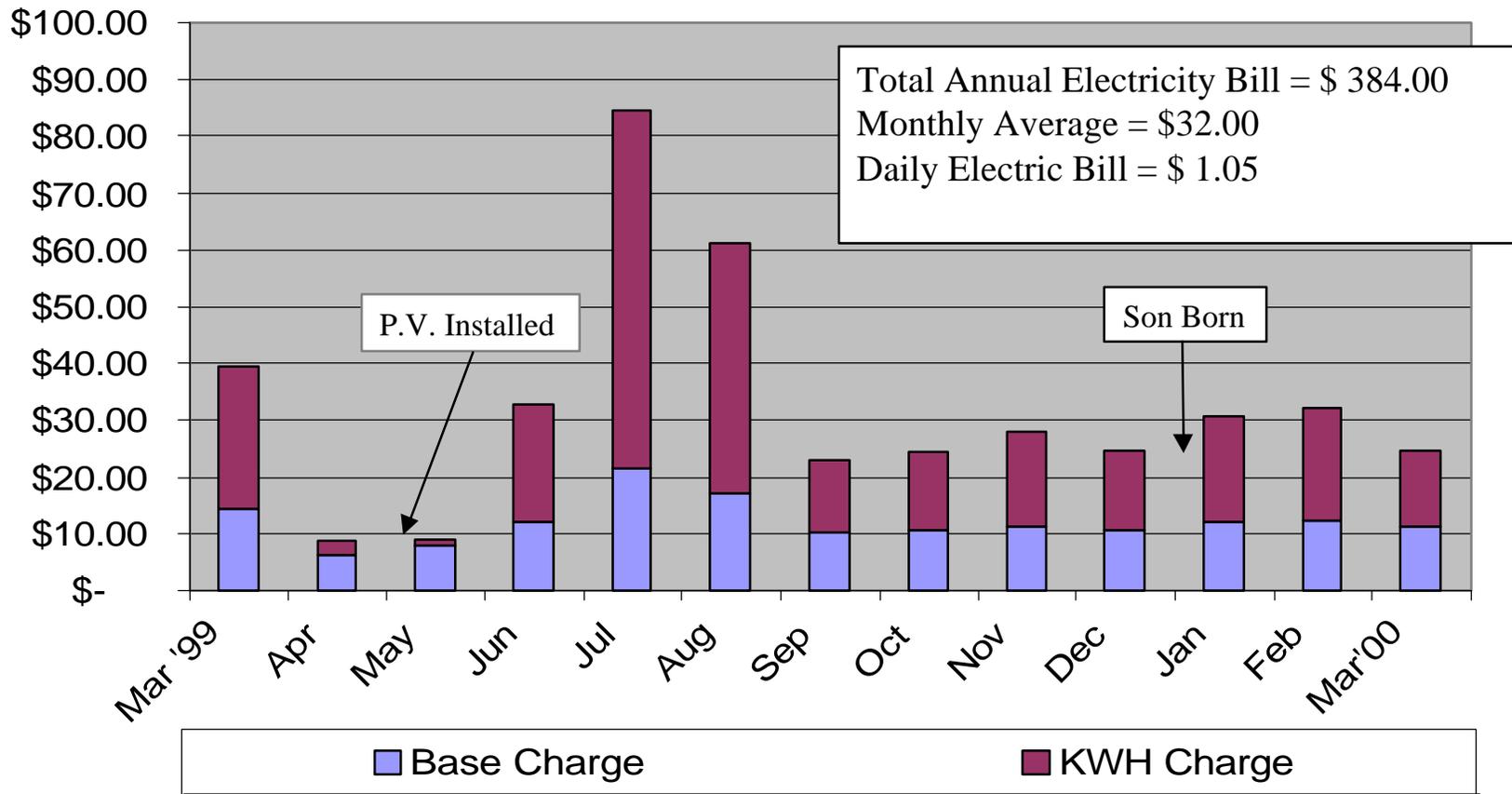
# Bringing It Home

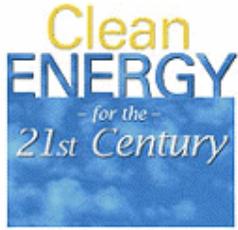




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## Dan Reicher's Electric Bill



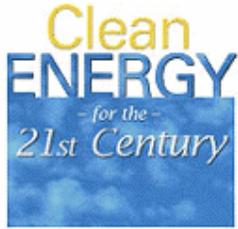


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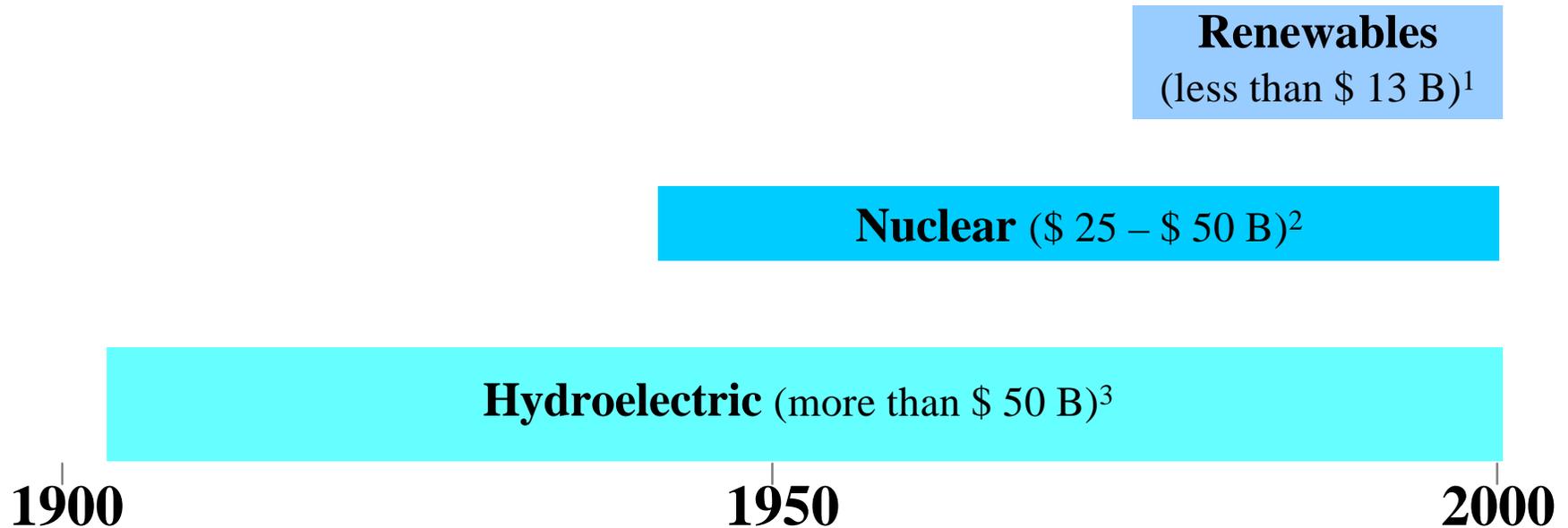
**DOE Supports Green Power in Many Ways**

- RD&D
- Policy
- Outreach
- Procurement



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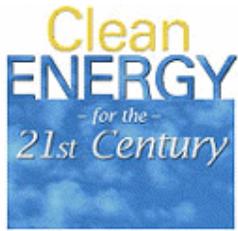
**Maturing an Energy Source = Time + Money**



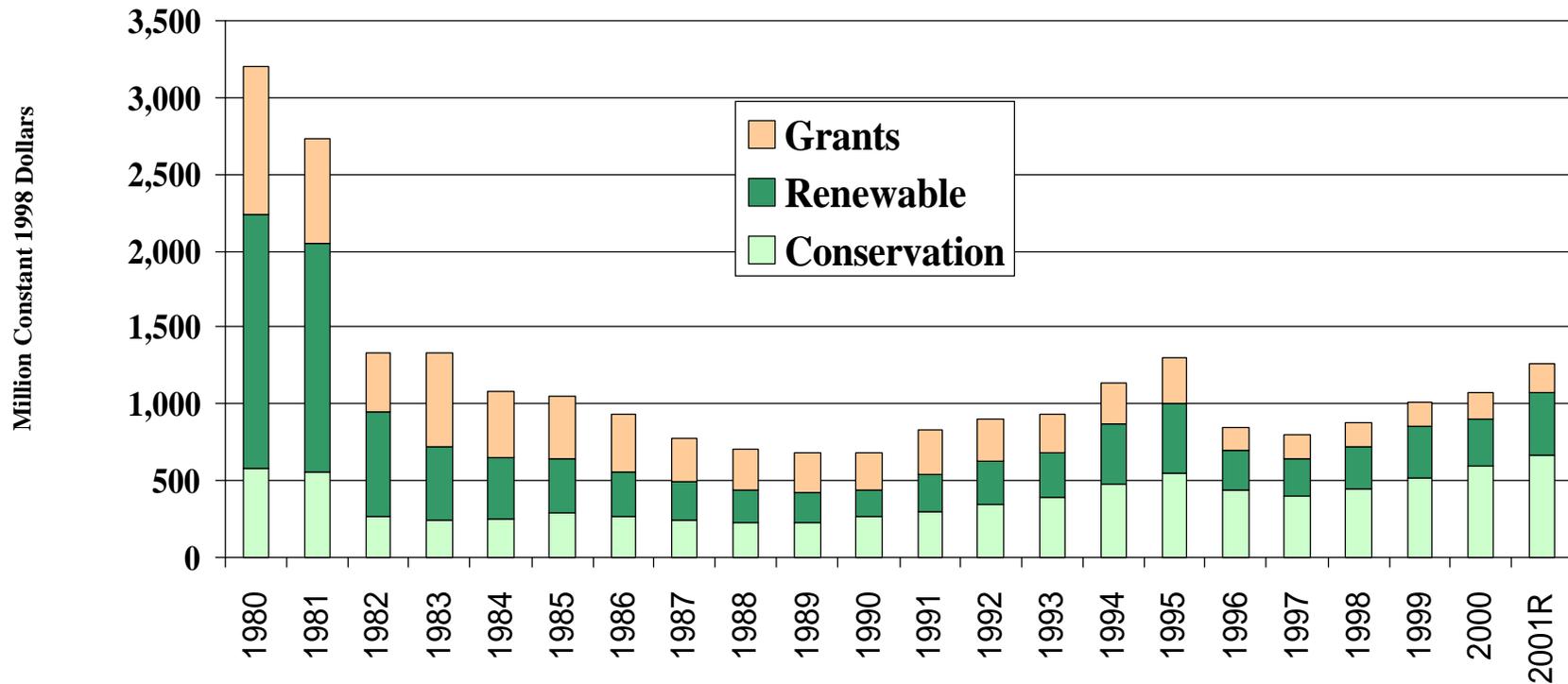
1 Cumulative Federal renewable energy federal appropriations (1999\$)

2 Range of cumulative appropriations based on 1998 Nuclear Energy Institute Federal Spending Analysis (1997\$)

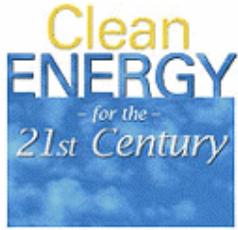
3 Federal appropriations since 1903 (1999\$)



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## EERE Budget History 1980-2001



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by NREL/LBNL Green Power Team

<http://www.eren.doe.gov/greenpower>