

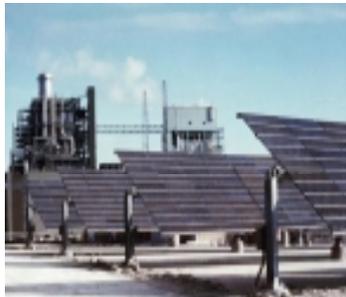


Perspectives on the Future of Solar Energy R&D at the U.S. Department of Energy

Presentation at NCPV Program Review

October 15, 2001

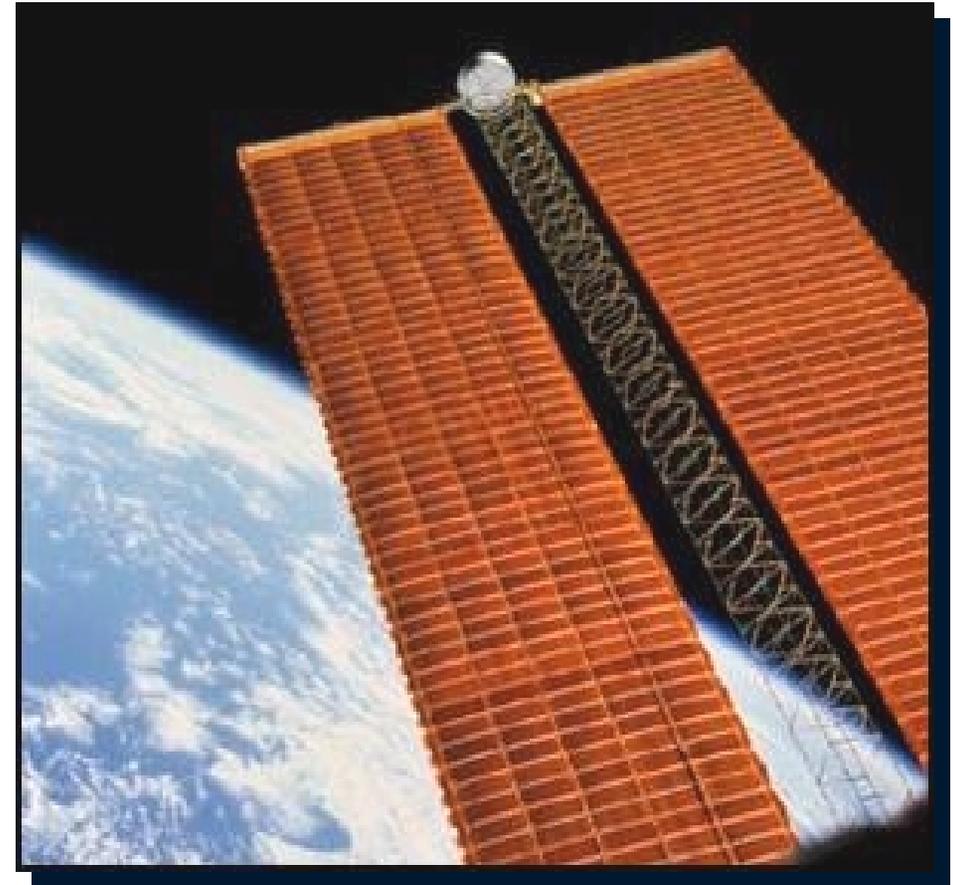
**Dr. Robert K. Dixon
Deputy Assistant Secretary
Office of Power Technologies
U.S. Department of Energy**





Solar Energy

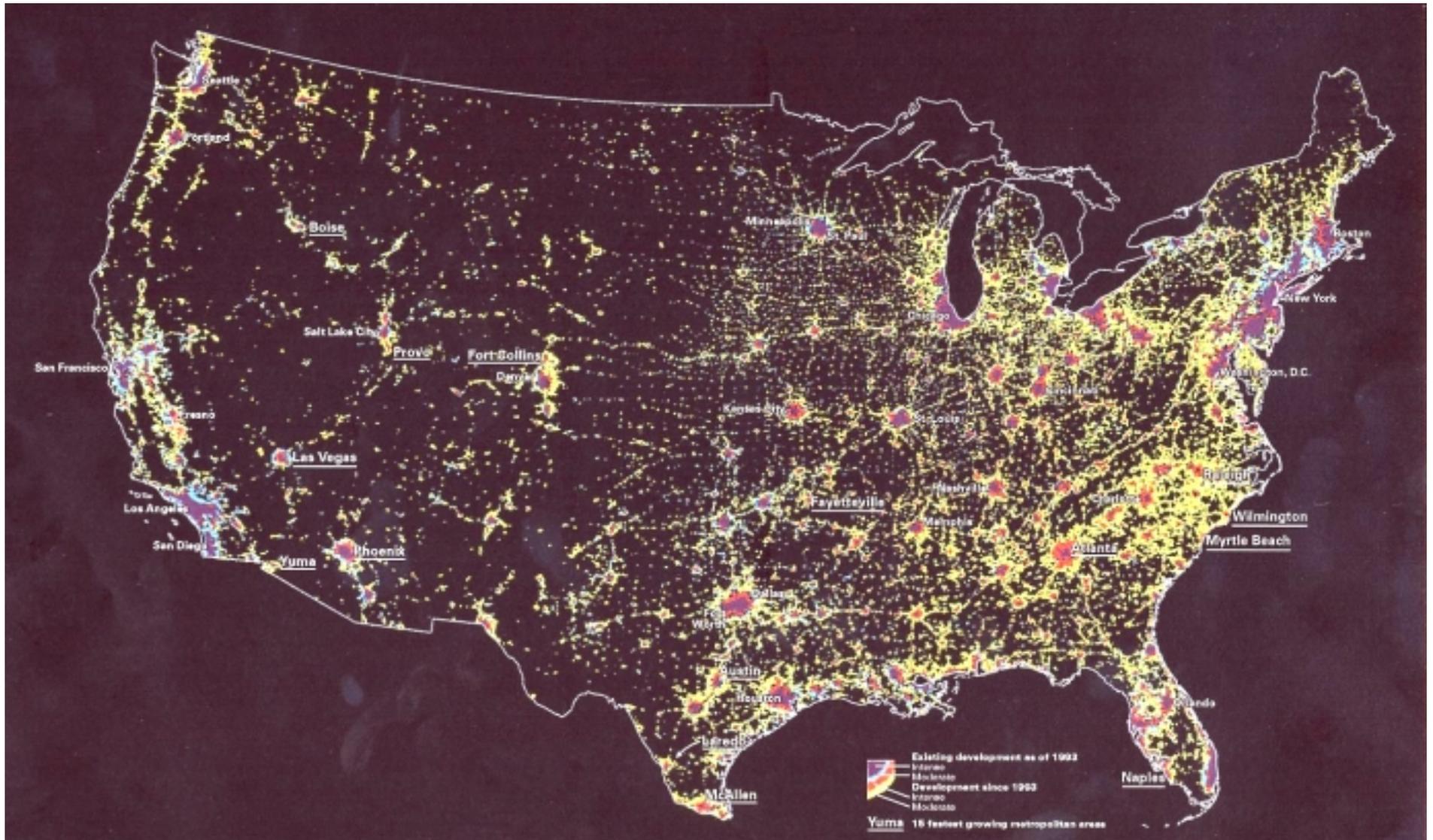
Much to be proud of...



Much to look forward to...



Electric Power Needs Today

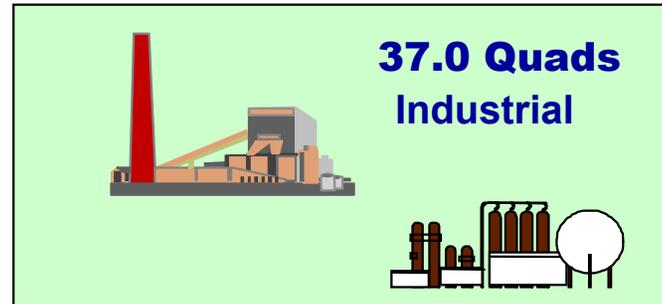
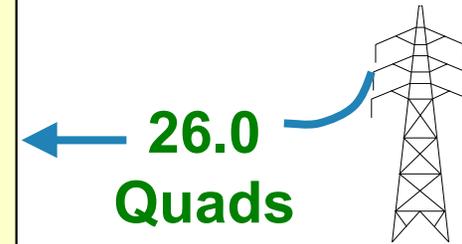
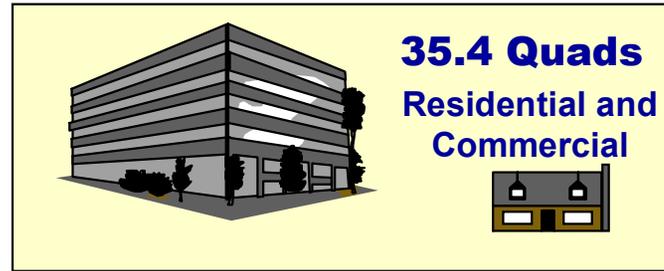
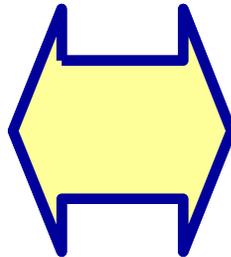
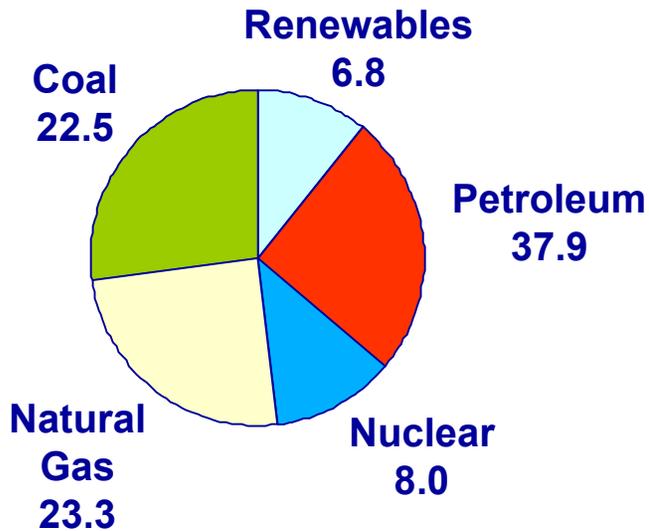


Source: National Geographic



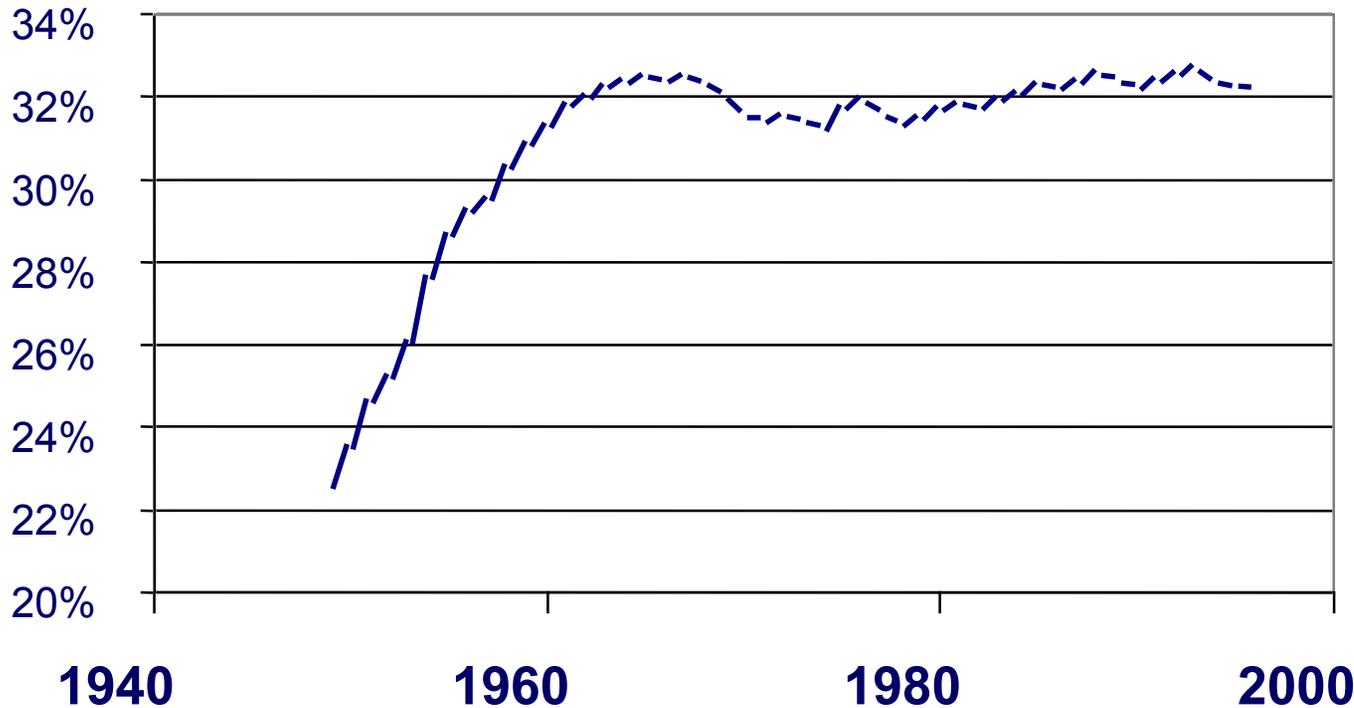
U.S. Energy Consumption in 2000

98.5 Quads
(Quadrillion Btu)





Stagnant Efficiency of U.S. Electric System



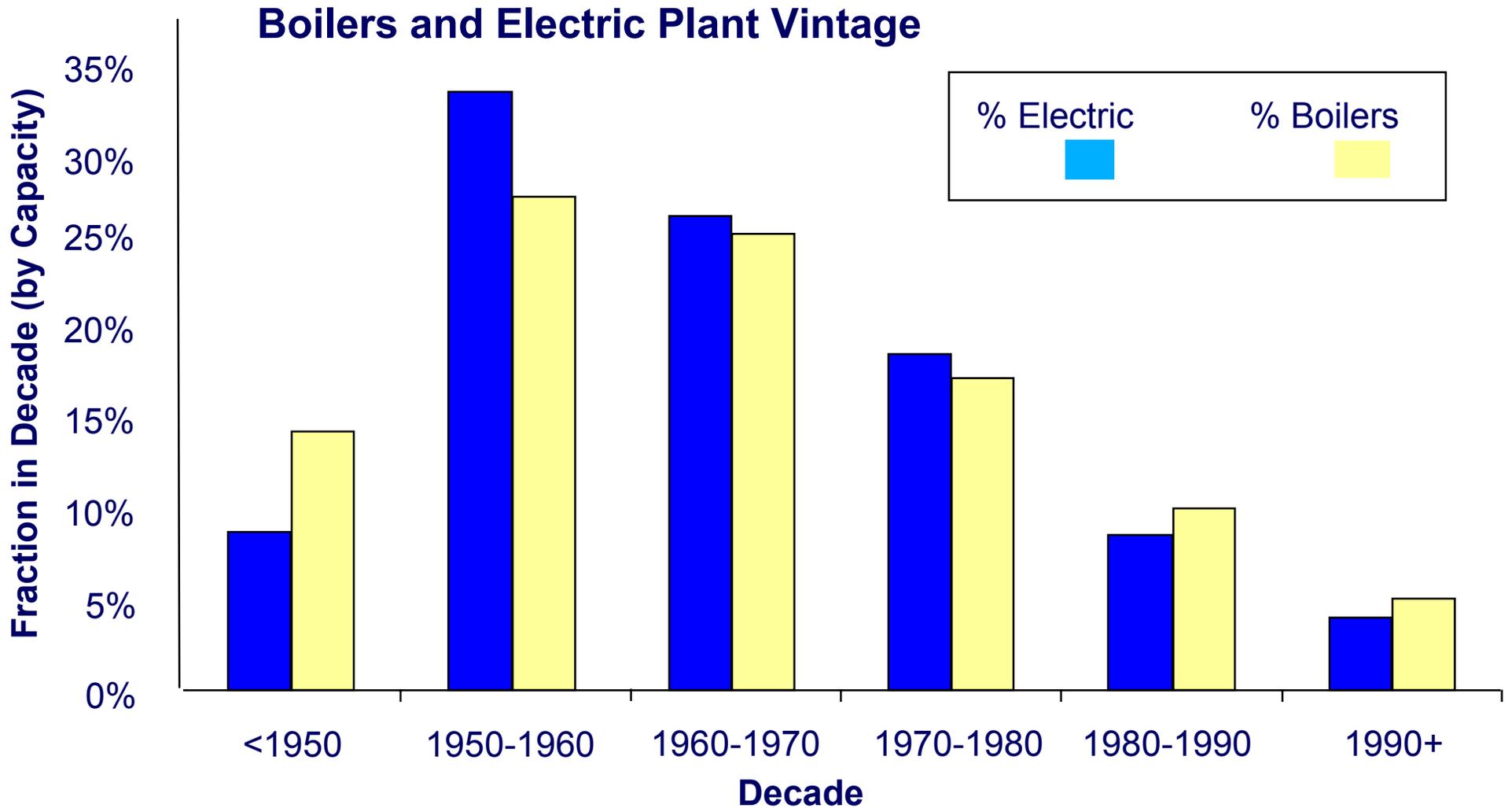
U.S. electricity conversion losses totaled 23.4 quads in 1998, enough energy to fuel Japan.

Fossil Electric Generation Efficiency (at plant, W/O T&D)

Source: EIA, Annual Energy Review 1996



Aging Heat & Power Generation

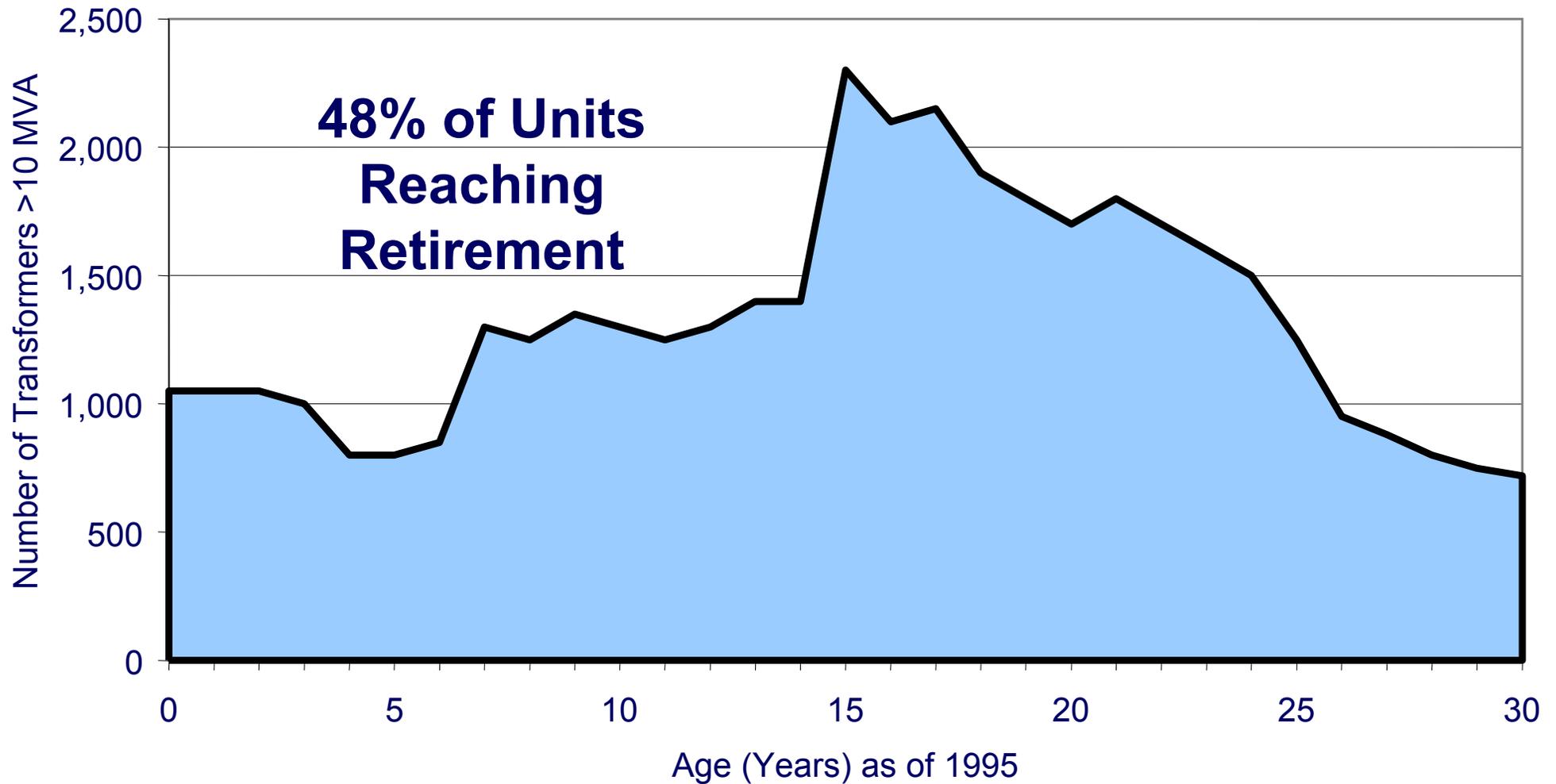


Sources: Energy Information Administration, Gas Research Institute



Aging Power Infrastructure

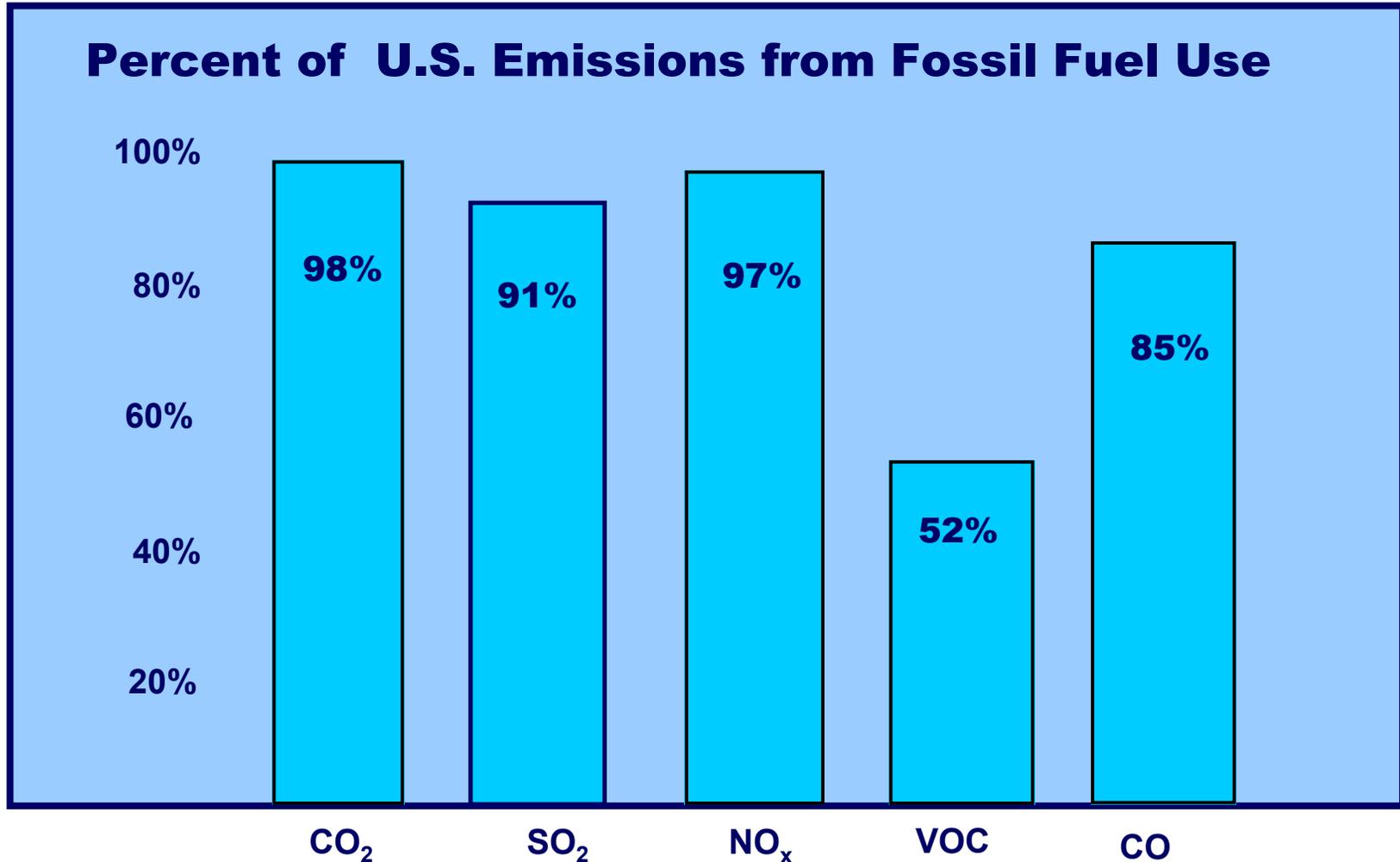
Installed Transformer Banks in the U.S.



Source: Waukesha Electric Systems 1997



Air Emissions

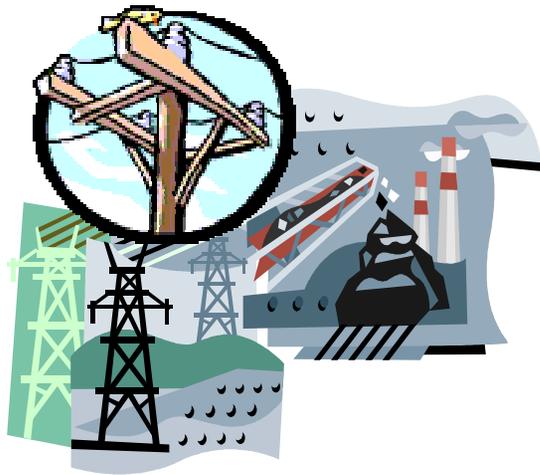


Source: U.S. EPA 1996 Emissions Trends Report and U.S. DOE-EIA Emissions of Greenhouse Gases in the U.S.

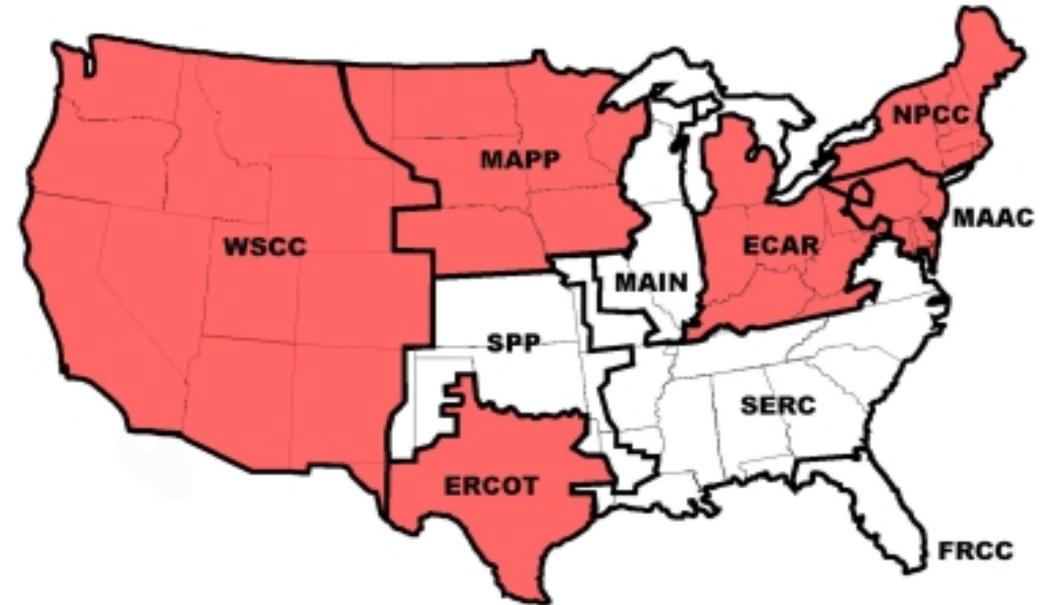


Electric Power Constraints

“If the energy infrastructure of this country is inadequate or in some way excessively costly, it will undermine economic growth, and is therefore a major issue that must be addressed.” *Alan Greenspan, January 26, 2001*



2009 Projections



■ Areas with Capacity Margins < 10 percent

ECAR- East Central Area Reliability Coordination Agreement
ERCOT- Electric Reliability Council of Texas
FRCC- Florida Reliability Coordinating Council
MAAC- Mid-Atlantic Area Council
MAIN- Mid-America Interconnected Network
MAPP- Mid-Continent Area Power Pool
NPCC- Northeast Power Coordinating Council
SERC- Southeastern Electric Reliability Council
SPP- Southwest Power Pool
WSCC- Western Systems Coordinating Council



Power Outages & Reliability

Regions Forecasting Capacity Margins < 10% in 2009

	Affected NERC Regions (WSCC, MAPP, ERCOT, ECAR, NPCC, and MAAC)	U.S. Total	% of U.S. Total
Number of Customers (1999)	~81 million	125.2 million	~65%
Electric Sales (million kWh in 1999)	~1,959,734	3,235,899	~60%
Revenue from Electric Sales (1999)	~\$137 billion	\$215.5 billion	~63%

Source: U.S. DOE, Energy Information Administration, Electric Power Annual 1999, Volume II, October 2000.



“Window of Opportunity”

2000

- Implement the National Energy Policy and proposed national energy and environmental legislation

- Implement New National Energy Legislation

- Re-Authorize H₂ Legislation

- Relicense Hydropower Sites

- Restructure Utility Regulations

2010

- Improve T&D Infrastructure

- Add Generation Capacity

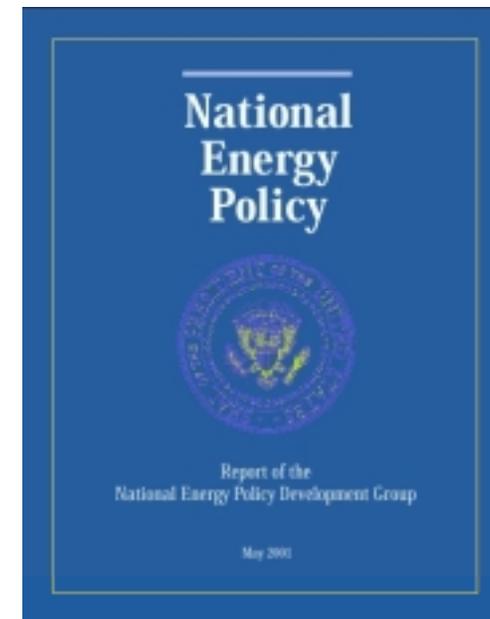
- Implement Transition to the “Digital Age”



National Energy Policy

Of the 105 total recommendations...

- 21 affect distributed energy
- 17 affect renewable energy
- 13 affect T&D
- 8 affect international activities

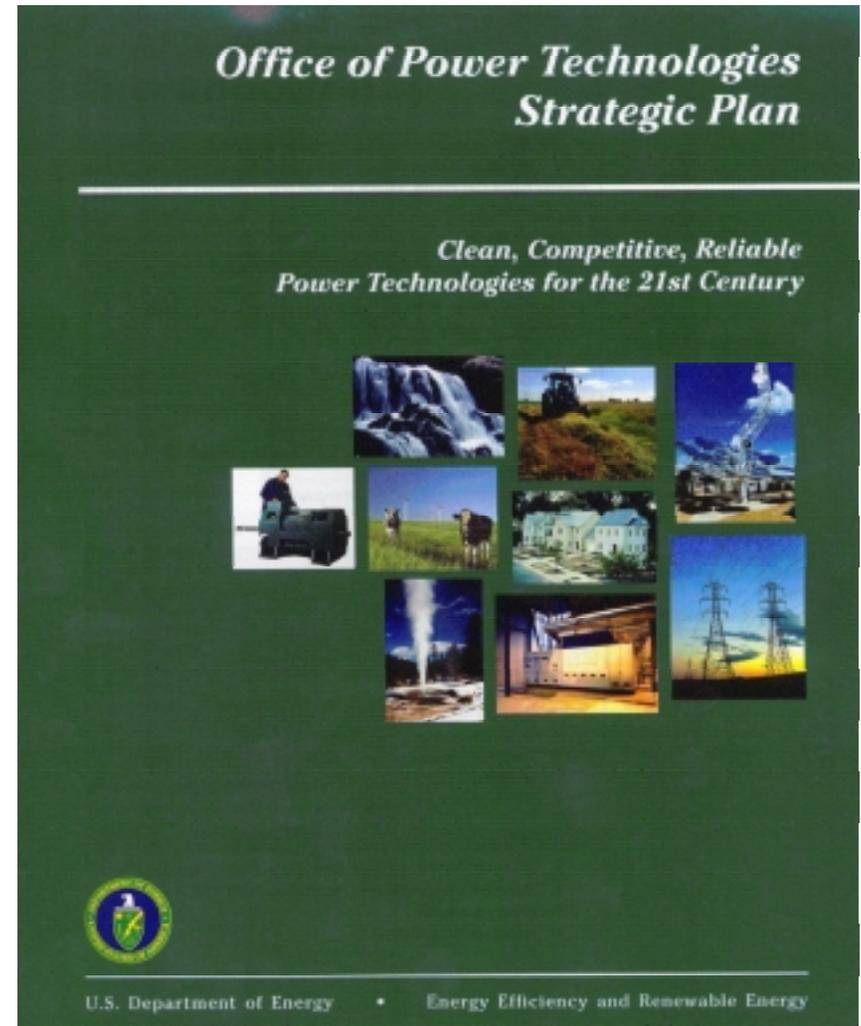




Office of Power Technologies

Mission

To lead the national effort to develop and support clean, competitive, reliable renewable energy, distributed natural gas, and power delivery technologies for the 21st century.





The OPT Portfolio

Fuels

Generation

Delivery

Storage

End-Use

Policies & Regs



BioPower



Superconductivity



Hydrogen



Distributed Energy



Wind



Geothermal



Solar



Hydropower



International



Office of Power Technologies – Organization Chart

OFFICE OF ENERGY EFFICIENCY AND RENEWABLE ENERGY

David Garman, Assistant Secretary

OFFICE OF POWER TECHNOLOGIES

Robert K. Dixon, Deputy Assistant Secretary

William Parks, Associate Deputy Assistant Secretary

Solar Energy
Jim Rannels, Director

Biopower & Hydropower
Don Richardson, Director

Hydrogen & Superconductivity
Jim Daley, Director

Wind & Geothermal
Peter Goldman, Director

Technology Access,
Thomas Sacco, Director

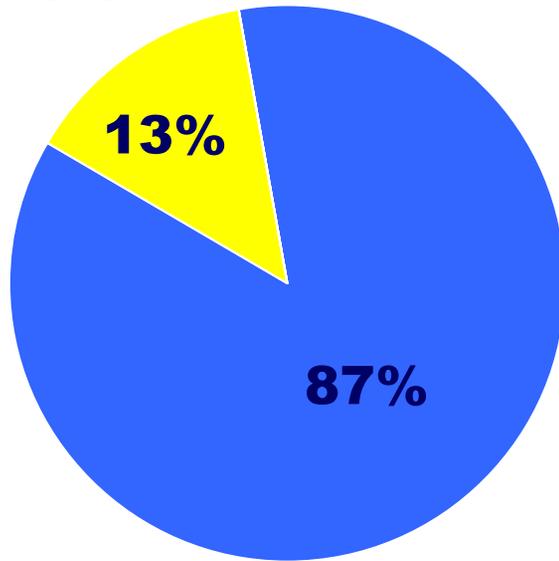
Distributed Energy Resources
Patricia Hoffman, Director



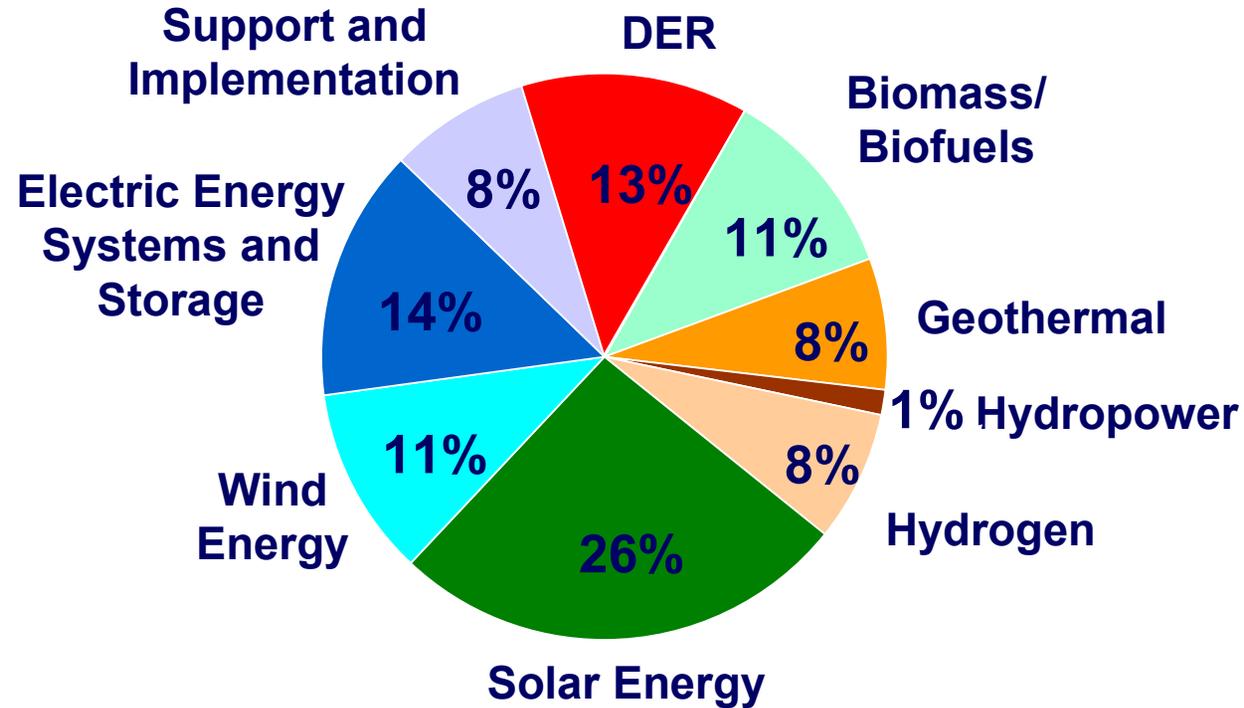
OPT Funding

FY 2001 Appropriations \$358 M

Interior

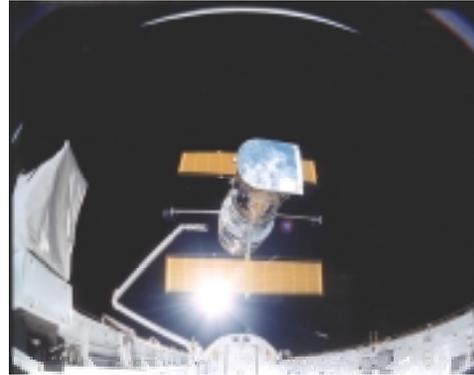


EWD



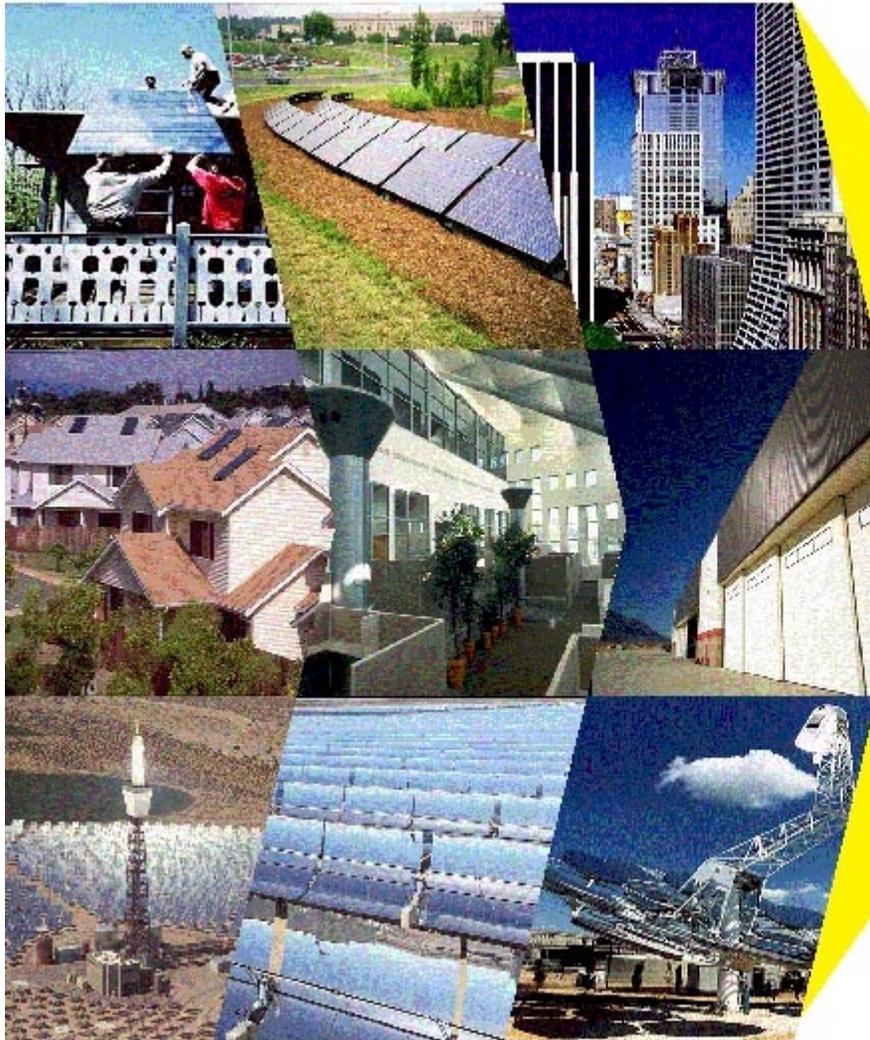


The Value of Solar





Office of Solar Energy Technologies



Photovoltaics

Solar Buildings

**Concentrating
Solar Power**



The Future of PV Markets

- **PV is a Distributed Technology – Think Customer Owned!**
- **PV is a Buildings Technology – Part Appliance and Part of the Building Structure**
- **Expanding Roles for Energy Services**
 - **Customer support – consumers, buildings, solar industry**
 - **Infrastructure support – delivery channels, interconnection, O&M**
 - **Quality assurance – certification, standards**



2001 PV Program Peer Review

- **Two day public review**
 - All topical areas
 - Independent 5 member panel

- **PV Program judged “outstanding”**
 - Quality of science, technology, and engineering
 - Relevance to national needs and agency mission
 - Programmatic performance, management, and planning

- **Panel recommendations**
 - Improvement in continuity of funding
 - Increase funds for exploratory, high-risk research
 - Increase concentration on systems reliability
 - Maintain partner-based, accomplishment oriented, leveraging of funds with industry



“Zero Energy” Buildings





Solar Funding Summary

	FY 2001 Appropriations	FY 2002 Request Senate	FY 2002 Request House
Total	\$92.68M	\$92.30M	\$94.63M
Photovoltaics	75.06	70.00	81.78
Solar Buildings	3.91	7.00	4.95
Concentrating Solar Power	13.71	15.30	7.90



Issues and Opportunities

- **Energy supply-demand balance**
- **Energy security of vulnerable facilities**
- **Siting, permitting, interconnection**
- **Federal-state coordination**
- **Industry-government partnerships**
- **Sustainable power systems**
- **Technology integration and hybrid systems**





Working Together

- www.eren.doe.gov/power
- Technical publications
- Workshops and conferences
- Technology planning
- Cost-shared RD&D

Information Clearinghouse and Networking

Energy Efficiency and Renewable Energy Network (EREN) □ U.S. Department of Energy

OFFICE OF POWER TECHNOLOGIES
Clean Power for the 21st Century

Renewable Energy Wind Energy Photovoltaics Concentrating Solar Power Solar Buildings Geothermal Energy Biomass Power Hydropower Hydrogen	Power Reliability and Delivery Distributed Energy Resources Electricity Restructuring Combined Heat and Power Superconductivity	Energy Outreach International Customer Power Choices Renewable Energy Production Incentive Climate Challenge
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