U.S. Renewable Energy Strategy Since WSSD

A Tale of State and City Policy

John Byrne

Presentation to the

International Workshop on National Renewable Energy Strategy Since WSSD

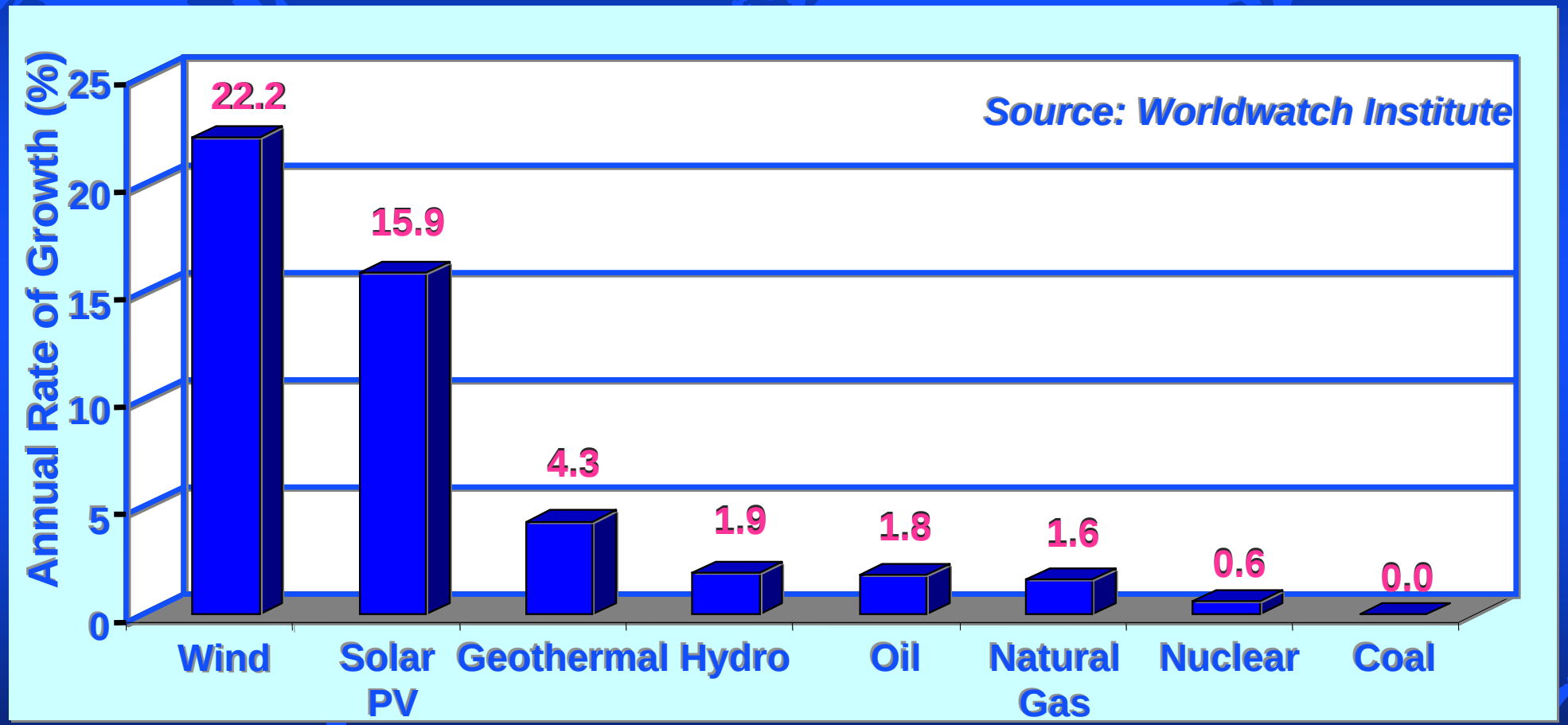
Korea Energy Economics Institute

January 16, 2004

Center for Energy and Environmental Policy

Global Trends in Energy Use, 1990-2001

에너지 사용의 세계적 추이



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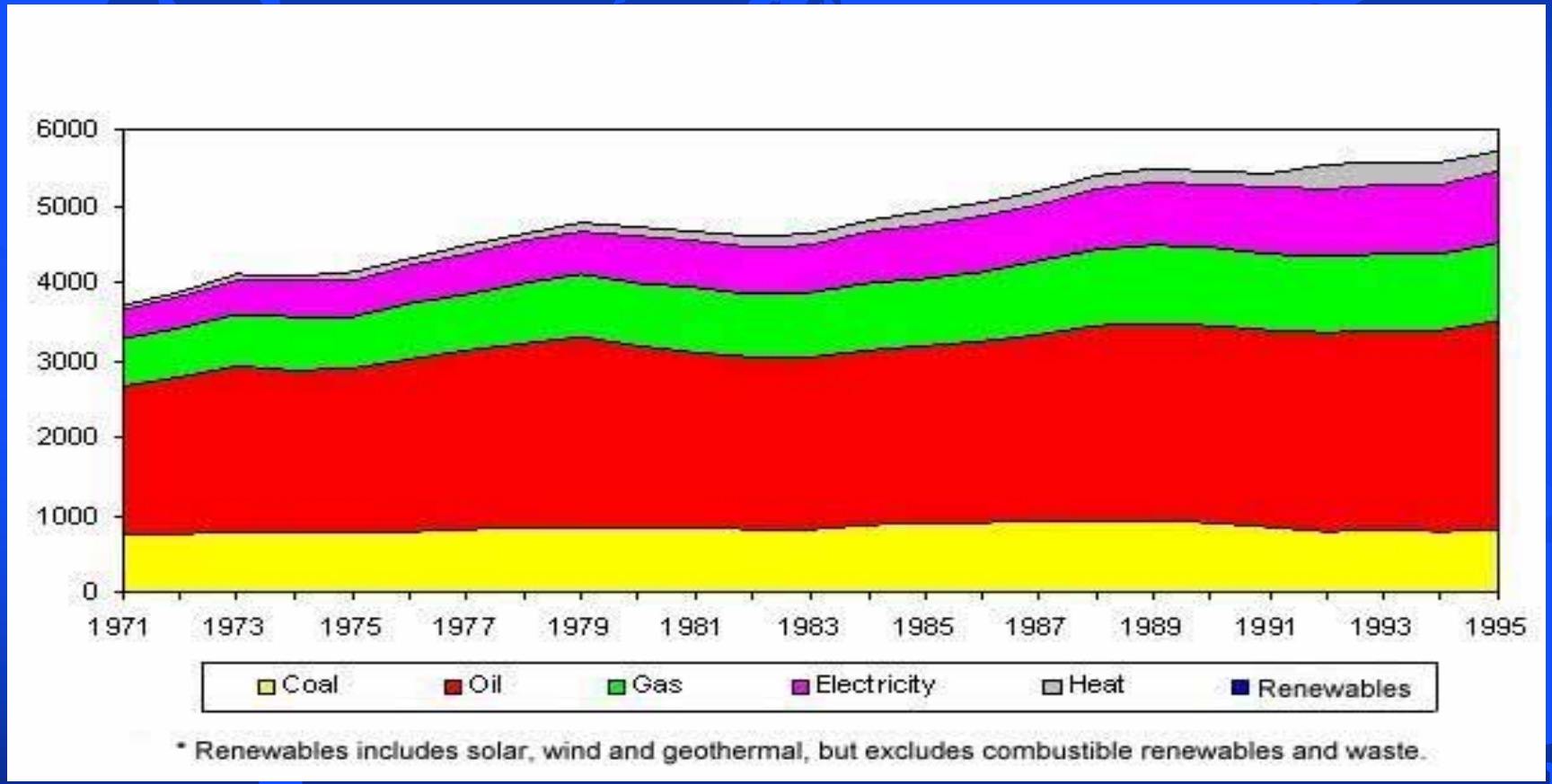
World Commercial Energy Supply by Fuel (Mtoe)

세계 연료별 에너지 공급



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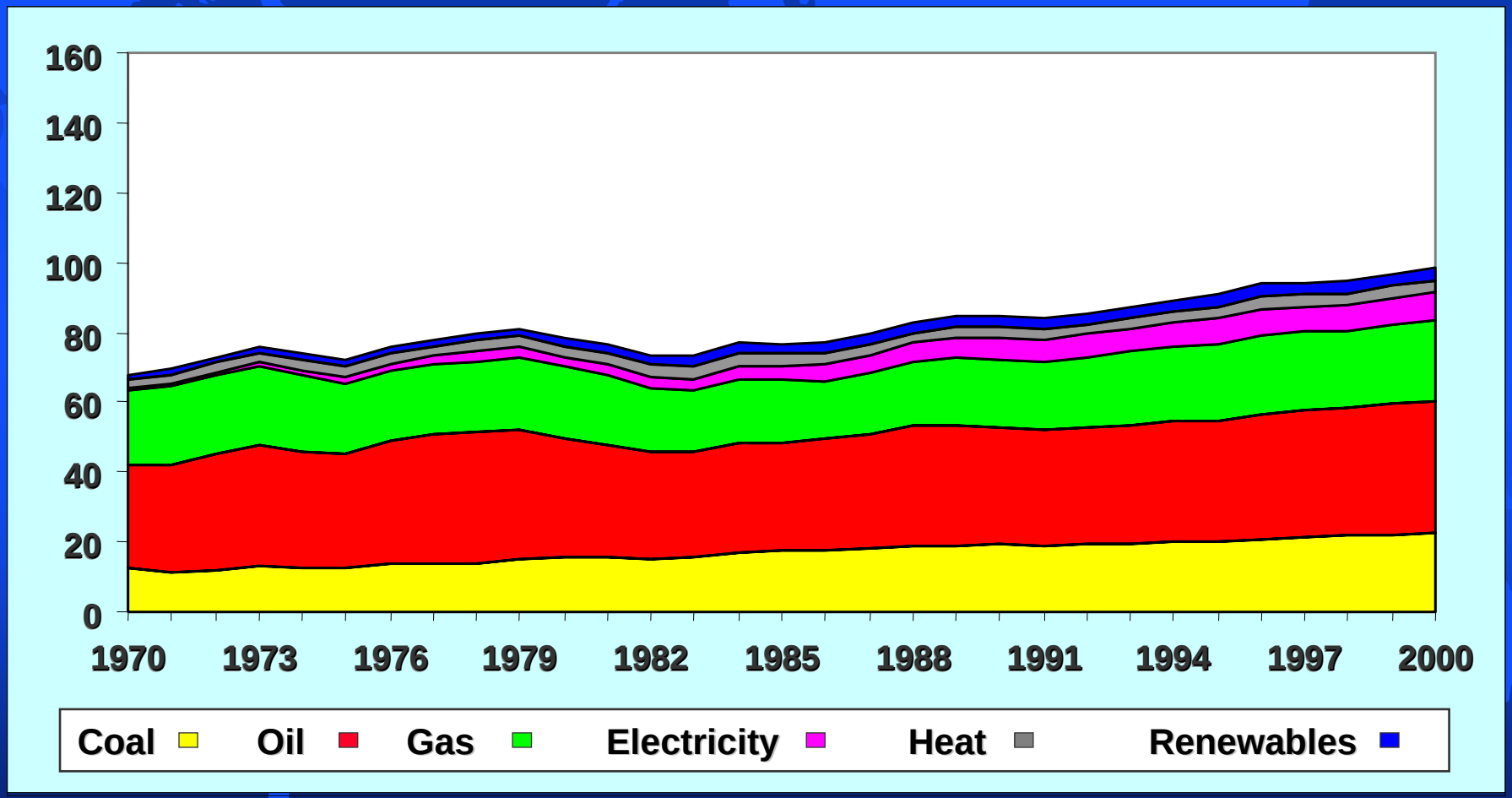
U.S. Energy Supply by Fuel (Mtoe)

미국의 연료별 에너지 공급



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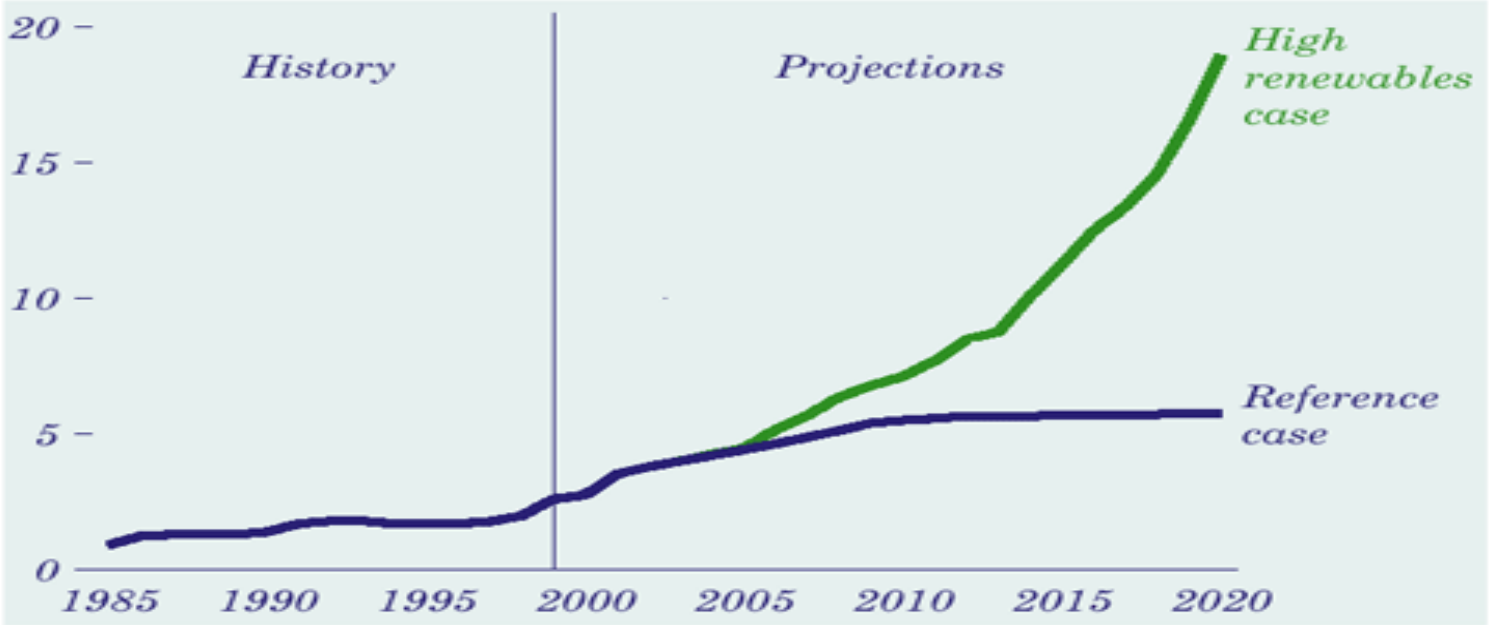
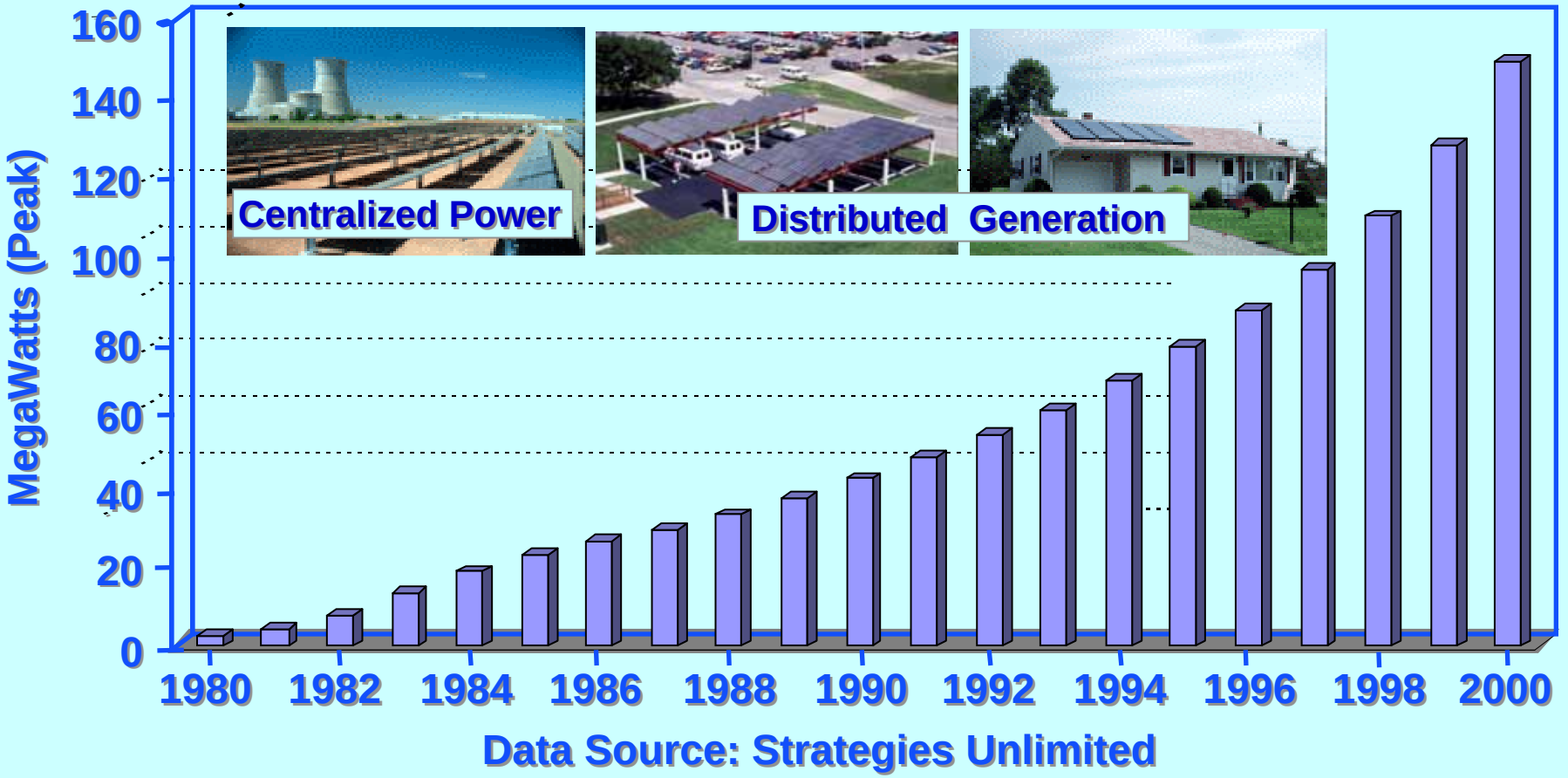
Trends in US Wind Energy

Figure 87. Wind-powered electricity generating capacity in two cases, 1985-2020 (gigawatts)



1985-1988: California Energy Commission. **1989-1998:** Energy Information Administration, *Annual Energy Review 1999*, DOE/EIA- 0384(99) (Washington, DC, July 2000). **Projections:** Table F9.

Cumulative U.S. Installed Photovoltaic Electricity Generating Capacity



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U.S. Secretary of State Colin Powell at the WSSD (Sept. 4, 2002)

U.S. … “dedicated” to “encourage” the use of renewable energy

(U.S. Department of State, 2002: www.state.gov/secretary/rm/2002/13235pf.htm)

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U.S. Responses to the WSSD

- ✓ Launch *Clean Energy Initiative: Powering Sustainable Development from Village to Metropolis*
- ✓ Initial federal commitment $ 43 million
- ✓ Expected private sector leverage $400 million
- ✓ Participate in GVEP
- ✓ No specific action on U.S. use of renewables

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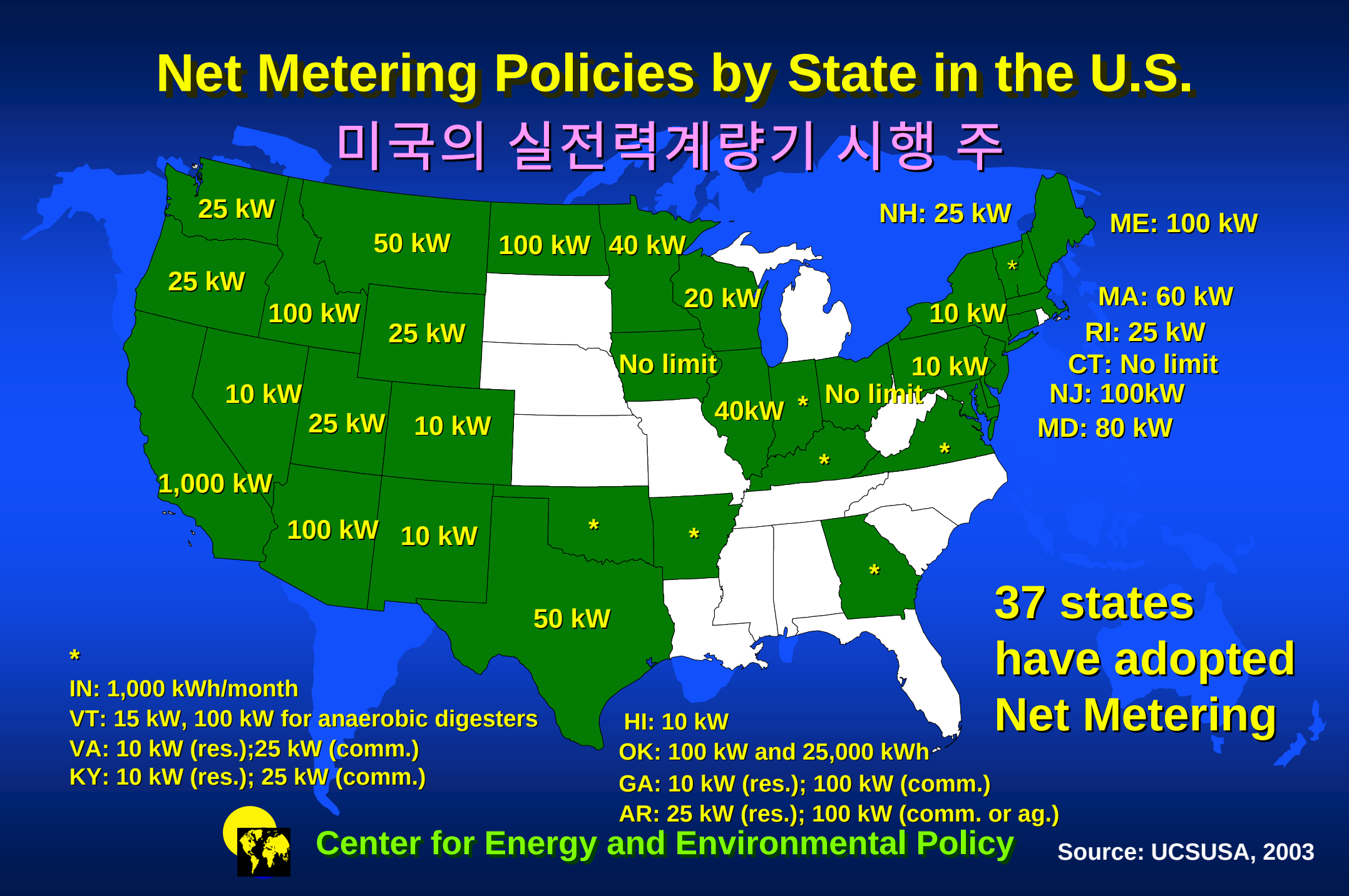
Net Metering Policies by State in the U.S.

미국의 실전력계량기 시행 주



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Source: UCSUSA, 2003

Selected State Public Benefit Charges

공공 효용 부과금제도

States	Public Benefits Charges
California	$1.4 billion over 4 yrs. For efficiency and conservation projects and renewables development ($359 million/yr. 4천 300억원 /년)`
Connecticut	$1.09 billion over 10 yrs. For conservation and renewables ($109 million/yr. 1천 300억원 /년)
Massachusetts	$750 million over 5 yrs. To support conservation and efficiency projects and selected renewables ($150 million/yr. 1천 800억원 /년)
New Jersey	$1 billion over 8 yrs. For energy efficiency and renewables ($125 million/yr. 1천 500억원 /년)

Note: 31 states have adopted Public Benefits Charges (typical range is 0.1 ~ 0.3¢/kWh).

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State Renewable Portfolio Standards in the U.S.

미국 각 주별 재생가능 에너지 의무 도입제도

25 states have initiated Climate Change Action Plans and 19 have completed them.

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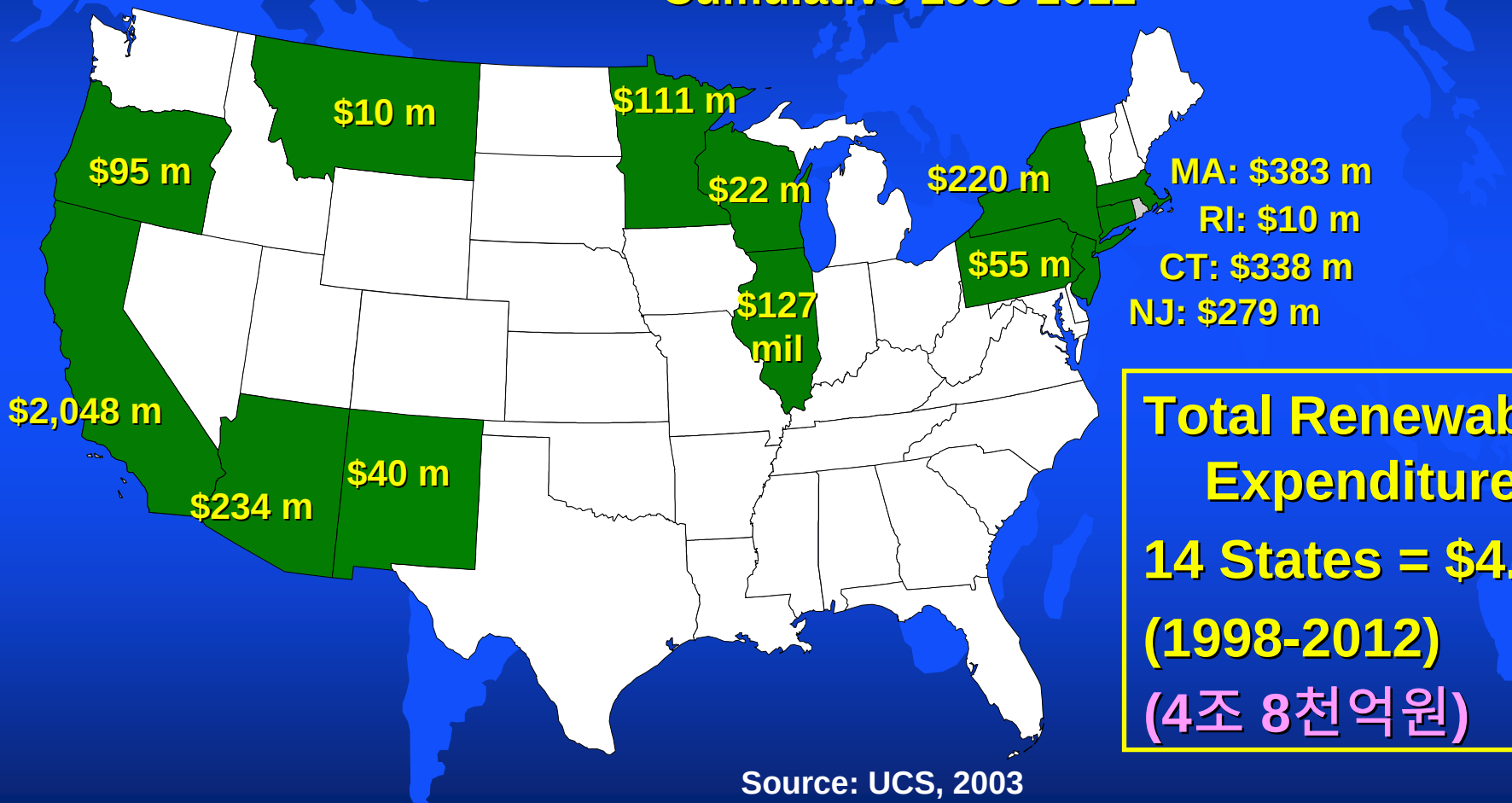
Sources: US EPA, 2003; UCS, 2003

State Funds for Renewables

주별 재생가능 에너지 지원 기금

Cumulative 1998-2012



Total Renewables Expenditures by 14 States = $4.0 billion (1998-2012)

(4조 8천억원)

Source: UCS, 2003

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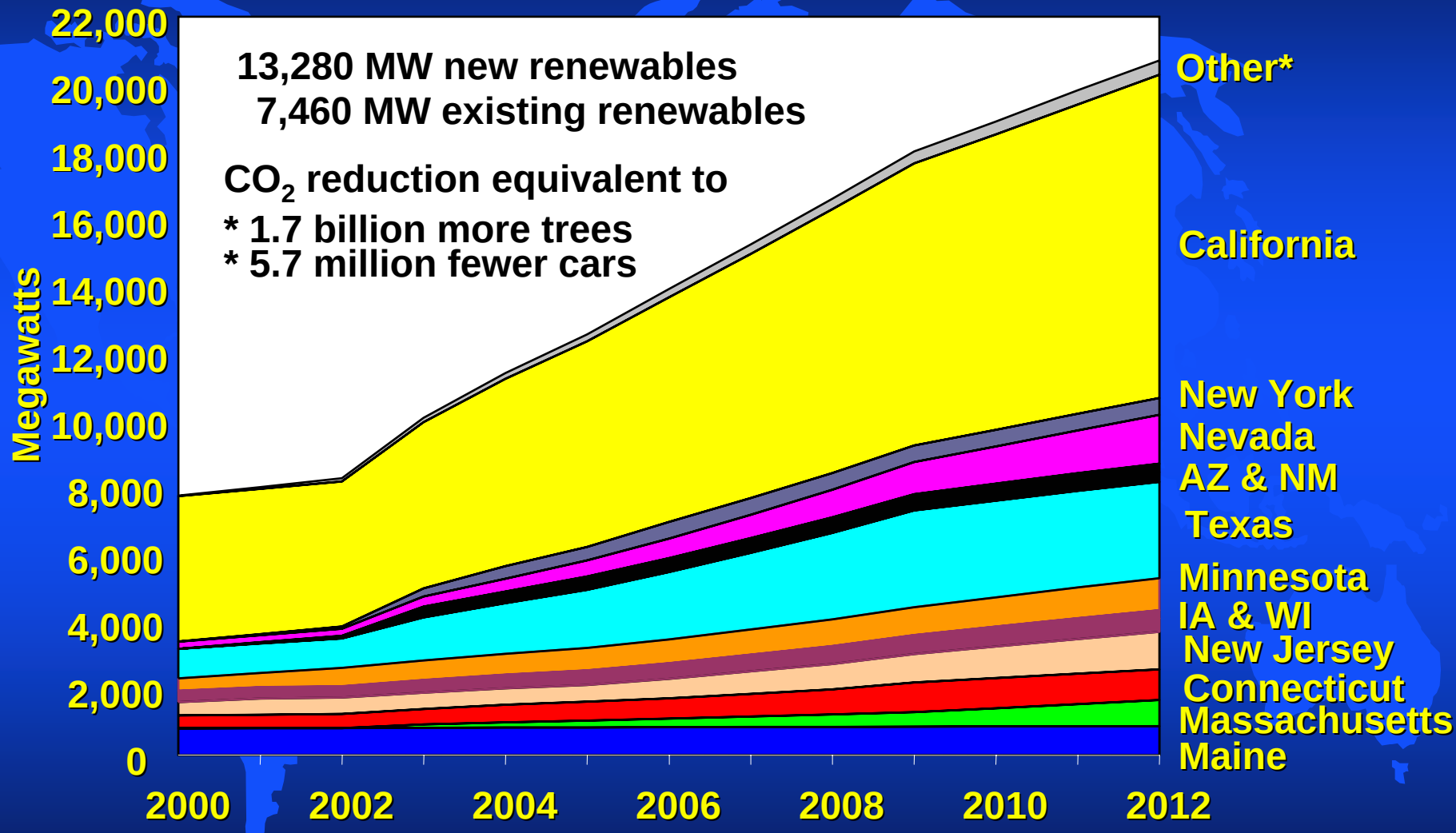
Renewables from State Standards and Funds in the U.S.

의무 도입제도와 지원기금을 통한 재생가능 에너지 발전 전망



*Includes Illinois, Montana, Oregon, Pennsylvania and Rhode Island.

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Source: UCS, 2003

Sacramento
새크라멘토

- US leader in solar technologies for urban use
- Service to 1.3 million
- Service area: 6,000 km^2
- Peak demand: ~ 2,800 MW
- Annual electricity revenues: $1.5 billion
- Annual electric use: 9,300 GWh
  - Residential: 46%
  - Industrial: 54%

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Program Highlights

주요 정책 프로그램

SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT
The Power To Do More.SM

- 'Greenergy' 20,000 subscribers (pay additional $6/ month for 100% renewables, $3/ month for 50/50 renewables/ conventional supply)
- 'PV Pioneers' Assistance for residential PV:
  10 MW connected to grid, 3,100 homes served
- 'Sacramento Shade' (312,000 free trees planted to reduce participant residential cooling costs by 40%
- Electric Vehicle Charging Stations (PV-powered)
- Wind Power Purchase of 17 wind turbines providing ~ 10 MW of clean energy

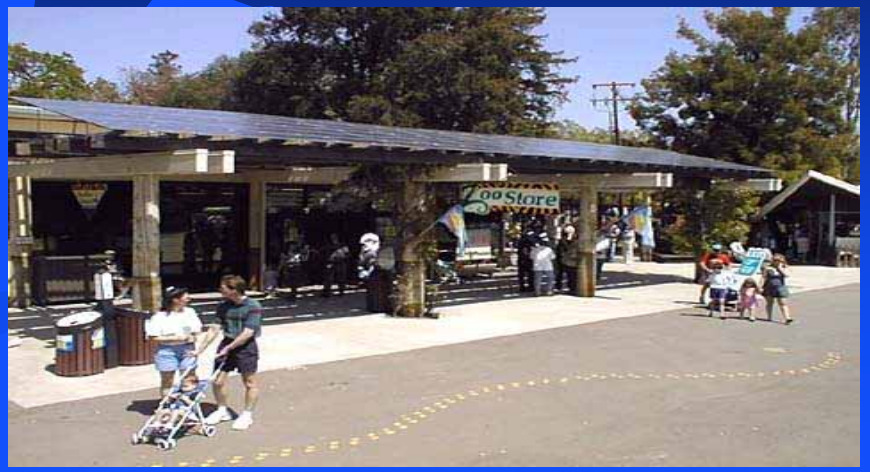
Results of Sacramento's 'Soft Path'

세크라멘토의 '연성에너지 경로' 결과

- Peak load reduced by 372 MW (12 percent)
- Annual consumption reduced by 563 GWh ($43 million in bill savings to customers)
- Total regional output increased by $124 million
- Wages increased by $22 million
- Carbon dioxide emissions decreased by 265,000 tons

Sacramento's 'Soft Energy Path'
세크라멘토의 연성 에너지 경로

Residential Rooftops



Community Sites (Zoo)

PV Shading & Vehicle Charging

17 City-Owned Wind Turbines

San Francisco
샌프란시스코

- Population: 777,000 people
- Area: 122 km^2
- Annual electric use: 5,235 GWh
  - Commercial/Industrial: 60 %
  - Residential: 27 %
  - Other: 13 %
- From 1994-2000 electricity consumption grew 9%

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Renewable Energy Policy
재생가능 에너지 정책

- **City Solar Goal** 50 MW installed by 2012
- **Wind Initiative** 150 MW of new wind regionally by 2012
- **Biogas Project** 2 MW plant operating at the Southeast Water Treatment Control Facility (2003)
- **Climate Policy** 20% below 1990 by 2012

Program Highlights
주요 정책 프로그램

- **City Solar Bond** $100 million in 2001 for solar, other renewables and high-efficiency projects for public buildings

- **City-State Partnership** 'Emerging Renewables Rebate Program' covers 50% of residential installation costs up to $4.50 / W_p

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Moscone Convention Center
모스콘 컨벤션 센타

First city solar project completed: combines 670 kW PV system and high efficiency technologies

Cost:

- $4.2 million PV +
- $3.2 million efficiency upgrades

Annual reduced electricity consumption: 5.3 GWh

Annual savings: $639,000

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SAN FRANCISCO

Office of the Mayor

Solar Cities Summit

Solar Cities Summit
Thurs., Sept. 18-Fri., Sept. 19, 2003
San Francisco War Memorial Bldg., 401 Van Ness

Conference highlights include:

- Special tour of the 675 kw solar array on the Moscone Convention Center
- Mayors Reception at San Francisco City Hall
- Luncheon Keynote by world renowned energy expert Amory Lovins of the Rocky Mountain Institute

CONFERENCE AGENDA

Special Guests and Speakers

- **Mayor Willie L. Brown,** Jr., City of San Francisco
- **Mayor Richard Daley**, City of Chicago
- **Amory Lovins**
- **Steven Strong**
- **Dr. Donald Aitken**

Long Island Power Authority (LIPA) New York

롱 아일랜드 (LIPA) 뉴 욕

- Customers served: 1.1 million
- Area: 3200 km^2
- Annual electric use: 18,400 GWh
  - Residential: 45%
  - Industrial/commercial: 55%

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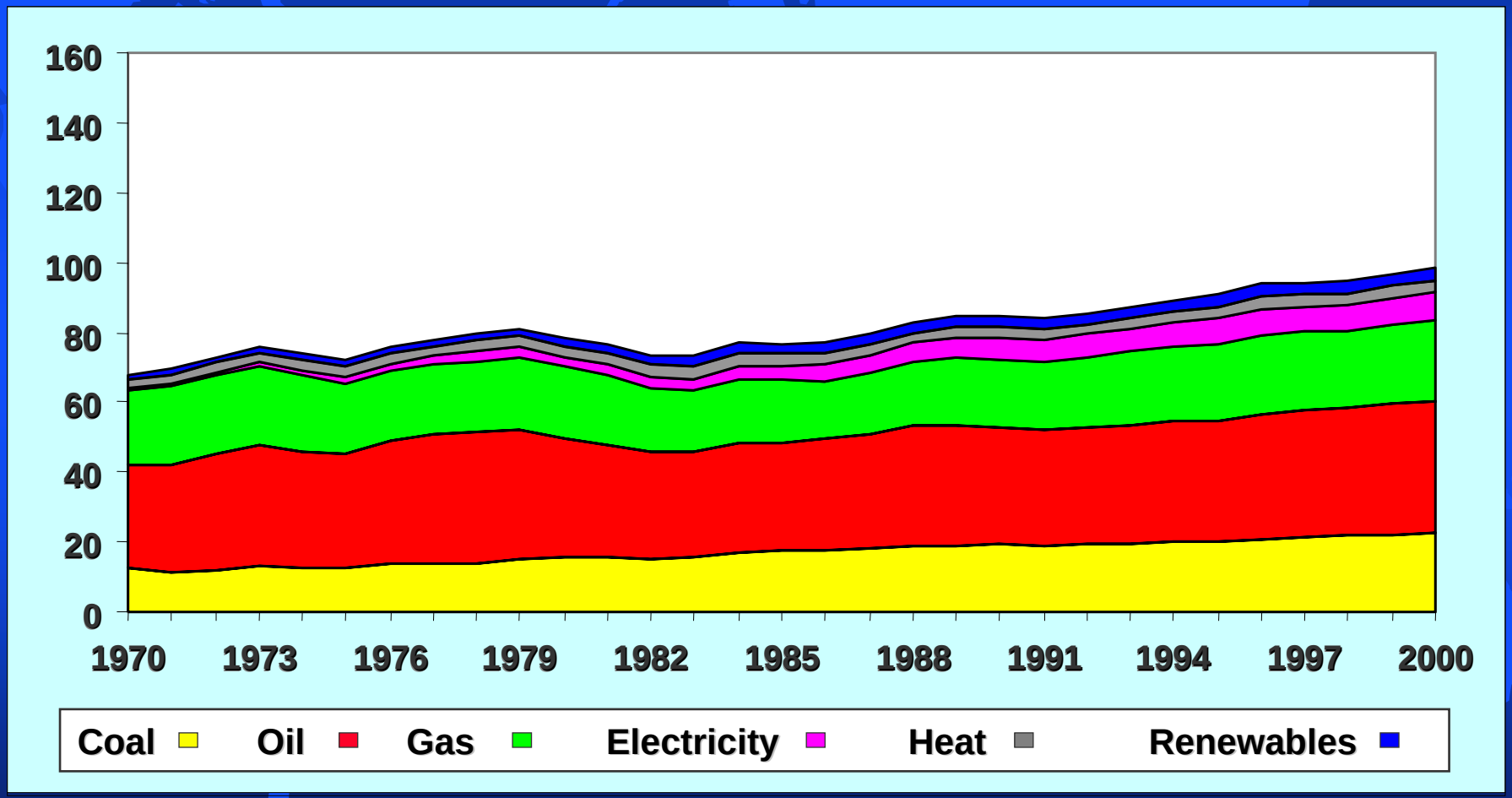
Renewable Energy Strategies

재생가능 에너지 전략

- **Wind Initiative**
  - 140 MW offshore wind park
  - RFP signed
- **Solar Pioneer Program**
  - $6.00 / Wp PV install incentive
  - 1st Year: 0.4 MW capacity installed, providing 1.0 GWh of green energy annually

U.S. Energy Supply by Fuel (Mtoe)

미국의 연료별 에너지 공급



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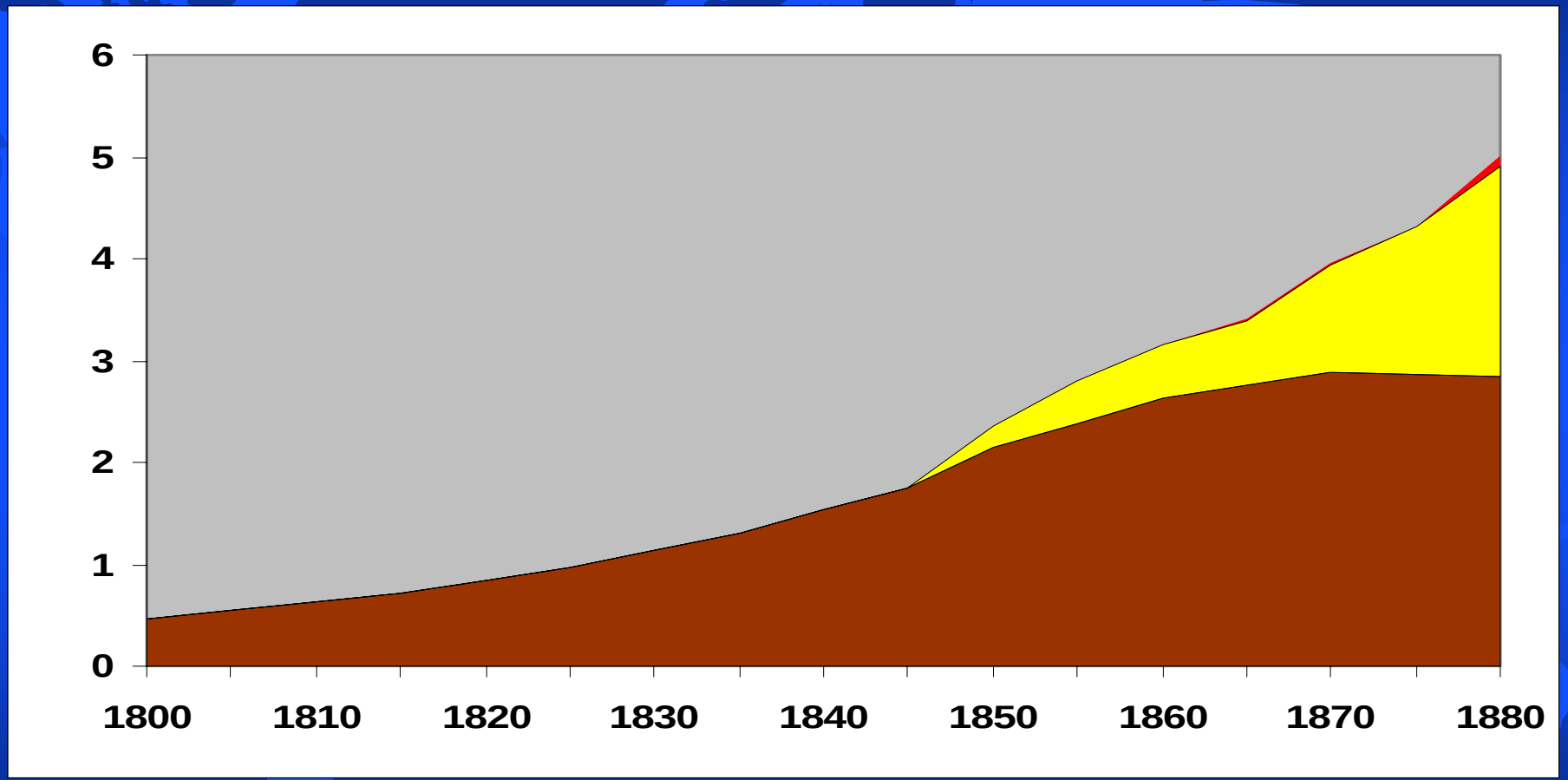
U.S. Commercial Energy Supply by Fuel (Mtoe)

미국 연료별 상업용 에너지공급



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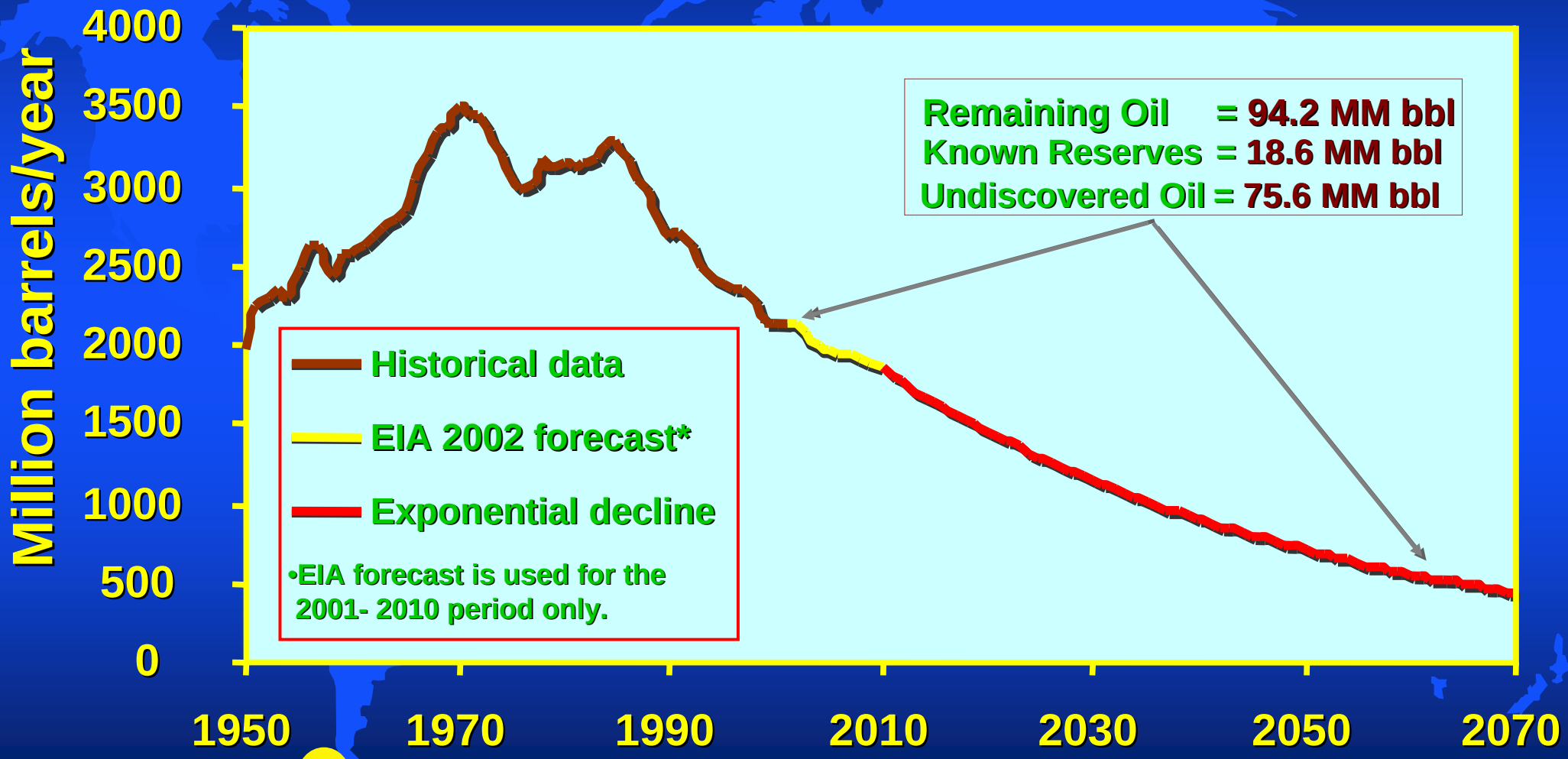
Historical and Forecasted US Oil Production

미국의 석유생산의 추세와 전망



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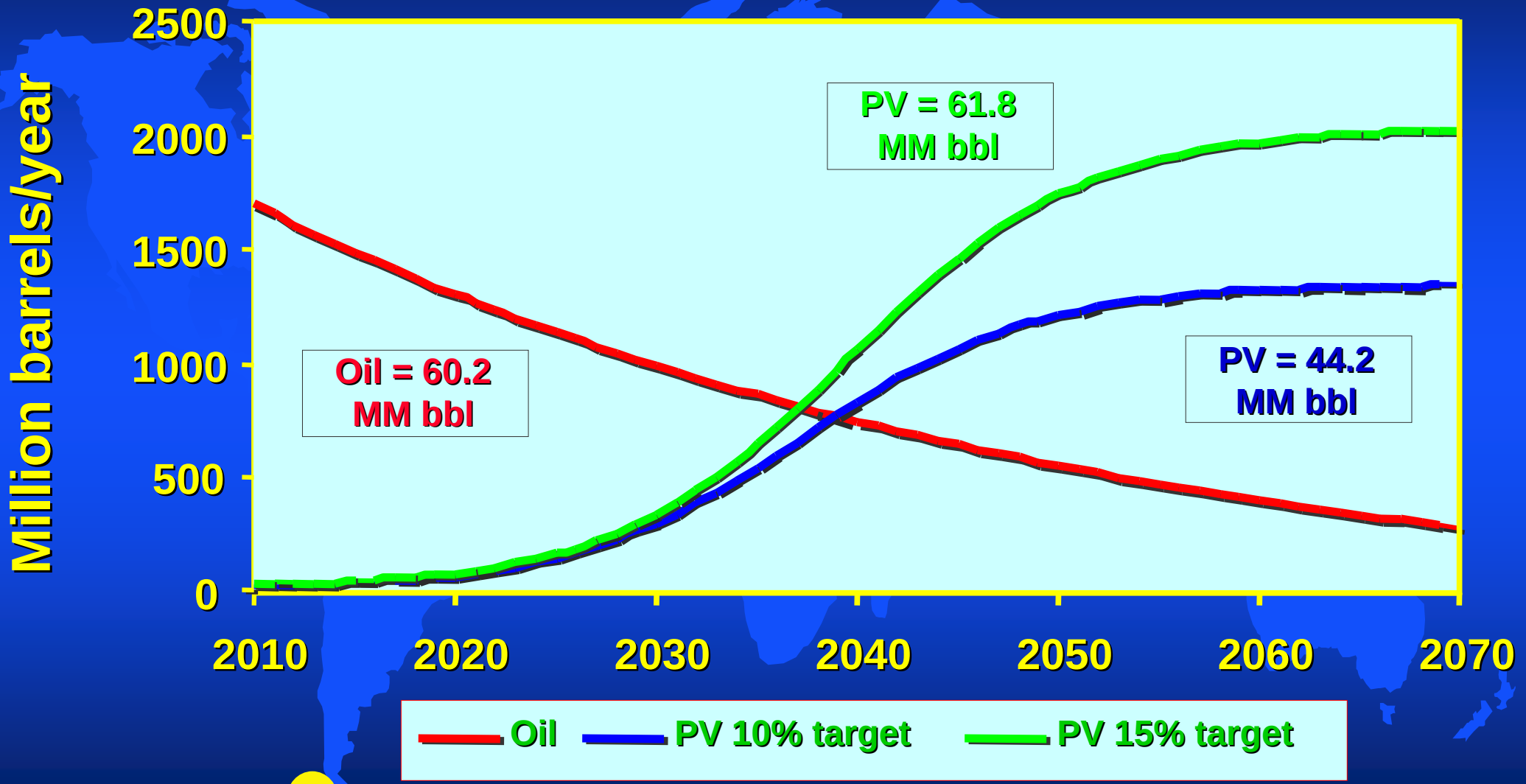
Forecasts of US PV energy supply and US oil production
미국의 태양광 에너지 공급과 석유생산 전망비교



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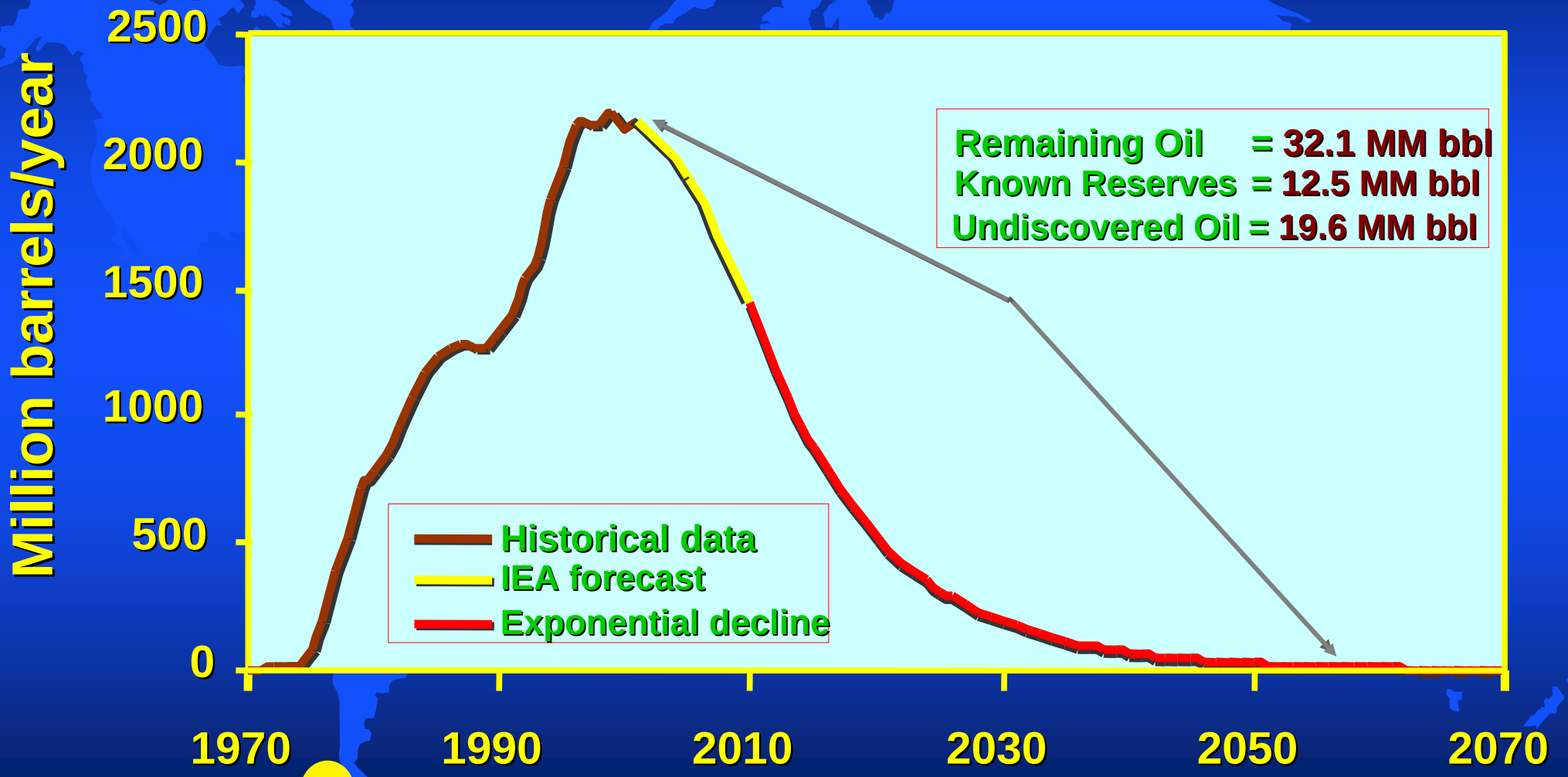
Historical and Forecasted EU Oil Production

유럽연합의 석유생산 추세와 전망



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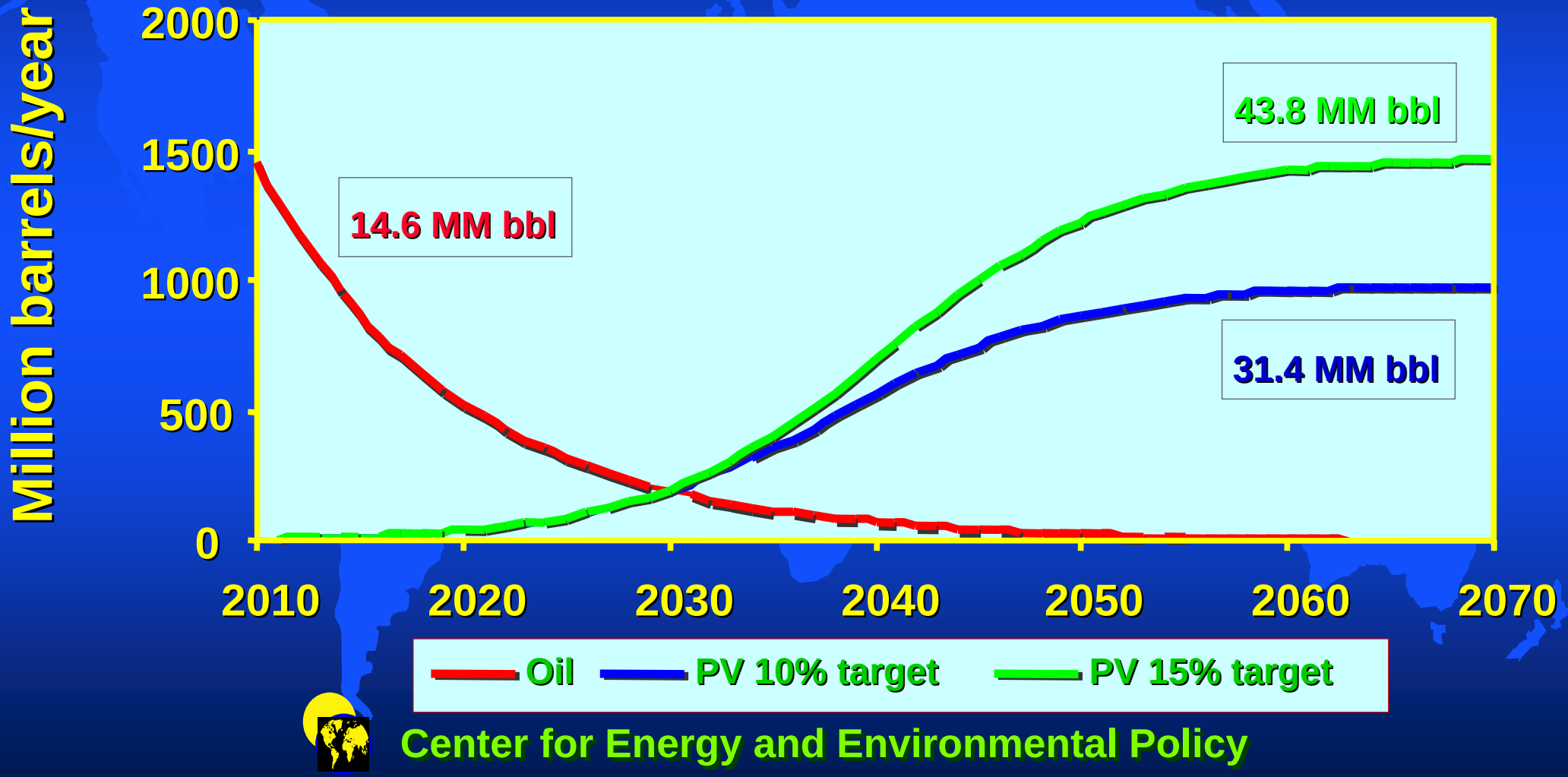
Comparison of forecasts of EU PV and EU oil production

유럽연합의 태양광 에너지 공급과 석유생산 전망비교



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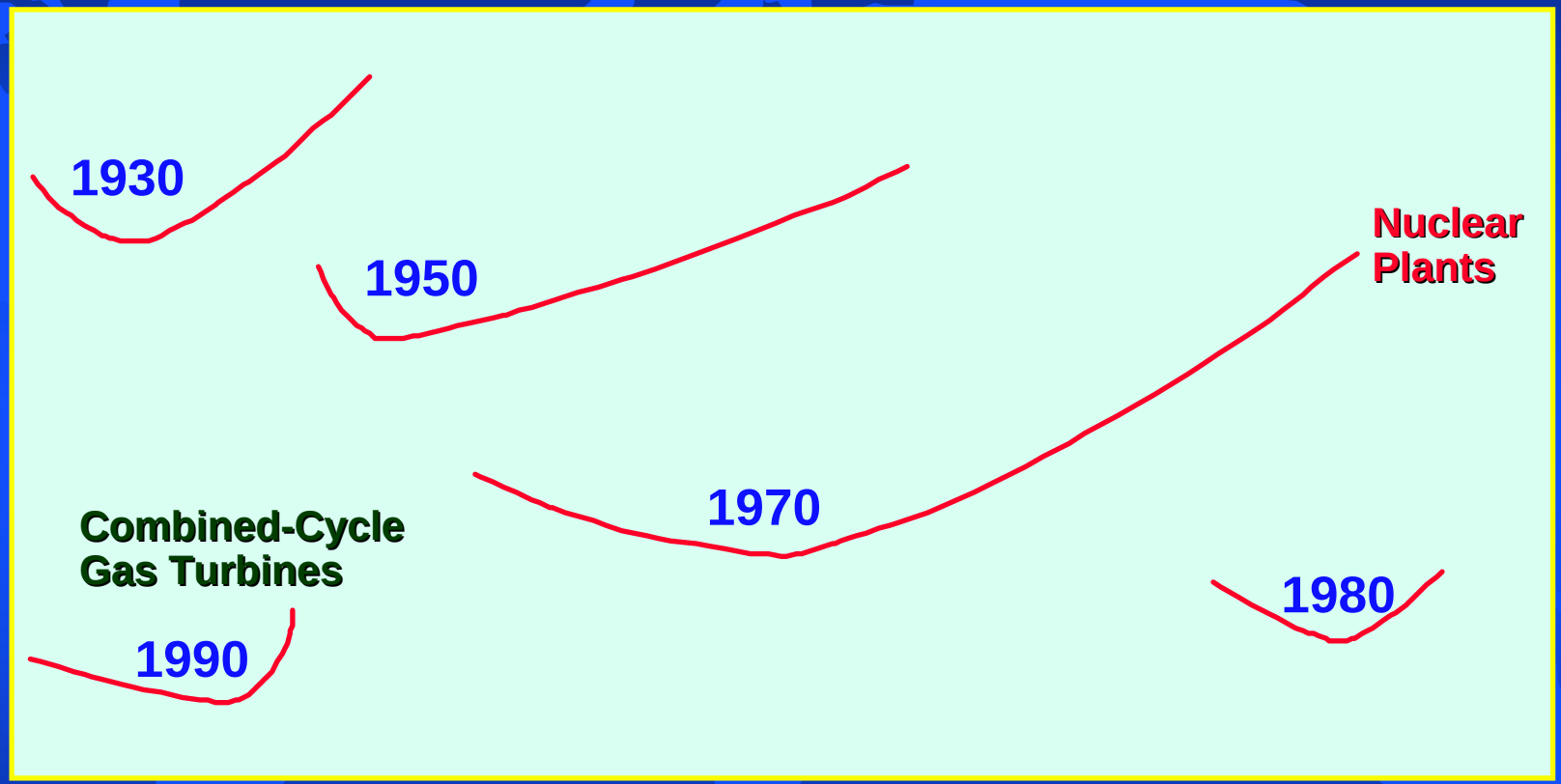
Capital Costs per kW for Electric Power Plants(1930-1990)

발전소별 건설 단가 ($/kW)



Source: T. R. Casten. 1995. *The Energy Daily* (September 7).

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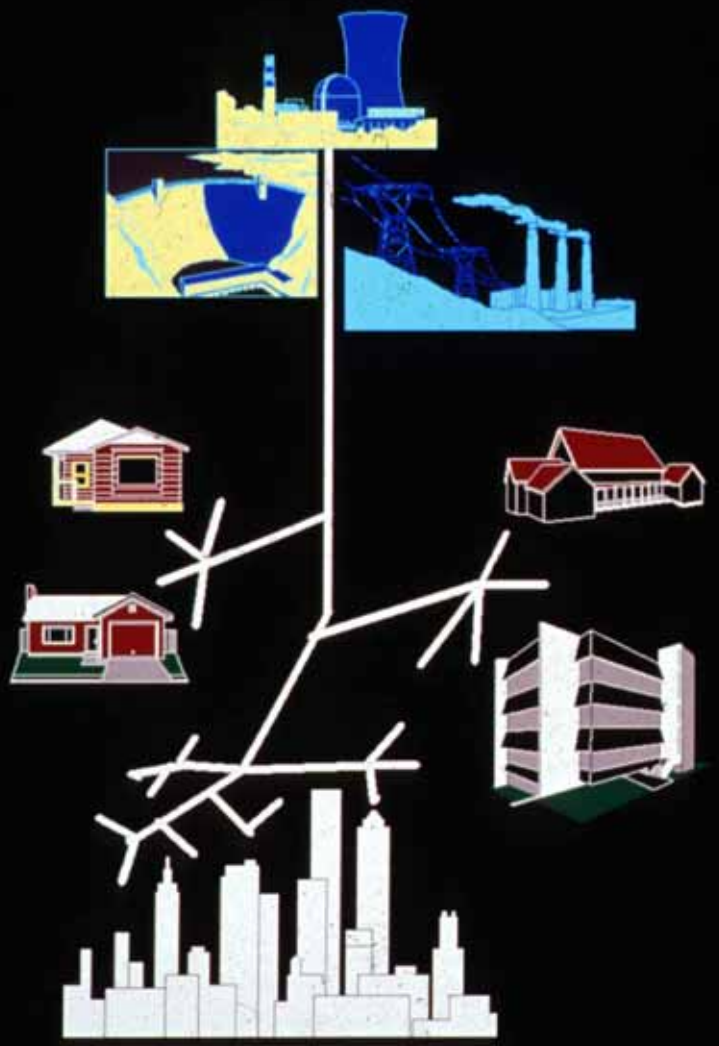
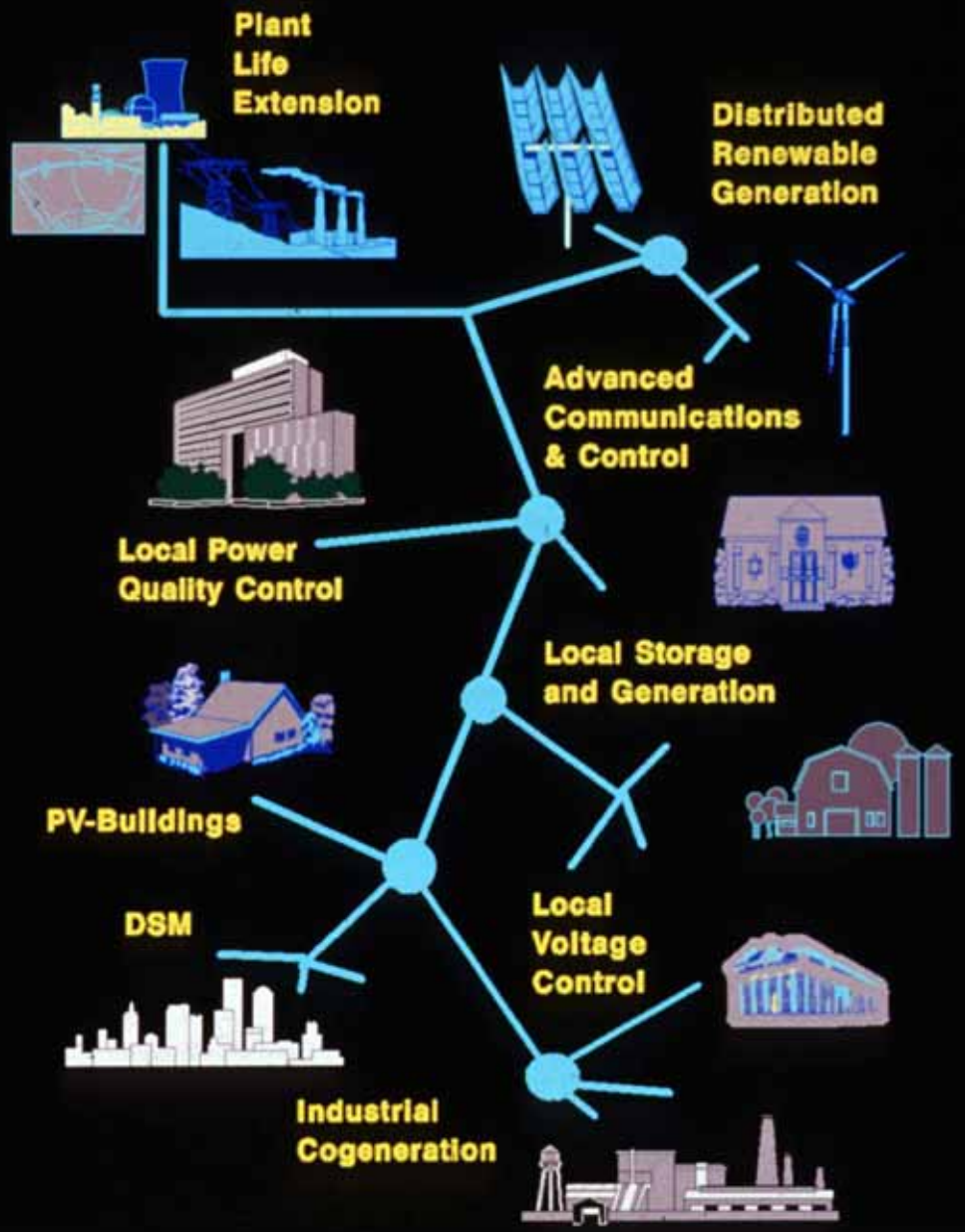
Central Supply

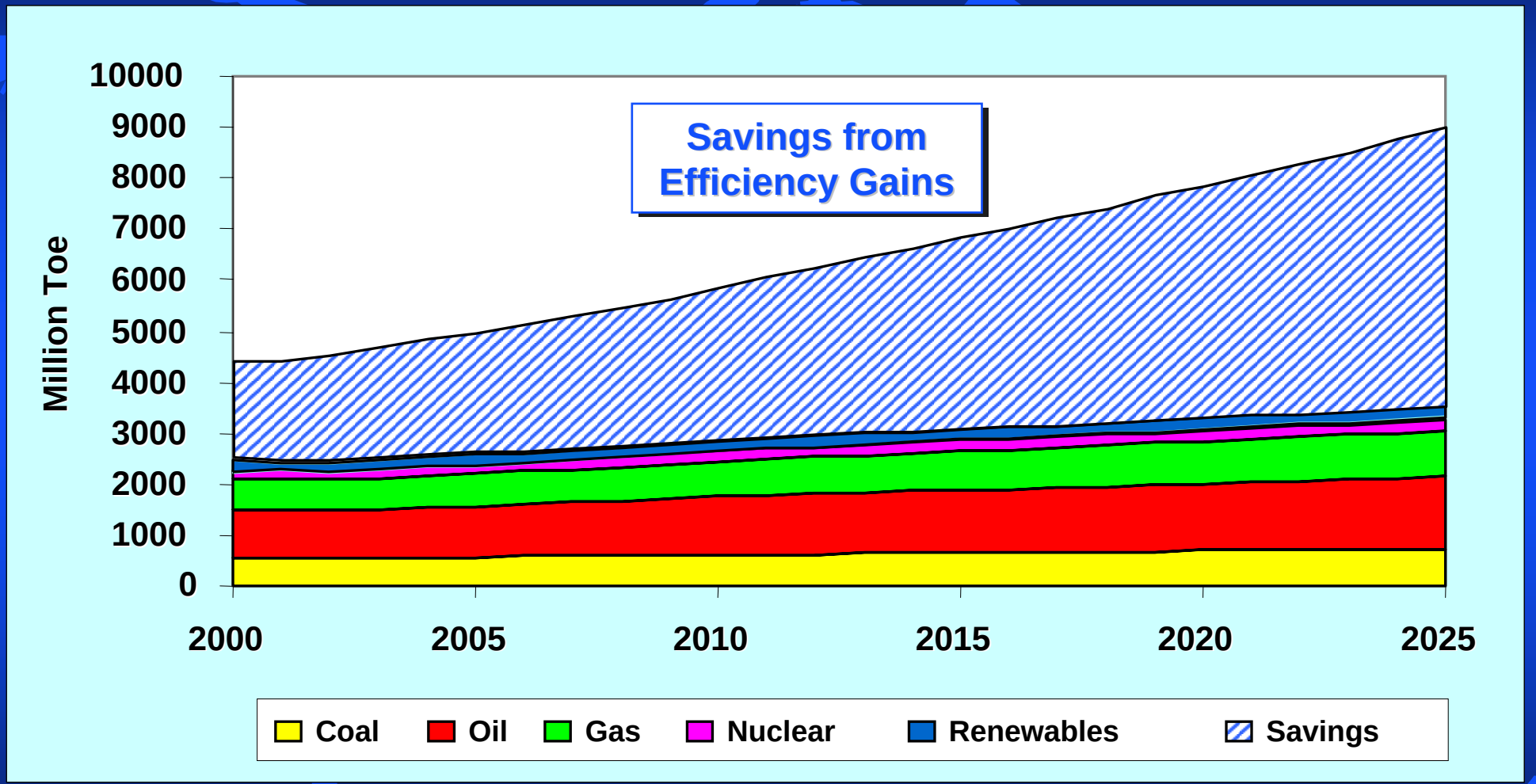


Distributed Utility



Projected U.S. Energy Mix by Source (Mtoe)

미국의 연료별 에너지 공급



Note: Data from U.S. EIA, *Annual Energy Outlook* (2003)

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