PROSPECTS FOR NUCLEAR POWER
A U.S. PERSPECTIVE

Paul L. Joskow

University of Paris – Dauphine

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NUCLEAR POWER IN THE U.S.

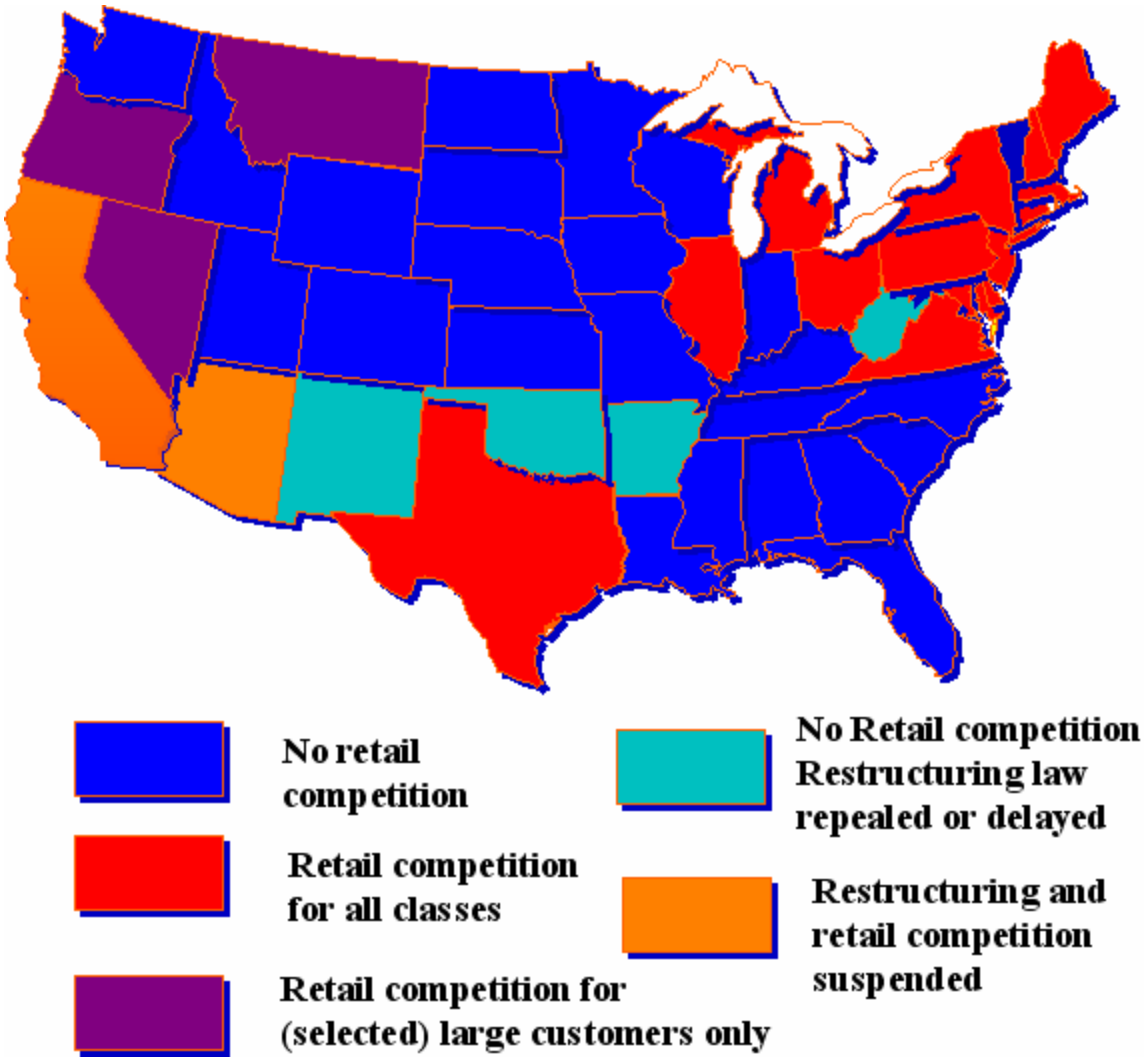
- U.S. has 100 GW of nuclear capacity (20% of U.S. electricity generation)
- Performance has improved dramatically over time in all dimensions
- It is economical to extend the life of the existing fleet and “uprate” some units to increase capacity (3+ GW more)
- Growing interest in the U.S. in promoting investments in new nuclear capacity but economics, waste disposal, and public acceptance are uncertain
- Changes in licensing process and efforts to resolve waste disposal issues support new investment
- 2005 Energy Act contains financial incentives (production tax credits, other subsidies) to encourage “first-movers” to build new plants
- 6 GW of nuclear capacity additions plus 3.2Gw uprates forecast between 2015 and 2030 by EIA
  - 311 Gw total generating capacity additions forecast by 2030
  - 34 Gw of new nuclear in “low construction cost” sensitivity case
  - 70 Gw of new nuclear in “vendor cost goals” sensitivity case
- Several companies are starting the licensing process for new plants but no firm orders have been made

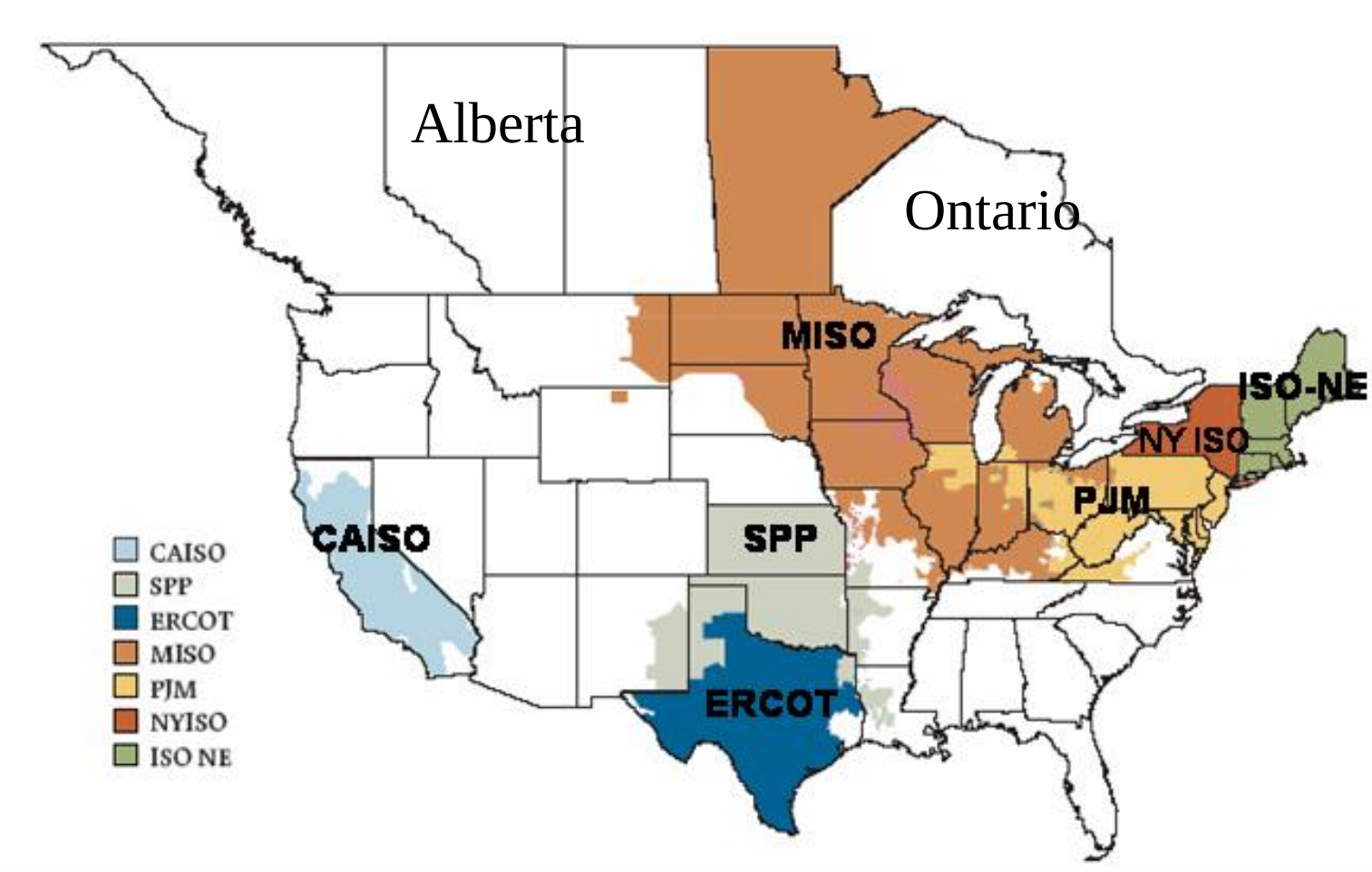
Source: Nuclear Energy Institute

BACKGROUND CONSIDERATIONS

- Need to distinguish existing fleet of plants from investments in new plants
- Economics is only one consideration for viability of investment in new nuclear plants
  - Public and political acceptance
  - Effectiveness of new licensing process
  - Waste disposal policies
- CO_2 policies, natural gas prices, coal prices, government subsidies and competitive/contractual/regulatory framework are important drivers of comparative economics of investments in new nuclear plants for private sector investors

STATUS OF RETAIL COMPETITION AND RESTRUCTURING REFORMS 2005

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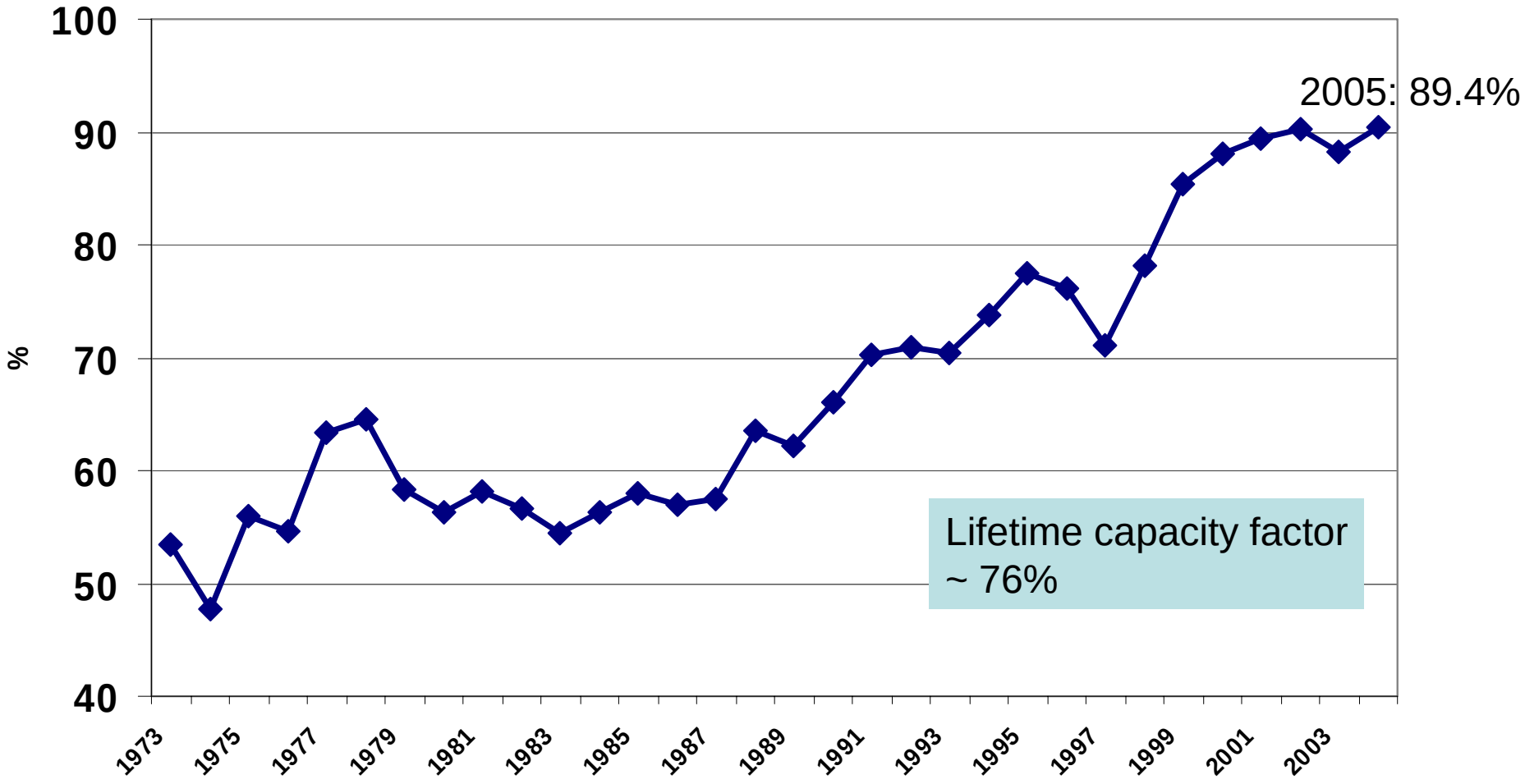
PERFORMANCE OF THE EXISTING U.S. FLEET OF LWRs

- Availability of the existing fleet of LWRs has improved significantly over time
- Real nuclear O&M costs have declined over time
- The existing fleet of plants is getting old but …
- On a going forward cost basis the existing fleet of LWRs is very economical compared to the market value of electricity
  - Life extension of existing fleet is typically economical
  - Modest increases in capacity (uprates) of existing units is feasible (3+ Gw more)

U.S. NUCLEAR PLANT CAPACITY FACTORS: 1973-2004

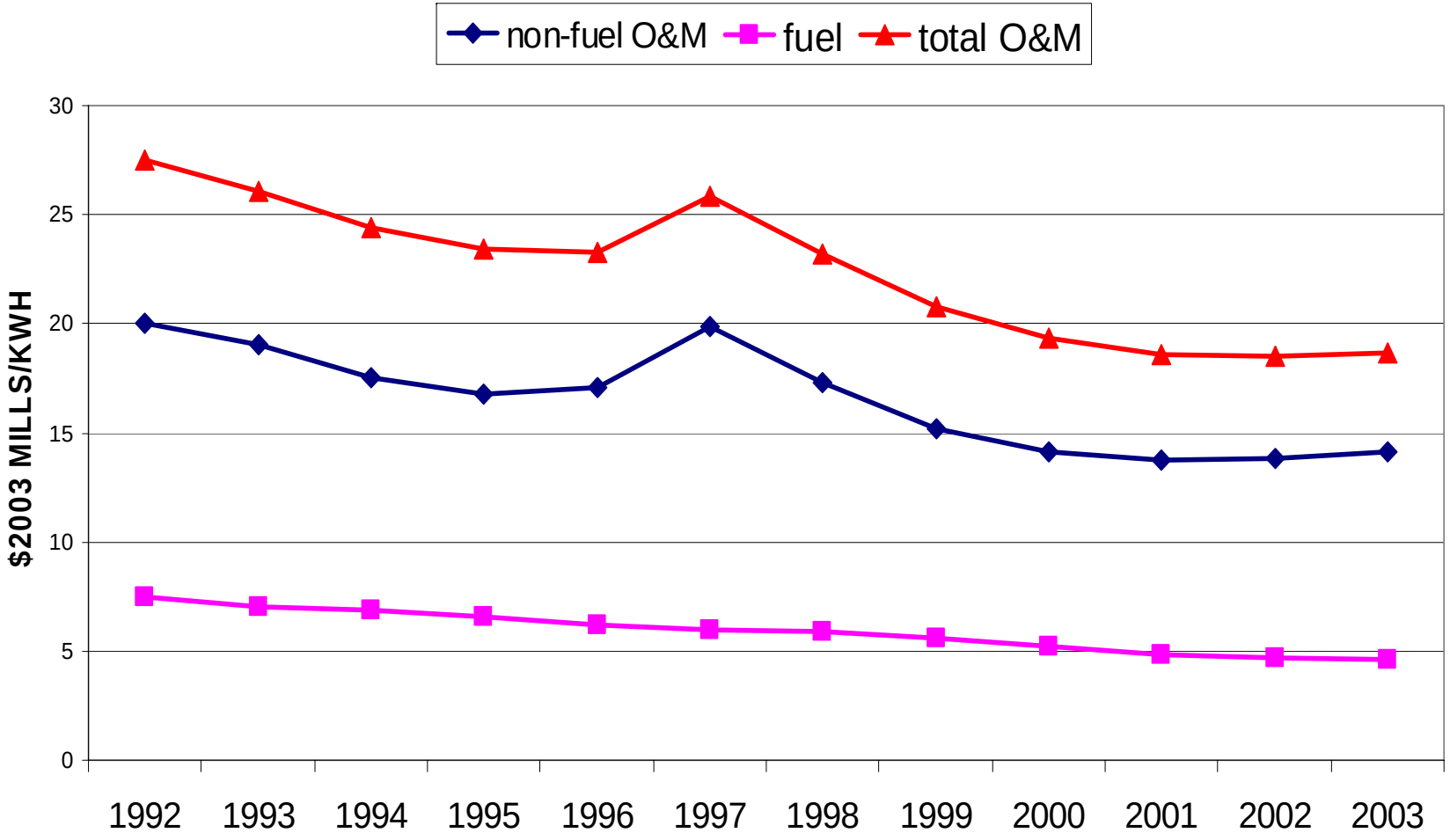


NUCLEAR PLANT AVAILABILITY FACTORS

Country	Lifetime	2002-2004
USA	76%	89%
France	77	81
Japan	74	67
Germany	83	87
Sweden	79	85
Spain	85	91
Belgium	85	88
Russia	69	73
Korea	85	89
Finland	90	93
World	76	82

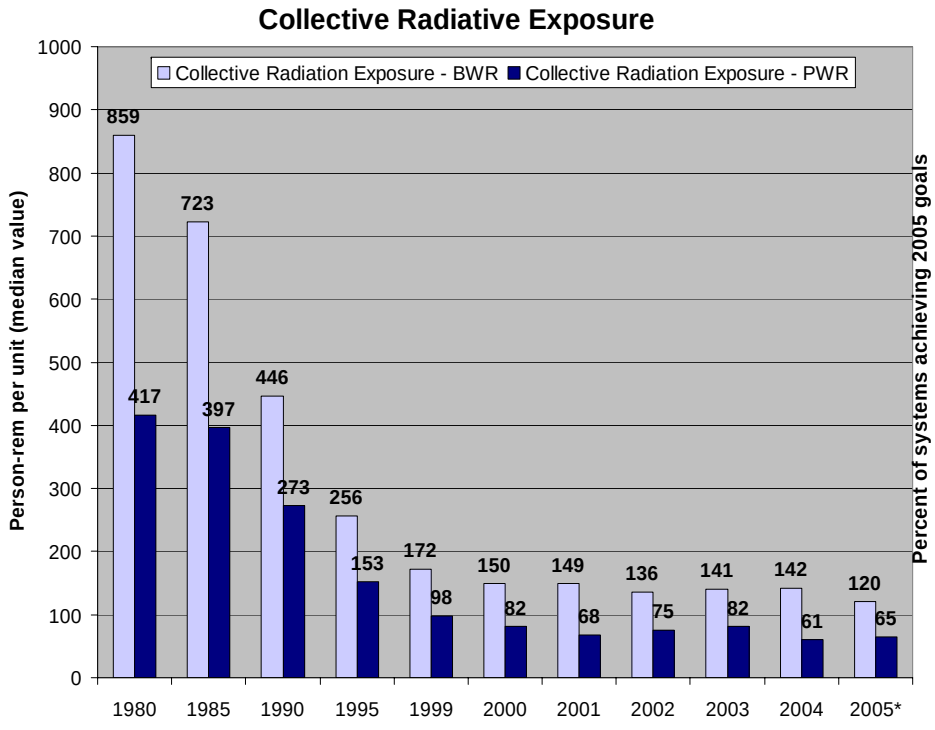
Source: IAEA

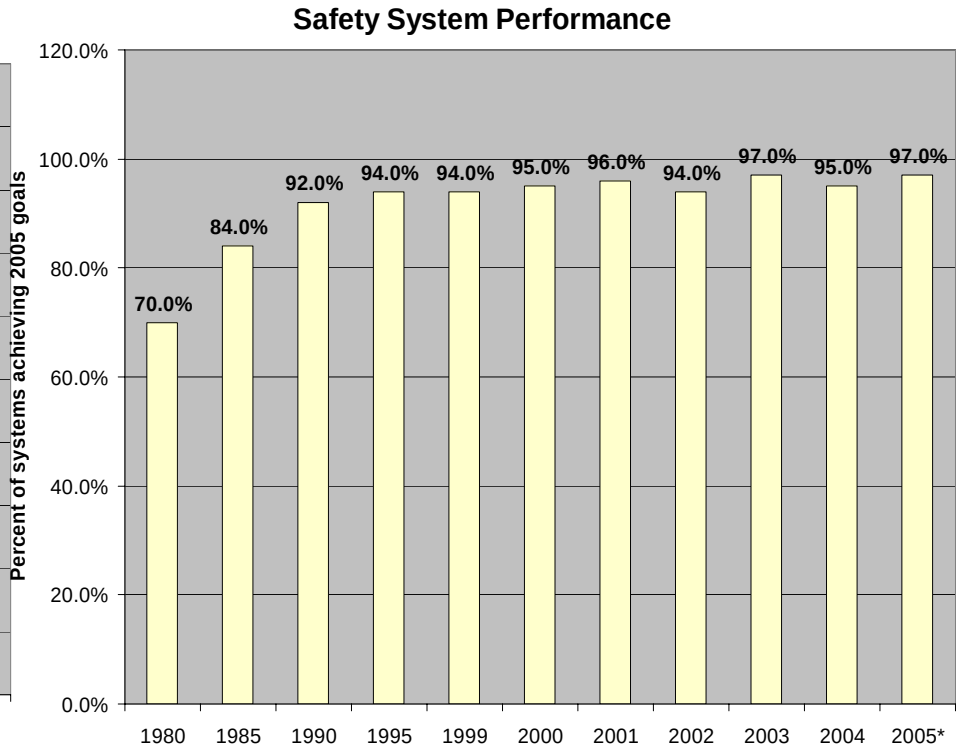
REAL U.S. NUCLEAR O&M COSTS ($2003 MILLS/KWH)
(Excludes Corporate Support Costs)



Source: U.S. EIA (various years)

Safety Performance Has Improved



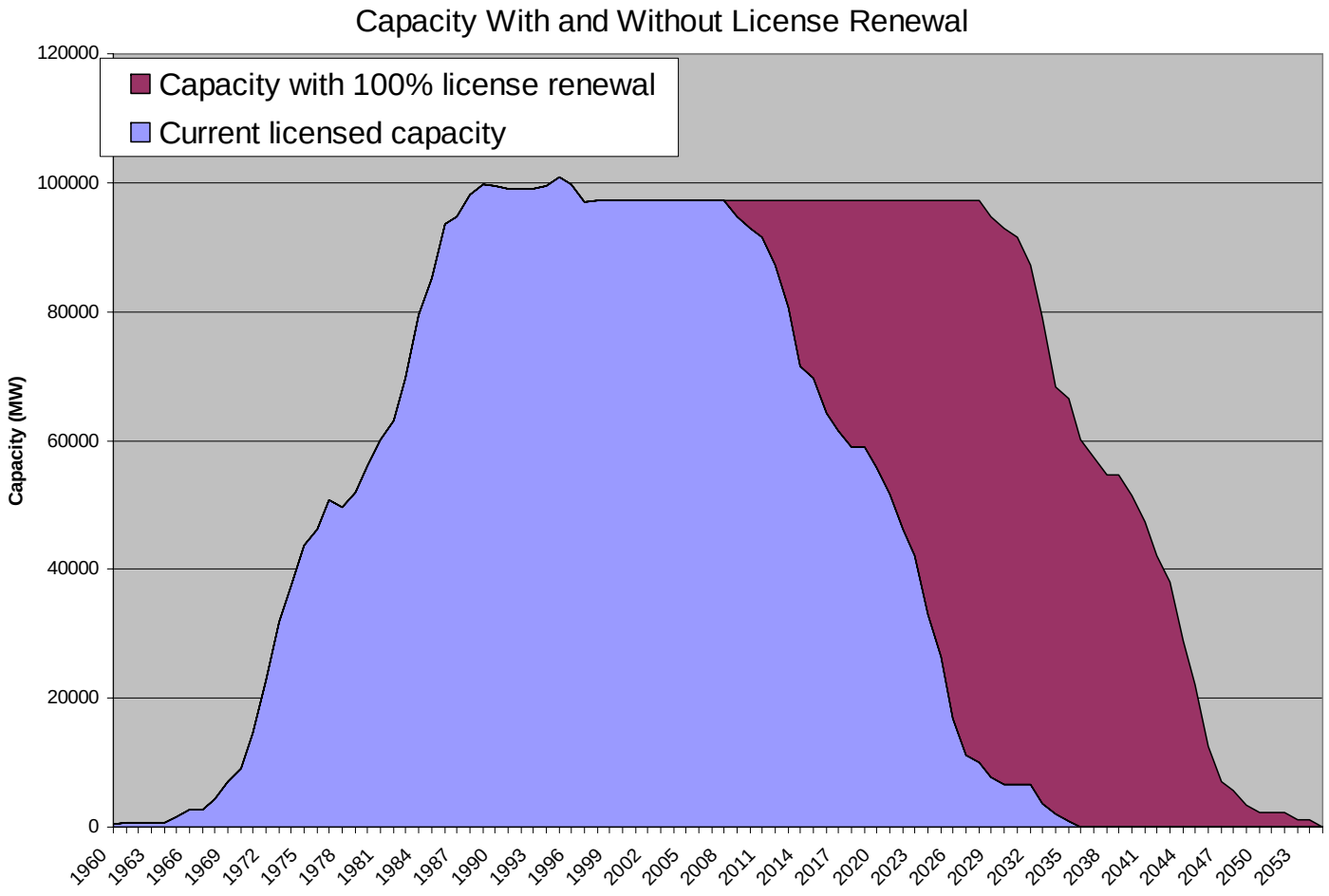


Source: Nuclear Energy Institute, 2005

Prospects for Expanding/Extending Capacity of Existing U.S. Fleet

- License renewals/extensions (as of May 1, 2006)
  - 39 units approved
  - 12 units under review
  - 27 letters of intent (multiple units)
- Power uprates
  - Additional 3.2 GW forecast by EIA
- Refurbishment:
  - Browns Ferry 1 on track for 2007
  - 1,280 MW plant
- Capacity factors:
  - Further improvement will be difficult

Without New Investments U.S. Nuclear Capacity Declines Quickly After 2030



Source: Dominion Resources, 2005

WHAT IS NEEDED TO STIMULATE SIGNIFICANT NUCLEAR INVESTMENT IN THE U.S.?

- Stable regulatory, competitive and commercial framework that will support capital intensive projects with relatively long construction expenditure cycles
- Stable and efficient nuclear plant licensing framework
- Achieve credible $1500/kW overnight cost including all relevant owner's costs, 5-year construction period and ≥ 85% life-time capacity factor
- Placing a significant "price" on carbon emissions helps a lot
- Realize credible and economic nuclear waste disposal policy

INVESTMENT IN NEW NUCLEAR PLANTS IN THE U.S.

- No new nuclear plants completed in the U.S. for over 10 years
- There are few new nuclear plants under construction in the world
  - Mostly in less developed countries
- Recent credible construction and cost data are limited
- Competitive, regulatory and contractual environment is very uncertain and varies widely across the U.S. (and the world)
- The U.S. has not adopted policies to place a price on CO2 emissions

WORLD NUCLEAR GENERATING CAPACITY UNDER CONSTRUCTION

Country	Units	Capacity
Argentina	1	692 (since 1981)
Bulgaria	2	1,906
China	3	3,000
Finland	1	1,600
India	8	3,600
Iran	1	915
Japan	1	866
Pakistan	1	300
Romania	1	655
Russia	8	3,375
Taiwan	2	2,600
Ukraine	2	1,900
TOTAL	27	21,810

Source: IAEA (May 2006)

INVESTMENT IN NEW PLANTS ECONOMIC CONSIDERATIONS

- Capital costs
  - Construction cost
  - Construction time
  - Financing costs [regulatory, competitive, contractual framework, income/property taxes]
- O&M Costs: fuel and other
- Life-time capacity Factor
- Effective prices placed on emissions from fossil-fueled competitors to internalize environmental externalities, including CO2
- Compared to base-load generation alternatives
  - Pulverized coal (PC)
  - NGCC
  - IGCC (with or without CCS)
- Direct and indirect subsidies

CONSTRUCTION COST ESTIMATES

- Construction cost estimates should include all costs, including engineering, construction management and owner's costs (~ 20%)
- The best estimates are drawn from actual experience rather than engineering cost models
- Construction cost estimates for PC and CCGT can be verified from actual experience
- Publicly available data on recent nuclear plants completed suggest that $2000/Kw, including all owner's costs, with a 5-year construction period is a good base case cost estimate
- Competitive power markets induce truthful revelation of costs and associated uncertainties
  - Need to convince investors not me

Weston 4
Proposed 515 Mw PC Unit
(2008 in-service, dollars of the day)

Item	Estimated Costs	
Engineering Costs		**$35,602,471**
Procurement Costs:		
Civil/Structural Equipment	$45,257,123	
Mechanical Equipment	$72,811,933	
Electrical Equipment	$13,897,651	
Control Equipment	$6,086,948	
Chemical Equipment	$7,389,774	
		$145,443,429
Construction and Fabrication/Engineering Contract Costs:		
Civil/Structural Erection	$93,602,099	
Mechanical Erection	$332,623,982	
Electrical Erection	$35,869,075	
Control Erection	$2,342,214	
Chemical Erection	$616,669	
		$465,054,039
Owner Construction Costs		**$47,832,534**
Construction Management Costs		**$58,508,736**
Total Cost		**$752,441,209**

Source: Public Service Commission of Wisconsin 2004

NUCLEAR CONSTRUCTION COST CONSIDERATIONS

- U.S. nuclear industry has a poor historical record on construction cost estimation, realization and time to build
- Few recent plants built anywhere and limited information on recent actual construction cost experience
- Nuclear industry has put forward very optimistic construction cost estimates but there is no experience to verify them
- Nobody has ever overestimated the construction cost of a nuclear power plant at the pre-construction stage

HISTORICAL U.S. CONSTRUCTION COST EXPERIENCE

75 (pre-TMI) plants operating in 1986: $2002/kWe

Construction Started	Estimated Overnight Cost	Actual Overnight Cost	% OVER
1966-67	$ 560/kWe	$1,170/kWe	209%
1968-69	$ 679	$2,000	294%
1970-71	$ 760	$2,650	348%
1972-73	$1,117	$3,555	318%
1974-75	$1,156	$4,410	381%
1976-77	$1,493	$4,008	269%

Source: U.S. EIA

RECENT CONSTRUCTION COST EXPERIENCE ($2002)

Genkai 3	$2,818/kW (overnight)
Genkai 4	$2,288/kW (overnight)
Onagawa	$2,409/kW (overnight)
KK6	$2,020/kW (overnight)
KK7	$1,790/kW (overnight)
Yonggwang 5&6	$1,800/kW (overnight)
Browns Ferry RESTART	$1,280/kW (overnight estimate)
Finland EPR (AREVA-Seimens contract only)	$2,350/kW (nominal estimate 2005)
Bruce RESTART	$1,425/kW (nominal estimate 2005)

Source: MIT

COMPARATIVE BASE LOAD COSTS (MIT REPORT)

($2002 cents/kWh)

	Merchant	Traditional
Base Case ($2000/kW)	**6.7**	**5.2**
Reduce Construction Costs 25% ($1500/kW)	**5.5**	**4.4**
Reduce Construction time by 12 months	**5.3**	**4.3**
Reduce cost of capital (financing cost)	**4.2**	**3.6**
Coal-PC	**4.2**	**3.5**
Gas-Low ($3.77/MCF)	**3.8**	**3.6**
Gas-Moderate ($4.42/MCF)	**4.1**	**4.0**
Gas-High ($6.72/MCF)	**5.6**	**5.7**

FOSSIL GENERATION COSTS WITH CO_2 PRICES
($2002 levelized cents/kWh - Merchant)

	$50/tonne C	$100/tonne C	$200/tonne C
Coal	**5.4**	**6.6**	**9.0**
Gas (low)	**4.3**	**4.8**	**5.9**
Gas (moderate)	**4.7**	**5.2**	**6.2**
Gas (High)	**6.1**	**6.7**	**7.7**
Nuclear (base)	**6.7**	**6.7**	**6.7**
Nuclear (-25%)	**5.5**	**5.5**	**5.5**
Nuclear (low)	**4.2**	**4.2**	**4.2**

EIA ANNUAL ENERGY OUTLOOK (2006) 2005-2030

- Reference Case (2030)
  - 6 Gw of new nuclear plus 3.2 Gw of additional uprates by 2030
  - Reflects 2005 Energy Policy Act subsidies for new nuclear (more on this presently)
  - About 50% of new generating capacity additions are coal
- Advanced nuclear case (20% average construction cost reduction from reference case)
  - 34 Gw of new nuclear by 2030
  - Primarily replaces coal capacity
- Vendor cost goal case (35% average construction cost reduction from reference – 44% in 2030)
  - 77 Gw nuclear by 2030
  - Primarily replaces coal capacity

CONCLUSIONS ON ECONOMICS

- Under base case assumptions coal beats nuclear in the U.S. absent CO_2 charges
- Under base case assumptions gas beats nuclear absent CO_2 charges unless gas prices are expected to stay above $6/mmbtu
- High gas price cases push investment toward coal absent CO_2 charges in regions with good access to coal resources
- Nuclear construction costs (including financing) must fall by about 25% - 30% from base case level to compete with coal and/or gas absent CO_2 charges

CONCLUSIONS ON ECONOMICS

- Nuclear is roughly competitive with coal with a $100/tonne C (~ $25/tonne CO_2) carbon charge even without significant nuclear construction cost reductions from base case
- With $100/tonne C carbon charge nuclear is only competitive with gas if gas prices are high without significant nuclear construction cost reductions from base case
- Plausible 25% construction cost reduction plus $100/tonne C charge makes nuclear very competitive with coal and with gas in all but low gas price cases
- 25% nuclear construction cost reduction plus $100/tonne C charge makes nuclear competitive with IGCC + CCS

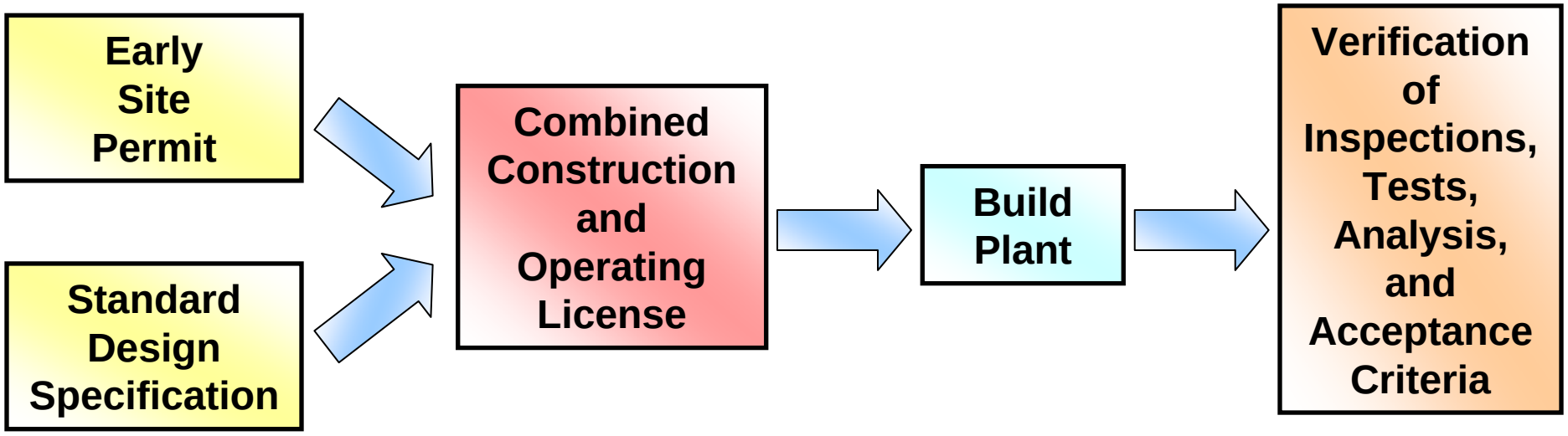
WHAT IS THE U.S. DOING TO ENCOURAGE INVESTMENT IN NUCLEAR?

- Streamline licensing process
- Banking of licensed sites
- “First mover” financial incentives
- Resolve waste disposal deadlock
- “Moral support” for nuclear investment

New U.S. Reactor Licensing Process

Old Process: The two-step licensing process (10 CFR 50)

New Process: Combined licensing process (10 CFR 52)



Source: Berger and Parsons (MIT CEEPR 2005)

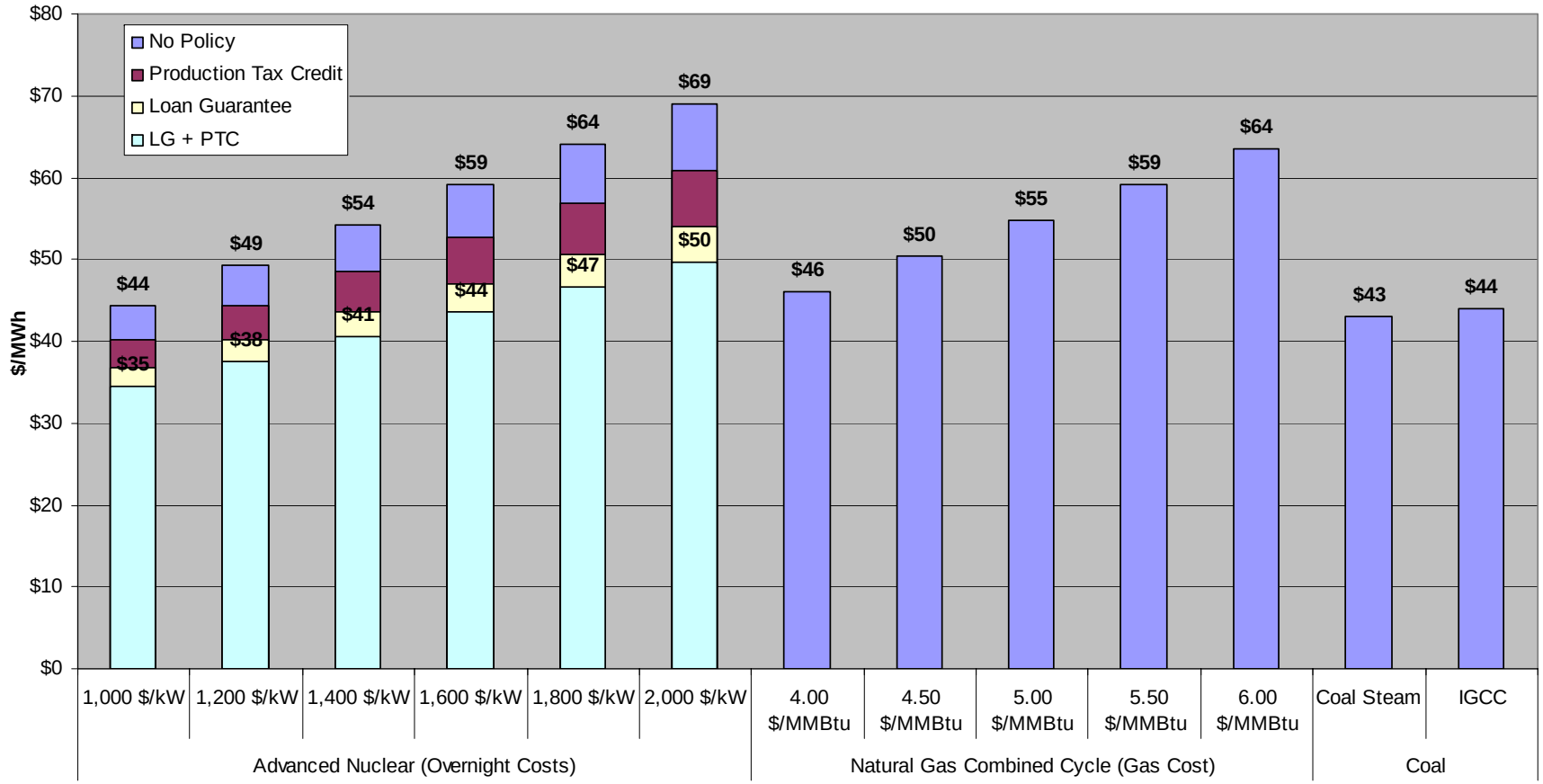
Energy Policy Act of 2005

- Loan guarantees for up to 80% of project cost
  - Valid for all GHG-free technologies
  - Higher leverage, lower debt cost reduces overall project cost
- Production tax credit of $18 per MWh for 8 years for new nuclear capacity through 2021, subject to 2 limitations:
  - $125 million per 1,000-MW per year
  - 6,000-MW eligible, allocated among available capacity
- Insurance protection against delays during construction and until commercial operation caused by factors beyond private sector's control
  - Coverage: $500 million apiece for first two plants, $250 million for next four
  - Covered delays: NRC licensing delays, litigation delays

Energy Policy Act of 2005

- Renewal of the Price-Anderson Act of 1957
  - Liability protection extended until 2025
- Legislation updates tax treatment of nuclear decommissioning trust funds to reflect competitive electricity markets
  - All decommissioning trust funds will qualify for tax deductibility (not only those of regulated utilities)
- Federal commitments on R&D portfolio ($2.95 billion authorized)
- Creates Assistant Secretary for Nuclear Energy at DOE

The Energy Policy Act of 2005 Reduces Costs for First Movers



Source: Berger and Parsons (MIT CEEPR 2005)

STANDARD PLANT DESIGN APPROVALS NRC REVIEW STATUS

- Application reviews
  - AP600, ABWR, System 80+ -- were certified (97-99)
  - AP1000 (Westinghouse PWR): Approved March 10, 2006
  - ESBWR (GE BWR): Under review
- Pre-application reviews
  - ACR 700 (AECL CANDU): in process
  - EPR (Framatome ANP): in process
  - IRIS (International Reactor Innovative and Secure) (Westinghouse 350 Mwe; Gen IV): early in process
  - PBMR (Pebble Bed Modular): Exelon withdrew 2002; PBMR Ltd. intent to proceed in the future

NEW NUCLEAR PLANTS UNDER CONSIDERATION

Company	Site	Early Site Permit	Design	Construction/ Operating License
Dominion	North Anna	Under Review	ESBWR	Pending (2007)
TVA (NuStart)	Bellefonte	N/A	AP1000 (2)	Pending (2007)
Entergy (NuStart)	Grand Gulf	Under Review	ESBWR	Pending (2007/08)
Entergy	River Bend	N/A	ESBWR	Pending (2008)
Southern	Vogtle	Development	AP1000	Pending (2008)
Progress Energy	Harris, TBD	N/A	AP1000 (4)	Pending (2007/08)
SCE&G	Summer	N/A	AP1000 (2)	Pending (2007)
Duke/Southern	South Carolina	N/A	AP1000 (2)	Pending (2007)

Source: Nuclear Energy Institute

NEW NUCLEAR PLANTS UNDER CONSIDERATION

Company	Site	Early Site Permit	Design	Construction/ Operating License
Exelon	Clinton	Under Review	N/A	N/A
Unistar	Calvert Cliffs or Nine Mile Point	N/A	EPR	Pending (2008)
FP&L	Florida (TBD)	N/A	N/A	Pending (2009)
Duke	North Carolina	N/A	N/A	N/A
Duke	South Carolina	N/A	N/A	N/A

Source: Nuclear Energy Institute

ATTRIBUTES OF ACTIVE U.S. PROJECTS

- Companies with good nuclear operating experience (consolidation in the U.S.)
- First movers are likely to be on existing sites
- Energy Policy Act subsidies have stimulated a lot more interest
- Projects are primarily in states that have not deregulated
  - What will the regulatory framework be?
  - Construction cost caps and operating performance incentive mechanisms are likely
- No firm commitments have been made to build a new plant
  - Companies are buying options at the moment
  - Uncertainty about the competitive, regulatory, and contractual framework is a major issue

FINLAND

- Teollisuuden Voima Oy (TVO) is building Olkiluoto 3
  - EUR 3 billion contract with Areva and Siemens (~$2300/kw)
  - 1600 MWe
  - Construction Started September 2005
- Ownership and Long Term Contract Shares

UPM-Kymmene (forestry products via PVO energy company)	25.63%
Stora Enso Oyj (forestry products via PVO energy company)	9.39%
others (forestry products via PVO energy company)	25.18%
Fortum Power & Heat (government controlled power corp)	25.00%
Oy Mankala Ab (city of Helsinki)	8.10%
Etala-Pohjanmaan Voima Oy (distr cos in NW coast of Finland)	6.50%
Graninge Suomi Oy (energy co. in forestry/energy group)	0.10%