New Nuclear Power and Climate Change: Issues and Opportunities

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Nuclear Energy's Role in The United States

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and EBC-NE Seminar

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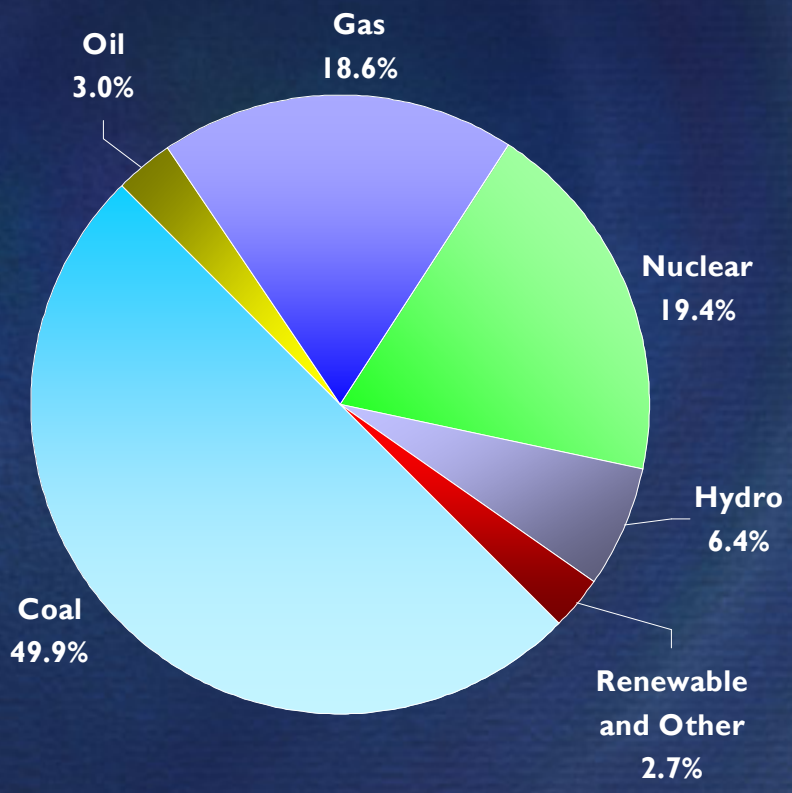
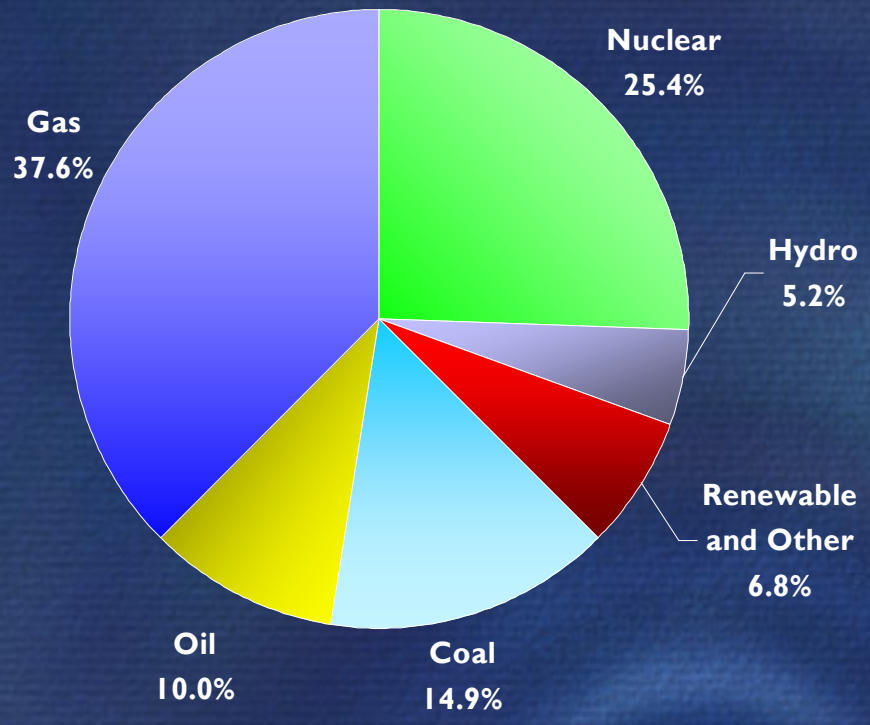
Share of Total Electricity Generation by Fuel (2005)

United States



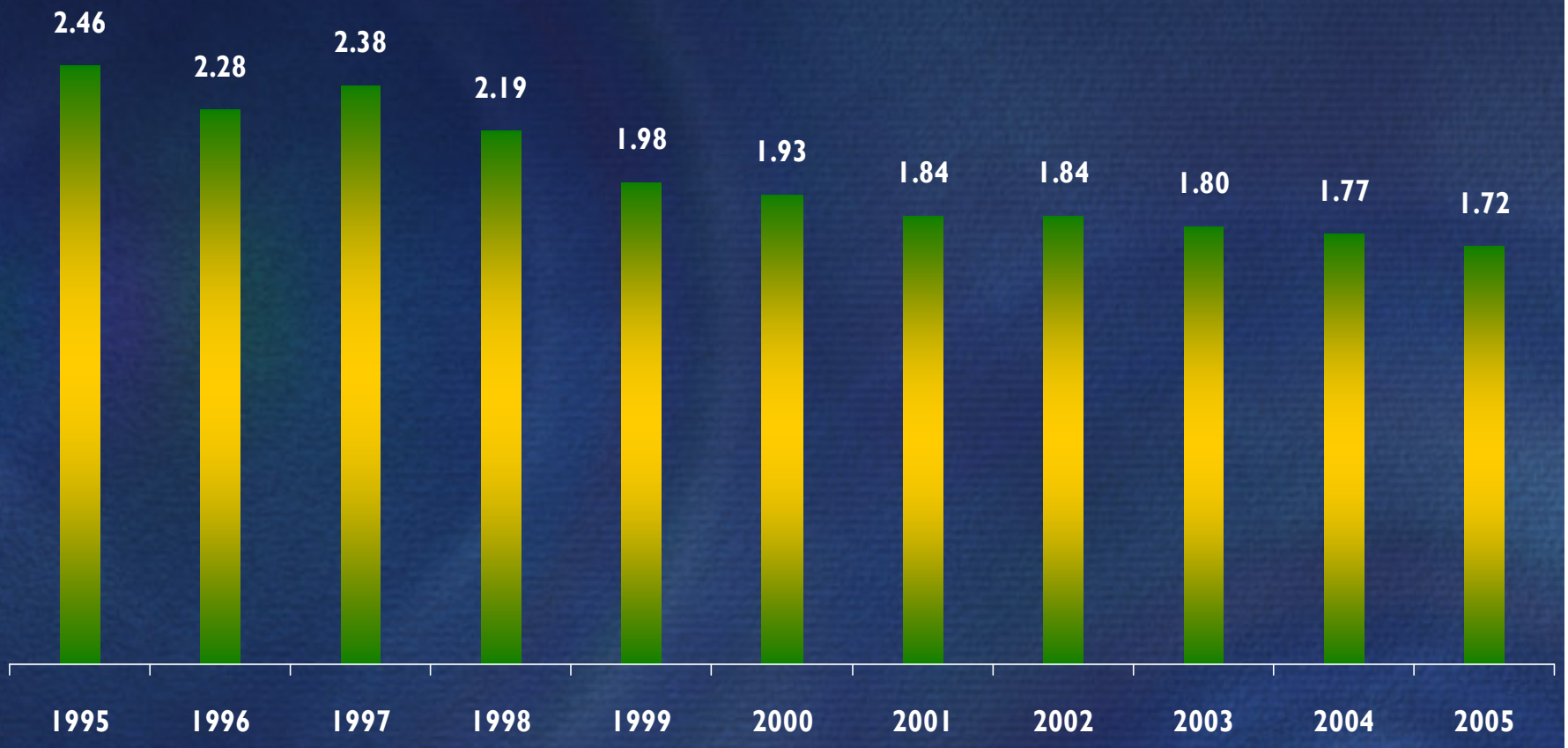
New England



Source: Global Energy Decisions / Energy Information Administration

Updated: 4/06

U.S. Nuclear Industry Production Costs 1995-2005 *(In 2005 cents per kilowatt-hour)*

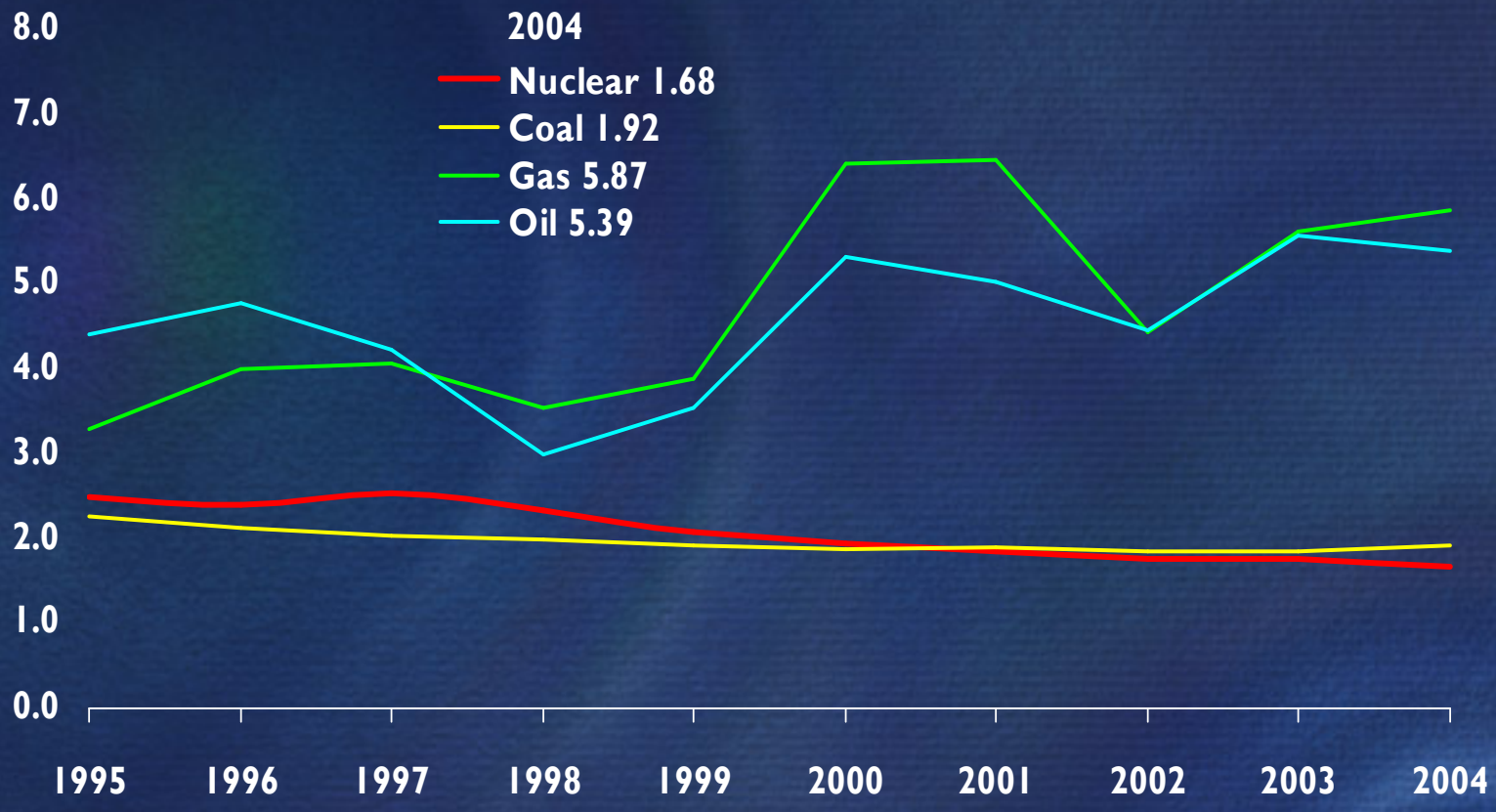


Production Costs = Operations and Maintenance Costs + Fuel Costs

Source: Global Energy Decisions
Updated: 6/06

U.S. Electricity Production Costs

1995-2004 (*Averages in 2004 cents per kilowatt-hour)*



Production Costs = Operations and Maintenance Costs + Fuel Costs

Source: Electric Utility Cost Group and Global Energy Decisions
Updated: 6/05

Nuclear and Coal Provide Baseload Power

U.S. Capacity Factors by Fuel Type 2005

Fuel Type	Average Capacity Factors
Nuclear	90%
Coal (Steam Turbine)	73%
Gas (Combined Cycle)	38%
Gas (Steam Turbine)	16%
Oil (Steam Turbine)	30%
Hydro	29%
Wind	27%
Solar	19%

Source: Global Energy Decisions / Energy Information Administration

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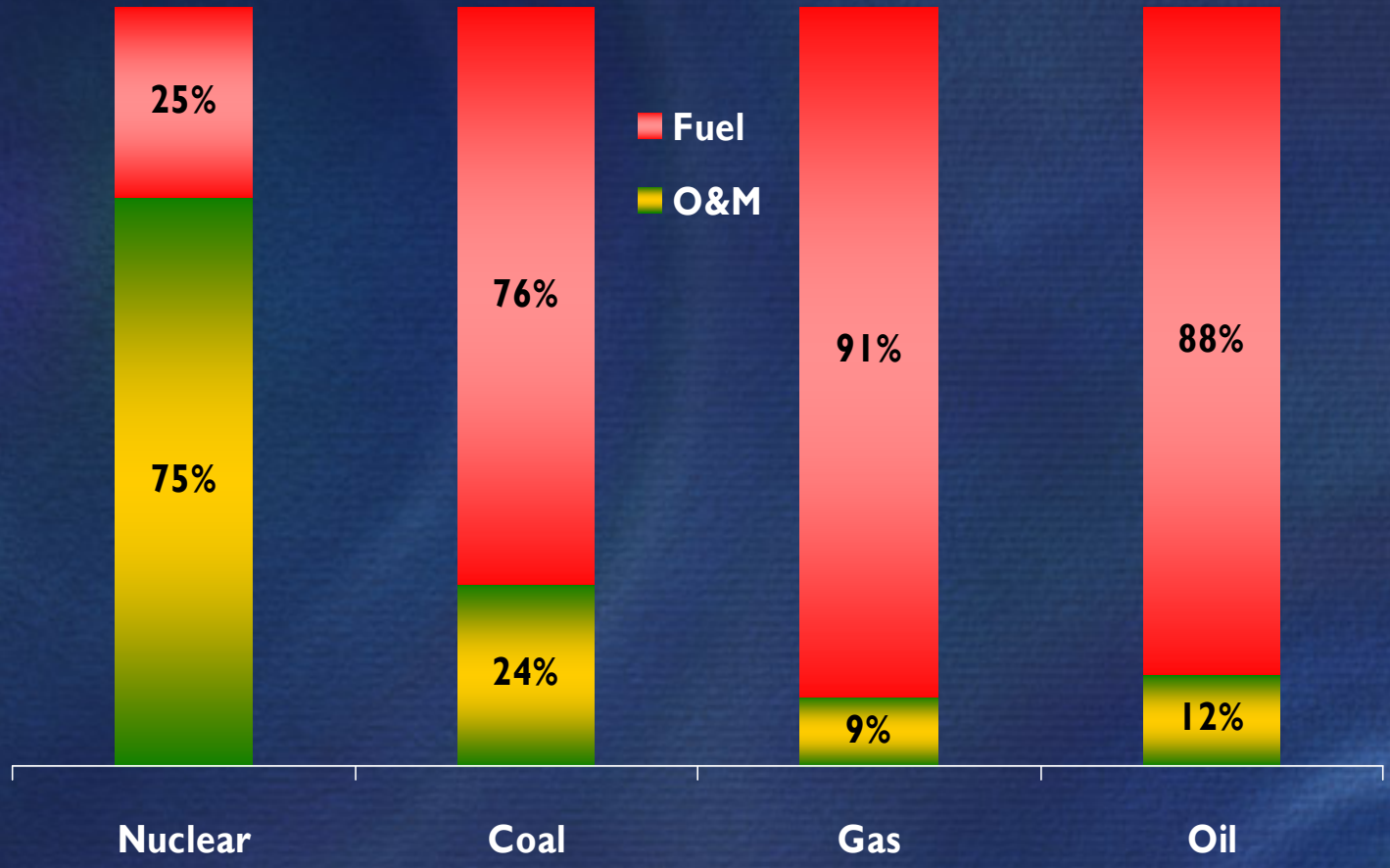
Fuel as a Percentage of Electric Power Industry Production Costs 2004



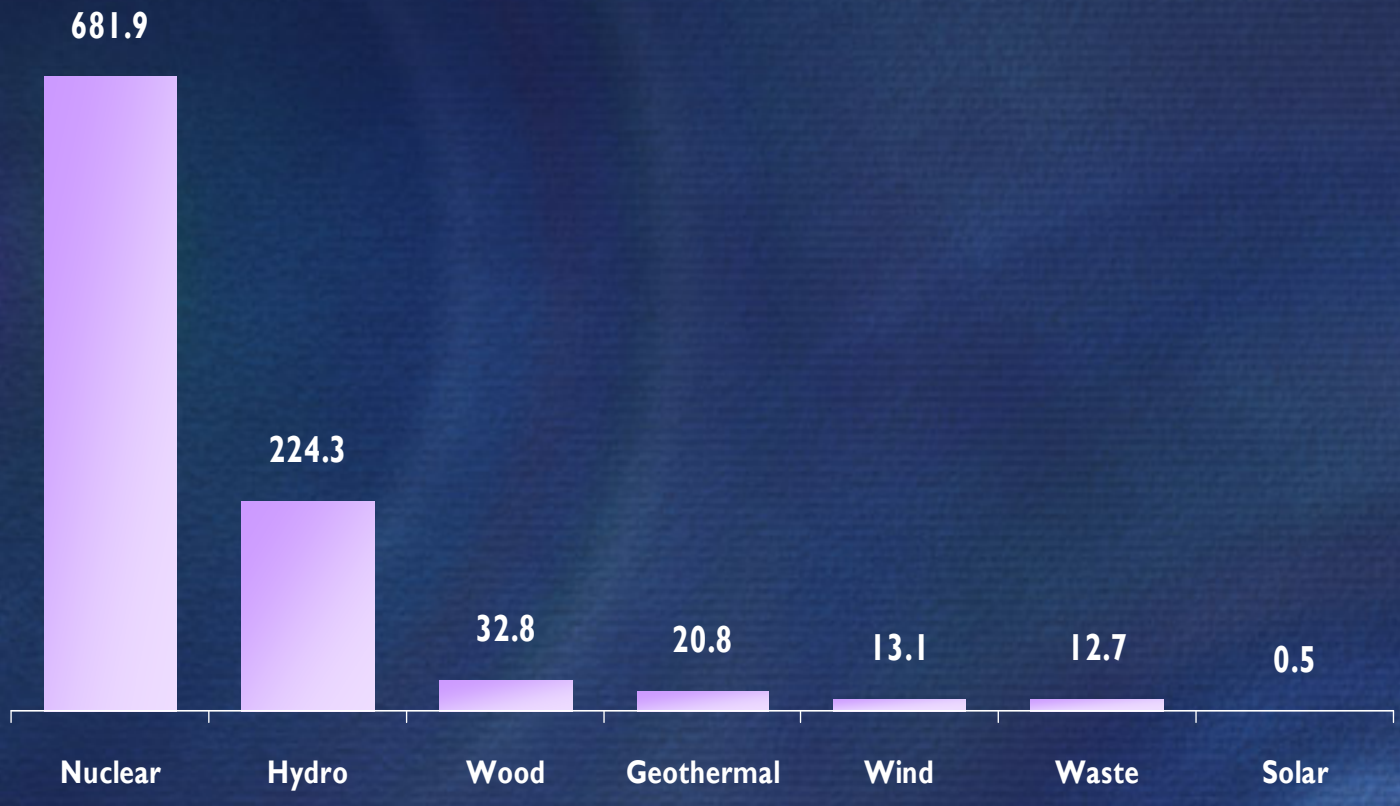
Source: Electric Utility Cost Group and Global Energy Decisions
Updated: 6/05

Emissions Prevented by Nuclear Energy (2005)

	CO_2 (metric tons)	SO_2 (short tons)	NO_X (short tons)
United States	681,900,000	3,320,000	1,050,000
New England	21,200,000	65,200	17,100
RGGI* Region	89,800,000	515,000	123,000

* RGGI region includes CT, DE, ME, MD, NH, NJ, NY, and VT
Source: Emissions avoided by nuclear power are calculated using regional fossil fuel emissions rates from the Environmental Protection Agency and plant generation data from the Energy Information Administration
Updated: 4/06

U.S. Electric Power Industry CO_2 Avoided Million Metric Tons (2005)



Source: Emissions avoided are calculated using regional and national fossil fuel emissions rates from the Environmental Protection Agency and plant generation data from the Energy Information Administration.

Updated: 4/06

Used Fuel Management: Where We Stand Today

- Yucca Mountain site judged suitable in 2002
  - 20 years of scientific investigation
  - $6-7 billion of research
- License application expected in 2008
- Complex program with many moving parts:
  - A collision of science, politics, the federal budget, technology, federal versus state prerogatives, business imperatives, and international policy issues

"Closing" the Nuclear Fuel Cycle

- Worldwide expansion of nuclear energy prompting renewed interest in:
  - recycling used nuclear fuel
  - advanced used fuel reprocessing technologies
  - developing new type of fuel from reprocessed product
  - new reactor designs able to consume fissile materials recovered from used fuel
- Together, these advanced technologies reduce volume and toxicity of nuclear waste and are the underlying technologies of Global Nuclear Energy Partnership (GNEP)
- But ... still need Yucca Mountain disposal facility

Used Fuel Management: Long-Term and Short-Term Goals

- Long-term goal: License and build disposal facility for waste by-products at Yucca Mountain with multi-decision points on closure
- Short-term goal: Maintain flexibility as we move toward long-term goal
  - Accommodate advances in fuel processing and recycling technologies
  - Provide federal storage capability before shipment to Yucca Mountain at interim storage sites linked to future recycling

Near-Term Need for New Capacity

Projected Excess Capacity by NERC Region, 2005–12, Including Power Plants Under Construction
(megawatts)

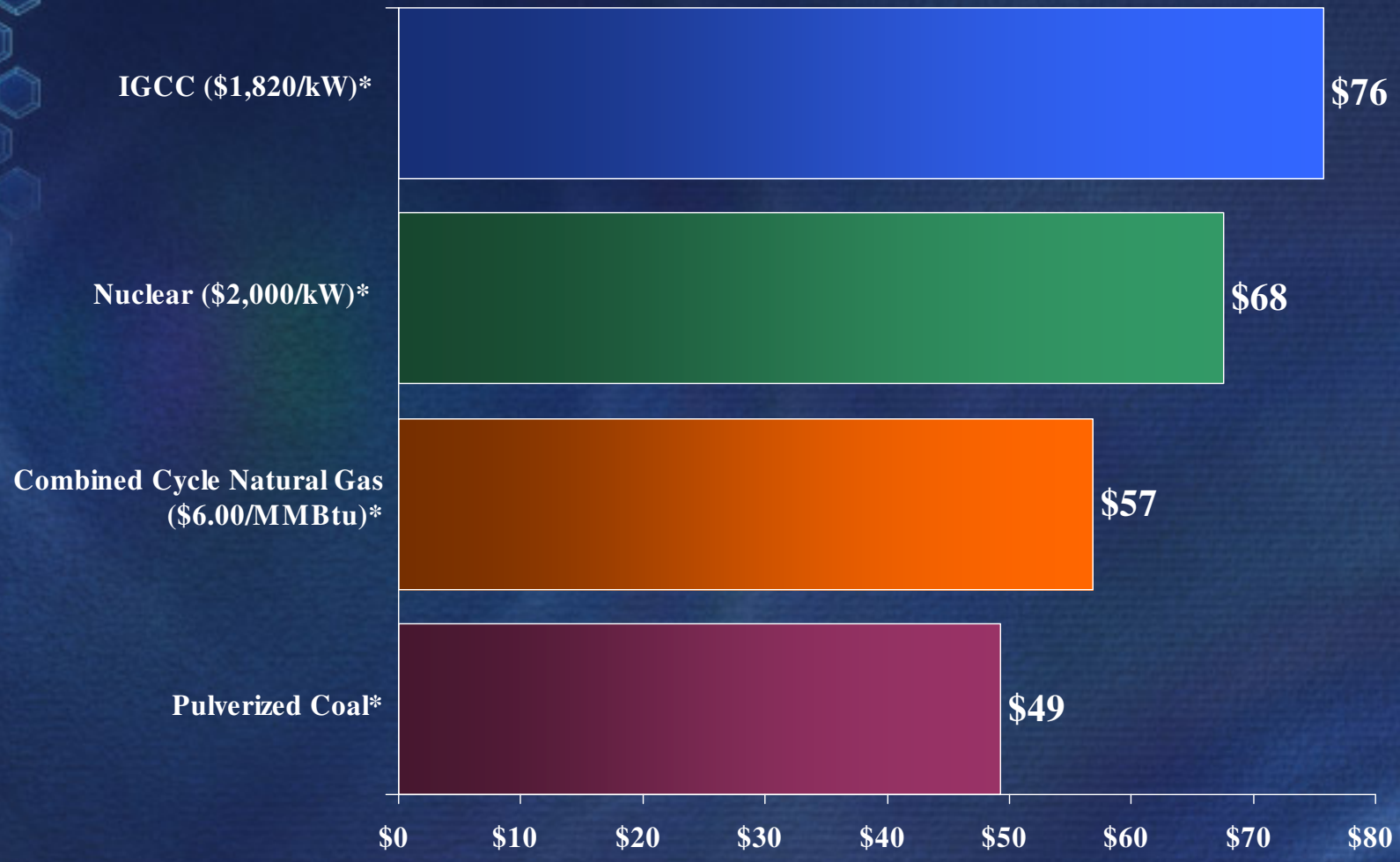
Region	2007	2008	2009	2010	2011	2012
ISO-NE	861	213	0	0	0	0
NYISO	1,353	0	0	0	0	0
MAAC	1,583	0	0	0	0	0
ECAR	12,344	9,970	8,686	6,441	4,169	1,869
MAIN	6,740	7,390	5,661	4,884	4,367	3,024
MAPP-US	3,621	2,939	2,422	1,575	690	0
VACAR	0	0	0	0	0	0
Southern	2,738	1,029	0	0	0	0
TVA	1,317	236	0	0	0	0
Entergy	16,330	15,691	15,109	15,184	14,586	13,977
FRCC	2,472	1,488	145	0	0	0
SPP	5,729	4,690	3,746	2,750	1,759	750
ERCOT	0	0	0	0	0	0
WECC-US	20,731	17,931	15,945	14,140	11,547	8,900

Source: Cambridge Energy Research Associates and EV Power ®, Global Energy Decisions, Inc.
Notes: (1) Required reserve margin assumed to be 18 percent in New England, New York, PJM, WECC, and FRCC; otherwise it is 15 percent; (2) Includes only known scheduled retirements.

Energy Policy Act of 2005

- Federal loan guarantees
  - Covers up to 80% of project cost
  - Allows more highly leveraged capital structure
  - Reduces project cost
  - Applies to other technologies that reduce emissions (IGCC, renewables, etc.)
- Production tax credits
  - $18/MWh for up to 6,000 MW new nuclear
  - For 1,000 MW of capacity, that is worth up to $125 million in tax credits per year for 8 years

New Generating Capacity: Estimated Power Costs ($/MWh)



*Assumes 15% cost of equity, 8% cost of debt, and a 50/50 debt/equity structure; Source: NEI Analysis

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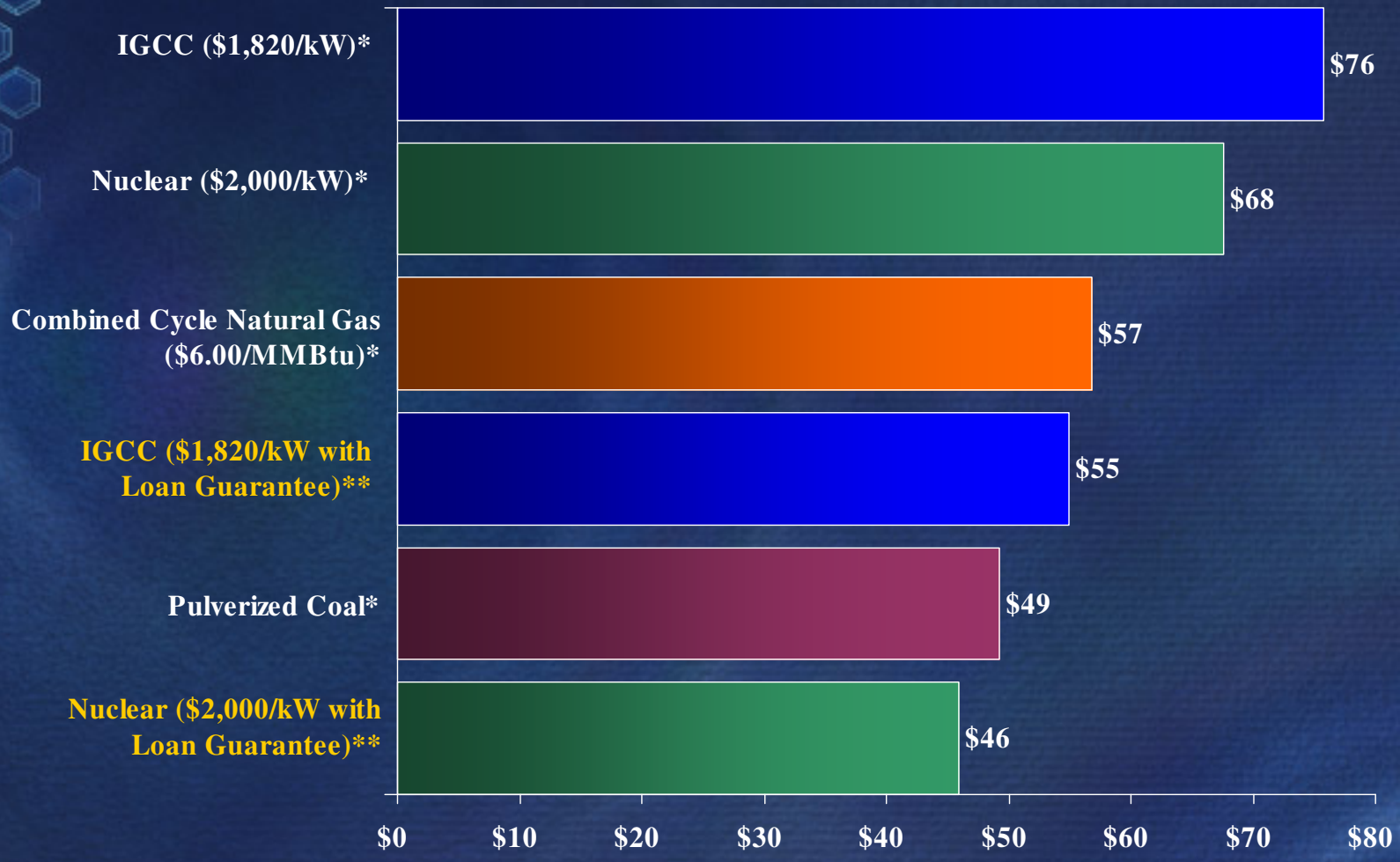
New Generating Capacity: Estimated Power Costs ($/MWh)



**Assumes 15% cost of equity, 8% cost of debt, and a 50/50 debt/equity structure; **Assumes 15% cost of equity, 6% cost of debt and an 80/20 debt/equity structure..*

Source: NEI Analysis

Containing the Perceived Risk Of First New Nuclear Plants

- New licensing process reduces risk of delay
  - Project developers will have regulatory approvals before significant capital is spent
  - Standardized designs complete before construction begins
- Federal standby support
  - Provides $2 billion of risk insurance for first six plants
  - Covers delays resulting from licensing or litigation

Significant Industry Investment Underway

- Design and engineering:
  - 2 designs certified: AP1000, ABWR
  - ESBWR under review, U.S. EPR being prepared for certification
- Supply chain: Major investments underway in long-lead procurement, expansion of U.S. manufacturing capability
  - BWXT renewed "N-Stamp" accreditation from ASME
  - BWXT-AREVA joint venture to manufacture heavy components
  - LES enrichment facility licensed
- Licensing
  - 3 ESPs (Exelon, Dominion, Entergy) under NRC review: approval 2007
  - Southern Nuclear preparing 1 ESP (Vogtle), Duke considering 2
  - 13 companies, consortia preparing license applications for as many as 31 units: submittal 2007-2009 (public announcements only)

New Nuclear Plants Under Consideration

Company	Location	Units	Date for Filing COL Application
Dominion	Virginia	1	2007
NuStart Energy (TVA)	Alabama	2	2007
NuStart Energy (Entergy)	Mississippi	1	2007/2008
Entergy	Louisiana	1	2008
Southern Co.	Georgia	1-2	2008
Progress Energy	North Carolina and Florida	2-4	2007
South Carolina Electric & Gas	South Carolina	1-2	2007
Duke Energy	South Carolina	2	2008
UniStar Nuclear	New York or Maryland	1-5	2008
Florida Power and Light	TBD	TBD	2009
NRG (at South Texas Project)	Texas	2	2007
Amarillo Power	Texas	2	~2007
TXU	Texas	2-5	~2008
Exelon	Texas	2	2008

Growing Need for Additional Baseload Capacity

- Electricity demand in 2030 will be 45% greater than today
- To maintain current electric fuel supply mix would mean building:

50	Nuclear reactors (1,000 MW)
261	Coal-fired plants (600 MW)
279	Natural gas plants (400 MW)
93	Renewables (100 MW)

Source: 2006 Annual Energy Outlook, Energy Information Administration