

Utilities' Use Of Nuclear Generation

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How Were The Existing US Nuclear Plants Built?

- Existing US nuclear plants were proposed, developed and financed by vertically integrated electric utilities
 - Franchised monopolies, with integrated resource plans
 - Cost effectiveness determined by regulators
 - Regulatory compact allowed recovery of investment through integrated rate base
 - Projects earned interest during construction delays
- In most cases, all lifetime fixed costs, including decommissioning, were guaranteed to be recovered through utility's bundled rates

What Was A Nuclear Plant's Market?

- Plant output was provided to native load customers who paid bundled rates
 - Obligation to serve
 - Utility management's challenge was to operate the plant in a safe, compliant, prudent, reasonable, and reliable manner
- Wholesale markets existed, but utilities sold only their surplus power as “system sales”, priced at incremental cost of system generation
 - This seldom represented sales from a nuclear plant, as nuclear almost never was the marginal generator on the system

How Are Generating Costs Recovered In A Competitive Market

- Each generating plant earns revenue from a competitive electricity market
 - Spot market sales
 - Bi-lateral contracts (short term and long term)
- The spot market price is determined by the highest supply bid required to clear the market - i.e., the "marginal supplier"
 - No supplier can bid below its incremental cost of production
- Difference between bid and the incremental cost of production is the "capacity value" in the market

Illustrative Example: Market Price For Energy In A Competitive Market



Market Conditions Are Not Conducive To New Nuclear Plants In The Near Term

- Existing and proposed US capacity may exceed demand for the foreseeable future
 - Reasonable operating reserves are predicted to exist in most regions
 - Capacity utilization still leaves room for improvement
- On-peak and load-following resources may be needed vs. base-load resources
- Market prices for electricity are likely to remain depressed
 - Federal and State regulators will ensure that price spikes due to market manipulation or dysfunctional markets do not occur
- One big factor will be the long-term impact of the current creditworthiness of leading independent energy producers

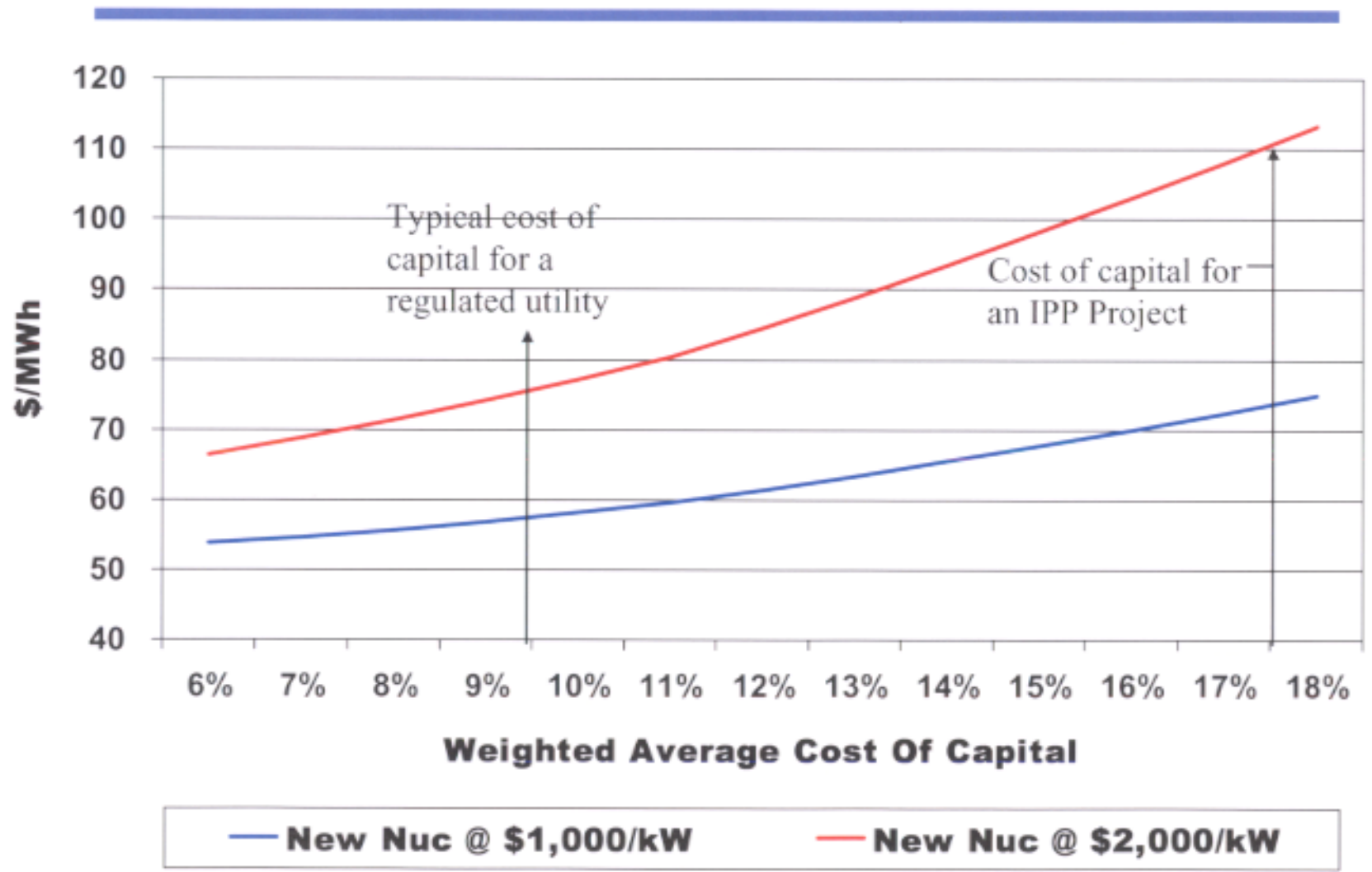
US Utilities Are Unlikely To Propose New Nuclear Plants In The Near Term

- Utilities are increasingly required to use competitive markets to meet their Obligation to Serve
- Regulatory Compacts have become untrustworthy
 - Investment recovery may no longer be assured
- With current costs and construction time, new nuclear capacity is not competitive with fossil fuels

Current Capacity Cost For Different Fuel Types

<u>Technology Type</u>	<u>2001 \$/Installed kW</u>
Combustion Turbine	\$360
Advanced Combustion Turbine	\$500
Combined Cycle Gas Turbine	\$480-\$500
Advanced CCGT	\$600-\$650
Pulverized Coal	\$1,200
Atmospheric Fluidized Bed Combustion Coal	\$1,100-\$1,200
Integrated Gassification Combined Cycle (coal-gas)	\$1,400-\$1,500
Wind	\$1,000-\$1,500
Bio Mass	\$1,000-\$1,500
Geothermal	\$2,250-\$2,750
Nuclear	\$2,000-\$2,400

Levelized Cost Of A New Nuclear Plant



Utilities' Use Of Nuclear Generation

- Utilities will maintain the status-quo and will continue to safely and reliably operate the existing nuclear plants
- However, industry expansion by building the next generation of new nuclear plants is not likely to happen unless major economic and political changes occur
 - Government may have to actively participate in setting up a demonstration plant
 - Capital cost and construction time of a new nuclear facility must be brought down
 - Wall Street must be convinced of the economic viability of such industry expansion

BACK-UP SLIDES

Assumptions: New Nuclear Plant

- All figures are in 2001 dollars
- 1,000 MW project, operating at 92% capacity factor
- Operating life = 30 years
- “Overnight” cost of construction = \$1,000/kW or \$2,000/kW
- Annual capitalized maintenance = \$10 million/year
- Direct O&M = \$10/MWh
- Payroll Loaders & Other A&G = \$7.5/MWh
- Fuel = \$5/MWh
- Decommissioning = \$1,000/kW
- Debt/equity ratio = 50:50
- Cost of Debt sensitivity = 3%-8%
- Before tax Cost of Equity sensitivity = 9%-28%

Competitive Energy Markets

- Various models
 - Ranging from power exchange to power-pools
- Multiple markets
 - Energy
 - Ancillary Services
- Two fundamental types of transactions
 - Spot market sales
 - Bi-lateral contracts (short term and long term)
- Capacity additions determined by market factors
 - No integrated resource planning
 - No guaranteed cost recovery
- Market prices reflect the value of capacity
 - No value if capacity glut; Exaggerated value if shortage
 - Markets cannot exist permanently with no value for capacity

Current Merchant Capacity Additions

- Majority of new merchant capacity currently under development in USA is based on natural gas
 - Merchant developers do not have any incentive to create balanced portfolios
 - Market transactions allow fuel price volatility risk to be passed on to Buyers
- Merchant developers prefer:
 - Low initial investment
 - Quick concept-to-market cycles
 - Technologies that are easier to site and permit
 - Low risk
- Society will continue to subsidize merchant “renewable” energy
 - Subsidized capacity distorts true market economics