Synapse
Energy Economics, Inc.

Are there Nukes in our Future

National Association of State Utility Consumer Advocates

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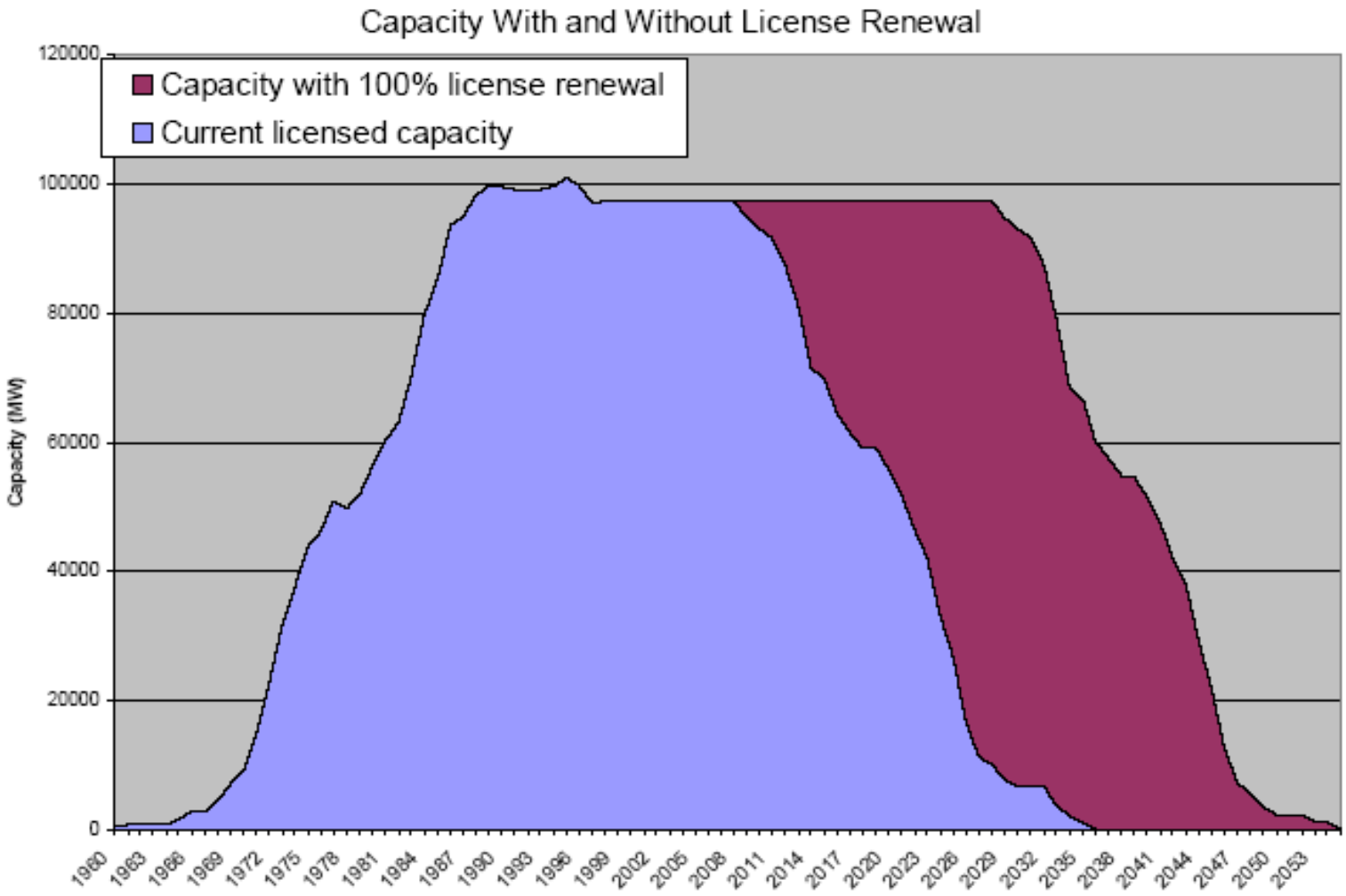
A Nuclear Renaissance?

- Are there new nuclear plants in our future? Probably some but will be very expensive.
- How many? Best guess – 5 to 15 new plants by mid 2020's with cost of $8 to $12 billion or more for each unit.
- Large federal and state incentives and guarantees will get some new plants built but no evidence that capital markets willing to risk own money in new plants.

What Will Happen with No New Nuclear Plants



What U.S. has done to encourage investment in new nuclear units

- Streamlined licensing process – Now really 'Alice Through the Looking Glass'
- Financial incentives in EPACT 2005
  - Extension of Price-Anderson Act to 2025
  - 1.8 cents per kWh production tax credit for first 6,000 MW of new nuclear generation for first 8 years of operation. Limited to a total of $125 million per 1,000 MW of new generation
  - Insures utilities for construction delays due to hearings or litigation.
  - Federal guarantees for up to 80 percent of estimated project costs for innovative technologies – including new advanced nuclear reactor designs – that will diversify and increase energy supply while protecting the environment.
- Continuing efforts in Congress to increase loan guarantees for new nuclear plants to $50 to $100 billion.
- Individual state incentives.

But is this just “Deja Vue – All Over Again”?

- Atomic Energy originally promoted as “too cheap to meter”
- But existing generation of nuclear units became so expensive:
  - Owners experienced severe financial problems
  - Many plants cancelled
  - Many cost disallowances and settlements in lieu of disallowances
  - Plants sold/divested at far below book value – ratepayers bore hundreds of millions of stranded costs

U.S. Nuclear Industry Construction Cost Experience

Year Construction Started	Estimated Overnight Cost (1990$)	Actual Overnight Cost (1990$)	Actual vs. Estimated Cost
1966-67	$560/kW	$1,170/kW	209%
1968-69	$679/kW	$2,000/kW	294%
1970-71	$760/kW	$2,650/kW	348%
1972-73	$1,117/kW	$3,555/kW	318%
1974-75	$1,156/kW	$4,410/kW	381%
1976-77	$1,493/kW	$4,008/kW	269%

Estimated Costs of New Nuclear Plants Have Skyrocketed in Recent Years

Forecast	Overnight Cost	Total Plant Cost	Total Plant Cost - 2 Units
	($/kW)	($/kW)	(billions$)
DOE (2002)	$1,200		
	$1,500		
MIT (2003)	$2,000		
Keystone Center (2007)	$2,950	$3,600	
	$2,950	$4,000	
Moody's Investor Services (2007)		$4,000	
		$6,000	
Florida Power & Light (2007)	$3,108	$5,492	$12.1
	$4,540	$8,081	$17.8
Progress Energy (2008)			$14.0
Georgia Power (2008)			$6.4 for 45% of 2 plants

Factors Which Have Led to Higher Estimated Costs for New Nuclear Power Plants

- Significant increase in worldwide demand for power plants. Demand for plants is straining the supply.

- Skyrocketing costs for critical power plant commodities - e.g., cost of iron and steel increased at 20% average annual rate between 2003 and 2007. Cost of copper rose at 69% average annual rate. Cost of cement rose at 11% average annual rate.

- Worldwide demand is straining the limited capacity of EPC (Engineering, Procurement, and Construction) firms and equipment manufacturers. Only two companies in world have the qualified forging capacity for pressure vessels, steam generators and pressurizers for new nuclear plants – Japan Steel Works and Creusot Forge in France.

- Demand for heavy forgings will be significant because the nuclear industry will be waiting in line alongside the petrochemical industry and new refineries for the material.

Factors Which Have Led to Rising Power Plant Construction Costs

- Fewer suppliers of nuclear plant components – 2 decades ago there were about 400 suppliers and 900 so-called nuclear stamp, or N-stamp, certifications from the American Society of Mechanical Engineers. Today there are fewer than 80 suppliers in the U.S. and fewer than 200 N-stamp certifications.

- The limited number of manufacturers and suppliers could cause bottlenecks in construction if, as expected, there are multiple orders for new power plants in the U.S. and abroad.

- This means fewer bidders for work, higher prices, earlier payment schedules and longer delivery times. Long lead times (six years or so) are expected for key plant components.

- The demand and cost for both on-site construction labor and skilled manufacturing labor also have escalated.

US Nuclear Industry Plans

Expected New Nuclear Power Plant Applications Updated June 4, 2008					
Company *	**Design**	**Date Accepted**	**Site Under Consideration**	**State**	**Existing Op. Plant**
Calendar Year (CY) 2007 Applications					
NRG Energy (52-012/013)	ABWR	11/29/07	South Texas Project (2 units)	TX	Y
NuStart Energy (52-014/015)	AP1000	1/18/08	Bellefonte (2 units)	AL	N
UNISTAR (52-016)	EPR	1/25/08	Calvert Cliffs (1 unit)	MD	Y
Dominion (52-017)	ESBWR	1/29/08	North Anna (1 unit)	VA	Y
Duke (52-018/019)	AP1000	2/25/08	William Lee Nuclear Station (2 units)	SC	N
2007 TOTAL NUMBER OF APPLICATIONS = 5 TOTAL NUMBER OF UNITS = 8					
Calendar Year (CY) 2008 Applications					
Progress Energy (52-022/023)	AP1000	4/17/08	Harris (2 units)	NC	Y
NuStart Energy (52-024)	ESBWR	4/17/08	Grand Gulf (1 unit)	MS	Y
Southern Nuclear Operating Co. (52-025/026)	AP1000	5/30/08	Vogtle (2 units)	GA	Y
South Carolina Electric & Gas (743)	AP1000		Summer (2 units)	SC	Y
Progress Energy (756)	AP1000		Levy County (2 units)	FL	N
Entergy (745)	ESBWR		River Bend (1 unit)	LA	Y
Exelon (761)	ESBWR		Victoria County (2 units)	TX	N
AmerenUE (750)	EPR		Callaway (1 unit)	MO	Y
PPL Generation (762)	EPR		Bell Bend (1 unit)	PA	Y
UNISTAR (759)	EPR		Nine Mile Point (1 unit)	NY	Y
Luminant Power (754)	USAPWR		Comanche Peak (2 units)	TX	Y
Detroit Edison (757)	ESBWR		Fermi (1 unit)	MI	Y
Alternate Energy Holdings (765)	EPR		Bruneau (1 unit)	ID	N
2008 TOTAL NUMBER OF APPLICATIONS = 13 TOTAL NUMBER OF UNITS = 19					
Calendar Year (CY) 2009 Applications					
Florida Power and Light (763)	AP1000		Turkey Point (2 units)	FL	Y
Amarillo Power (752)	EPR		Vicinity of Amarillo (2 units)	TX	UNK
2009 TOTAL NUMBER OF APPLICATIONS = 2 TOTAL NUMBER OF UNITS = 4					
Calendar Year (CY) 2010 Applications					
Blue Castle Project	TBD		Utah	UT	N
Unannounced	TBD		TBD	TBD	UNK
Unannounced	TBD		TBD	TBD	UNK
2010 TOTAL NUMBER OF APPLICATIONS = 3 TOTAL NUMBER OF UNITS = 3					
2007 – 2010 Total Number of Applications = 23 Total Number of Units = 34					

Extremely Limited Construction or Operating Experience with New Plant Designs

- U.S. companies are considering 4 designs – ABWR, AP1000, ESBWR and EPR – only ABWR and AP1000 have been certified by NRC so far.
- No operating experience with any plant with AP1000, ESBWR or EPR design.
- Only one plant with an EPR design – Olkiluoto-3 in Finland – is even under construction.
- But project has experienced significant problems, delays and cost increases.
- Turnkey project -- builder, the French company Areva, took a $922 million write off in 2006 due to cost increases at Olkiluoto-3.
- Project now 18 months to 2 years behind schedule, with currently projected completion in 2009 and 2010.
- ABWR construction projects in Taiwan have experienced multi-billion dollar cost increases and multi-year delays.

Nuclear Power and Climate Change

- MIT and Princeton studies -- to make a significant contribution to reducing world CO_2 emissions, 1,000 new reactors will have to be built by 2050 – that's 2 new reactors coming on line each month.

- Analysis by the Institute for Energy and Environmental Research suggests that between 1,900 and 3,000 reactors would be needed to maintain global CO_2 emissions at year 2000 levels. That would be one new reactor almost every week.

- 100 new plants will be needed by 2040-2050 just to replace existing plants.

There Continue to be Significant Nuclear Risks for Ratepayers, Plant Owners and Investors

- **Skyrocketing construction costs.**
- **Construction and regulatory delays.**
- **Too few new plants built – no learning curve or economies of scale.**
- **Nuclear Terrorism.**
- **What to do with nuclear waste.**
- **Public acceptance of nuclear power could be lost as the result of one major accident/incident.**
- **Future state commissions in regulated states may not pass imprudently incurred construction or operation costs through to ratepayers.**
- **Risks resulting from deregulation of electric industry in areas of the U.S.**
- **Potential loss of substantial plant investment as a result of a significant accident or incident – TMI-2 went from a billion dollar asset to a liability in less than an hour.**
- **Risk that federal subsidies and guarantees will not be sufficient to induce investors or that Congress will limit or eliminate some incentives in EPACT 2005.**

Actions Needed to Protect Consumers

- No preferential incentives for new nuclear plants – level planning field with other resources – no government predetermination of technology winners and losers.
- No advanced approval for recovery of plant development costs.
- No predetermination of prudence of project construction costs.
- Utilities must demonstrate as part of IRP that building new nuclear power plant is the lowest cost, low risk option.

Actions Needed to Protect Consumers

- Ongoing reviews needed to determine prudence of plant construction expenditures and schedule – before costs are put into rate base.
- Post construction planning prudence and ‘used and useful’ reviews.
- To the extent that risks are shifted from investors to ratepayers, cost of equity should be adjusted.

