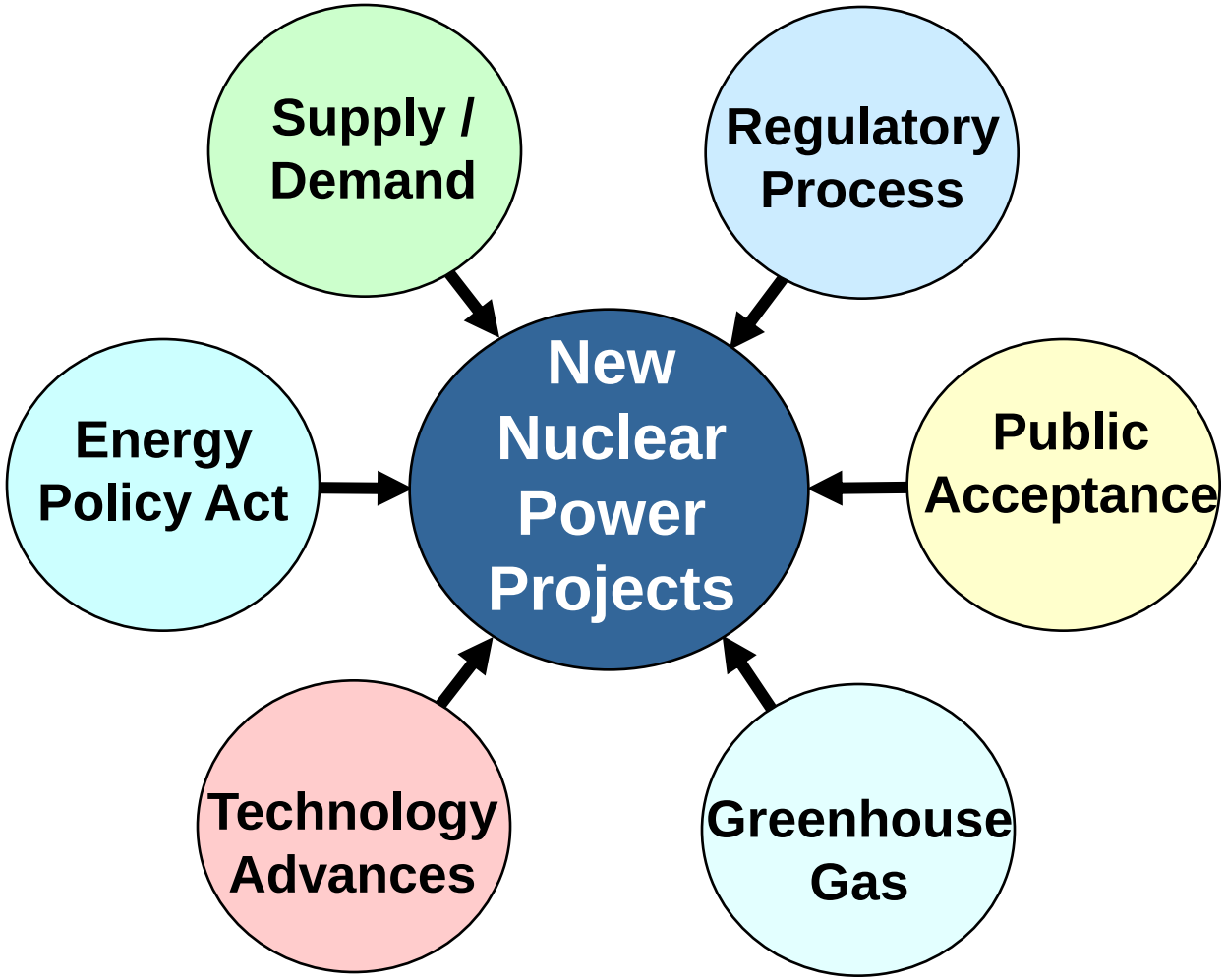
New Nuclear Development: Part of the Strategy for a Lower Carbon Energy Future

Nuclear Energy Summit

Joe Turnage

October 8, 2008

Forces Driving New Nuclear Power Projects



Supply / Demand

Driver #1 – Supply / Demand Fundamentals

- **Tremendous growth of electricity demand in the 21st century**
  - China will surpass the U.S. as largest energy consumer by 2030[1]
  - Global electricity demand will double between 2004 - 2030[2]
  - By 2030, the electricity demand in the developing world will exceed that of developed countries by 30%[2]
- **In the U.S.:** Several regions projecting needs for new base load electric capacity over the next decade
  - DOE forecasts that 81,000 MW of new nuclear construction will need to be in place by 2035 to maintain nuclear generation's market share of 20%
  - 85% of electric industry executives surveyed by CERA last year felt that there would not be adequate generation within the next 5 years[3]
  - New nuclear plants being seriously considered by a growing number of electric power producers -- Constellation Energy, Dominion, Duke, Entergy, Exelon, Progress, SCANA, Southern, TVA, NRG, Amarillo Power, TXU, DTE, Northwest Energy and Ameren

1 – Source: International Institute of Applied Systems Analysis
2 – Source: Global Electricity Outlook (EIA)
3 – CERA North American Power Executive Survey 2006: The Reality of Perceptions

Supply / Demand

Driver #1 – Supply / Demand Fundamentals

In the U.S. (continued):

- **Demand is connected to societal opportunity**
  - "Energy is the master resource of modern society…with abundant, reliable, affordable energy, much is possible. Without it, hope, opportunity and progress are hobbled"[1]

- **Supply is connected to energy security and decreasing the risk of proliferation**
  - With regard to energy security there are two time frames:
    - Near term via reduction in LNG dependence
    - Long term via potential electrification of transportation
  - With regard to proliferation risk:
    - Nuclear energy will be part of a global response to electric demand. If the U.S. is not a significant player in influencing closure of the fuel cycle in a manner that minimizes proliferation risk, our national security risk increases

1 – Roy Innis, Congress of Racial Equality

Supply / Demand

Driver #1 – Supply / Demand Fundamentals

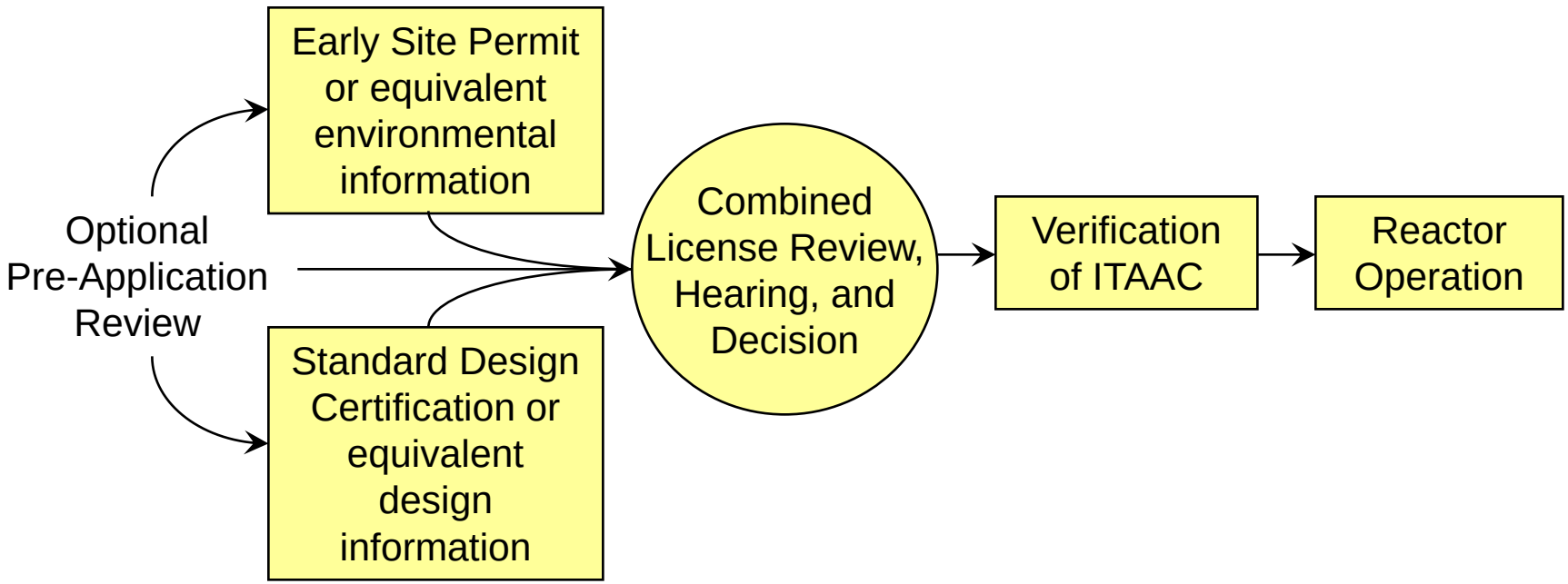
Alternatives:

- **OIL:** Rising demand will require another Saudi Arabia every 10 years to keep up with increased demand[2]
- **GAS:** Transport constraints and global demand will limit availability of natural gas
  - Many analysts predict spot prices beyond 2015 from now to be above $8/MMbtu
- **COAL:** Abundant, but with serious (and expensive) pollution control issues
- **NUCLEAR:** ~440 reactors supply 16% of world electricity. ~30 more under construction

2 – Source: Nuclear Energy: Current Status and Future Prospects; Professor Burton Richter, Stanford

Regulatory Process

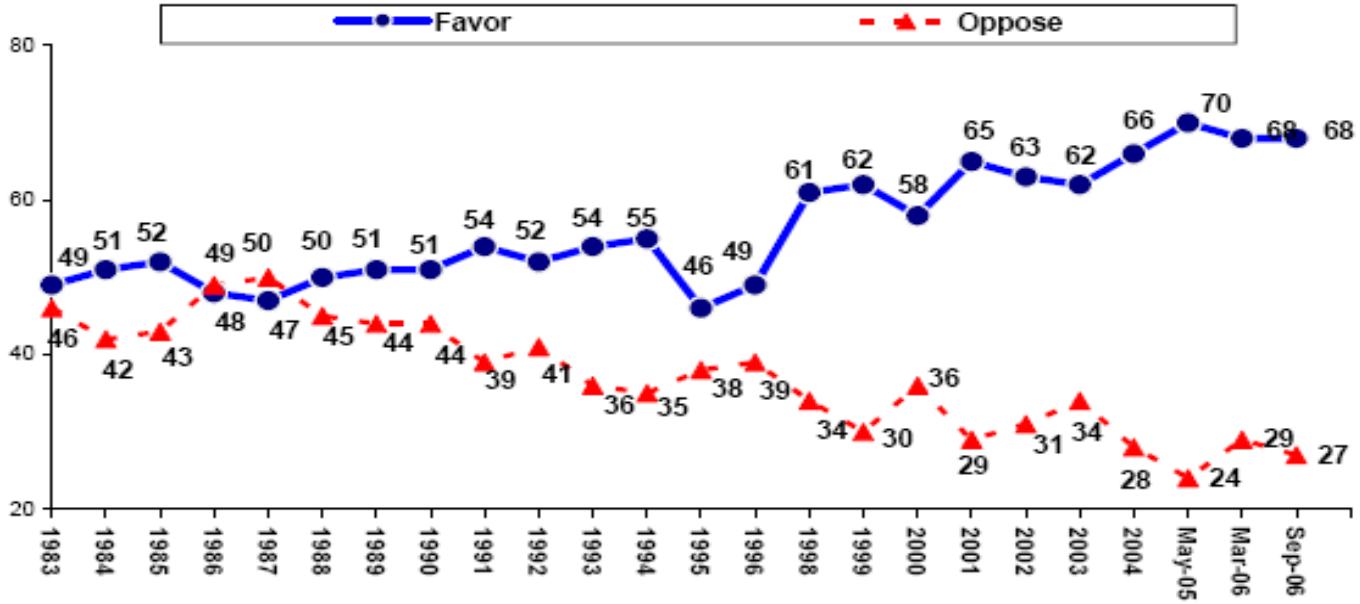
Driver #2 – Changes in Regulatory Process



New licensing regulations create a combined construction and operating license, more streamlined process.

Public Acceptance

Driver #3 – Major Shift in Public Acceptance



~70% favorability among general public -- even higher in communities near nuclear power plants:

- 83% of residents near nuclear plants favor nuclear energy
- 87% have a favorable impression of the local plant

Source: NEI Website

Some States are Moving Aggressively to Promote New Nuclear Development

Issue	Florida	Georgia	South Carolina	Louisiana	Virginia	North Carolina
Allows recovery of Pre-construction Investments Prior to commercial operation	Yes	No	Yes	Yes	Yes	Yes
Allows recovery of cancelled plants	Yes	Yes	Yes	Yes	Yes	Yes
Cash earnings on CWIP	Yes	No	Yes	Yes	Yes	Yes
Cost Subject to Prudence Review	Yes	Yes	Yes	Yes	Yes	Yes
Annual or Periodic Prudence Review	Annual	Periodic	Annual	Annual	Annual	Annual

Other states with legislation favorable to new nuclear plants include:
Iowa, Kansas, Ohio, Texas, and Mississippi

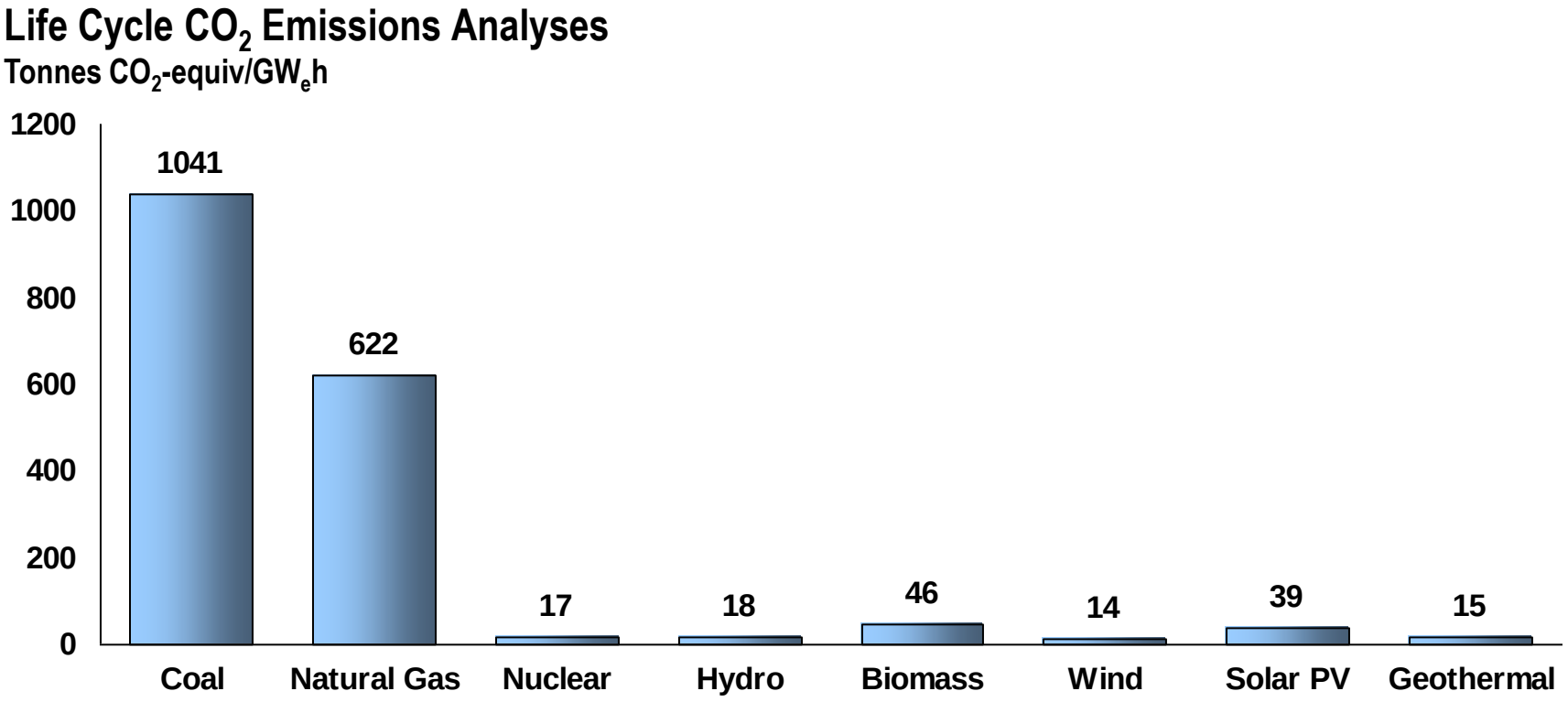
Greenhouse Gas

Driver #4 – Global Warming Concerns

- **A political issue whose time has come**
  - Prominent environmentalists are rethinking nuclear opportunities
  - Drove wide bipartisan support of the Energy Policy Act of 2005
- **"Zero Emissions" Generating Source Gains new Allies**
  - Acceptance of new nuclear based not only on increased political and societal acceptance, but also because of its impact on the bottom line. Gross profit of nuclear generation could rise by 1/3[1]
  - Nuclear players are "well positioned to take advantage of the fixed cost characteristics of nuclear generation during boom phases of environmental investment"[2]

1 – Source: Bernstein Report, September 2001
2 – Source: Lehman Brothers Report, September 2004

Nuclear: Toward a Lower Carbon Energy Future



"Life-Cycle Assessment of Electricity Generation Systems and Applications for Climate Change Policy Analysis," Paul J. Meier, University of Wisconsin-Madison, August, 2002

Nuclear energy is on par with renewables

Nuclear: "A Clean Green Generating Machine"

"Nuclear energy is the only non-greenhouse gas-emitting power source that can effectively replace fossil fuels and satisfy global demand."

Patrick Moore, Founder Of Greenpeace, Chair and Chief Scientist of Greenspirit

"If we NIMBY anywhere and anytime, we should not expect the utility industry to provide electricity to everyone, everywhere, all of the time. If we believe that global warming is a real threat to our planet, then the very best way to provide baseload electricity is through emission-free nuclear power."

Norris McDonald, President African American Environmental Assoc.

"Nuclear energy is the only green solution."

James Lovelock, London geophysicist who developed the Gaia Theory on which the Greenhouse Effect is based

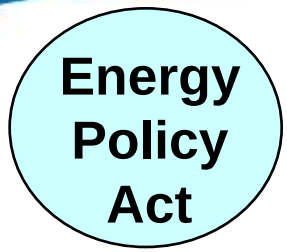
Adding Twice Today's Nuclear Output to Displace Coal

=

- **Increasing solar power 700 fold to displace coal**
- **Increasing wind power 40 fold to displace coal**
- **Driving 2 billion cars on ethanol, using 1/6 of world cropland**
- **Increasing fuel economy of 2 billion cars from 30 to 60 mpg**
- **Installing CCS at 800 large coal-fired power plants**
- **Cutting electricity use in homes, offices and stores by 25%**

We would need <u>all</u> of these initiatives just to <u>maintain</u> current carbon emission rates over the next 50 years

Source: "A plan to keep carbon in check," Socolaw and Pacala, Scientific American, Sept. 2006



Driver #5 – Energy Policy Act of 2005

Jump starts the nuclear industry by providing:

- Loan Guarantees
- Production Tax Credits
- Standby Default Coverage
- Potential for Research and Development Credits
- Qualified Decommissioning Costs
- Price Anderson Indemnification

EPAct Incentives

	Standby Support	Production Tax Credits	Loan Guarantees
Function	• Limited financial protection against licensing/litigation delays	• Provide tax-based incentive to construct own and operate new nuclear plants	• Provides credit enhancement for debt-financing that should facilitate nuclear plant construction
Availability	• $500 M – first 2 units • $250 M – next 4 units	• $18/MWhr – first 8 yrs of operation • 6,000 MW eligible • $125 M per 1,000 MW installed	• Available to all plants
Proposed Conditional Queue	• COL docketed by NRC	• COL docketed by NRC on or before Dec 31, 2008	N/A
Proposed Firm Queue	• COL issued by NRC • Construction commencement	• COL issued by NRC • Construction commencement on or before Jan 1, 2014 • Facility expected to be placed in service prior to Jan 1, 2021	N/A
Rulemaking Timeline	• Interim Rule Published May 8, 2006 (30 day comment period) • Final Rule – Aug 2006	• Interim guidance published May 1, 2006	• Final rule published in October • Allows Loan Guarantees for up to 100% of debt • Targets technologies not “in general use” (general use = installed in 3 or more commercial projects and operated for at least 5 years)

Government incentives reward early movers

Bottom Line About Loan Guarantees

1. Federal Loan Guarantees are a more efficient investment incentive than production tax credits.

2. Although Loan Guarantees are helpful in creating access to capital at attractive rates, their fundamental benefit is in dealing with new technology risk and in creating opportunities to leverage equity. Absent this leverage, capital requirements for a program of substantial new nuclear builds will strain the balance sheets of the largest nuclear power generating companies (both regulated and merchant).

3. There are significant public policy benefits which drove the Energy Policy Act, including those associated with electricity generation at attractive prices. We should not forget, however, that the fundamental drivers of energy security and concerns over global warming require that this policy be applied effectively, in a sustained fashion, over several years.

Technology Advances

Driver #6 – Enhanced Safety

Nuclear Island

- Proven Four-Loop Reactor Cooling System Design
- Four-Train Safety Systems
- Double Containment
- In-Containment Borated Water Storage
- Severe Accident Mitigation
- Separate Safety Buildings
- Advanced 'Cockpit' Control Room
- Radiation Release to Public undetectable from background under any accident scenario

Electrical

- Full Load Rejection 100%-3% w/o plant trip
- Four Emergency diesel generators
- Two Smaller, Diverse SBO D/Gs

Site Characteristics

- Airplane Crash Protection
- Explosion Pressure Wave

Fuel Efficiency

- 35% plant efficiency (typical U.S. plant at 33%)
- Uses 8% less uranium to generate a MW of electricity

"Of all the new reactor designs being seriously considered for deployment in the United States, only one – the Evolutionary Power Reactor – appears to have the potential to be significantly safer and more secure than today's Reactors" – Union of Concerned Scientists – Nuclear Power In A Warming World, December 2007

Driving Forces Create Opportunity – UniStar Nuclear Energy is aggressively pursuing

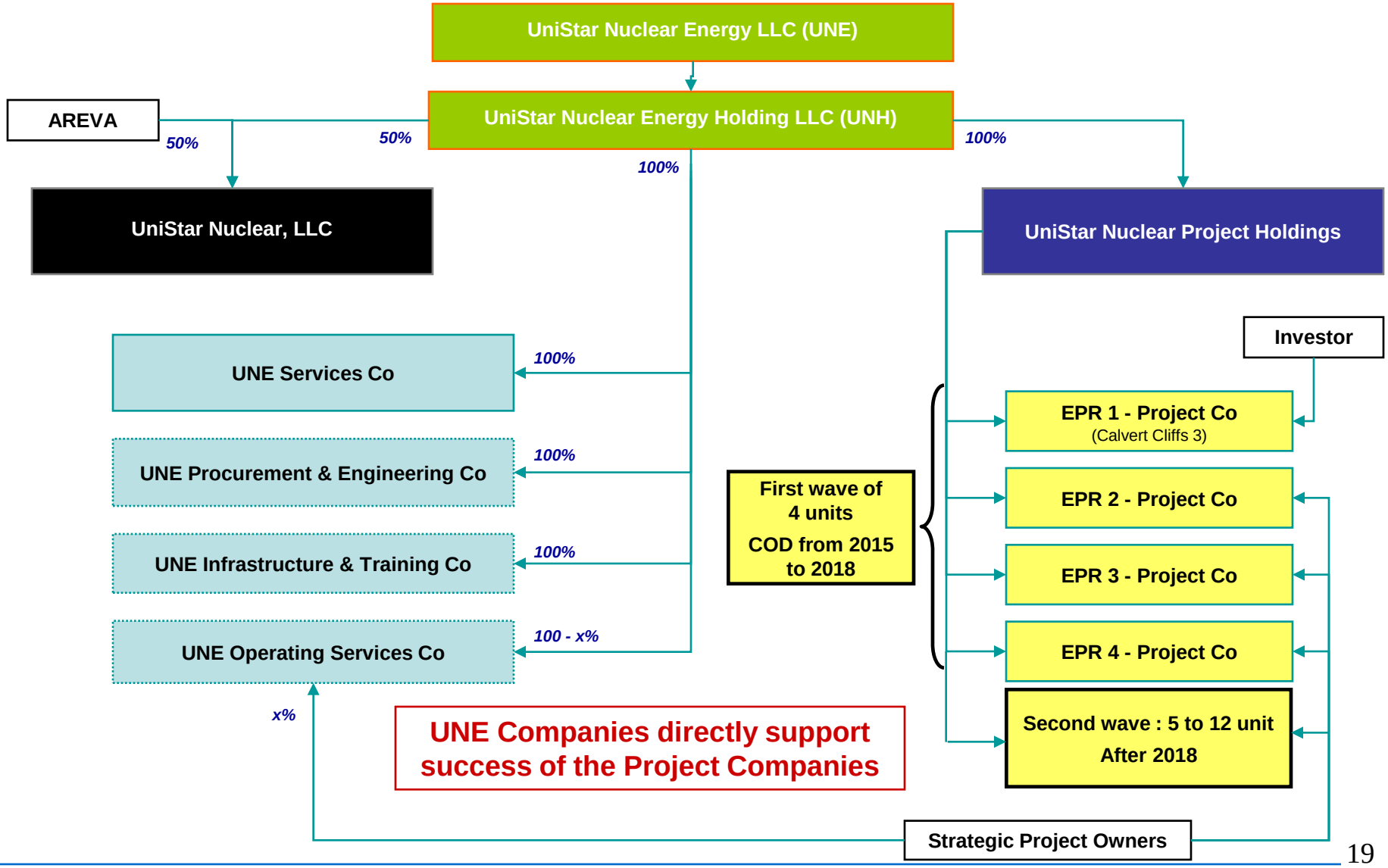
- **Constellation Energy and Electricité de France have formed UniStar Nuclear Energy**
  - Maintains joint venture with AREVA (UniStar Nuclear Marketing) facilitating the deployment of U.S. EPRs
  - Teamed with Bechtel as the architect, engineer and constructor of the fleet

- **Objective: Deploy a fleet of at least four identical U.S. EPRs through project companies**
  - Standardization of fleet yields efficiencies in project cost, licensing, and operations
  - Projects jointly developed and potentially owned with UniStar Nuclear Energy
  - UniStar Nuclear Energy and its partners will form and staff a single operating company to act as licensee and operator for the fleet
  - Project partners in project companies will participate in ESP/COL, Development and construction, ownership and O&M
  - AREVA is supplier of the Nuclear Steam Supply System

Strategic Rationale

- **Furthers UniStar Nuclear Energy's leadership to drive potential nuclear renaissance in North America**
- **Builds scale in design, materials procurement and operations**
- **Provides access to technical expertise of world leader in nuclear operations**
- **Manages and reduces financial risks associated with licensing and development of new nuclear plants**

UniStar Nuclear Energy Structure



Driven by public policy issues surrounding global warming and energy security, UniStar also represents a compelling investment opportunity

But First – A Word About Capital Costs: They Have Risen

UniStar Analysis:

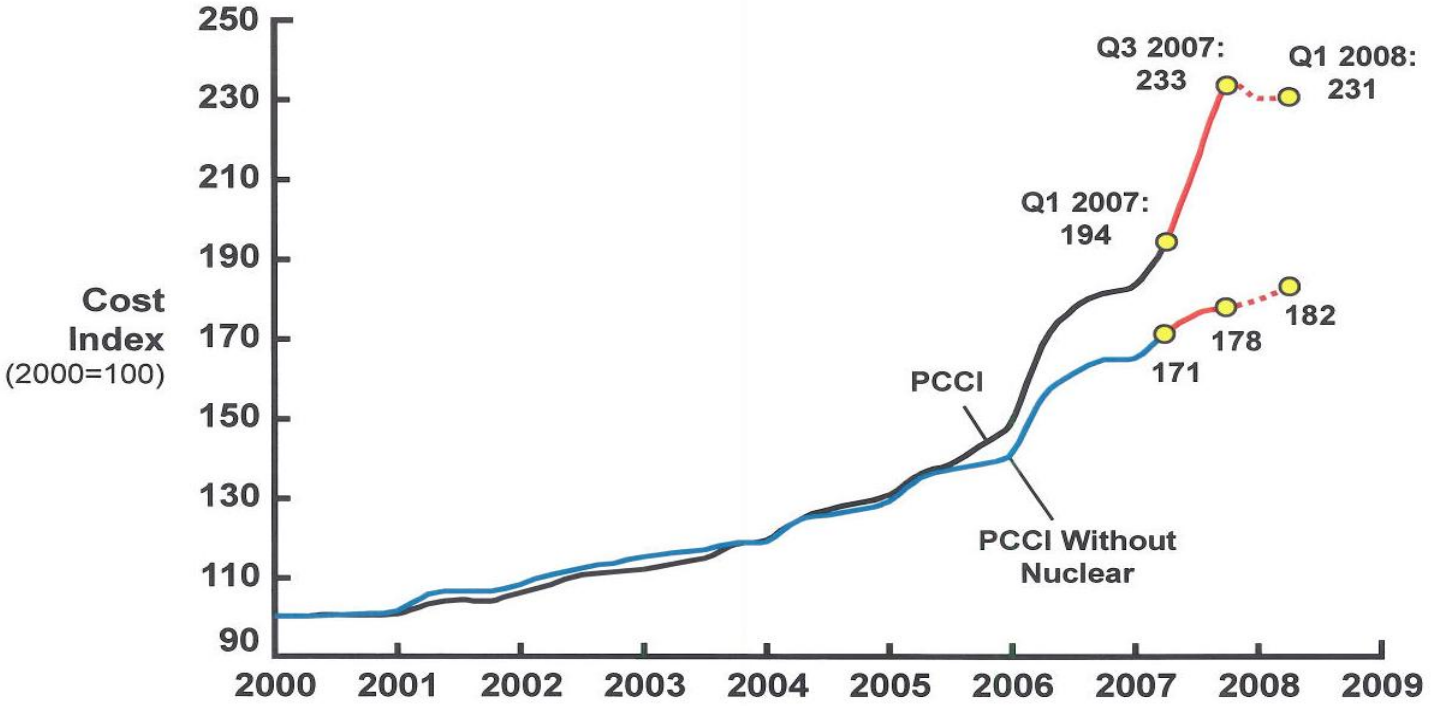
Fall of 2005 – Est. Overnight Cost at $1,935/kW

Summer of 2007 – Est. Overnight Cost Grew to $2,665/kW

Today Costs are Being Updated at UniStar. Based on the reports of others, overnight costs could range from $3,000/kW to $4,750/kW (February 2008 FP&L midpoint $3,605/kW)

1 – Nucleonics Week - Feb 21, 2008

HIS-CERA Power Capital Cost Index (PCCI) With and Without Nuclear



Source: Cambridge Energy Research Associates

The Investment Opportunity

Base Case: Overnight Cost - $3,500/kW

Items Included in Base Case Overnight Cost:

- Design Certification
- Home Office Overhead
- Nuclear Island
- Turbine Island
- Balance of Plant
- Owner's Costs

Items Not Included in Base Case Overnight Cost But Included in Base Case Proforma:

- Initial Nuclear Fuel Load
- COLA
- Transmission Upgrades
- Contingency
- Financing Costs

Base Case Proforma: Assumptions

- EPR – 1600 MWe (2016 COD)
- $3,500/kW Overnight Capital Cost (in 2007 $)
- 15% Return on Equity
- Assumes 30-Year Financing with 80% Debt and 20% Equity
- 5.0% Interest on Debt
- 2.5% Subsidy Cost (2011)
- 1.0% Administrative Cost (2011)
- 1-Year Debt Service Reserve (2016)
- 50% Receipt of PTCs
- 95.3% Average Capacity Factor
- 40% Effective Tax Rate

Proforma Break Even Price Sensitivities

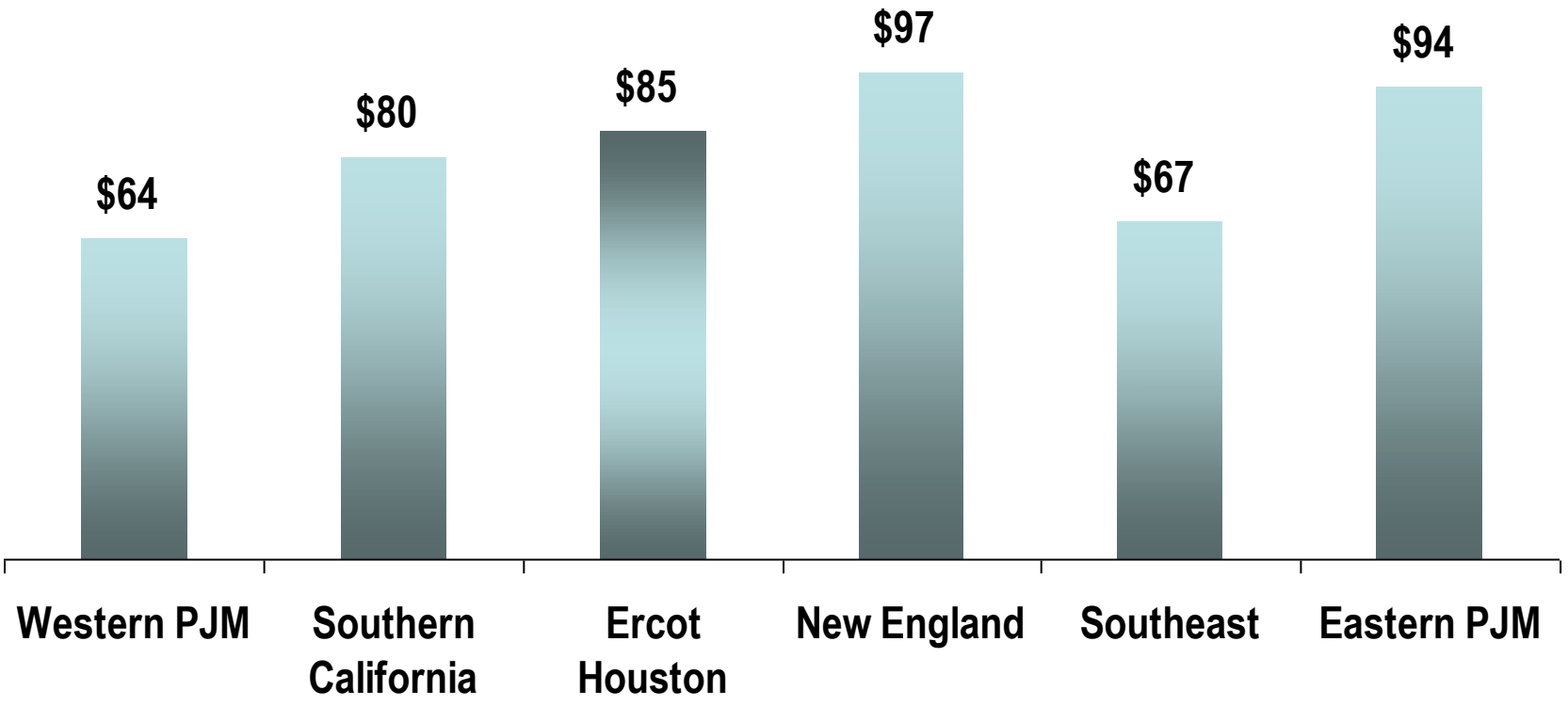
Scenario	Capital Cost ($/kW) [1]		2007 $/MWhr Break Even Price [2] @ 15% ROE	$/MWhr Delta from Base Case
Generic US EPR (Base Case)	$3,500		$57	-
DOWNSIDE CASES				
Stress Case	$4,750		$72	($15)
1-Year COD Delay	Base		$63	($6)
20% Higher O&M Cost	Base		$59	($2)
20% Higher Fuel Cost	Base		$58	($1)
Capacity Factor Decreases to 85% vs. 95.3%	Base		$65	($8)
No Receipt of PTCs vs. 50%	Base		$62	($5)
6.0% Subsidy & Administrative Fees vs. 3.5%	Base		$61	($4)
No Federal Loan Guarantee: Debt 50% (12% Interest Rate) & Equity 50%	Base		$94	($37)
UPSIDE CASES				
15% Savings	$2,975		$51	$6
20% Lower O&M Cost	Base		$55	$2
20% Lower Fuel Cost	Base		$56	$1
11 RFO Days vs. 15 Days	Base		$56	$1

Notes:

[1] In 2007 Dollars

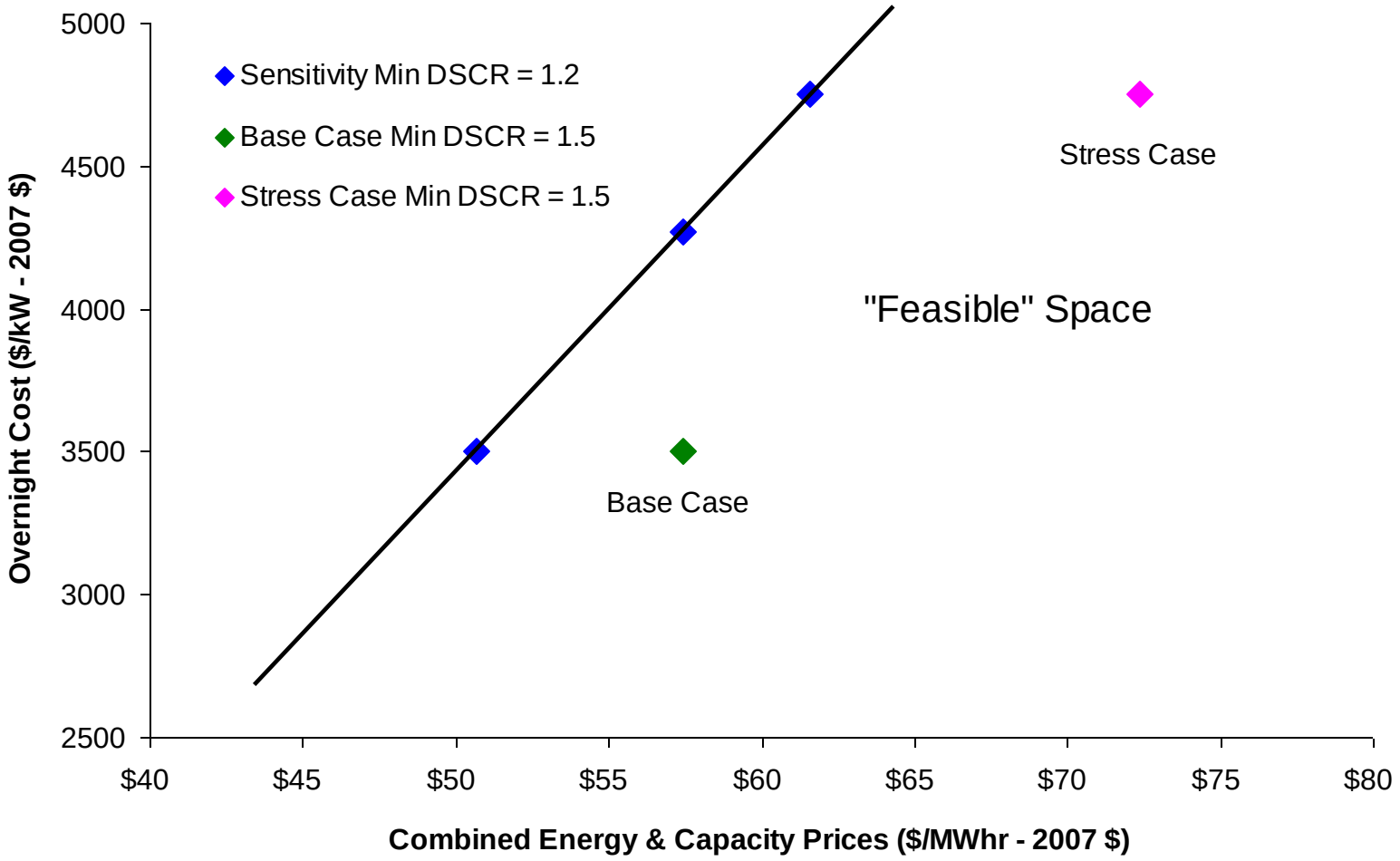
[2] Break Even Price is a 7x24 price that includes both energy & capacity

Indicative Wholesale Regional Power Prices ($/MWh)[1]



1 12 month forecasts as of July 1. Source – Energy Velocity

Minimum Debt Service Coverage Ratios



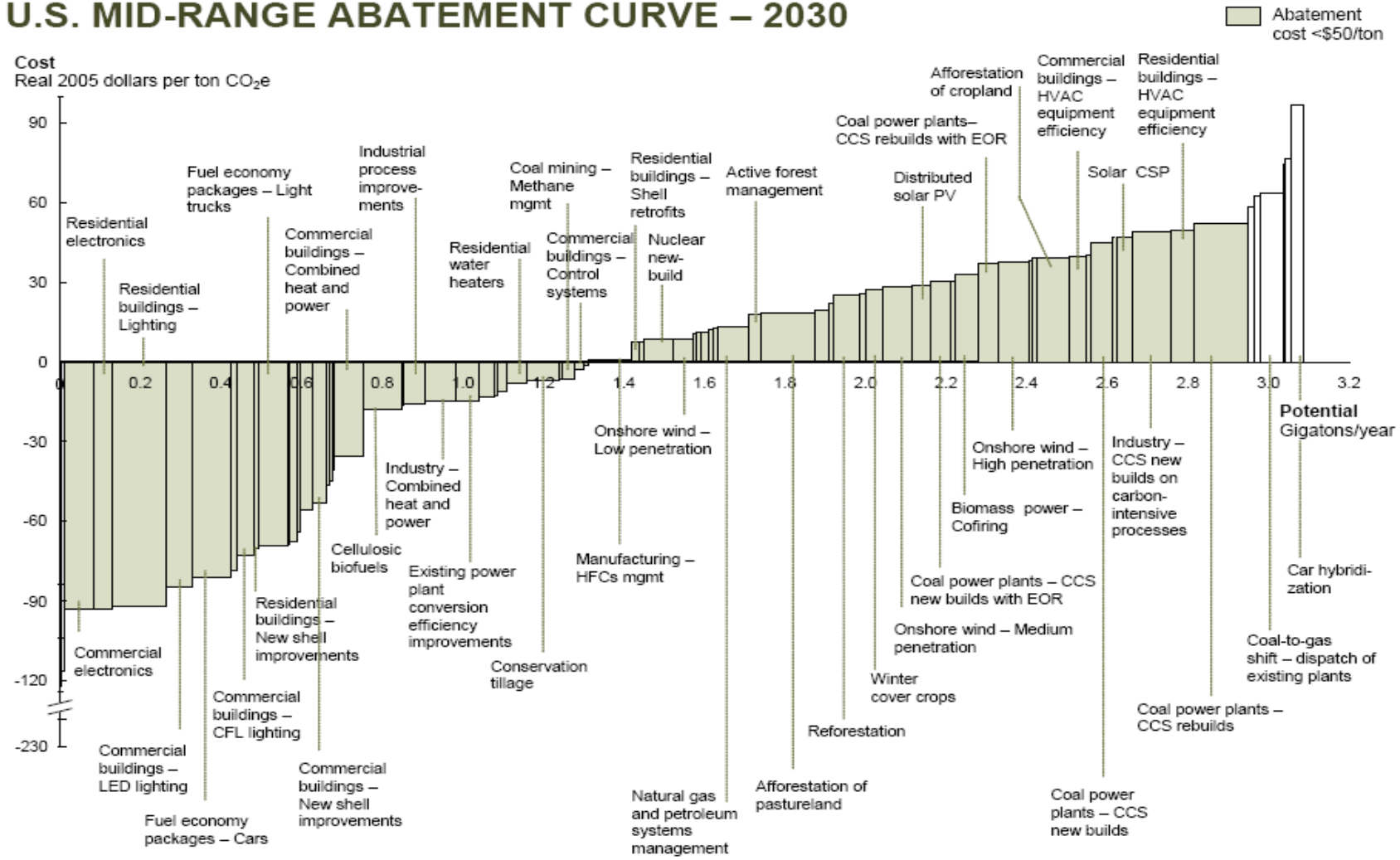
Impact of Carbon Cap-and-Trade Proposals ($C0_2$ Equivalent $/T)[1]
Note: $34/T CO_2 Equivalent in 2015 would imply about $15/MWh Market Impact (in PJM)

	2015	2050
Lieberman-McCain ('07)	31	121
Kerry-Snowe ('07)	~47	~141
Feinstein ('06)	41	161
Sanders-Boxer ('07)	53	210

1 – "Assessment of U.S. Cap-and-Trade Proposals; Pattsey, Reilly, Jacoby, Gungel, Metcalf, Sokolov & Holak; April 2007: MIT Center for Energy and Environmental Policy Research

Exhibit 11

U.S. MID-RANGE ABATEMENT CURVE – 2030



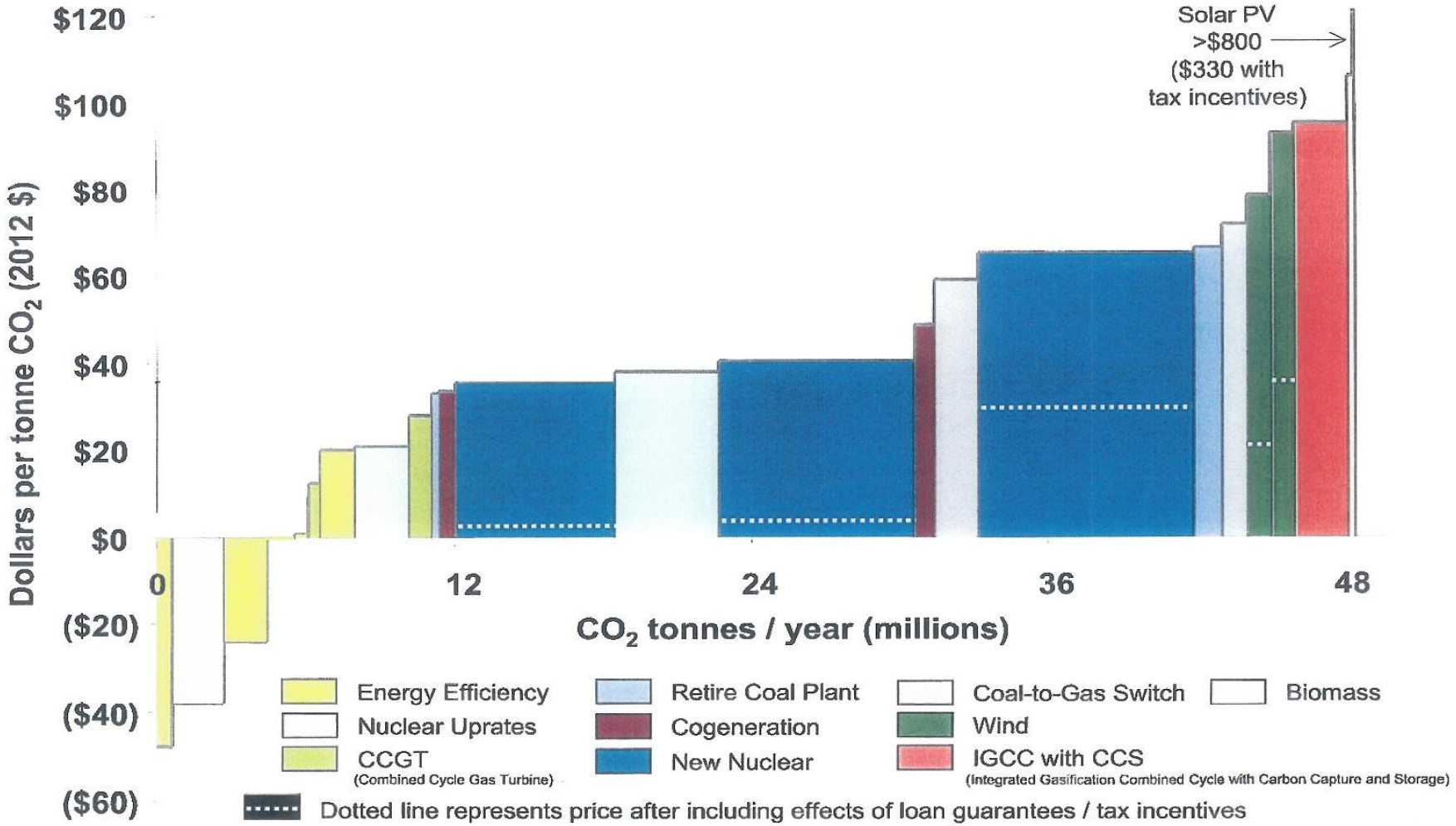
Source: McKinsey analysis

John Rowe (Exelon)[1]

"Our goal is to reduce, displace, or offset the equivalent of our entire carbon footprint by 2020"

1 – "Carbon, Competition and Kilowatts" – Brookings Institution, February 12, 2008

Exelon CO_2 Abatement Curve



John Rowe (continued):

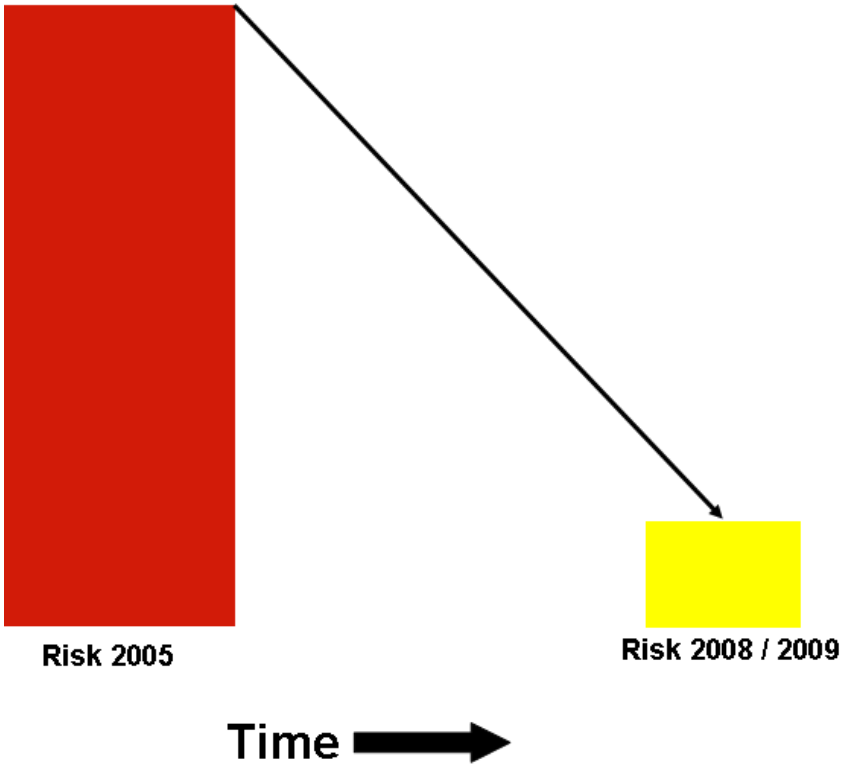
"IF we allow competitive markets to choose the most cost effective demand or supply side solutions (our goal can be achieved) at an incremental cost of (about) $22/MWh"

"If policy makers…insist that we invest only in uneconomical renewable resources and untested technology, it will cost three times as much, or $67/MWh to (reach our goal)."

Challenges

- Authorization cap
- Subsidy cost calculation
- Public perceptions (only 1 micron deep?)
- Infrastructure (components from a globally sourced supply chain)
- Qualified labor pool (must pay attention now)
- Issues with the back end of the fuel cycle (including implications for public perception)
- Construction and capital cost uncertainty

UNE is doing its share to drive down the Level of Uncertainty



Current Risk Assessment

Risk		Jan. 2008
Technology		
Licensing Delay	Energy Policy Act 2005	
First Movers Cost	Energy Policy Act 2005	
Financeability	Energy Policy Act 2005	
NRC Licensing Process		
State Permit Process		
Project Risk Sharing (AREVA, Bechtel, Alstom)		
Business Model Support (EDF)		
Commodity Prices	Project Cost	
Global Supply Chain	Project Cost	
Labor	Project Cost	
Construction Experience	Project Cost	

Risk environment being managed ➡ Driving down the level of uncertainty

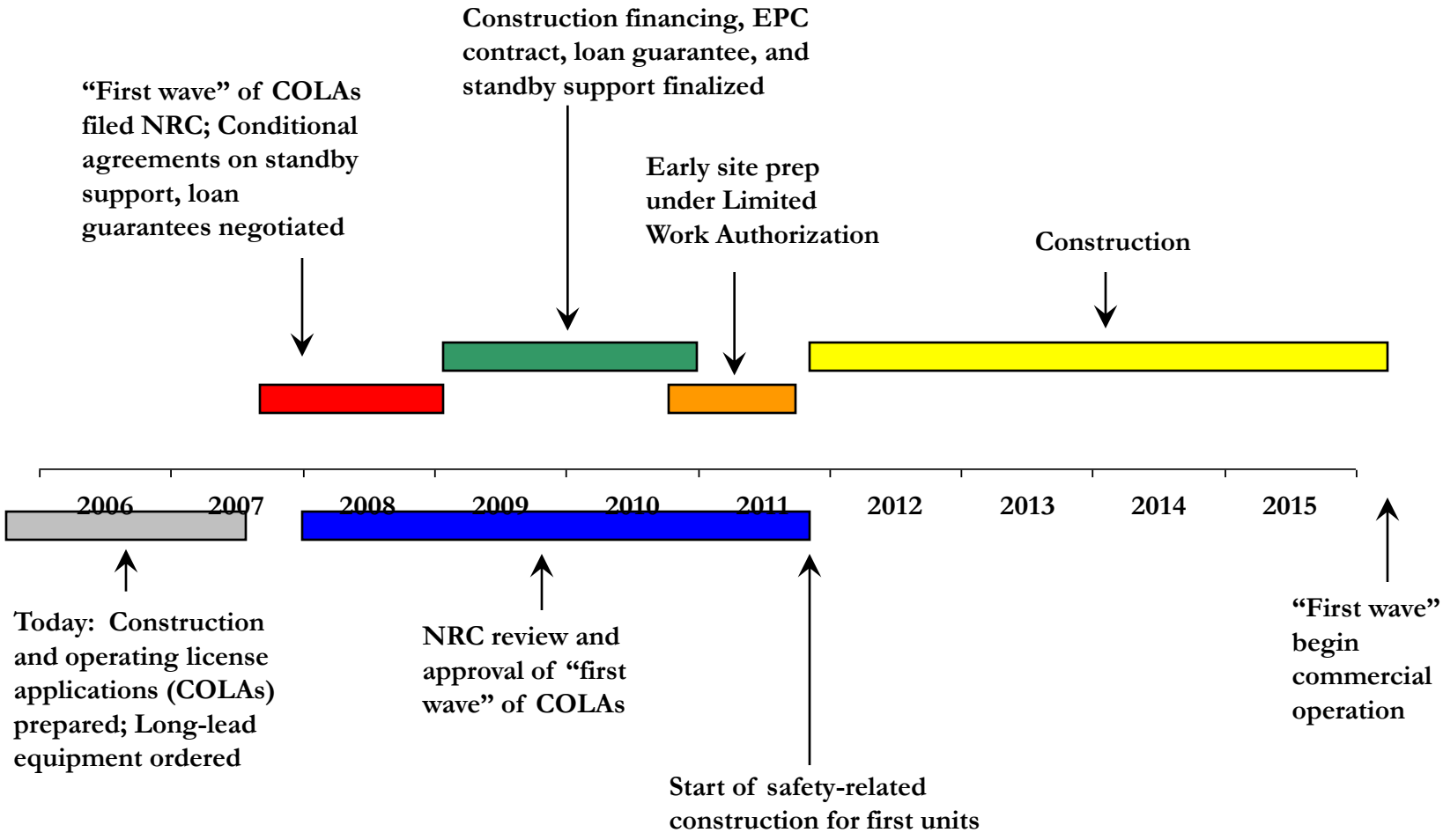
New Nuclear Risks

Current risks that are effectively managed or mitigated

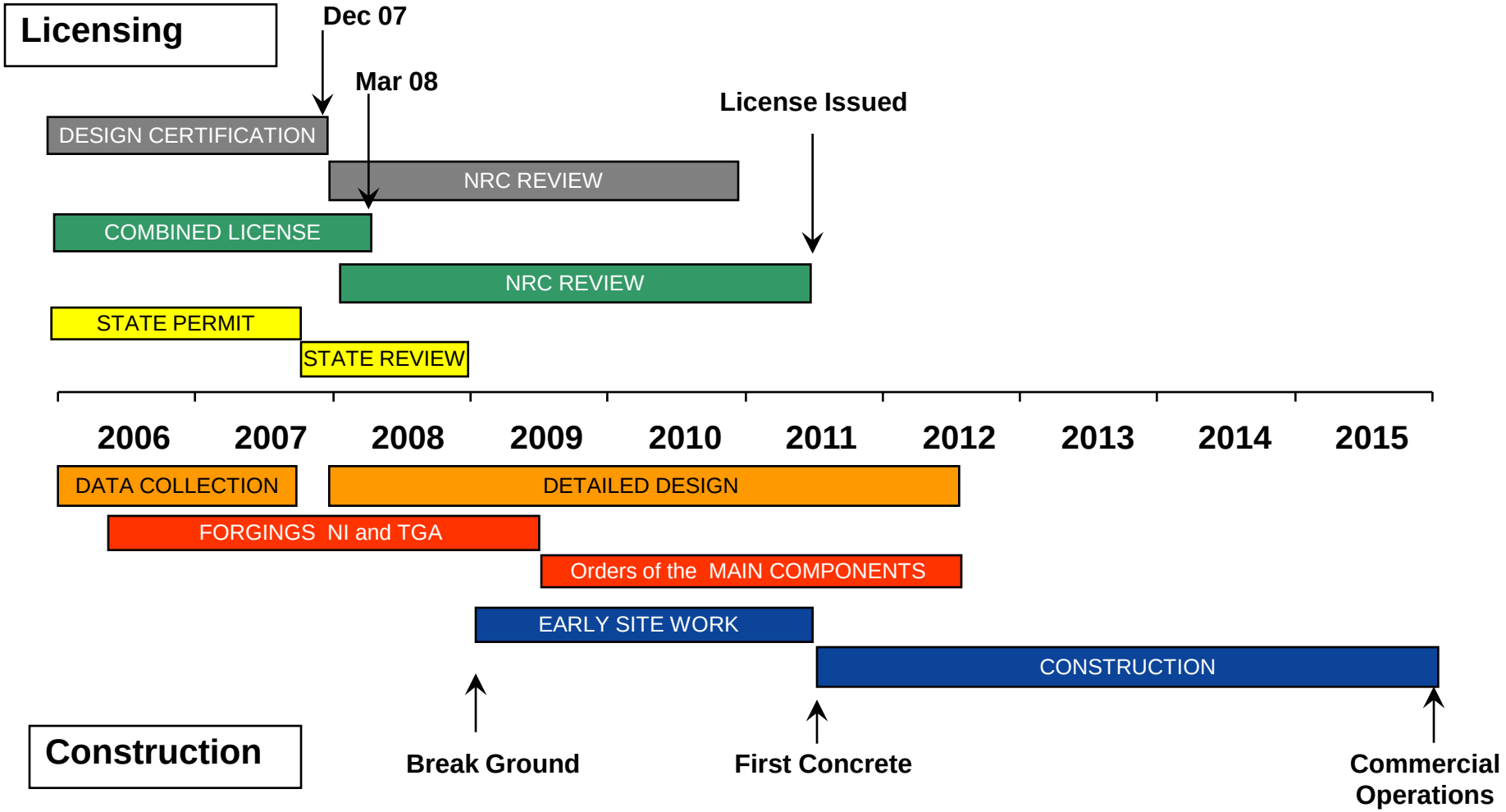
Risks with emergent issues requiring elevated attention

Risks that require the highest level of vigilance

Indicative Timing of New Nuclear Plant Deployment across the Country



Overview of CC 3: An Aggressive Project Global Timeline



Calvert Cliffs 3 is on a path to be commissioned in 2015

The Disposition of Spent Fuel[1]

Components of Spent Reactor Fuel

Component	Fission Fragments	Uranium	Long-Live Component
Per Cent Of Total	4	95	1
Radioactivity	Intense	Negligible	Medium
Untreated Required isolation time (years)	200	0	300,000

1 – "Nuclear Energy: Current Status and Future Prospects; Prof. Burton Richter, Stanford University; Oct 1, 2005

The Problem with Spent Reactor Fuel[1]

- "There is no real difficulty in principle with the uranium which makes up the bulk of spent fuel."
- 'There is no scientific or engineering difficulty in dealing with fission fragments (FF) alone, the next most abundant component. There are two long-lived FFs, Iodine-129 and Technetium-99. I-129 can simply be diluted with non-radioactive iodine. The Technetium is relatively inert and only present at a low level. It can be handled with the actinides as described below."
- "The problem comes mainly from the last 1% of the spent fuel which is composed of plutonium and the minor actinides, neptunium, americium, and curium. There are two general ways to protect the public from this material: isolation from the biosphere for hundreds of thousands of years, or transmutation by neutron bombardment to change them into more benign FFs".

1 – "Nuclear Energy: Current Status and Future Prospects; Prof. Burton Richter, Stanford University; Oct 1, 2005

"Nuclear Power Joint Fact-Finding" June 2007
The Keystone Center*

- "On balance, commercial nuclear power plants in the U.S. are safer today than they were before the 1979 accident at Three Mile Island"
- "There is wide agreement among the NJFF group participants that transport spent fuel and other high-level radioactive waste is highly regulated, and that it has been safely shipped in the past."
- "With regard to older spent fuel that must be stored on an interim basis until an operating repository is available, the NSFF participants believe that this spent fuel can be stored safely and securely in either spent fuel pools on dry casks, on-site. The NSFF group also agrees that centralized interim storage is a reasonable alternative for managing waste from decommissioned plant sites and could become cost-effective for operating reactors in the future."

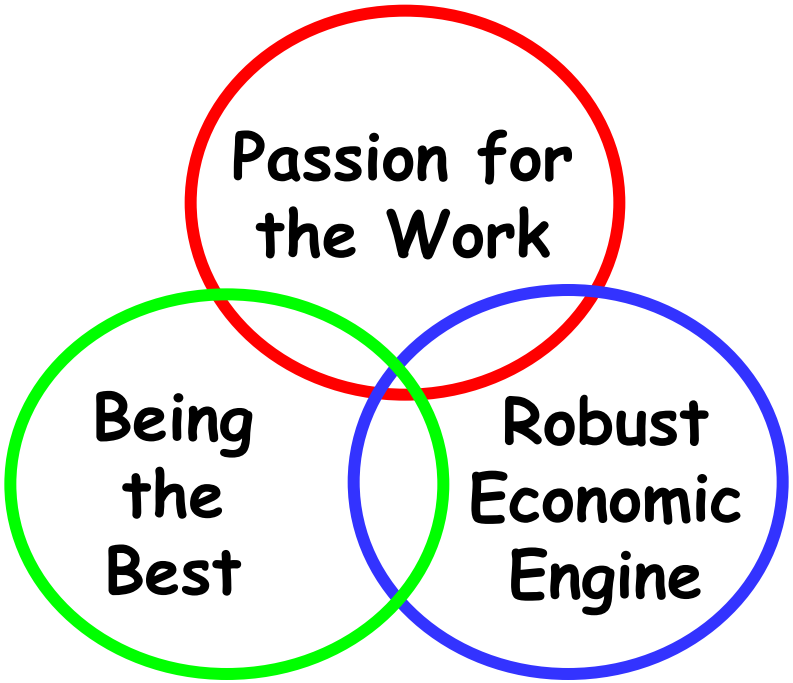
* Steering Committee: Peter Bradford (Union of Concerned Scientists); Thomas Cochran (Natural Resources Defense Council); Armond Cohen (Clean Air Task Force); Ted Marston (Marston Consulting); Patrick Mazza (Climate Solutions); Brian Moline (Kansas Corporation Commission); Mano Nazair (American Electric Power); Sonny Popowsky (Pennsylvania Office of Consumer Advocate)

We endorse the Policy Recommendation of the National Commission on Energy Policy (a bipartisan Commission of 21 members, including John Holdren (Professor of Environmental Policy – Harvard), John Bryson (CEO – Edison International), Ralph Cavanah (Co-Director Energy Program – NRDC), and Richard Meserve (President of the Carnegie Institution – former Chairman of the U.S. NRC):

Take action to address the current impasse on nuclear waste disposal, while reaffirming the ultimate objective of siting and developing one or more secure geologic disposal facilities, by amending the Nuclear Waste Policy Act (NWPA) to:

- Align its requirements with human engineering and scientific capabilities, while adequately protecting public health and safety and the environment
- Require DOE to site and operate consolidated national or regional interim storage options.
- Undertake R&D to explore technological alternatives to the direct geologic disposal of waste from a once-through cycle that meet commercial requirements and non-proliferation objectives, reduce the challenge of waste disposal, ensure adequate protection of public health and safety, and extend fuel supply
- Codify that interim storage and federal responsibility for disposal of nuclear waste is sufficient to satisfy the Nuclear Regulatory Commission's waste confidence requirement
- Require the Secretary of Energy to take possession of and/or remove fuel from reactor sites that have been, or are in the process of being fully decommissioned

In Spite of the Challenges, the Opportunity is Real[1]



It's an exciting time to be in the nuclear industry – from any perspective!

1 – Source: The Hedgehog Concept – Jim Collins in Good to Great