



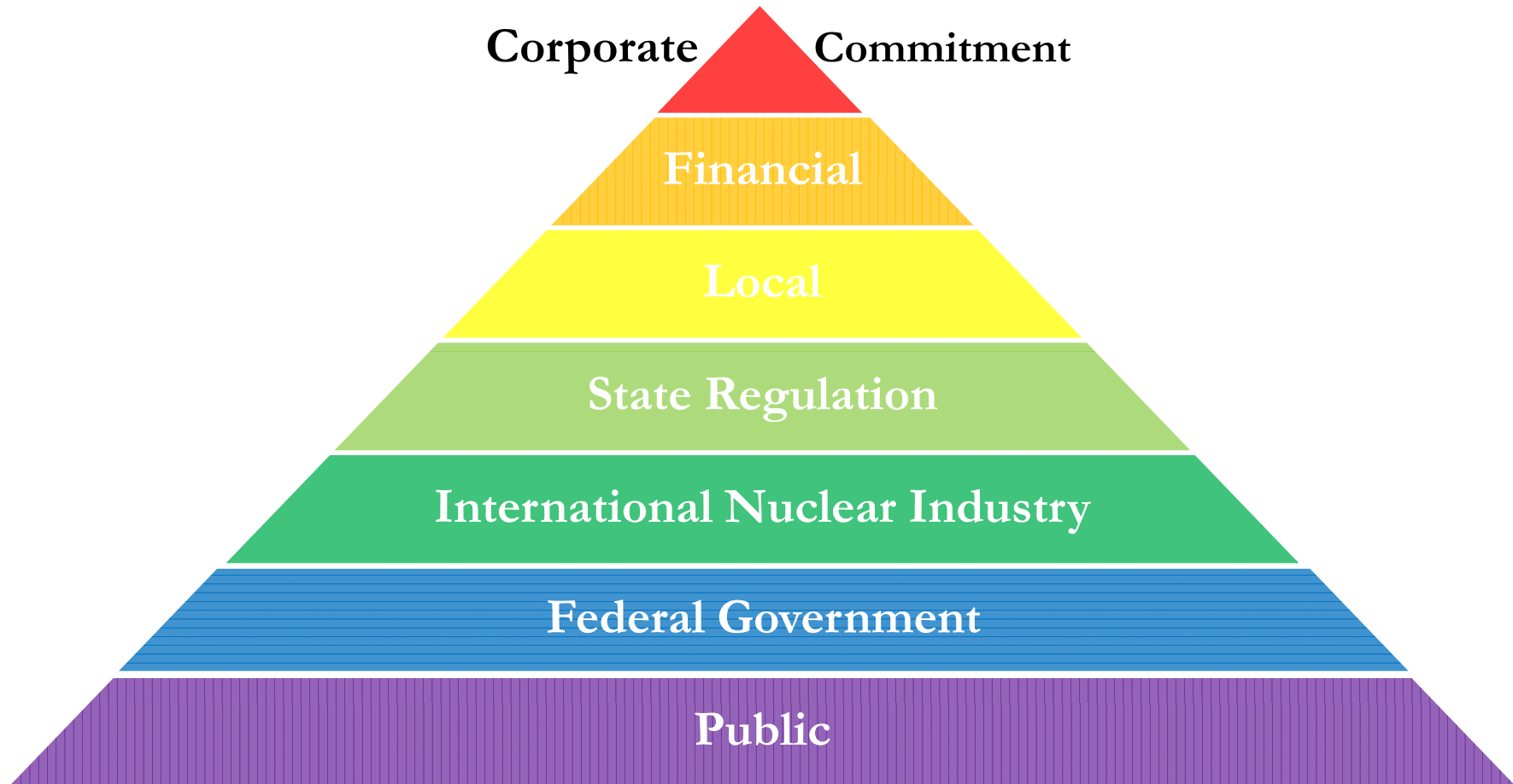
Shaking the Foundations of the U.S. Nuclear Industry



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The Viability of Nuclear Power in the U.S. Depends on Multi-Level Support



The events at Fukushima have shaken all of these ...



Let's Begin with the Basics at Fukushima

- Beyond Design Basis Event (earthquake)
 - Units tripped
 - Loss of off-site power
 - On-site diesels started and took plant into cooldown
- Second Beyond Design Basis Event (tsunami)
 - Loss of on-site generation
 - Batteries and steam-driven pumps (RCIC) continued cooldown
 - Loss of battery power for controls caused RCIC loss
- Loss of Coolant Accident (LOCA)
 - Core uncovered, hydrogen produced, exploded
- Spent Fuel Pool (SFP) loss of water
 - Hydrogen produced, exploded



The lessons learned go beyond technology and safety, to cooperation, communications, cultural challenges and constrained choices



Beginning at the Top ...



- TEPCO's losses will be seen as proof that nuclear is a “bet the company” proposition
- TEPCO, Hitachi, Toshiba, Mitsubishi and the Japanese trading companies are important U.S. players and supply chain partners
- NRG's announcements regarding a slowdown in development are indicative of broader merchant nuclear concerns
- New nuclear units already faced delays due to weakening demand, lower gas prices, etc.

The good news is that nuclear sponsors have time to fully consider and incorporate the lessons from Fukushima



Beginning at the Top ...

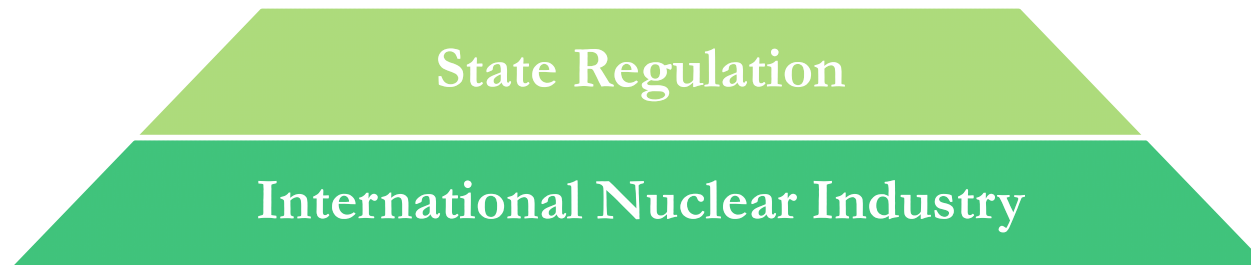


- Standard & Poor's sees the events as having “a profound effect” on the nuclear power industry; its concerns are:
 - Enhanced regulatory oversight leading to greater costs (focus on backup power, SFPs)
 - Delays in life extensions
 - Deteriorating economics of new plants
 - Closures due to increased costs, regulatory action
 - These events underscore the “tail risk” of nuclear power (low P, high K)
- Moody's simply states that the events are “material credit negative for the U.S. nuclear generation industry”
 - Worse for merchant nuclear

**STANDARD
& POOR'S**



U.S. Nuclear Sponsors Need to Be Prepared for Regulatory and International Challenges



- State regulators are asking tough questions and may impose tighter cost controls, but these concerns should be manageable
- Intervenors in state regulatory proceedings will mount re-energized challenges to new nuclear units
- International events, especially in Europe, have raised questions in some discussions about whether the U.S. response is “prudent” enough
- The level of international industry cooperation in the past month has been tremendous and demonstrates the best characteristics of our industry
- The international reversals of pre-3/11 positions should be expected to take years to overcome



The Most Direct Effects in the U.S. Will Come from the Public and Government Sectors

Public

- Initial polls after 3/11 found reductions in public support for nuclear power of up to 8 percentage points
- By March 27, there was still evidence of increased concern, but the reduction had been trimmed to 2 percentage points
- Gallup: “... support for nuclear power may be more stable than some might think”
- The longer-term trends are still distinctly positive since 2001 lows; there are certain “irreducible” levels of anxiety about the technology
- Support for additional off-shore drilling show what’s possible (2/10: **63%**, 6/10: **44%**; 3/11: **57%**)
- The most dramatic differences between now and 1979 or 1986 reflect nuclear power’s role in:
 - Climate Change
 - Energy Security



Support from Climate “Hawks” Has Barely Waivered

Public

- “All energy crises lead to coal, which **is** an energy [and environmental] crisis”
- A retreat from nuclear power could represent an environmental “tipping point, which could take the biosphere in the direction of uncontrolled global warming”
- “The risk facing the biosphere from climate change is many orders of magnitude greater than anything resulting from even a succession of worst-case-scenario nuclear accidents”
- “The doors are fast closing on the 2-degree [C] target, and with a decrease in nuclear energy it makes it even more difficult ... it’s all bad news – costs of energy will increase, energy security and diversification decrease and carbon emissions go up”

Nuclear power still can be part of balanced energy/ environmental policy, but the industry needs to avoid becoming a polarizing agent



The Future of U.S. Nuclear Power Depends on Federal Government Support

Federal Government

- Price-Anderson, safety regulation, climate change policy, energy security policy, loan guarantees, SNF storage, R&D, EP/ER, environmental regulation all shape that future
- Legislative, executive and regulatory support have held up well so far
- The NRC's response has been cautious and thoughtful
 - Creation of senior manager task force (6 people) with focus on station blackout scenarios, SFPs, LOCA, EP
 - Reports due 5/12, 6/16 and 7/19
 - To be followed by longer-term review (6 months)
- DOE expects little impact on loan guarantee program **if** additional \$36 billion is forthcoming
- Congress has already jumped into the debate



Rep. Markey's Nuclear Power Plant Safety Act of 2011

- Rulemaking requirement for NRC, with 18-month completion
- Focuses on enhancements to stand-by generators (14 days), batteries (72 hours), offsite supplies
- Core and SFP cooling to withstand certain events
- Mandatory removal of fuel rods from SFP within one year of eligibility
- Limits on SFP re-racking
- EP exercises to reflect broader events
- DOE to re-calculate Loan Guarantee fee based on Fukushima risks



Don't focus on the bill, focus on the concerns ...



What to Expect from the NRC

- Look to NUREG 660 (TMI) and NUREG 1251 (Chernobyl) reports, incorporated into NUREG 933 (Generic Safety Issues)
- Shorter term focus is likely to be on review of planning scenarios for station blackouts, EP verification, system “hardening,” battery life, SFP reinforcement and isolation, etc.
- Longer term issues will likely include PRA of multiple BDB events, SFP offloading, Severe Accident Mitigation Guidelines, likelihood of component failure from DB events, standards for international industry cooperation
- Eventually these are likely to transition from generic findings to rulemakings to plant-specific compliance programs
- Best guess is that compliance costs will be manageable at the existing fleet



But, are we “too focused on onslaughts from ‘the natural world’”?



Guesses About What to Expect From Fukushima ...

- 6 to 12 months to return to permanent cooling, remove contaminated water
- Unpleasant news from and political challenges to other Japanese nuclear sites
- 3 years to get visual assessment of core damage (5 years at TMI)
 - More immediate assessment of SFP damage
- Years more to complete defueling (total 11 years at TMI)
- More than 20 years to complete decommissioning (prompt) at a cost of more than \$10 billion, perhaps much more
- Loss of units at Dai-ichi site:

1-4	2,800 MW
5-6	1,900 MW (potential)
7-8	2,760 MW (potential)
- Political challenge to Dai-ni: 4,400 MW



What to Watch For and Be Concerned About

Federal Government

- Political intervention in NRC, DOE programs
- Challenges to Price-Anderson
- NRC focus shifting to seismic standards or loss of “backfit” protection
- German and Swiss reconsideration (or lack thereof) of early decisions
- Suspension or cancellation of European and Asian new build projects
- Substantial broadening of (re)licensing contentions
- State regulators placing limits on new nuclear cost recovery
- Increased AG challenges to relicensing

There is a lot of risk remaining in these events ...



The U.S. Industry Worked Hard to Buttress Its Foundations Over the Past 30 Years ...



But the Job's Not Done

