



Business Judgment, Market Forces, and Aging Nuclear Plants

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Nuclear... The Middle Age Dilemma?

Facing Declining Performance, Higher Costs, Inevitable Mortality

February 19, 2013

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“Sustained cost inflation at 3 - 5% per year is a reasonable expectation, leading most plants to generate negative cash margins (fuel + O&M + maintenance capex) against standard off-peak power price benchmarks.”*

*defined as 50% of all dispatch hours

Concern with Market Prices in the \$31 - 55 per MWh range

- SONGS 2 & 3 @ 90% capacity factor = \$57 per MWh
- Unit 2 @ 90% capacity factor = \$114 per MWh
- Unit 2 @ 70% output & 90% capacity factor = \$163 per MWh



UBS Investment Research US Electric Utilities & IPPs

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Americas

Electric Utilities

Sector Comment

Re-Evaluating Merchant Nuclear

■ We believe gas and policy mandates threaten nuclear units in 2013

Following Dominion's recent announcement to retire its Kewaunee nuclear plant in Wisconsin in October, we believe the plant may be the figurative canary in the coal mine. Despite substantially lower fuel costs than coal plants, fixed costs are approximately 4-5x times higher than coal plants of comparable size and may be higher for single-unit plants. Additionally, maintenance capex of ~\$50/kW-yr, coupled with rising nuclear fuel capex, further impede their economic viability and mask underlying FCF generation when comparing EBITDA and ascribing EV/EBITDA multiples. Units at particular risk include Exelon's Clinton unit in Central Illinois, and its Ginna plant (CENG) in upstate NY, as well as ETR's Fitzpatrick and Yankee plants. We see risk to primarily deregulated assets in New York and Midwest, which suffer from low capacity payments due to over-capacity and structural regulatory interference, in conjunction with low power prices.

■ Modest upside to estimates on retirement, but negative to sentiment

We believe moves to decommission nuclear plants early would be accretive to near year EPS, potentially bolstering aggregate cash flows for generators such as EXC and ETR as they adapt to the lower gas price environment. That said, we believe the perception impact of retiring 'leverage' to the upside (and with timing/liabilities on decommissioning plants nuclear) may limit upside to shares. Additionally, we believe as investors increasingly appreciate the limited FCF generated by the nuclear portfolios (despite positive EBITDA), financing and paying down associated debt will come into greater focus; this is particularly relevant for Entergy with ~\$3 Bn in parent recourse debt. We anticipate the subject of nuclear economics and viability will feature prominently with 4Q12 results.

■ Fukushima related costs remain a key uncertainty into 2013

Among our greatest concerns for the US nuclear portfolio into 2013 is the risk of greater Fukushima-related costs. While expectations around the need for hardened vents differ, we see cost risks of up to \$30-40 Mn/per unit under a worst case scenario; while other estimates suggest costs range in the \$15 Mn ballpark. Notably PPL ests. Fukushima-related costs of \$50-60 Mn, excluding vents for its 1.6 GW Susquehanna unit. We await the next update from the NRC on hardened vent retrofits in February, with capital likely to be spent by the NRC's 2016 target. Additionally, concerns over once-through cooling regulations pervade (albeit with the primary point of contention around Entergy's Indian Point plant near NYC).

■ Will the policy reaction differ? One thing to close coal, another nuclear.

With the gas glut dragging into its fifth year, we believe what started as a focus on coal plant retirements has been expanding into growing risk of retirement of all fuel types, particularly nuclear and oil-fired units. With limited public policy support for capacity markets (as demonstrated by efforts in the Midwest ISO and NYISO), and a lack of any policy encouraging a diverse fuel mix, we see this as an unavoidable outcome. That said, given the substantial tax base and employment supported by nuclear plants, as well as the material increases in capacity/power prices resulting from a retirement, we see real potential for regulatory and political intervention to save plants, particularly in IL & NY.

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EIA's Weighted Average Prices

- 2012

SP 15	\$35.25 per MWh
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NP 15	\$32.64 per MWh
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- 2013 (thru May 28)

SP 15	\$50.81 per MWh
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NP 15	\$42.79 per MWh
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Based on Platts Data

The only periods of potential 2012 cost-effectiveness, had both SONGS units operated with 90% capacity factors, were six 16-hour blocks between 6 a.m. and 10 p.m. that cleared above \$57 per MWh:

- August 9 \$66.00
- August 15 \$61.25
- August 16 \$62.75
- October 1 \$73.25
- October 2 \$62.75
- October 17 \$58.00

Credit Suisse: “For Regulated utilities ... costs are generally higher but the need to economically optimize fleet dispatch has more leeway under a cost of service model ...”





Has Diablo Canyon been immunized?

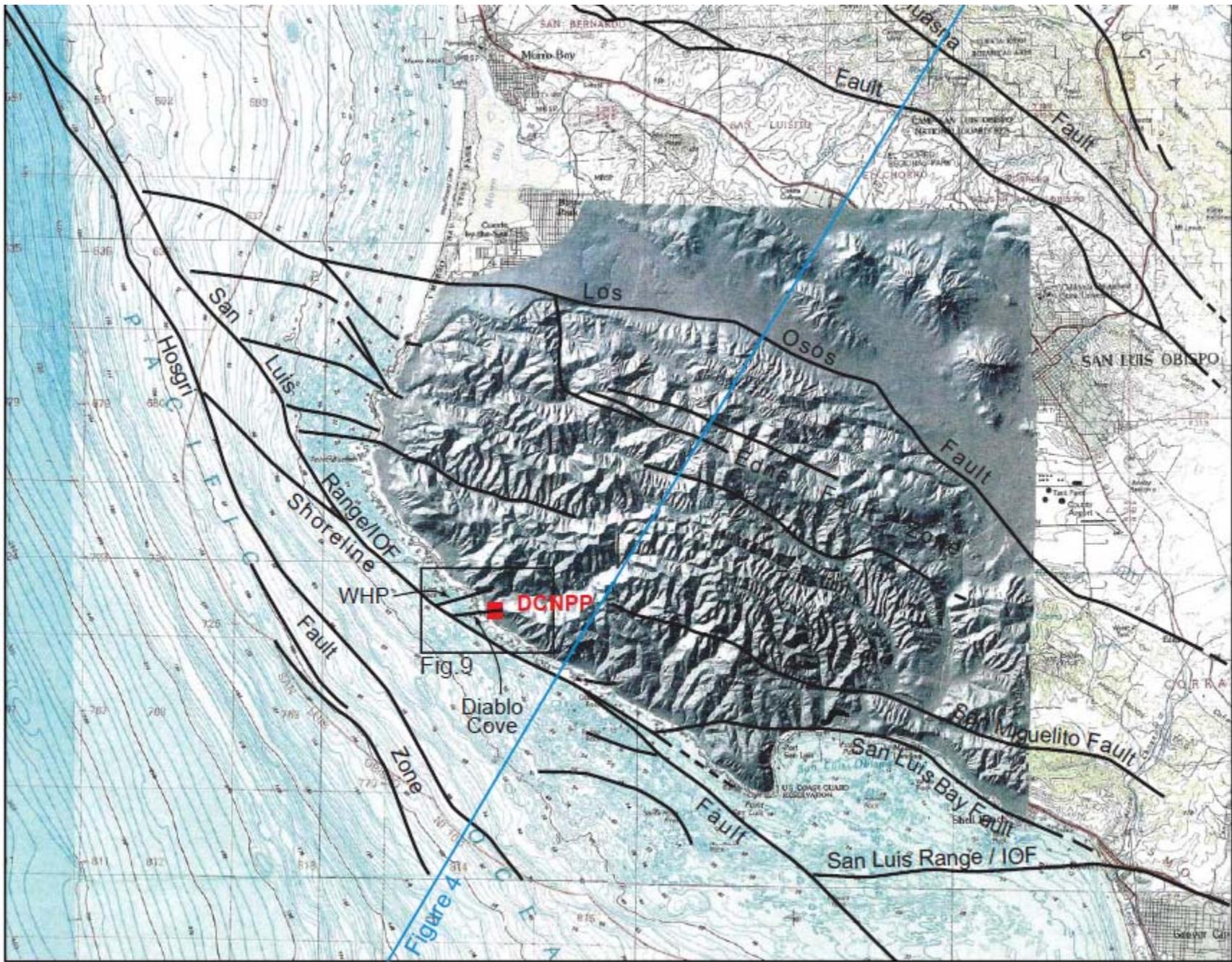


Figure 3. Terrain and faults in the Estero Bay - Irish Hills (Diablo Canyon) - San Luis Obispo region.

Evaluating the Shoreline Fault

*“Although the [long-term seismic program] margin analysis demonstrated that the new Shoreline Fault Zone information was bounded by the Hosgri Event, **the licensee didn’t evaluate the new seismic information against the other two design basis earthquakes, the Design Earthquake and the Double Design Earthquake.**”*

NRC Task Interface Agreement 2011-010

August 1, 2011

NRC Task Interface Agreement 2011-010

cont'd.

- *“Plant safety analyses concluded that seismic qualification for certain structures, systems and components **was more limiting for the Design Earthquake and Double Design earthquakes than for the Hosgri Event.**”*
- *“New seismic information developed by the licensee is required to be evaluated against all three of the seismic design basis earthquakes and the assumptions used in the supporting safety analysis . . . **Comparison to the [long-term seismic program] by itself is not sufficient to meet this requirement.**”*

Internal PG&E Emails

- **Sept. 14, 2010:** *“ This issue was raised again by Peck at 605 mtg. He is continuing to make the case that Shoreline fault should have been compared to original design not hosgrai [sic] in his opinion of our licensing basis **and that our operability position taken a year ago was to the wrong licensing basis.**”*
- **Sept. 20, 2010:** *“If the DE is now estimated to have a higher chance of occurring, then the plant just has **a greater chance of having to shut-down. This is an economic issue, not a safety issue.**”*

Internal PG&E Emails

cont'd.

- **Sept. 29, 2010:** *“could SF challenge the DE, DDE ground motions if it was evaluated based on the methodology that DCPP was licensed to (i.e., DE based on earthquakes A, B, C, D)?”*
- **Sept. 30, 2010:** *“M. Peck told him Region IV recommended a violation (instead of an URI) for a poor operability determination because our operability determination (OD) in 50086062 did not address DE and DDE.”*

Internal PG&E Emails

cont'd.

- **Oct. 1, 2010:** *"I agree that we should not have to revisit DE and DDE with each new study or informational finding. The only reason this was an issue this time was **because Hosgri probability is so small that it would mask in PRA space any probability of an issue occurring.**"*
- **Oct. 1, 2010:** *"It appears Shoreline is outside our SSE and Hosgri ground motion acceleration spectra and therefore the CLB **does not appear to fully bound Shoreline.**"*

Internal PG&E Emails

cont'd.

- **Oct. 1, 2010:** *"If we have **misrepresented our design and licensing basis requirements** or have compared to non-D&LB (like LTSP) then this introduces new station vulnerability to additional violations regarding the **completeness and accuracy of our communications.**"*
- **Oct. 11, 2010:** *"The team needs to ensure that the path we are pursuing is technically viable **as well as understand the legal risk and implications,** but must meet licensing rules and policies."*

Internal PG&E Emails

cont'd.

- **Oct. 13, 2010:** *“Dr. Peck again stopped by my office ... He reiterated that he feels **we are obligated to review the Shoreline earthquake (and any new geological feature) to the same standard ... that we are licensed** and based on that analysis make a call on operability. He argues that using LTSP is not appropriate because it is not a part of our licensing basis... With respect to the 4/9/09 letter from NRR, he would conclude that the NRC statement that the CLB is bounding was **based on the essentially misleading information provided by us that we were within the LTSP.**”*

Internal PG&E Emails

cont'd.

- **Jan. 6, 2011:** *"It would behoove us to explain the conservatisms in the Shoreline report with Dr. Peck. Be aware he will start asking about how we know we can safely shut down with the new spectra (ie, do we meet DDE) ... **I suggest we'll have to keep him focused on addressing safety and capability vs licensing compliance.**"*

PG&E's Nov. 3, 2011 Form 10-Q

- “. . . in early August 2011, the NRC found that a report submitted by the Utility to the NRC on January 7, 2011, to provide updated seismological information **did not conform to the requirement of the current Diablo Canyon operating license.**”
- “On October 21, 2011, the Utility filed a request that the NRC amend the operating license to address this issue. If the NRC does not approve the request the Utility **could be required to perform additional analyses of Diablo Canyon's seismic design** which could indicate that modifications to Diablo Canyon would be required to address seismic design issues.”
- **“The NRC could order the Utility to cease operations until the modifications were made or the Utility could voluntarily cease operations if it determined that the modifications were not economical or feasible.”**

PG&E notes on Dec. 15, 2011 call w. new NRC Branch Chief, Neil O'Keefe

- *"Neil then asked us if there is any technical reason for leaving the DDE in the design basis ... **his advice is that we eliminate the DDE as our safe shutdown earthquake for our licensing basis.**"*
- *"His opinion is that by leaving it in, **it appears as if we are covering something up.** We need to be able to tell a simple story for people to understand, and **the simple story won't stand on its own if we leave the DDE in.**"*

PG&E notes on call w. Neil O'Keefe

cont'd.

- “Neil’s greatest concern ... **is that we cannot provide a good argument** for why the analysis using the DDE can’t be done.”
- “We don’t make the argument for why it should be removed completely, but **that’s what we need to do, in Neil’s opinion.**”
- “He made the comment that it is **better to be legally clean than legally correct but confusing** (and added that both have to be technically correct).”

PG&E notes on call w. Neil O'Keefe

cont'd.

- *“Following the call ... some additional discussion with Dr. Peck [who] continues to stress his view that **PG&E cannot use the alternate analysis method ...**”*
- *“If he is correct, and we can't use that approach, **we have to apply Shoreline using the DDE approach.**”*
- *“That would almost certainly result in exceeding code allowable limits that would require us to get NRC approval to continue to operate ...”*

DE and DDE Significance, according to Dr. Peck's "Non-Concurrence" filing

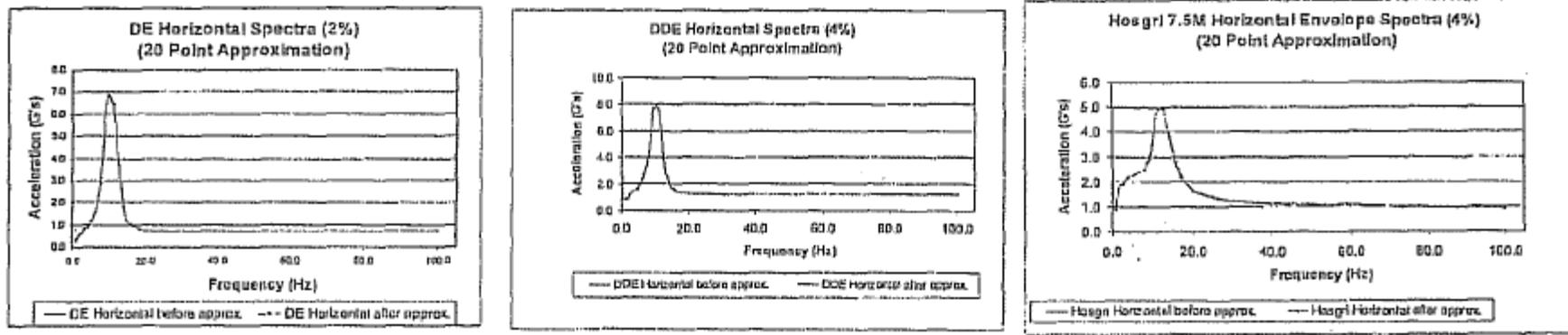


Figure 1
Comparison of DE, DDE, & HE Horizontal Response Spectrum at the Steam Generators

- "Portions of the reactor coolant pressure boundary **were more limited** by the DE and DDE than HE."
- "For example, the safety analysis **predicted higher vibratory motion** for DE and DDE than the HE at the steam generators."

DE and DDE Significance, according to Dr. Peck's "Non-Concurrence" filing

cont'd.

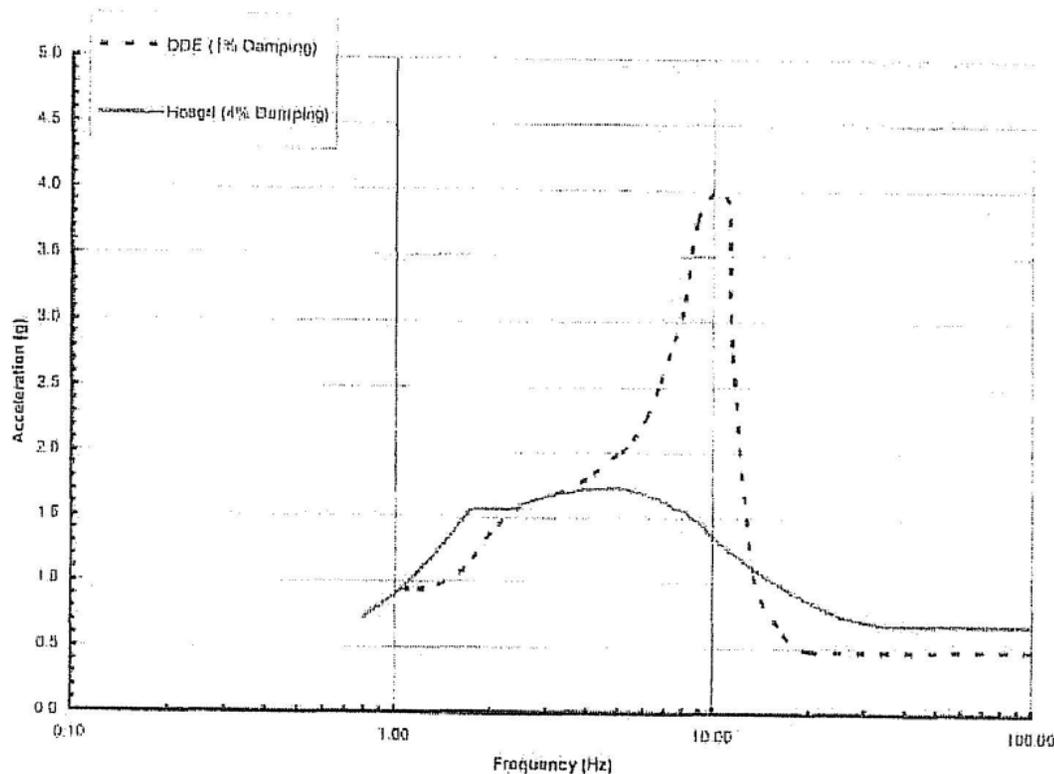


Figure 2
Comparison of DDE and HE Containments Floor Response at 88 Foot

Neil O'Keefe's response to Dr. Peck's "Non-Concurrence" filing

- "Dr. Peck has thoroughly researched these issues. The **actual facts are not in dispute.**"
- "While this concern has **overtones of safety**, the **actual questions are procedural.**"
- "The actual seismic current licensing basis **did not provide a way to evaluate new information** that becomes available."