US Electric Utilities & IPPs
Reacting to Retirements

Wave of nuclear retirements keeps coming, now with regulated flavor
In the past few years the retirement of nuclear assets has been largely concentrated on merchant plants (ex. Entergy’s unregulated Vermont Yankee, Pilgrim, and Palisades assets) and we expect even more retirements over the next decade due to challenging economics but even regulated assets are not immune to the symptoms of cost inflation. In the past two months PCG’s Fort Calhoun Station (FCS) and Diablo Canyon announced their planned retirements for 2016 and 2024/2025, respectively. While we anticipate more regulated nuclear retirements (for instance, XEL’s Prairie Island could be at risk for premature retirement in 2020s per recent filings and press reports), these two plants are unique: Fort Calhoun is the smallest nuclear plant in the US (476MW) and thus is not able to amortize its high cost structure off a large capacity base, making it less economic on a $/MWh basis than larger dual-unit nuclear plants; Diablo Canyon is located near multiple fault lines in California and has above-average seismic risk, a significant focus following Fukushima incident in 2011. PCG management requested additional time to prepare seismic studies after Fukushima and the additional risks could have been a factor in the decision not to pursue relicensing.

How does relicensing impact the equation?
The nuclear industry is preparing for ‘subsequent’ license renewals to extend the useful life to 80-years from 60-years currently with Exelon and Dominion already announcing plans to pursue the latest extension. With license expirations clustered in the early-2030s we anticipate utilities having to justify potentially significant capital spending plans in the middle of the next decade to support the continued operations. As technological advancements make solar, wind, natural gas, and battery investments increasingly more economic, we expect regulators are likely to carefully scrutinize whether it makes sense to continue investing in nuclear well into the next decade.

Clean Power Plan is the wild card: some states have difficult path w./out nukes
If the Clean Power Plan (CPP) is ultimately enforced as law and the states desire to reduce their carbon footprint then we could see more support for nuclear assets but that is far from a certainty at this point. For certain states such as New York, we believe it would be exceptionally challenging to achieve the preliminary CPP targets if the entire nuclear fleet in the state retires. We don’t see this as an unrealistic scenario with the owner of Ginna and Nine Mile (Exelon) describing its plants as economically challenging and Indian Point 2 & 3 currently operating beyond their initial expiration dates (running under “timely renewal” today).

Can the nuclear promise reverse the trend?
The Nuclear Energy Institute (NEI) is backing an industry-wide plan to reduce costs to the 2002 level ($28/MWh) by 2020 through a combination of lower capex, O&M, and nuclear fuel to help combat the macro pressures facing the nuclear industry. In the absence of cost reduction we believe that smaller nuclear plants will remain challenged.

Contracted nuclear fleet at risk as well too
Further, we see long-term contracted plants as also at particular risk of shutdown as utilities have little incentive (ratebase) and high costs attached to these typically smaller facilities. An update from ETR around its Fall EEI update on its nuclear portfolio could potentially include an arrangement with CMS on premature retirement of Palisades. We think such arrangements across the Midwest could materialize over time (depending on progress in achieving carbon goals with wind, etc).

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Reviewing the Nuclear Headwinds

We published a note in early April analyzing nuclear costs and the headwinds the industry is facing. We again highlight the slew of retirements that are expected to impact the conversation regarding the future of nuclear plants. In a previous conference call with NEI, we discussed the latest industry-wide plan to bring down costs back down to the 2002 level of $28/MWh by 2020, leveraging reductions on capex, O&M, and nuclear fuel. These aggressive – and sometimes lofty – goals may be plausible in a scenario where both capex and fuel costs continue to undergo a structural shift over the coming years. With the industry facing approximately $45/MWh costs for single unit sites in 2015, we caution that even with long-term PPAs, units operated by regulated utilities are at risk for premature retirement. The NEI compares the latest slew of retirements to the last wave in the mid-1990s largely executed under regulated utilities.

Framing those likely to (and likely not to) be Beneficiaries in Equities

▪ **Beneficiaries:** We see CMS as the clearest beneficiary; we see XEL as a potential eventual beneficiary from further investment. We see the latest nuclear retirements as a potentially mixed positive to EXC given market uplift impacts and removal of a cash drag.

▪ **Unlikely to benefit:** Those with contracted plants. We think investors should be cautious on applying multiples across the sector while ETR, NEE, and D are exposed to further risk of eventual retirement of their merchant/contracted nuclear assets. Furthermore, we see the potential loss of PG&E ratebase as a further headwind to EPS growth into the 2020s, with ~10% of EPS attributable to the plant.

Which units are potentially poised to retire? The list is growing, including regulated units.

Below we show a list of nuclear plants that are either expected to retire or have licenses that expire in the next decade. We note the cumulative capacity that could be taken off the market is approximately 8 GWs.

What’s changed? We look towards relicensing decisions and other key capex milestones as critical junctures given the lower power price backdrop. The units listed below include those that have indicated retirement as well as those with upcoming license expirations (not necessarily at risk of retirement, but worthy of monitoring around any newsflow on these decision points).
The Debate at Palisades: Illuminating the Dilemma

Focus has shifted towards Michigan where the conversation revolves around ETR’s remaining single-unit plant, Palisades, which continues to run with an above-market contract with CMS. We reiterate our view that shutting down this unit early could not only save money for ETR in operating the plant and accelerating its strategic positioning away from nuclear but also reduce delivered costs to CMS consumers avoiding the cost of such a high-priced PPA. While merchant IPPs have been on the front end of the latest retirement wave, we see a trend towards regulated entities should the industry prove unable to rein in costs. We emphasize with power prices across much of the country now trending below $30/MWh – and capacity contributing an additional $5-10/MWh, the implicit value of carbon remains the key ‘discrepancy’ in justifying the economics of these plants.

Both sides would likely save costs

We believe a scenario in which Entergy opts to shut down Palisades nuclear plant during the spring 2017 refueling timeframe would likely be mutually beneficial for CMS/ETR later this year (~3Q timeframe for ETR decision) and envisage scope for CMS and ETR to arrive at a mutually agreeable arrangement to close the plant early and effectively replace the arrangement with a lower all-in cost solution, such as ratebasing further available merchant capacity in the MISO market for instance. This would likely result in both CMS and ETR respectively transitioning to a more regulated profile. Further, we see an early retirement scenario as likely addressing ongoing concerns around nuclear sustenance capital. An update could be provided in tandem with ETR’s EEI capex update on its future nuclear strategy. Given its

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**Figure 1: Possible retirements and license expirations of nuclear plants (2016-2025)**

<table>
<thead>
<tr>
<th>Power Plant</th>
<th>Current Operating Capacity (MW)</th>
<th>Owner</th>
<th>State/Province</th>
<th>Year Unit in Service</th>
<th>Year Unit Retired</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diablo Canyon</td>
<td>2,240</td>
<td>Pacific Gas and Electric Company</td>
<td>CA</td>
<td>1986</td>
<td>2024/25</td>
</tr>
<tr>
<td>Clinton</td>
<td>1,078</td>
<td>Exelon Generation Company</td>
<td>IL</td>
<td>1987</td>
<td>2017</td>
</tr>
<tr>
<td>Quad Cities</td>
<td>1,819</td>
<td>Exelon Generation Company</td>
<td>IL</td>
<td>1972</td>
<td>2018</td>
</tr>
<tr>
<td>Oyster Creek</td>
<td>637</td>
<td>Exelon Generation Company</td>
<td>NJ</td>
<td>1969</td>
<td>2019</td>
</tr>
<tr>
<td>Ginna</td>
<td>582</td>
<td>Exelon Generation Company</td>
<td>NY</td>
<td>1970</td>
<td>2017*</td>
</tr>
<tr>
<td>Pilgrim</td>
<td>684</td>
<td>Entergy Nuclear</td>
<td>MA</td>
<td>1972</td>
<td>2019</td>
</tr>
<tr>
<td>James A. FitzPatrick</td>
<td>852</td>
<td>Entergy Nuclear</td>
<td>NY</td>
<td>1975</td>
<td>2017</td>
</tr>
<tr>
<td>Total</td>
<td>7,892</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

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*Ginna has an RSSA ending in 3/2017

Source: SNL, UBS
spring 2017 outage, we see this Fall timeframe as still providing latitude for a possible expedited retirement as soon as next year.

**What's the Real 'Alternative'?**

In analyzing the latest series of datapoints, we emphasize nuclear plant retirements won’t simply occur and be replaced by new CCGTs. We estimate the equivalent Levelized Cost of Energy (LCOE) for a new gas plant is between $45-55/MWh using recent gas curves, largely equal to the variable cost of continuing to operate even higher-cost nuclear plants. Rather, we see other options as ‘leading’ the way on alternatives to higher-cost nuclear generation.

**What's changing in the equation? Cheap Renewables.**

What’s shifting in recent years with the latest PTC extension is the ability for utilities to opt for a yet cheaper resource than gas to supplant the nuclear generation – and one that is indeed carbon-free as well. We emphasize the clear limiting factor remains both transmission constraints and grid intermittency. Our point here is that the reduction in renewable costs (admittedly still net of meaningful tax credits) makes nuclear less of a consideration in achieving carbon goals. We see the improving cost profile of renewables as adding to nuclear pressures.

**The trend towards re-ratebasing capacity**

While renewables are less cost effective in the case of Michigan, we see re-ratebasing merchant assets as a suitable potential source of low all-in cost capacity to replace nuclear units. This wider trend points to the excess of capacity available, such that higher cost nuclear units may well be untenable amidst high reserve margins.

**What are the key criteria?**

What is similar for the latest announcements:

1. **Capex considerations:** Nuclear plants at risk have potentially significant capex involved, either to bring plants back up from their lower NRC column ratings or simply upgrades required to keep units up to NRC standards to achieve future life extensions. We emphasize in the instance of Diablo Canyon this includes the capex involved in achieving both the once-through cooling requirements on plants as well as any potential added safety needs to accommodate further seismic studies.

2. **Economic alternatives:** They are in regions where economics for peer units are less costly. For units located in regulated regions, we see the availability of options to ‘swap’ capacity for meaningfully lower cost resources. With limited to negative load growth of late, regulated companies are keen to find more cost-effective solutions and capture savings back to customers and/or enable further capital investments.

3. **Remaining asset base:** A further question is what is the depreciated asset base against the nuclear plants. We note with meaningful capital having gone into plants in recent years, we still see regulated plants as having meaningful ratebase. In the example of Diablo Canyon it is the licensing process that appears burdensome rather than the economics, given the ~$2 Bn+ in ratebase projected.
But in restructured markets, it's all about fixed costs: We emphasize this was indeed the case in restructured markets, where merchant gas plants could live through a cycle of lower energy prices off just capacity prices. As such, we have seen substantial churn of the underlying asset portfolio in regions like New England in recent years towards lower fixed cost production. Bottom line, we would expect continued retirement in restructured markets as plants continue to be undermined by zero-cost renewables.

Looking at Recent Case Studies

Diablo Canyon to retire at end of license

Permitting process appears too onerous to attempt license extension

PG&E indicated earlier this week it would retire the two-unit Diablo Canyon nuclear plant in Northern California ahead of the likely lengthy process to attempt to extend its operating license to 60-years from 40-years (most plants have been successful in their petitions). We believe corresponding challenges to achieve this goal alongside anticipated costs likely made this investment unpalatable particularly given the need to maintain competitive rates and declining native load served (switching, efficiency, rooftop solar, etc. in California).

With the unit still having $28bn + in projected ratebase, this decision would appear to represent ~$0.40 in EPS or ~10% of projected EPS; this could prove a modestly lower figure by its expiration date of 2025. While management remains confident further growth opportunities to reinvest in the grid will emerge, we see this as a longer-term risk to earnings to the story (offsets the above-average growth in ratebase). That said, we expect the plant’s undepreciated asset balance should be recoverable (albeit not with an equity return).

Management would likely not have retired the plant had it not been for overwhelming pressures pertaining to the ability to relicense the plant. PG&E is currently under an operating lease that is set to expire in 2018 and management has already requested an extension to align this with its 2025 NRC license (the two were not in sync given the delayed timeline for the original in-service of the asset).

The State Lands Commission is holding a meeting on June 28th to discuss license extension and the company expects to file a subsequent proposal with the CPUC 30 days following; management will ask for a final decision by Dec. 31, 2017. The closure remains dependent on alignment of the two license expirations in 2025.

The company filed Nuclear Decommissioning Cost Triennial Proceeding 2017 (NDCTP) prepared testimonies earlier this year. In the filing, PG&E requests authorization for recovery through CPUC-jurisdictional rates of the following costs:

1. “$117.324 million annual revenue requirement for contributions to the tax qualified Diablo Canyon ND Trusts”
2. “$62.924 million annual revenue requirement for contributions to the tax qualified HBPP ND Trust”
3. “$4.493 million in estimated annual revenue requirements for 2017; $4.475 million in annual revenue requirements for 2018; and $3.885 million in annual revenue requirements for 2019”

The total CPUC-jurisdictional revenue requirement for ND is $184.741 million.
But what’s the issue with the plant? Fault Lines.

California State has heard opposing views from numerous parties calling for either the renewal of the Diablo Canyon nuclear plant’s license or the shutdown of the plant in the near future. We note seismic focus for Diablo Canyon remains the primary perceived headwind. The table below summarizes the mean probabilities for a 6.7+ magnitude earthquake. The most dangerous fault is the southern San Andreas region which has a 59% probability of generating a 6.7 magnitude quake in the next 30 years, according to a study. The Diablo Canyon plant is surrounded by 4 faults, with San Andreas being one of them. The company has not indicated whether it will opt to relicense the plant yet – we would expect such a decision in the coming years as its permits come up for renewal.

Figure 2: Mean Probability of 6.7+ magnitude quake taking place

<table>
<thead>
<tr>
<th>Fault</th>
<th>Mean Probability</th>
<th>2007</th>
<th>2003</th>
<th>1995</th>
</tr>
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<tr>
<td>S. San Andreas</td>
<td>59%</td>
<td>53%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hayward-Rodgers Creek</td>
<td>31%</td>
<td>27%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>San Jacinto</td>
<td>31%</td>
<td>61%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N. San Andreas</td>
<td>21%</td>
<td>23%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elsinore</td>
<td>11%</td>
<td>24%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calaveras</td>
<td>7%</td>
<td>11%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Garlock</td>
<td>6%</td>
<td></td>
<td></td>
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</table>


Omaha Utility votes to shut down Fort Calhoun

In May, the board of directors of the Omaha Public Power District (OPPD) unanimously voted to shut down the Fort Calhoun nuclear power plant, making it the latest in a series of nukes failing to maintain profitability in a low power price environment. The 43-year-old plant is expected to close by the end of this year (2016). OPPD management determined the plant was “not financially sustainable” in their May 12 recommendation to the board of directors to close operations. The single-unit plant faces headwinds due to lower output versus peers. Although the plant is the smallest nuclear reactor in the country on a power capacity basis, it accounts for approximately 34% of the utility’s total electricity generation.

The closure of the plant is expected to “save the district between $735 million and $994 million over the next 20 years.” Additionally, “the decision means no general rate increase is anticipated for the next five years, through 2021, furthering the district’s goal of pursuing rates that are 20 percent below the regional average.” Market conditions including low natural gas prices, the Clean Power Plan, and economies of scale all contributed to the ultimate decision to elect for a shutdown at Fort Calhoun Station. Management stated in a release, “larger and multi-unit nuclear plants can spread costs over high levels of production.”

Accelerated decommissioning liabilities yet a further impediment

Management is estimating the cost to decommission the plant at approximately $1.2 billion. As it stands, the utility has $388 million in funds available for that purpose. OPPD was contributing to the fund based on an expected 2033
decommission date but will need to ramp up the contributions to meet the accelerated timeline. We believe details on this angle could prove an impediment to the decision to pursue an early retirement of existing assets.

**XEL: Little Nuke on the Prairie**

**Considering an earlier retirement given mounting costs**

Earlier this year, Xcel Energy requested Minnesota state regulators to examine the options relating to an early retirement of the Prairie Island nuclear plant, a dual-unit site. According to a filing the company submitted to the PUC on Jan. 29, management is anticipating a $175 million increase in expenditures in the next 5 years in excess of 2012 predictions. Additionally, the company’s “forecast for the thirteen-year period from 2021 through 2034 would likely need to increase by roughly $600 to $900 million.” The company is attributing these costs to increased regulations by the U.S. Nuclear Regulatory Commission in response to the Fukushima incident in 2011. Citing the “uncertainty at play when considering the costs to operate a two-unit nuclear plant for the remaining 19 years of its licensed life,” management remained open to options including the early retirement of the Prairie Island plant. The plant has been operating for more than 40 years and recently received renewal on its license by the NRC to operate until 2033-2034.

Management believes the lowest cost option is to continue operating the plant and does not “foresee an economically prudent time to retire Prairie Island prior to the end of its licensed life.” However, the company believes a potential shut down in the mid-2020s would be more beneficial versus a shut down in the near-term. We expect the potential new sources of generation to replace nuclear generation will be discussed in the company’s subsequent Integrated Resource Plan, likely with a combination of wind and gas solutions. Xcel’s current IRP aims to reduce carbon emissions by 60% in 2030 vs 2005 levels. We note the company plans to run its corresponding single-unit Monticello nuclear plant through to the end of its license period following recent meaningful investments in the plant, incurred during a period of higher comparable gas and power prices as well as during a higher period of comparable renewable costs.
Valuation Method and Risk Statement

Risks for Utilities and Independent Power Producers (IPPs) primarily relate to volatile commodity prices for power, natural gas, and coal. Risks to IPPs also stem from load variability, and operational risk in running these facilities. Rising coal and, to a certain extent, uranium prices could pressure margins as the fuel hedges roll off Competitive Integrateds. Further, IPPs face declining revenues as in the money power and gas hedges roll off. Other non-regulated risks include weather and for some, foreign currency risk, which again must be diligently accounted in the company’s risk management operations. Major external factors, which affect our valuation, are environmental risks. Environmental capex could escalate if stricter emission standards are implemented. We believe a nuclear accident or a change in the Nuclear Regulatory Commission/Environment Protection Agency regulations could have a negative impact on our estimates.

Risks for regulated utilities include the uncertainty around the composition of state regulatory Commissions, adverse regulatory changes, unfavorable weather conditions, variance from normal population growth, and changes in customer mix. Changes in macroeconomic factors will affect customer additions/subtractions and usage patterns.

Solar sector risks include: 1) Solar panel and other input pricing is subject to ongoing price deflation, which affects economics of downstream projects and margins of upstream producers; 2) Government incentives being added or removed have had a disproportionate effect on demand in the past, and may continue to do so; 3) reliance on power purchase agreements in electricity markets could make future contracts more difficult to sign; 4) solar power is directly competing with other traditional generators as well as other renewables like wind, which creates uncertainty as wholesale power markets shift; 5) headline risk and policy risk continue to shift economics in countries as trade policies and changes to other key policies affect solar economics.
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<td>32%</td>
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<td>Stock price expected to rise within three months from the time the rating was assigned because of a specific catalyst or event.</td>
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<td>&lt;1%</td>
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<td>Stock price expected to fall within three months from the time the rating was assigned because of a specific catalyst or event.</td>
<td>&lt;1%</td>
<td>&lt;1%</td>
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Source: UBS. Rating allocations are as of 31 March 2016.
1:Percentage of companies under coverage globally within the 12-month rating category.
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<th>Short-term rating</th>
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Source: UBS. All prices as of local market close.

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