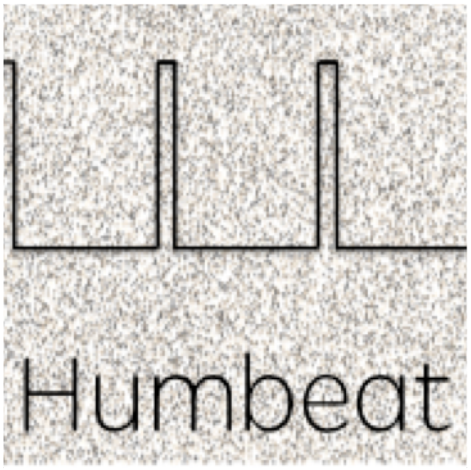
Has the AP1000 entered its autumn years? Life post VC Summer

Four AP1000 units currently under construction in the US may not be completed. Westinghouse, a giant of the global nuclear industry, has lost its shirt through their construction, and US ratepayers risk having paid out billions for nothing: is there still hope for Summer? It is also not clear how the AP1000 design will survive this very public setback, and other reactor designs will be looking to capitalize on Westinghouse's misfortune. Specifically: is there a future for the AP1000 in the UK?



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“Summer's lease hath all too short a date”

Just last month, Santee Cooper, the 45% shareholder of VC Summer Units 2 and 3 expansion in South Carolina, USA, issued a project abandonment statement. Days later the 55% shareholder, SCE&G, followed suit … although discussions at both State and Federal level are now investigating ways of keeping the project alive. Is there hope for Summer? And is there a UK future for the AP1000? Let’s start with a brief history of events.

Summer time

In the last decade, many regional US utilities have set about expanding their generation portfolios with new nuclear power. Enablers, such as a streamlined licensing process, federal loan guarantees and capital allocation allowances, have landed as a result of consistent support for nuclear power from Washington DC.

In 2007 the VC Summer Units 2 and 3 expansion project commenced. Two Westinghouse AP1000 units were selected, each expected to cost $4.5Bn. Ground was broken in 2013. By 2014, the projects were behind schedule and over budget due to the "construction crews [running] into problems” with the AP1000 design. By then, the total project cost had risen to $14Bn. In 2015, Westinghouse Electric Company LLC, a subsidiary of Japan’s Toshiba Corp., signed a fixed price construction contract for the Summer build. But in March 2017, Westinghouse filed voluntary petitions under Chapter 11 of the US Bankruptcy Code, claiming their losses on construction at Summer and another project (Vogtle in Georgia) to have eclipsed $6Bn. Subsequent reviews of project schedules and cost estimates put Summer’s earliest possible completion 6 years late, in 2023/2024, for a total cost (including debt financing) of nearly $25Bn.

Therefore, with no main contractor, constrained finances and a ticking clock, the project owners have made the decision to pull the plug.

Strategic importance

Alarmed by the prospect of America's nuclear renaissance finishing before it has even started, State leaders are examining options for keeping Summer alive. Westinghouse stated that it remains “committed to its AP1000 technology as the industry’s premier Gen III+ nuclear power plant design, and will continue its existing projects in China as well as [pursue] other [future] potential projects.”

Summer’s closest relative, the 2-unit Vogtle project in Georgia, USA, also remains under review. It’s 45.7% majority owner, Georgia Power, recently put forward a recommendation to the State regulator to continue with construction at Vogtle. Delivering the units at a total cost of over $21Bn has been proposed by Georgia Power as “the most economic option for [their] customers.” Alternatively, owners may write off over $9Bn already spent. The State regulator has recently

approved construction (and spend) to continue pursuing a revised project schedule until early next year when a decision on the "reasonableness" (rate-payer value-for-money assessment) of revised project costs can be reached.

Some reports have suggested that Georgia Power's recommendation includes enablers such as "loan extensions from the DoE and nuclear production tax credits," as well as the appointment of a strong lead contractor to take control. Either way, owners of the remaining 54.3% of the project will need to fall in step with Georgia Power's recommendation – or find a buyer for their stakes – in order for the project to continue. It is revealing that Oglethorpe Power, a 30% owner at Vogtle, in August requested additional financial support from the US Federal government in order to fund their share of construction costs.

It is difficult to see a future for the AP1000 unless one (but preferably both) of these US projects are completed, and lessons on design and construction learned and shared internationally.

Until this happens, the AP1000 forward order book is thinning. Duke Energy have applied to pull their licence to construct at Lee (South Carolina); and NuGen (now 100% Toshiba owned) have placed their UK project at Moorside "on hold" pending a strategic review. "Investors" are circling …

An Indian AP1000 development planned at Andhra Pradesh, remains loyal, but may not yet proceed. Indian law requires a "functional prototype" plant to be in operation before any Indian build commences. Moreover, the AP1000 would have to be Indian built due to Westinghouse exiting "the construction of nuclear plants as a part of its bankruptcy proceedings".

The VC Summer storm therefore raises three critical questions for the AP1000's future prospects.

Is the AP1000 constructible?

An independent engineering report on the Summer construction project from early 2016 was recently released. It suggests the long-term strained commercial relationship between major contractors lead to design and planning challenges, and caused on-site construction difficulties, schedule slips and cost inefficiencies. SCANA have also been subpoenaed for further information, aiming to establish exactly when the company was first made aware that the project was going off track. Suspicions are that it was a long time ago … a worrying fact for the constructibility of the AP1000, with worrying repercussions for the industry as a whole. Keeping bad news private is simply not "the nuclear way", and especially not when rate payers are footing the bill.

Construction at Voglte shares many characteristics with Summer, but one key difference is in partnerships. A nuclear expert, who believes these AP1000s can be completed, has now taken control of construction at Vogtle. Westinghouse, however, must still deliver a constructible design.

Internationally, four AP1000s are closing in on Grid Connection in China (Sanmen and Haiyang). A construction duration of nearly 100 months for each reactor, more than twice the initial planned duration, is due to draw to a close within 12 months. Success in China will prove the AP1000's constructibility; provide a legal basis to proceed with the 6-unit Andhra Pradesh project; and provide, to the rest of the world, a baseline build duration which must be accepted until it is bettered. The US may attempt to better, but at what price?

Is the AP1000 unique?

The EPR, it seems, is in not too dissimilar a position as the AP1000 regarding constructibility, save that none of its five current projects have been abandoned. The lead EPR, Taishan-1, is reported to be close to commercial operation. At least for Hinkley Point C, the project ownership structure is tight and well-backed. Further, enabling contracts with UK Government place construction cost and duration risk firmly with the Operator.

For examples of successful construction, one only need look East. Japan, Korea and China all have recent experience in building their own LWR designs over 5 years (as opposed to 8 in the West). So while the AP1000 is not alone in construction complexity, not all GW+ reactors need to be 10-year builds.

Is the AP1000 investible?

Summer and Vogtle have not helped Westinghouse's international reputation. But has this has undermined the AP1000's claim on the future Gen III+ reactor market?

Critically, the issue of federal support has arisen in Summer and Vogtle salvation discussions. Government commercial support is an important avenue for discussion in the US, as much as it is an important pre-requisite in other countries for projects to get off the ground. Government has a fine path to tread, in balancing economic growth, infrastructure, power security and environmental performance, with protection for customers if construction projects go wrong. If, as a result of Summer investigations, the AP1000 is assessed by financiers to be a more risky project now than it was even just 6 months ago, governments will look to cover risk in at least one of a number of different ways:

- An increased levy on any construction project loans or guarantees (making the project potentially more expensive);
- Limiting their exposure to the risk (requiring parties to go to commercial markets for larger debt instruments, again adding to project cost); or
- Imposing more protective claw-back or construction milestone conditions on projects (leaving less potential upside for investors);
- Prioritising (or selecting) more attractive technologies.

In summary, the failure of one nuclear project directly impacts on the investibilty of subsequent projects, particularly where less risky alternatives exist. So for Summer and Vogtle, will regulators permit good ratepayer funds to be put after bad? Or will that be seen as political disaster in a now "proudly made here" country?

The only successful outcome for Summer, one which is beyond bold for government but helps protect US nuclear, would be a once-off payment of project debts, allowing investors the opportunity to finish Summer without its unattractive past burdening themselves or, ultimately, ratepayers.

We believe Summer has cost the AP1000 significant ground to competitor technologies in terms of project investibility. To recover ground, we believe that Summer's root-cause difficulties must be identified and mitigated, and AP1000 construction proven possible both on-time and within-budget at other locations. Whichever way this recovery is looked at, it is a long road ahead. Investors in the next AP1000 build will be taking a very brave step; there are other designs which have already delivered which have less project risk.

Will an AP1000 be built in the UK?

The UK remains an open and attractive market for nuclear construction, receiving interest from around the world. In March 2017, just days before the Westinghouse Chapter 11 announcement, the AP1000 received approval from the UK's ONR under it's GDA process. Critically, constructibility in the UK remains an operator issue.

Because successful nuclear companies from Japan and Korea currently have no home build markets, they are looking to the UK. From Japan, while Hitachi progress their proven 5-year build ABWRs at Wylfa, Toshiba appear focused on salvaging value from their currently uncertain UK project. Both Horizon (Hitachi) and NuGen are attracting potential suitors.

KHNP and KEPCo, from South Korea, continue to branch out internationally with both eyeing the UK. KHNP is reportedly in talks to invest in Horizon (although KHNP signed a 2016 technical cooperation deal with Westinghouse). KEPCO, designers of South Korea's reactors, is in talks with NuGen, as are CGN, the Chinese company already partnering EDF at up to three UK sites. Both would likely substitute their reactors in place of the AP1000.

A sale of NuGen would be a second UK blow to Toshiba: the AP1000 was shortlisted for Wylfa before Hitachi purchased Horizon in 2012. With potential build-only partners for Toshiba watching for success at Summer, a technology pivot at NuGen away from the AP1000 seems the most likely outcome.

And with that outcome, a graceful exit from the UK market, pristine GDA certificates in hand, seems probable for the AP1000.