

Renaissance Watch: Uncertainties abound

BY E. MICHAEL BLAKE

LONGTIME READERS OF *Nuclear News* may have watched with some bemusement over the past few years as the “Renaissance Watch” summation in the Power section has grown from a modest sidebar to a sprawling two-page spread. In this issue—and, the editors hope, *only* in this issue—the summation has been enlarged further to allow some issues to be addressed at greater length, along with the usual updates on specific projects.

In what was supposed to be a streamlined, straightforward process for design approval and licensing, under 10 CFR Part 52, nearly every initiative has taken on unintended complexities. Industry leaders have long bemoaned “regulatory uncertainty” (in day-to-day operations as well as in license applications), but there are sources of uncertainty in virtually every aspect of the new-reactors endeavor.

In the past few months in particular, the actions of state governments have had great influence on new reactor projects. In the abstract, there seems to be a trend in favor of nuclear power (*NN*, Apr. 2009, p. 22), but in practical terms, efforts to remove reactor bans or encourage nuclear development in places such as Kentucky and West Virginia, where there are no current plans by electricity providers to build reactors, are less significant than rate recovery proposals. Georgia has approved rate recovery, so Vogtle-3 and -4 are on track; Missouri has not, so Callaway-2 has been suspended.

Other recent state-level actions include the rejection (for the fifth time) of a bill introduced in the California legislature by Assemblyman Chuck DeVore to repeal the state’s new-reactor ban, and a split between the two houses of the Minnesota legislature on a proposed ban repeal. There has not been an announced proposal to build new reactors in Minnesota, and the only proposal announced in California is by an association of business interests in Fresno, which hopes to have the ban repealed. The only place where state action in favor of nuclear might bear fruit is in Utah, the site of an expected application for a combined construction and operating license (COL) next year.

In the federal government, the Nuclear Regulatory Commission has done pretty

State governments, federal agencies, reactor vendors, license applicants, and the economy are all contributing to the air of doubt surrounding new reactor projects in the United States.

much what it has said all along that it would do, making the most headway on applications that have provided the largest amounts and highest quality of supporting information. In that sense, the uncertainty resides not with the agency but with the content of the applications.

Perhaps less certain has been the Department of Energy’s first-time-ever processing of applications for loan guarantees, which had not been awarded as of this writing. In the solicitation that began last year, the total amount of loan guarantees for nuclear projects (including uranium enrichment plants) was \$18.5 billion, and applications totaled \$122 billion. At the time, the DOE was criticized for not providing more guarantee authority. This year, with project financing of any kind hard to come by, guarantees in any amount may not be enough to support the projects as they move toward really large expenditures.

In the ideal world of 10 CFR Part 52, an applicant would apply for an early site permit (ESP), choose a certified reactor design, and then apply for a COL. Of the 17 applications submitted to the NRC so far, none of them has met that ideal. Even with the ESP requirement removed, the only application to reference a certified design is South Texas-3 and -4, and the ABWR design in use there has been amended by the chosen vendor, Toshiba, to remove the exclusive intellectual property of GE Hitachi Nuclear Energy that is in the certified version.

In the real world, certification has a limited shelf life. The ABWR was certified in 1997, and both Toshiba and GE Hitachi have informed the NRC that they will seek to renew the certification (which expires in 2012), and the design will be modified to include digital instrumentation and controls, which were not available in the 1990s.

The other four designs cited by license applicants are in various stages of the certification process. How they get through the process may matter less than how their vendors market them to customers. *NN* does not have access to the decision-making process

of each reactor manufacturer, but from the outside it is possible to see differences in the results so far. Westinghouse, majority-owned by Toshiba, with the Shaw Group a minority owner, has received engineering, procurement, and construction (EPC) contracts for three twin AP1000 plants, and separately, Toshiba has a contract for two ABWRs. None of the other vendors has announced that EPC contracts have been signed. GE Hitachi, in fact, has gone from negotiating sales for six ESBWRs to perhaps having a chance at one or two (an uncertainty that will be elaborated on below) and involvement in two others, with ABWRs instead of ESBWRs.

Westinghouse has gone to great lengths to get the AP1000 to market, including the sale of four reactors to China, reportedly with terms that will transfer the reactor technology to China fully with the fourth unit. Safety-related concrete has been poured for the world’s first AP1000, Sanmen-1, in China (*NN*, May 2009, p. 17), perhaps hastening the arrival of nth-of-a-kind efficiency and pricing. GE Hitachi, conversely, has a dwindling presence nationally and globally, with partial involvement in the Hitachi-led ABWR projects in Asia. Statements by disaffected ESBWR customers (at Entergy, Exelon, and Dominion) all attribute to GE Hitachi an unwillingness to share risks on this new reactor model, at least to the extent sought by the customers.

Which strategy is best is yet to be seen. If current appearances accurately portend later results, Westinghouse will thrive with the AP1000, and GE Hitachi will wither with the ESBWR. But what if Westinghouse has given away too much in order to get where it is now? In 10 years, will China be marketing its own AP1000s more cheaply than Westinghouse can? Will GE Hitachi’s negotiating stance come to be seen as a justified faith in the merits of the ESBWR and in pricing that the vendor believed to be in line with those merits?

Continued

At the start of the decade, when the DOE began touting Nuclear Power 2010, established nuclear owners/operators may have been too timid about testing out the licensing process and exploring real-world opportunities for new nuclear. At the end of the decade, they may have become too eager. With the NRC processing paperwork for as many as 26 new reactors, Nuclear Energy Institute officials have continued to say that the most that anyone could reasonably expect would be four to eight new reactors entering service in the 2018 time frame. As frustration mounts over the NRC's requests for additional information, and accounting departments ponder what financing is actually available (and at what terms), it would come as no surprise if suspended projects remain that way for some time, or perhaps are abandoned.

With all of that said, the following is a summation of current project status: **Bold** indicates a submitted application; *italics* means that an application is expected. The abbreviations and acronyms not already used above are as follows: ASLB, Atomic Safety and Licensing Board; FEIS (DEIS), final (draft) environmental impact statement; RAI, request for additional information; TBD, to be determined.

Design certification

There might actually be less uncertainty in this realm than there was at the start of the year. The chapter-by-chapter reviews of the ESBWR application have led to what amount to a safety evaluation report (SER) with open items and a schedule for progress to the final SER (FSER). A rough schedule has also been issued for Revision 16/17 of the design control document for the AP1000, which differs so much from the certified Revision 15 that the NRC is putting it through virtually a new certification process. It is now possible for license applicants to have at least a rough idea of what still needs to be done for each cited reactor model to get to final approval, resolving nuclear safety issues in advance so that they need not be addressed again in the licensing process.

ABWR, 1350-MWe boiling water reactor, available from GE Hitachi, Hitachi, and Toshiba. Thus far, the NRC has not disagreed with NRG Energy's assertion that the Toshiba design's variations from the certified design can be addressed fully during licensing, without the need for a certification amendment process.

AP1000, 1100-MWe Westinghouse pressurized water reactor. The SER with open items is now planned for January 2010, the FSER in December 2010, and the rulemaking to complete the certification in August 2011.

ESBWR, 1520-MWe GE Hitachi BWR. An advanced SER with no open items is scheduled for March 2010, and the FSER

for August 2010. A target date has not been announced for the completion of the certification rulemaking, but it would be some time in 2011.

US-APWR, 1700-MWe Mitsubishi PWR. The schedule calls for the SER with open items in March 2010, the advanced SER with no open items in May 2011, and the FSER in September 2011.

U.S. EPR, 1600-MWe Areva PWR. The SER with open items is planned for January 2010, the advanced SER with no open items for January 2011, and the FSER for June 2011.

License applications

All 17 COL applications submitted to date have been docketed by the NRC. This means that they provide enough basic information to allow the start of technical reviews, but it does not mean that the information will be found sufficient after reviews have begun in earnest. Design-centered licensing streamlines specific nuclear safety issues, but site-specific issues vary with each application and affect safety reviews as well as environmental reviews. The applications are listed chronologically.

Calvert Cliffs-3, U.S. EPR, UniStar Nuclear; Lusby, Md. The schedule's target dates are in flux, with changes to the water intake structure affecting the environmental review, and seismic design issues affecting the safety review. The presiding ASLB has admitted three contentions from intervenors for deliberation in hearings, including whether the existing and planned influence of foreign-owned Electricité de France (EDF) over applicant UniStar is contrary to the Atomic Energy Act.

South Texas-3, -4, Toshiba ABWRs, NRG Energy; Palacios, Texas. The NRC resumed licensing reviews in February, after NRG amended the COL application to use the Toshiba version of the reactor model. The review schedule could lead to the FSER in September 2011 and the FEIS in March 2011. Petitions to intervene have been submitted, and an ASLB was named in May. NRG signed an EPC contract with Toshiba in February. In March 2008, NRG and Toshiba formed a joint venture, Nuclear Innovation North America (NINA), to work on Units 3 and 4 and to market the Toshiba ABWR to other customers. Toshiba invested \$300 million for a 12 percent share of NINA, with half of the money going to South Texas-3 and -4, meaning, effectively, that the reactor vendor has taken an equity

stake in the project.

Bellefonte-3, -4, AP1000s, NuStart/Tennessee Valley Authority; Scottsboro, Ala. The review schedule established last year has been set aside pending TVA's submittal of additional information, chiefly regarding site hydrology, which is not expected until late this year. This project was the reference COL (R-COL) application for the AP1000. Under the NRC-encouraged design-centered licensing approach, once an issue is settled on the R-COL, it is automatically settled on subsequent COL (S-COL) applications, as long as they have not deviated from the R-COL on that issue. The Bellefonte delays prompted NuStart to ask the NRC in late April to transfer R-COL status to Vogtle-3 and -4 (see page 15, this issue). An ASLB had admitted four contentions from intervenors, but the NRC

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struck down two of them in February. The proceeding is further complicated by TVA's request for the reinstatement of the construction permits for Bellefonte-1 and -2, which were canceled in 2006. The NRC granted the request, but gave the reactors "terminated" status and set various requirements if TVA wanted them placed on a more active status. TVA had stated that if the permits were restored, it could study the feasibility of completing Units 1 and 2. Intervenors have argued that the possibility of Units 1 and 2 again being viable projects should open Units 3 and 4 to new contentions.

North Anna-3, reactor model TBD, Dominion; Mineral, Va. This may have been the most smoothly progressing new reactor project until the start of this year, when Dominion announced that it had broken off negotiations with GE Hitachi and would seek a different contractor for the project—adding, however, that it had not dropped the ESBWR model and was not asking the NRC to suspend licensing reviews. Dominion is now considering other reactor models as well as the ESBWR and may reach a decision later this year. Unlike the ABWR, the ESBWR is available only from GE Hitachi. Because of the uncertainty surrounding Dominion's reactor choice, we are listing it as

TBD. An ESP was issued for the project in 2007, and the DEIS was issued last December. The schedule—based on the inclusion of an ESBWR—could lead to the FEIS in December and the FSER in February 2011. The ASLB admitted one contention from intervenors. A change in reactor model and vendor would probably require a different schedule and would perhaps open the hearing process to new contentions. North Anna-3 has already gone through two major changes, first in reactor model (from AECL Technologies' ACR-700 to the ESBWR), and then in the addition of a cooling tower system. Dominion's procurement of ultra-heavy forgings, specifically for an ESBWR, is not just a place on a waiting list at Japan Steel Works: The first of the forgings was produced last year.

Lee-1, -2, AP1000s, Duke Energy; Gaffney, S.C. The review schedule could lead to the FSER in February 2011. The FEIS schedule currently has no target dates, because Duke did not submit RAI responses and an environmental report revision at the times expected by the NRC. Siting in South Carolina appears to convey a key advantage at this stage: access to the low-level waste disposal site at Barnwell. The LLW issue has led to admitted contentions in other proceedings, but not here. In fact, the ASLB denied all contentions last September, meaning that Lee will face only the mandatory licensing hearing.

Harris-2, -3, AP1000s, Progress Energy; New Hill, N.C. The review schedule could lead to the FEIS in May 2010 and the FSER in April 2011. The ASLB has admitted one contention from intervenors. Of the two Progress Energy projects, this one has made it farther through the review process. The company, however, had originally expected a somewhat later startup for Harris than for Levy County because of the utility's decision to maximize renewable energy sources and demand-side management in the eastern Carolinas service area before reactor startup, perhaps around 2020.

Grand Gulf-3, reactor model TBD, NuStart/Entergy; Port Gibson, Miss. This is one of the earliest new reactor projects, dating back to the 2003 application for an ESP (approved in 2007), but Entergy suspended both its own and the NRC's work in January when it gave up on the ESBWR. Entergy has stated that it considers the suspension temporary and is still considering nuclear power for new generating capacity, but it has not announced any further plans since then. NuStart was involved with the application to demonstrate ESBWR licensing (as it is with Bellefonte, for the AP1000), but Entergy's break with the ESBWR left NuStart without that role.

Vogtle-3, -4, AP1000s, Southern Nuclear Operating Company; Waynesboro, Ga. The review schedule could lead to the FSER in December 2010. The FEIS dates are TBD,

perhaps pending the completion of the ESP application (for which the hearings were in March, and final action from the NRC is expected later this year). The ASLB has admitted one contention for the COL hearing. The Georgia Public Service Commission's review process, covering almost two years and requiring Southern Nuclear to justify the need for the power, the site selection, and the use of reactors, ended in March with a favorable outcome. This was followed a few weeks later by legislation allowing cost recovery from ratepayers during construction. In anticipation of the ESP and a requested limited work authorization (LWA), Southern Nuclear on April 8 gave Westinghouse and the Shaw Group (parent of the architect-engineer Stone & Webster) a "full notice to proceed" on the EPC contract. As noted above, NuStart has asked the NRC to transfer the AP1000 R-COL designation to Vogtle, which is the farthest along of the AP1000 COLs in the technical review process.

Summer-2, -3, AP1000s, SCANA/Santee Cooper; Parr, S.C. The review schedule could lead to both the FSER and the FEIS in February 2011. The ASLB has denied all intervenor contentions, and the intervenors appealed the ruling to the NRC in February. An EPC contract was signed with Westinghouse and Shaw in 2008.

Callaway-2, U.S. EPR, AmerenUE; Fulton, Mo. The application was docketed last December, but at this writing the NRC had not issued a schedule. AmerenUE announced in April that it has suspended the project because of a setback in state legislation that would have allowed cost recovery from ratepayers during construction, but it has requested that the NRC continue its reviews (see page 20, this issue). AmerenUE estimates its total spent and committed cost to the project at \$160 million, and the continuation of the NRC reviews is seen as a way to make it possible to sell the project outright to someone else. The uncertainty here can include several possibilities: a sale to UniStar, which has an interest in getting U.S. EPRs built; a sale to Entergy, which has a neighboring territory and has suspended its own new reactor projects; the sale of the ultraheavy forgings and other committed hardware to another EPR customer, perhaps in China; or even the revival of the project by AmerenUE itself if its desired legislative language is restored, or if the other options for cost recovery can't recoup enough of the \$160 million.

Levy-1, -2, AP1000s, Progress Energy;

Levy County, Fla. The review schedule could allow for the FEIS in September 2010 and the FSER in May 2011. An ASLB was named in February, and at this writing it had not yet ruled on contentions from intervenors. In January, Progress Energy signed

Some public statements of interest have been made in the past couple of years by organizations that might be ready, willing, and able to add nuclear power.

an EPC contract with Westinghouse and the Shaw Group (which it has not yet done for the AP1000s planned for Harris). The Florida Public Service Commission has approved the project, including the cost estimate (\$14 billion for the plant, and an additional \$3 billion for transmission links and other facilities).

Victoria-1, -2, Hitachi ABWRs, Exelon; Victoria County, Texas. Exelon was the first ESBWR customer to walk away, last November. At the time, the reason given was the ESBWR's uncertified status and how that might adversely affect Exelon's request to the DOE for loan guarantees. (Exelon had procured ultraheavy forgings for both reactors, but a spokesperson said that the procurement could be used for other reactor models.) Exelon has since announced that it would use ABWRs, but neither GE Hitachi's nor Toshiba's; rather, they are to be Hitachi ABWRs, with GE Hitachi involved as a subcontractor. (GE Hitachi has told *NW* that any Hitachi ABWRs built in the United States are by GE Hitachi, while Hitachi Power Systems American may get the construction contract from Exelon.) The COL application was suspended by the NRC at Exelon's request and will remain so until Exelon amends it to include the new reactor model. Submission of the amended application is planned for later this year. Adding uncertainty both to this project and to South Texas-3 and -4 is Exelon's uninvited campaign to gain control of NRG. Exelon has stated that if it succeeds it would continue with all four of the new reactors proposed by the two parties separately.

Fermi-3, ESBWR, Detroit Edison Company; Monroe, Mich. The COL application was docketed last November, but at this writing the NRC had not yet issued a review schedule. The most recent applications have been getting slower treatment by the NRC staff, partly because of the agency's resource limitations, about which it has been warning applicants for more than a year.

RAIs are being issued, however, and an ASLB was named in March to rule on contentions from intervenors. No public announcement has been made that Detroit Edison will not continue to use the ESBWR or that the company expects to take steps to sign an EPC contract.

Comanche Peak-3, -4, US-APWRs, Luminant Power; Glen Rose, Texas. The review schedule could lead to the FEIS in January 2011 and the FSER in December 2011. Contentions have been submitted, and an ASLB was named in May. This is the only project in the United States using the US-APWR, and only the second in the world to use this general Mitsubishi model. (Tsuruga-3 and -4, planned for Japan but not yet committed, would use an earlier version of the APWR.) Mitsubishi has shown how important it considers the project by committing to take a 12 percent equity stake in Comanche Peak-3 and -4.

River Bend-3, reactor model TBD, Entergy; St. Francisville, La. When it joined NuStart to apply for the COL for Grand Gulf-3, Entergy also announced that it would apply on its own for another ESBWR at River Bend. Entergy now has two suspended COL applications and no plans to buy ESBWRs. It does, however, have a procurement commitment for ultraheavy forgings for one ESBWR. (The company never stated which project would get the forgings and has not procured a second set.) The current totals of apparently unneeded forgings are as many as four sets for ESBWRs and one for a U.S. EPR. If the actual forging process has not taken place for an order, it might be possible to have the specifications changed while the order is still waiting in line at Japan Steel Works. If forging has already been done, we may see the development of an aftermarket in raw hardware for new reactors.

Nine Mile Point-3, U.S. EPR, UniStar Nuclear; Scriba, N.Y. The COL application was docketed in December, but UniStar later requested that the NRC suspend the proceeding to allow the company to focus on Calvert Cliffs-3, the R-COL for the U.S. EPR. Constellation Energy, the U.S.-based partner in UniStar, is eager to conserve funds and is waiting for the approval of EDF's offer to buy 49.9 percent of Constellation (which could then give EDF nearly 75 percent control of UniStar). This suggests that UniStar may not be able to mount a campaign for Callaway-2.

Bell Bend, U.S. EPR, PPL Bell Bend; Berwick, Pa. The application was docketed in December, but the NRC had not issued a review schedule at this writing. The reactor would be built on property adjacent to PPL's two-reactor Susquehanna plant.

Turkey Point-6, -7, AP1000s, Florida Power & Light Company; Florida City, Fla. The COL application is to be submitted this month, along with a request for an LWA. The Florida Public Service Commission has

approved the project.

Amarillo-1, -2, U.S. EPRs, Amarillo Power; vicinity of Amarillo, Texas. The NRC expects to receive the COL application in the fourth quarter of 2009, although the applicant has said that it might be pushed back to 2010. The applicant is a private venture with no generating assets, and it does not have a formal agreement with UniStar Nuclear.

Elmore, U.S. EPR, Alternate Energy Holdings Inc.; Elmore County, Idaho. The COL application is planned for the fourth quarter of 2009. Like Amarillo Power, AEHI is a private venture with no generating assets and does not have a formal agreement with UniStar.

(*Unannounced*), reactor model TBD, applicant not disclosed publicly; site not yet announced. The NRC complies with potential applicants' requests not to divulge their identities publicly before COL or ESP application submission. The NRC expects this submission in January 2010.

Blue Castle Project, reactor model TBD, Transition Power Development LLC; expected to be one of four sites in Utah. The NRC has indicated that it expects to receive this application around March 2010. The applicant is a private venture with no current ownership in nuclear power.

(*Unannounced*), reactor model TBD, applicant not disclosed publicly; site not yet announced. The NRC expects to receive this submission around August 2010.

A guessing game

With so many of the 17 COL applications already received by the NRC going through unexpected developments, it might seem odd that there may be still more applicants eager to begin the process. Still, a later start might take place in an environment where both the NRC staff and the applicants have learned what to expect, and with design certifications further advanced, if not finished. In addition to the above, the NRC also expects ESP applications from PSEG Nuclear (in the spring of 2010, for a site not yet specified) and another "unannounced" applicant (in late 2011, also with no site specified). Lacking inside information, we can only speculate on the identity of the unannounced . . . and so we shall.

It is certainly possible that the unannounced—and there is no indication whether these are three entities, or two, or one—is pursuing the nuclear option completely outside the public eye, and if that is the case, we can all be surprised together when (and if) the applications are submitted and identities revealed. But it is worth noting that some public statements of interest have been made in the past couple of years by or-

ganizations that might be ready, willing, and able to add nuclear power.

Most notably, Arizona Public Service Company (APS) has recently announced a resource plan that includes the addition of about 800 MWe of nuclear capacity around 2020. Projecting APS's current ownership share of Palo Verde (where Units 4 and 5 were once planned but later canceled) to 800 MWe would mean about 2700 MWe of total generation, in the range of two new reactors of the models being planned (2200 MWe if AP1000s, 3400 MWe if US-APWRs, and somewhere in between if others).

Another current reactor owner that might be interested is American Electric Power Company (parent of Indiana Michigan Power), which announced in December 2007 that it was considering a COL application. Outside the experienced nuclear realm, but established as a power producer, Tri-State Generation and Transmission stated that it was looking into nuclear power, at a site in southeastern Colorado, after a planned coal-fired plant was rejected by Kansas regulators for environmental reasons. Of course, anyone can begin a study of nuclear options and decide not to follow through, and in the current financial climate, any new project could be daunting, especially one with the benefits available only after nearly all of the costs are paid.

More on the financial climate follows.

Financial repercussions

"Renaissance Watch" would not be complete without this. There has long been a school of thought asserting that any utility that orders a new reactor would immediately be shunned by the investment community, causing its stock price to plummet. Here are the stock prices and trends of companies that have signed EPC contracts for new reactors:

Company	Stock price just before EPC contract	Stock price at end of trading, May 4	Change
NRG	\$20.60 (2/24/09)	\$19.48	-\$1.12
Progress	\$40.65 (1/2/09)	\$35.19	-\$5.46
SCANA	\$40.00 (5/26/08)	\$30.77	-\$9.23
Southern	\$36.27 (4/7/08)	\$29.00	-\$7.27

All four stocks have gained since our last look (on March 6), by anywhere from 4 to 12 percent. They have roughly followed the upward trend in all stocks, just as they had followed the steep plunge of the previous several months. There is no clear indication that the act of signing nuclear EPC contracts has had any impact on them. It should be noted that while an EPC was seen in the earlier era of reactor construction as a firm commitment to build, these days all license applicants (with the possible exception of NRG) insist that no commitments have yet been made—not even by Southern Nuclear, with its full notice to proceed. ■