

Watching and waiting for Washington

BY E. MICHAEL BLAKE

THIS MAY SOUND odd, given the fact that there have been so many surprising developments in the past few years, but there may not be any major, unprecedented event in the general realm of new power reactor licensing during 2009. This could well be the case even if incoming President Barack Obama were to adopt exactly the same position toward nuclear energy that President George W. Bush has held. The credit crunch and economic slowdown may lead some license applicants to defer some spending commitments, but the main reason for what looks to be a less exciting year is that most of what will take place is the early-stage processing of license applications and technical reviews by the Nuclear Regulatory Commission staff. As noted in the table, even under the most optimistic conditions, no combined construction and operating licenses (COL) will be issued before 2011. All of the work carried out between now and then will be vital, but at best it will simply represent the licensing system under 10 CFR Part 52 functioning as intended.

The articles in this section are aimed at providing a view of what could happen in 2009, but none of what is stated here should be taken as a prediction. There are far too many variables in any equation of future events in nuclear energy to allow for such certitude. At this writing (early December), Obama had not yet announced his choice for secretary of energy, and that selection could say a great deal about the new administration's priorities. Even so, Obama's policies as expressed in the election campaign suggest that while he might not be enthusiastic about the expansion of nuclear generating capacity, he may not seek to prevent it.

There has been much discussion on energy-related blogs about Obama's stated acceptance of nuclear power, conditioned on progress in spent fuel disposal and the control of nuclear material. Depending on how one reads the tea leaves, this could allow Obama either to favor new reactors (if the problems can be considered to be on the way to resolution) or to op-

The private sector has driven the pursuit of new power reactors for the past two years, but the selection of a new energy secretary—and what that selection indicates about the priorities of the Obama administration—may return the focus of new nuclear power to the federal government.

pose them (if the problems are deemed to be insurmountable). Obama has been more definite in his opposition to the proposed high-level waste repository at Yucca Mountain, in Nevada (a state he carried in the election; his opponent, John McCain, had favored Yucca Mountain siting). Perhaps more significant to nuclear's fortunes, however, is an Obama position in another energy realm.

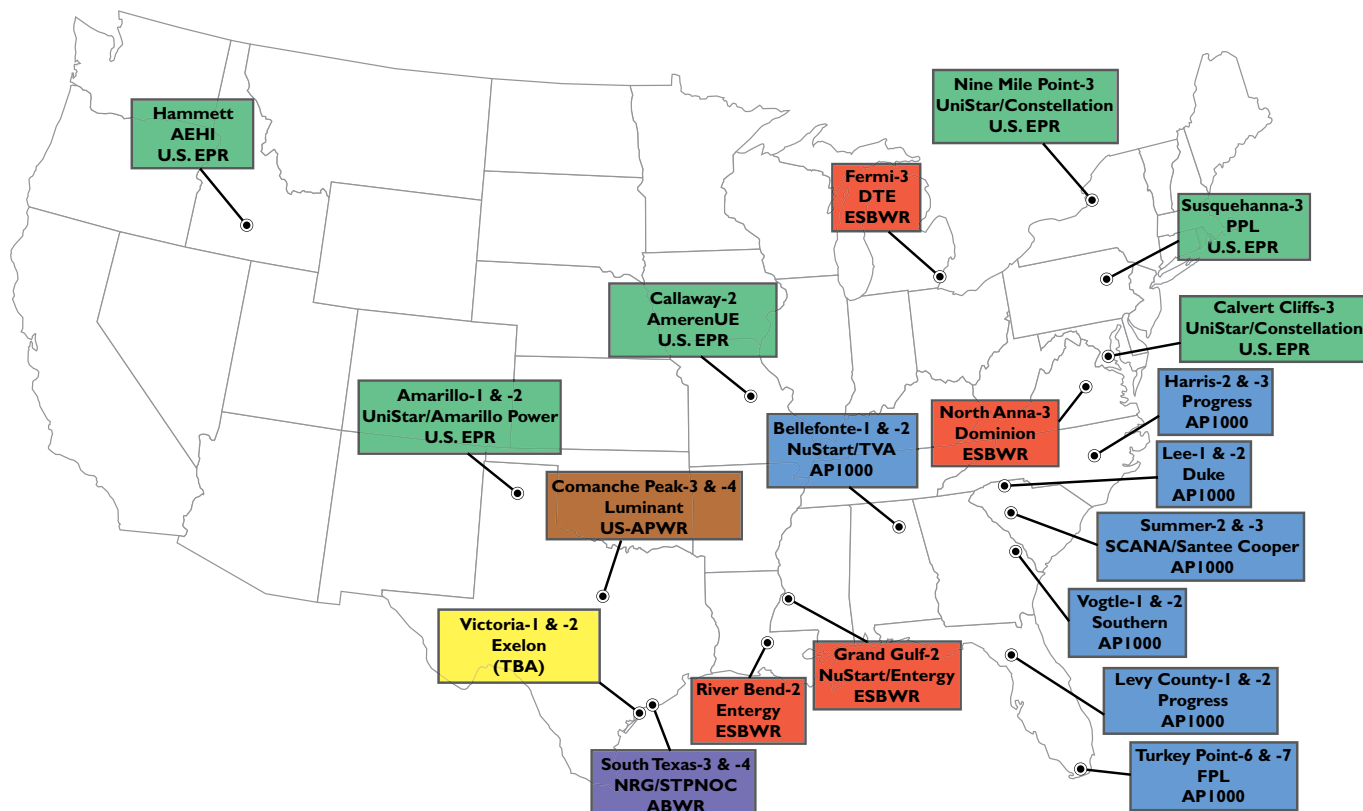
Obama favors the adoption of a "cap-and-trade" system for controlling emissions from electricity production—not just carbon dioxide and other greenhouse gases, but sulfur dioxide and contributors to more close-range environmental impacts (such as acid rain). Virtually all of these emissions come from fossil-fired plants. Not only is Congress—which is firmly controlled by the Democratic Party—expected to consider cap-and-trade legislation early this year, but the investment community has expected for years that some sort of emissions penalty would be enacted, no matter which party was in control of the federal government. Cap-and-trade, which is seen as less severe than an outright carbon tax, gives every generator an emission allowance pegged to its power output and sets a cap on what the total emissions can be. If you own fossil plants and need more than your emission allowance in order to operate them, you can buy allowances from generators that don't need them—such as owners of hydroelectric dams, wind turbines, and most especially power reactors. The net effect is that emission-based electricity becomes more expensive, emission-free electricity becomes less expensive, and a huge incentive exists to stop using the former and use more of the latter.

Since his days as a legislator in Illinois, Obama has had the support of a company that operates 11 power reactors in that state: Exelon. This is not to say that Obama embraced cap-and-trade because Exelon liked the idea. More likely, Obama saw the overall environmental benefits of cap-and-trade, and, later on, Exelon decided to ally itself with Obama. Some sort of federal legislation on cap-and-trade will probably take shape in Congress this year, and even if it does not pass quickly or is phased in over a few years, the boost for new power reactor investment (and even more new projects) could be substantial immediately, even if the DOE withdraws the license application for the Yucca Mountain repository.

This reporter has followed Obama's career dating back to the Illinois legislature. Despite his reputation as being left-leaning, I have found that on most issues, he does not set a doctrinaire position, but either looks for a best-case scenario or gathers stakeholders together to work out a consensus. While clearly guided by his views of justice and fairness, on technical matters he seems mainly interested in accuracy and competence. I also found the people who were presented during his campaign as energy spokespersons to be studious, well-informed, and not wedded to a narrow agenda and the repetition of its sound bites. None of the above guarantees a smooth ride for nuclear energy, but a complete derailment would be uncharacteristic and would come as a big surprise.

The 104 existing reactors

Nuclear News has often warned that too much pursuit of the shiny baubles of Generation III+ reactors could distract from the



THE MAYBE MAP, 2009 EDITION: In the interest of preventing clutter, this map is limited to basically the same information that was on last year's map (NN, Jan. 2008, p. 25), with updates as needed. Details about license application submission and docketing, EPC contracts, progress through the early phases of licensing reviews, and hearing plans are provided in the text. Shown above are the projects for which license applications have been submitted or will be submitted by the end of 2009. Box color indicates the chosen reactor model (or, in the case of Exelon's Victoria, the current lack of one): blue = AP1000, green = U.S. EPR, brown = US-APWR, purple = ABWR, red = ESBWR, yellow = no decision yet.

vital process of operating the 104 reactors that are actually producing electricity. Strictly from a news standpoint, there may actually be bigger headlines in 2009 related to operating reactors than to licensing projects, but if they turn out to be really big, they might count as bad news. This does not refer to operation—because there is no reason to think that something adverse will occur—but in legalistics, most notably license renewal, which is in the midst of its most strenuous challenge to date.

For the first time ever, a license for a reactor still considered to be operable could expire this year. AmerGen Energy Company's Oyster Creek, a 650-MWe boiling water reactor near Forked River, N.J., and the oldest operating power reactor in the United States, reaches the end of its license on April 9. The presiding Atomic Safety and Licensing Board (ASLB) has issued decisions in favor of renewal, which would add 20 years to the term of the license. The citizen organizations (led by the Nuclear Information and Resource Service [NIRS]) that intervened in the process have appealed the decisions, and it is possible that a final decision in favor of renewal by the NRC commissioners would be challenged in federal court. Whether Oyster Creek could operate

past April 9 without the renewal's being considered final and settled remains to be seen.

NIRS and other groups have made their most energetic stands against renewal for reactors that have long been controversial or subject to opposition. It appeared that Entergy Nuclear's Pilgrim BWR could be approved for renewal shortly (it received a favorable initial decision from an ASLB in October), but the ASLB for the renewal proceeding for another Entergy BWR, Vermont Yankee, placed conditions on an initial decision in November, requiring that Entergy carry out new analyses of metal fatigue on the core spray and recirculation outlet nozzles. Entergy's two Indian Point pressurized water reactors are at a much earlier stage of the renewal application process, and the ASLB had admitted 17 contentions for what may be a long hearing process. All of these reactors, however, are licensed until 2012 or later. The fact that the Oyster Creek license will expire in only three months adds to the urgency of what is about to unfold.

An operational issue that will extend through most of the year, and perhaps longer, is the turbine vibration problem that idled Indiana Michigan Power Company's Cook-1 PWR near Bridgman, Mich., and will keep it off line until at least September

while repairs are being made. The licensee has specifically stated that the cause of the event was broken blades in low-pressure turbines that were installed in 2006 and that there were no such problems in the original-equipment high-pressure turbine (although this sustained damage and is also being repaired).

As with new reactors, progress on regulatory aspects of operating reactors depends on how quickly the NRC gains approval for its fiscal year 2009 budget. With the agency currently operating on a continuing resolution—which replicates FY 2008 funding levels—the agency's priority as always is safe operation and its oversight and enforcement responsibilities. Amendment requests from licensees are a lower priority. TVA Nuclear's three Browns Ferry BWRs have been awaiting approval for 15 percent power uprates, which would add as much as 500 MWe to the grid. The current spring target date is already deferred from earlier, and tight budgeting might further slow down this and other power uprate plans.

Before our focus shifts to the licensing of new reactors, there should be a brief mention of the licensing of "old" reactors. The Tennessee Valley Authority expects to continue work this year on the completion of

its Watts Bar-2 PWR in Tennessee, now scheduled for operation in 2013, which is being reviewed by the NRC under the original licensing regime in 10 CFR Part 50. In 2008, TVA decided to expand its options even more by requesting that the NRC restore the construction permits of the canceled first two PWRs at Bellefonte in Alabama. TVA has stated only that it wishes to study the feasibility of reviving and finishing this project and that it can do so only if the permits are back in place. The NRC could reach a decision on this first-of-a-kind request sometime this year.

Fear of commitment?

Two engineering, procurement, and construction (EPC) contracts were signed in 2008 for two-reactor plants in the United States. This means that new reactors will be built, right? Not necessarily. To date, even the most advanced projects related to new power reactors are framed in a way that would seem to allow the applicants to walk away if things don't work out. Some of the applicants have flatly stated that there would not even be a decision to build until and unless a COL is issued. Announcements of more EPC contracts in 2009 would not, therefore, count as especially big news.

We are not privy to the details of the EPC contracts, forging procurements, partnering agreements, and other forms of paper-

work that underlie the new reactor projects, so we can do no more than speculate on whether cancellation would be less painful for utilities now than it was in the earlier era of reactor construction. It seems to depend on what counts as a commitment. People have been hired, work is being done, and someone has to pay for it all. Just the process of getting a COL application prepared, submitted, and into the current stage of reviews requires tens of millions of dollars. Yet no one wants to be thought of as committed. To the extent that this stems from uncertainty over the immediate future, 2009 should at least see answers on such points as what the Obama administration thinks of new reactor licensing and how the financial and economic turmoil could affect the projects.

Detailed schedules for some (but not all) of the applications for COLs and design certification are now posted on the NRC Web site, at <www.nrc.gov>. The table shows the projected end points of these schedules. It must be remembered that 10 CFR Part 52 licensing has never been carried through to completion, and so there is no reason to expect final action anytime close to these dates, especially since they come after not only technical reviews but hearings, which are beyond the NRC staff's control. At the very least, however, they provide the earliest starting points for con-

struction. Because the reactors listed in the table are the furthest along in the process, it appears that even with all of the critical-path advantages promised by modular construction, the startup of any new reactor by 2015 may be a challenge.

The status of each project is summarized in the Renaissance Watch sidebar that currently runs in the Power section of *NN* in each even-numbered month. Rather than repeat all of that information here, the focus will be on what is expected to occur in 2009, based in part on the NRC's schedule for technical reviews. First will come the reactor models seeking (or trying to confirm) certification, then the licensing projects in the order of their application dates. For the designs, the review phases are P1 (preliminary SER and requests for additional information [RAI]), P2 (SER with open items), P3 (Advisory Committee on Reactor Safeguards [ACRS] review of this SER), P4 (advanced SER with no open items), P5 (ACRS review of this SER), and P6 (final SER). Final design approval and the certification rulemaking would then follow. For the COL applications, the safety review phases are SP1 (RAIs issued), SP2 (SER with open items), SP3 (ACRS review of this SER), SP4 (advanced SER with no open items), SP5 (ACRS review of this SER), and SP6 (final SER). Summer, Victoria, and perhaps more of the later projects will be in a four-phase safety review, without the SP2 and SP3 listed above. The COL application environmental phases are EP1 (scoping), EP2 (draft environmental impact statement [EIS]), EP3 (public comments on draft EIS), and EP4 (final EIS). **Blue text** indicates that the application has been docketed; **brown text** means that the application has been submitted but not yet docketed; **orange text** indicates that applications have not yet been submitted.

Reactor models

ABWR, Toshiba, 1350-MWe boiling water reactor: STP Nuclear Operating Company (STPNOC), which is the COL applicant for the South Texas Project, confirmed to the NRC in November that it would use a Toshiba-developed digital instrumentation and control platform for safety-related systems, in keeping with a topical report sent to the NRC last March. The revised COL application—which references a Toshiba design for the ABWR that excludes aspects that are the intellectual property of GE Hitachi Nuclear Energy, which owns the version of the ABWR design that has been certified by the NRC—was submitted in September. At some point during 2009, the NRC is likely to decide whether the design revisions will require the kind of extra review now being given to Westinghouse's AP1000 or can be reasonably reviewed as site-specific details.

AP1000, Westinghouse, 1150-MWe

NRC TARGET DATES FOR COL ISSUANCE AND DESIGN CERTIFICATION

Project	Date
North Anna-3	July 13, 2011
Vogtle-3, -4	August 24, 2011
Lee-1, -2	September 27, 2011
Harris-2, -3	November 22, 2011
Summer-2, -3	December 13, 2011
Grand Gulf-3	February 1, 2012
Calvert Cliffs-3	March 16, 2012
U.S. EPR	February 5, 2012
US-APWR	June 25, 2012

A target date of November 1, 2011, was set for Bellefonte-3 and -4, but the NRC expected to revise the schedule in early 2009 because of extra work needed in areas such as site hydrology, and so the date is not included above. The NRC at this writing was still reviewing the revised COL application for South Texas-3 and -4, for which a detailed schedule had never been set. Also awaiting detailed schedules at this writing were the other projects the NRC has docketed: Levy-1 and -2, Victoria-1 and -2, Fermi-3, and Comanche Peak-3 and -4. No target date has yet been proposed for certification of the ESBWR, for which an SER with open items may be near completion, or of the revised AP1000, which has been scheduled for a final SER in March 2010, but the NRC expects to alter the schedule. Whether the Toshiba ABWR in the revised South Texas Project COL application will be treated as a plant-specific variation of the certified design or put through a review process like that for the amended AP1000 has yet to be determined.

The NRC may not have reached a consensus on these dates. A histogram linked from the new reactors page on the NRC's Web site, at <www.nrc.gov>, generally agrees with the dates for North Anna-3 and Grand Gulf-3 but appears to see the other proceedings going on for three to six months after the target dates.—E.M.B.

pressurized water reactor: The certified version was Revision 15 of the design control document. The COL applications submitted thus far reference Revision 16, and the NRC has decided that there is enough of a difference to warrant technical reviews nearly as extensive as those for the certification. (Revision 17, submitted in September, mainly incorporates changes made in response to NRC reviews of Revision 16.) The projected date for the final SER is March 2010 (with the rulemaking about a year later), but the NRC expects to revise this target. Westinghouse has said that it will complete analyses to resolve safety-related piping design acceptance criteria in June 2009. P1 was completed last September, and on the original schedule P2, P3, and P4 were to be completed in 2009, but the revised schedule may push one or more into 2010.

ESBWR, GE Hitachi, 1500-MWe BWR: The chapter-by-chapter development of the SER with open items may be nearly completed. In any event, it has gone on longer than originally expected, and the slow progress of the certification was cited by Exelon as a reason for the decision to consider other reactor models for the Victoria project. Even so, the earliest COL issuance currently anticipated by the NRC would be for North Anna-3, an ESBWR. While there are no specific target dates, the

NRC has a timeline linked to its Web page for new reactors that foresees final design approval in mid-2010 and rulemaking about a year after that.

US-APWR, Mitsubishi, 1700-MWe PWR: The most recent design to be submitted for certification still has a long way to go. P1 is expected to be completed in June. P2 would continue into 2010.

U.S. EPR, Areva, 1600-MWe PWR: P1 is scheduled for completion late this month, and P2 would be done in November. The relatively late target for Calvert Cliffs-3 in the table depends in part on the need to complete substantial work on the design certification first.

Licensing projects

Calvert Cliffs-3, UniStar, U.S. EPR, Lusby, Md.: SP1 is to be finished in June. EP1 was finished last October, and EP2 and EP3 are to be done in February and November, respectively. An ASLB has been named to consider hearing requests.

South Texas-3 and -4, NRG Energy/STPNOC, ABWRs, Palacios, Texas: EP1 was finished last September, but none of the other phases has been scheduled, pending the revised COL application (and the Toshiba ABWR design), submitted last September, and the NRC's decisions related to it. Because of Exelon's bid to take over NRG and the resistance from the NRG board of

directors, this project's future is open to question, despite Exelon's assertion that it would continue to pursue a COL for South Texas-3 and -4, as well as for Victoria-1 and -2, if its takeover bid is successful.

Bellefonte-3 and -4, NuStart/TVA Nuclear, AP1000s, Scottsboro, Ala.: As the first COL application for the AP1000, this project is the reference COL (R-COL) for which generic AP1000 issues are reviewed so that they don't have to be reviewed again for the subsequent COLs (S-COL). This has worked so far for most of the SER, but not for Chapter 2 because of the need for more site hydrology data and the time needed to obtain it, which will delay these reviews until the fourth quarter of this year. The good news for the S-COLs (five so far, and at least one more on the way) is that Bellefonte's site characteristics don't affect them, and two of them already have COL targets earlier than Bellefonte's, even before the schedule revision yet to be completed on the hydrology issue. EP1 was finished last August, but all other targets are subject to change. The ASLB for this proceeding admitted four contentions from intervenors to be litigated in the hearing process.

North Anna-3, Dominion Generation, ESBWR, Mineral, Va.: The ESBWR R-COL completed SP1 last August and will finish SP2 in April and SP3 in July. EP1 was finished last September; thanks in part to

the project's early site permit (ESP), the rest of the environmental review may be closed out this year, with EP4 in December. This project's ASLB admitted one contention for the hearing process.

Lee-1 and -2, Duke Energy, AP1000s, Gaffney, S.C.: This is the first project for which an ASLB has dismissed all of the submitted contentions, and so the only hearing will be the one mandated by 10 CFR Part 52, without intervenors. SP1 is to be finished in February, and SP2 in October; EP1 was done last September, and EP2 and EP3 are to be finished in March and August.

Harris-2 and -3, Progress Energy, AP1000s, New Hill, N.C.: SP1 was finished last November, and SP2 will follow in July. EP1 was also done in November, and EP2 and EP3 are scheduled for June and November. The ASLB for this project has admitted one contention.

Grand Gulf-3, NuStart/Entergy, ESBWR, Port Gibson, Miss.: SP1 will be done in January, SP2 in September, and SP3 in December. EP1 was to be done in late December 2008, with EP2 in May and EP3 in November. Entergy received an ESP for this project in 2007.

Vogtle-3 and -4, Southern Nuclear, AP1000s, Waynesboro, Ga.: SP1, SP2, and SP3 will be finished in January, July, and November. The ESP application (which includes a request for a limited work authorization) is scheduled to finish staff work with the release of the final SER in February. The permit itself might be issued in early 2010. The ESP proceeding has rendered EP1 moot. EP2 and EP3 are to be done in April and August. Southern signed an EPC contract with Westinghouse/Shaw last April.

Summer-2 and -3, SCANA/Santee Cooper, AP1000s, Parr, S.C.: The use of a four-phase safety review requires only one SER examination by the ACRS but does not otherwise shorten the process significantly. In 2009, only SP1 will be finished, in September. EP1 is to be completed in June. An EPC contract was signed last May.

Callaway-2, AmerenUE/UniStar, U.S. EPR, Fulton, Mo.: The COL application was submitted last July, but the acceptance review has been lengthened by the NRC staff's request for more information, including on the nearby New Madrid fault line. AmerenUE was to have provided the information in mid-November 2008.

Levy-1 and -2, Progress Energy, AP1000s, Levy County, Fla.: The COL application was submitted last July and docketed by the NRC in October, but the agency informed Progress that the review schedule could not be developed until more information was provided.

Victoria-1 and -2, Exelon, reactor model to be determined, Victoria County, Texas: Exelon's COL application, submitted last

September, stated that both reactors would be ESBWRs. The NRC docketed the COL application in October and planned to issue a schedule with a four-phase safety review on January 12. Exelon may have thrown the NRC's plans for a loop with a November 25 announcement that it has decided against the ESBWR and will announce a new choice of reactor model in early 2009.

Fermi-3, DTE Energy, ESBWR, Monroe, Mich.: The COL application was submitted last September and docketed in November. The NRC has not yet issued a schedule but probably will do so in early 2009.

Comanche Peak-3 and -4, Luminant Power, US-APWRs, Glen Rose, Texas: The COL application was submitted last September and docketed in December. As with Fermi-3, the NRC is likely to issue the review schedule early this year.

River Bend-3, Entergy, ESBWR, St. Francisville, La.: The COL application was submitted last September and was still undergoing acceptance review at this writing.

Nine Mile Point-3, UniStar, U.S. EPR, Scriba, N.Y.: The COL application was submitted last September and was still undergoing acceptance review at this writing.

Bell Bend, PPL/UniStar, U.S. EPR, Berwick, Pa.: The COL application was submitted last October, the first to come in after the end of FY 2008, and was still in acceptance review at this writing. The NRC had been stating since early 2008 that if its FY 2009 budget request was not enacted by October 1, and the agency therefore had to operate for a while on the same resources it had in FY 2008, then any COL application that arrived after September could get an acceptance review but might undergo a more protracted review schedule to conserve funds. This may have had the effect of accelerating some submissions, with five COL applications having been turned in during September. When the schedules for the recent submissions are announced early this year, there should be some indication of whether the NRC has taken September 30, 2008, as a deadline for regular-speed reviews—and if Bell Bend is the first to move more slowly.

Turkey Point-6 and -7, FPL Energy, AP1000s, Florida City, Fla.: The COL application submission is scheduled for March.

Hammett, Alternate Energy Holdings Inc., U.S. EPR, Hammett, Idaho: The ap-

plicant organization, which has no electricity generation assets, has most recently said that it planned to submit a COL application in the fourth quarter of this year, but it is already on its second proposed plant site, and last November the Elmore County Zoning Commission denied approval for use of the site. The company has issued a statement to the effect that it still hoped to gain approval from the county commission and is also considering reactor construction in Colorado and Mexico.

Follow the money

The above list excludes any COL application that would be submitted after the end of 2009, and that group now includes Amarillo Power, which informed the NRC last November that while a submission is still planned, the NRC need not expect to devote significant resources to this project during 2009. Also in the 2010 or later group are (or may be) the "Blue Castle Project," a proposal for reactor siting in Utah on which no firm information has been made public, and two projects that the NRC lists as "unannounced," indicating that the agency has been notified of possible submissions but the applicants have asked not to be revealed. Another unannounced application is expected in 2011.

For the U.S. nuclear industry in general,

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much of what takes place in the coming year will depend on money, or the lack of it. It is in the nature of the business that nuclear power can be achieved only after more money is spent than would be needed for comparable fossil-fired generation, and then the cheaper and more abundant fuel gradually makes the effort pay off. With the economy in decline and financing tight, that up-front money obstacle might become higher and more difficult to surmount. Before all the dire economic news and with the Bush administration still in place, the DOE had made available backing for loan guarantees of \$18.5 billion for FY 2008, and it received requests from power reactor and uranium enrichment projects totaling \$122 billion. Early this year it will probably be revealed which applicants were approved,

and for how much, but it may turn out that none of the applicants will come away completely satisfied.

What other options are there? Possibly country-of-origin financing, and in this sense it may be an advantage that the vendors of all five reactor models are at least 50 percent owned by non-U.S. interests. Mitsubishi has stated that some of the fi-

Projects that resemble those already under way were seen to have an advantage before the current economic turmoil, and may have even more of an advantage now, but there can be drawbacks. The fact that active construction will begin this year on an AP1000 in China may reassure customers in the United States and elsewhere that this is no longer a paper reactor. Then again, more advanced

construction of the first EPR, in Finland, has included multiple schedule delays, perhaps serving as a reminder of the realities of massive construction projects, even those using modular techniques.

The coming year could also see some redefinition of who and what a reactor licensee or applicant is. Constellation has agreed to be bought

by MidAmerican Energy Holdings, which has no previous institutional experience with nuclear power. Meanwhile, Constellation is still being pursued by France-based Electricité de France (EDF), raising the issue of whether NRC-licensed power reactors can be controlled by an organiza-

tion based overseas. (EDF's latest offer is for a 50 percent share of Constellation's reactors, which might skirt the foreign-control issue.)

Another organization with no nuclear experience until recently—NRG Energy, which purchased the largest share of STPNOC, operating South Texas-1 and -2 and seeking to license Units 3 and 4—has become the unwilling target of a takeover attempt by the country's largest and most experienced nuclear owner/operator, Exelon. Exelon has decided against the ESBWR for Victoria, and the joint venture of NRG and Toshiba, Nuclear Innovation North America, is trying to market the ABWR to other customers. Perhaps a resolution to the conflict could include a matching of these circumstances.

The year ahead might not include any specific landmark events, but if 2009 ends with the overall 10 CFR Part 52 process having continued more or less along the lines stated above, it will probably still be seen in retrospect as a landmark year, one in which the pursuit of new reactor licensing made it through the transition from a Republican to a Democratic administration. There are, of course, no guarantees, and surely new issues will arise that have not been anticipated in this article. But we will be publishing 11 more issues this year, so we'll have opportunities to track them down. **■**

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ancing for US-APWRs in the United States could be underwritten by the Japanese equivalent of the U.S. Export-Import Bank (which assisted in the financing of many U.S.-origin reactors built outside the United States in the previous millennium—and, yes, it does seem that long ago).