After Fukushima
Nuclear Power
in a New World
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The March 2011 accident at the Fukushima Daiichi nuclear plant in Japan was a startling illustration of the vulnerability of an individual nuclear plant site to unpredictable events. Fortunately, the responses predicted by some experts—a widespread rejection of nuclear power or prohibitively expensive redesign and retrofitting of the technology—have not come to pass.

Instead, the nuclear industry appears to have weathered the political storm surrounding the event. Yet it still faces real challenges in regaining the confidence of regulators and the public trust, and in promoting nuclear power as a safe and preferable choice for the future. The sector’s long-term success hinges on whether it can skillfully incorporate the lessons of low-probability, high-consequence events like Fukushima into its operational planning, and on how well it can execute new large-scale projects and upgrades of existing facilities.

The nuclear industry must develop improved risk analysis capabilities—to better assure the public and regulators that plants can safely survive future events and that investment decisions are economically justified. It must also fortify its most critical project management capabilities. This presents a challenge to the industry’s leaders, owners, and operators. Can they turn the current mandate for change into an opportunity? Can they enhance the capabilities needed to sustain their operational competence and thus demonstrate the level of commitment that is needed to alleviate the concerns of the public?
In March 2011, a 9.0 magnitude earthquake off the northeast coast of Japan triggered a massive, 45-foot tsunami that overwhelmed more than 200 square miles of land. As shocking as the physical devastation to the immediate region was, it was soon overshadowed by what happened at the nearby Fukushima Daiichi nuclear facility. Within an hour of the quake, the multi-unit plant was disabled by the tsunami surge, causing a chain reaction that ultimately led to a partial core meltdown, the venting of radioactive gases, and the leakage of contaminated water. Although the earthquake’s movement automatically shut down the units in operation at the Daiichi facility, the subsequent loss of electrical power and inability to dissipate residual heat resulted in widespread damage to the containment buildings, reactor coolant systems, and spent fuel pools. Complicating the efforts of the operators to respond to the crisis was their inability to obtain a real-time picture of exactly what was happening at the plants.

Outside the industry, advocates on both sides of the nuclear power debate immediately recognized the cascading effect this event could have on current and future plant design and operations. Opponents of nuclear power believed it would permanently diminish the global role of nuclear technology as a viable, safe source of power. They saw the event as a visceral reminder of the uncertainties and risks of nuclear energy, and they argued that it called into question the concept of “defense in depth” as a means of defending against operating risks. Nuclear advocates, on the other hand, viewed the meltdown as an acutely localized phenomenon that was triggered by a single highly improbable event, with few implications for the entire industry. In their view, the safety features already built into the more recent generation of plant designs and the industry’s decades-long history of safe operation proved the ongoing viability of nuclear power.

In addition, the Fukushima event shed light on the kinds of risks generally thought of as being extremely remote, yet having huge effects. These low-probability, high-consequence events, often called black swans, were also recently illustrated by the Deepwater Horizon BP oil spill and the near-global financial crisis of 2008. Executives now recognize that black swans don’t just have the potential to cause a loss in financial value or business continuity; they can threaten a company’s existence.

For their part, the leaders of the nuclear industry quickly acknowledged that a major turning point was at hand. The accident not only put at risk their ability to continue to run the more than 400 plants in operation around the world; it also threatened the opportunity that had emerged in recent years to pursue the industry’s renaissance. Clearly, how leaders responded to the crisis would be pivotal in ensuring continued political, regulatory, and public support for the current operating fleet, and for developing and building the next generation of reactors.

The nuclear industry is still defining how it should structure and implement its response to the Fukushima disaster. Plant operators and regulators alike are rethinking how to make their risk analyses more rigorous, especially for low-probability, high-consequence events, and how to ensure that their operating models have the ability to sense and respond to such events. Although many changes have already been put in place, it will take several years for all of them to fully take hold.

If the industry is to respond properly to the Fukushima crisis, and if existing and new nuclear plants are to remain viable options for the world’s energy future, nuclear owners must thoroughly reconsider how they think about and perform risk management and project execution. Successfully coping with existing and yet-to-be-written regulatory requirements while completing projects already under way will be critical to securing a future for nuclear power. Now is the time for the nuclear industry—owners, suppliers, and contractors alike—to develop both the sophisticated risk analysis and the leading performance management capabilities needed to ensure that future.
REACTION AND RESPONSE

The most immediately visible response to the events at Fukushima Daiichi, especially in countries dependent on nuclear power, did not come from regulators but from political leaders. In Japan, public support for nuclear power was already weakening at the time of the catastrophe. Suddenly, political leaders at both the national and prefecture levels were drawn into a debate that still continues, about whether to keep Japan’s more than 50 other reactors offline, given their similarities with the Fukushima design and questions about local siting conditions. Within two months, all of Japan’s plants were shut down; it was more than a year before the first one reopened, at Ohi in June 2012.

Although Japan’s response can be considered appropriately cautious, the German chancellor’s decision in April 2011 to phase out all of Germany’s nuclear plants by 2022 reflected the country’s growing wariness of nuclear power, which had existed well before the incident in Japan. Even in France, the world’s most nuclear-dependent country—where 75 percent of electricity is derived from nuclear energy—then-opposition leader and now president François Hollande had called for shutting down 28 of its 58 reactors by 2025.

Reactions also affected some of the proposals for nuclear energy expansion that had gathered momentum during the previous few years, reflecting the growth of emerging economies and concern about carbon emissions and climate change. Several countries that had been considering expanding their nuclear programs, including Switzerland, Italy, and Spain, decided to cancel all new construction. (The overall effect was small; fewer than 20 units were shelved.) Other countries, such as China, began reassessing their technology and siting options, but remained committed to continued expansion.

The net effect of the shutdowns and cancellations was significant: Approximately 15 percent of current capacity was taken offline (at least temporarily) by the end of 2011, and that figure could increase greatly, especially if the proposed shutdowns in Germany and France come to pass. The collapse of local support for restarting the Japanese plants that have been shut down, where

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municipal authorities are wrestling with the complexities of emergency preparedness, could reduce capacity even more (see Exhibit 1).

Despite these challenges, nuclear power’s future is far from gloomy. Its long-term operating history is still recognized as exemplary throughout the world. And the ongoing commitment of power-hungry emerging economies like China, Korea, and the United Arab Emirates will probably keep global nuclear capacity on an upward trajectory. Even if all the proposed shutdowns were to take place, nuclear power would remain a significant contributor to global power supply. Currently, it accounts for about 368 gigawatts (GW) of installed capacity, providing 13 percent of the world’s electricity output; an additional 116 GW or so is currently planned or under construction. If Japan were to permanently contract its nuclear fleet, global installed nuclear capacity would still amount to well over 400 GW, a meaningful contribution to the world’s energy supply.

But the potential contribution of nuclear power is much greater. With so much at stake, energy decision makers—including government leaders, regulators, and executives in the nuclear industry—must approach both the short- and long-term response to Fukushima pragmatically. To date, regulators have avoided overreacting and instead have taken a measured, fact-based approach to analyzing the impacts of Fukushima. This has had a valuable tempering effect and should continue. Just as importantly, the nuclear regulatory agencies appear to be concentrating on the less obvious root causes of catastrophic events, and considering how to build in better preventive measures and responses in the future.

Exhibit 1
The Impact of Fukushima on Global Fleet Capacity, 2011–20

<table>
<thead>
<tr>
<th>Year</th>
<th>Reductions since March 2011</th>
<th>Potential return of temporary shutdowns</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011–12</td>
<td>12</td>
<td>44</td>
</tr>
<tr>
<td>2013–20</td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td>2020</td>
<td>446</td>
<td>31</td>
</tr>
</tbody>
</table>

Note: Status as of July 2012, as reflected in the World Nuclear Association database. In Japan, the process for stress testing and restart is under way, but base case estimates assume conservative case where all units could stay offline.

Source: WNA, IAEA, Nuclear News, Reuters, TEPCO, Booz & Company analysis
As countries dependent on nuclear power move beyond their early, politically driven decisions, emphasis has turned to the regulatory process. Japan, the European Union, the United States, the UAE, China, and others have initiated safety reviews aimed at identifying plant modifications that may be needed at both existing plants and those planning or undergoing construction. In the United States, the Nuclear Regulatory Commission (NRC), widely considered a world leader in nuclear power oversight, acted promptly through its Fukushima Daiichi Near-Term Task Force, completing its review in July 2011.

The resulting recommendations are built on the “design basis” principle, which has long been the foundation for nuclear power reactor regulations. They include more stringent requirements for the design and construction of nuclear plants, intended to ensure that all such plants can withstand a more extreme accident than Fukushima without loss to the systems, structures, and components necessary to ensure public health and safety (see “Recommendations for Change,” page 10). The nuclear industry supports the NRC’s first three orders, and experts believe they are relatively straightforward to implement. But it is less clear what will be the ultimate price tag of implementing the full equipment, instrumentation, and software fixes related to the current orders, and just how manageable or costly any forthcoming requirements will be.

How owners manage the requirements for sufficient and reliable backup power, for example, will be complicated by the fact that many utilities have already invested in various backup power options. If a more stringent regulatory order requiring additional backup capability is eventually released, the implications for the equipment already procured may be severe. And in cases where more sophisticated instrumentation or equipment is mandated, as in the orders related to spent fuel

**Recommendations include more stringent requirements for the design and construction of nuclear plants, intended to ensure that such plants can withstand a more extreme accident than Fukushima.**
pool management and hardened containment vents, owner-engineers and equipment suppliers will need to collaborate on specifications for components and devices that meet the new requirements. They will then need to secure the equipment, conduct rigorous environmental and seismic qualification tests, and ultimately obtain NRC agreement on the acceptability of the new equipment before it is installed.

Owners in the U.S. will also need to increase their capital budgets for the existing fleet in the near term, to comply with emerging regulatory requirements. It is likely that the changed environment will affect their investment priorities related to planned refurbishments and unit capacity increases. Finally, they will need to improve their outreach to stakeholders, and tailor their communications to accommodate the changing political landscape and renewed public concerns. In general, nuclear energy retains the support of the U.S. public, but that support has diminished to some degree, and the opponents of nuclear power have been emboldened.

To date, most experts say that expenses—both ongoing costs and one-time investments—should be manageable within the U.S. nuclear power industry’s total annual capital budget. (The cost estimates for compliance vary, and ultimately they will depend on the specific design and vintage of each individual plant.) Moreover, there is no indication yet that the new rules will adversely affect the operating costs of nuclear plants, and thus the dispatch economics of delivering power to customers efficiently compared with coal and gas. That conclusion, however, assumes that implementing the plant hardware enhancements will not cause any appreciable unplanned or extended outages.

In short, the new safety requirements will not damage the long-term value proposition of maintaining or building nuclear reactors in the United States. The real challenge to the economics of nuclear power lies in the current low natural gas price environment, not the new safety requirements. If other countries implement similar regulatory regimes, planning for nuclear power’s future will likely involve design modifications and enhanced administrative actions, not overhauling fundamental designs or abandoning new nuclear projects altogether.

What, then, should the owners and operators of the nuclear industry concentrate on doing in a post-Fukushima world, to secure a continued role in the global energy supply business? They should emphasize two critical capabilities. First, they should broaden their understanding of operating risk and its implications at both the plant and enterprise levels, with an eye toward prevention as well as improved response. Second, they should enhance their project management capabilities to successfully deliver the next generation of new nuclear units. Both of these capabilities require an increased level of transparency into the industry’s decision-making processes and performance; this will be a challenge for many leaders. But it also offers an opportunity for the industry to prove to the world its commitment to superior risk management, design, planning, and execution.

**The real challenge to the economics of nuclear power lies in the current low natural gas price environment, not the new safety requirements.***
REVISITING RISK

It is still not fully clear how the new NRC recommendations will affect the U.S. nuclear fleet. One thing is certain, however: The way the industry has historically evaluated risk will have to change. In particular, the assessment of low-probability, high-consequence risks, such as events that trigger worst-case accident conditions, will need to be revisited. Owner resiliency and responsiveness will need to increase. Probabilistic risk assessment, common in the industry since the 1979 accident at Three Mile Island in Pennsylvania, will assume an even greater role in ensuring nuclear safety in the future. Operators will have to develop enhanced risk analysis methodologies that can adequately address not only the full range of “traditional” postulated design-basis accident scenarios, but also the much more improbable black swan events.

Finally, investment decisions will need to evolve to reflect this new risk environment.

The greatest degree of regulatory uncertainty surrounds the interpretation of the first recommendation of the NRC’s Near-Term Task Force, which the commission’s staff will consider over the next year. Its goal is to incorporate “beyond design basis” requirements within the definition of what is required to provide “adequate protection”: balancing considerations of defense and risk, without taking cost into account as a deterrent to action. The task force has pointed out that this move is analogous to regulatory changes enacted following the September 11, 2001, terrorist attacks. But it is potentially more far-reaching, given the wide range of possible black swan scenarios. Indeed, it is likely that the broadening of the underlying principle of adequate protection will markedly reshape the regulatory environment.

Traditional risk management approaches rely on estimating the likely consequences of potential events; they are not well suited for dealing with extremely low-probability, high-consequence risks. Black swan risks challenge the traditional approach because even when the events are anticipated, their impact falls outside the expected range of predictability. In the case of the tragic events in northeast Japan in March 2011, the black swan was not the earthquake and tsunami, which were foreseeable, but their sheer size. Another earthquake, the one that struck the East Coast of the U.S. in August 2011, was significantly stronger than what was thought possible in the region. The terrorist attacks on 9/11 represented another black swan event, not because terrorist attacks had never happened on U.S. soil—they had—but because of their scale, their means, and their enormous impact.

The U.S. nuclear industry must enhance its risk management capabilities in two ways. First, it must strengthen existing risk assessment methodologies to address extremely low-probability, high-consequence risks. This will involve improving existing processes and tools to
identify potential risks from a much wider range of uncertainties than the industry has used in the past (see Exhibit 2). Traditional thinking about “known unknowns” must be expanded to include “unknown unknowns.”

Scenario planning that includes situations that are themselves unimaginable can be a useful tool in expanding leaders’ range of thinking about identifying risks and assessing vulnerabilities. In these exercises, management is challenged to begin with the premise of an unforeseeable situation—like the apocryphal story of a wanderer in a desert who finds a Civil War battleship stuck in the sand there—and then to explore the potential vulnerabilities the situation may create. Often, when managers are required to construct a chain of causal events that could explain a seemingly inexplicable situation, a previously unthinkable scenario becomes plausible, even if still highly improbable. Another methodology used for expanding management’s thinking about the future involves wargaming and other simulations of real-world challenges; the games mimic the complexity of

Exhibit 2
The Range of Enhanced Risk Management Capabilities

Source: Booz & Company analysis
genuine events, in which seemingly rational interactions among players or actions can result in unanticipated outcomes. A deeper examination of the interdependencies and correlations among various risk factors can also help unearth additional exposures and potential systemic effects.

Nuclear plant owners should be encouraged to build this risk identification capability in a collaborative manner. Utility peer groups, technical experts, and industry support entities should work together to develop analytical risk assessment tools and methodologies that individual plant owners and operators can use to quantify the probability and effect of plant-specific worst-case events. The techniques developed through this approach should be tailored to the culture and practices of the companies involved. They can also provide plant owners with best-in-class, cost-effective solutions to regulatory mandates, potentially streamlining the overall NRC review and concurrence cycle with respect to providing “reasonable assurance” regarding operating safety.

The end goal of this next generation of risk management is to develop an industry-wide approach to defining and quantifying Fukushima-level improbable events that will both satisfy any regulatory safety requirements and assuage public concerns, while being implementable and cost-effective. Since the concepts of reasonable assurance and adequate protection do not contemplate direct cost-benefit trade-offs, anything short of this goal may hurt the future of nuclear power.

A further—and perhaps even more important—imperative involves building the plant, enterprise, and industry resilience needed to withstand these unpredictable events. Nuclear operators will undoubtedly be required to implement certain measures to increase defense in depth, but they would be well advised to take an active approach to enhancing their risk management across the enterprise. This calls for embedding more effective capabilities to identify potential adverse events and outcomes and to anticipate a range of tailored responses.

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Recommendations for Change

In July 2011, the NRC published recommendations stemming from the evaluation by its Near-Term Task Force of the Fukushima incident and the implications for its existing processes and policy direction. The Near-Term Task Force issued 12 recommendations for consideration:

1. Establish a logical, systematic, and coherent regulatory framework for adequate protection that appropriately balances defense in depth and considerations of risk.

2. Require licensees to reevaluate and upgrade as necessary their design-basis seismic and flooding protection.

3. Evaluate on a longer-term basis potential enhancements to the ability to prevent or mitigate seismically induced fires and floods.

4. Strengthen station blackout (SBO) mitigation capability at all operating and planned reactors for design-basis and beyond-design-basis external events, ensuring they keep running under all circumstances.

5. Require reliable, hardened vent designs in boiling water reactors with Mark I and Mark II containments.

6. Identify insights into hydrogen control and mitigation inside containment and other buildings.

7. Enhance spent fuel makeup capability and instrumentation for the spent fuel pool.

8. Strengthen and integrate on-site emergency response capabilities.

9. Require that facility emergency plans address prolonged SBO and multi-unit events.

10. Pursue additional emergency preparedness topics related to multi-unit and SBO events.

11. Pursue emergency preparedness topics related to decision making, radiation protection, and public education.

12. Strengthen regulatory oversight of licensee safety performance by focusing more attention on defense-in-depth requirements.
Subsequently, on March 12, 2012, the NRC issued the first regulatory requirements for the U.S. nuclear industry based on the highest priority (Tier 1) recommendations of the Near-Term Task Force. The three orders issued by the commission require safety enhancements at operating reactors and at new builds as well. These orders require nuclear power plant owners to implement safety enhancements related to:

- Creating mitigation strategies in response to extreme natural events resulting in loss of power (LOP) at plants
- Ensuring reliable hardened containment vents
- Enhancing spent fuel pool instrumentation

The orders require that these actions be completed within two refueling outage cycles, or by December 31, 2016, whichever comes first.

The commission also issued a request to all plants for the reevaluation of each site’s seismic and flooding hazards using contemporary methodologies to perform site walk-downs to ensure protection against these hazards in their current design basis, and to reevaluate their emergency communication systems and staffing levels.

For the remaining Tier 1 recommendations of the Near-Term Task Force, the NRC has issued an advanced notice of proposed rulemaking for SBO regulatory actions, and anticipates issuing an advanced notice of proposed rulemaking on the strengthening and integration of emergency operating procedures, severe accident management guidelines, and extensive mitigation guidelines in the next several months. By mid-2012, the NRC’s staff plans to provide the commission with an outline of proposed actions related to the remaining Tier 2 and Tier 3 recommendations of the Near-Term Task Force.
DELIVERING THE NEW FLEET

Most nuclear projects that were already planned or under construction at the time of the Fukushima catastrophe are still scheduled for completion—76 plants as of July 2012—but their status, collectively, has changed (see Exhibit 3). To retain its long-term credibility, the industry must also diverge as little as possible from its planned investment levels and schedule. If projects currently on the drawing board fail to deliver on expectations for cost and schedule performance, the ability to build the next-generation nuclear fleet will be impaired. Nuclear leaders can be in a good position to accomplish their goals only if they incorporate what they have learned from the challenges and outcomes of the last construction cycle and their recent experience with megaprojects.

The projects under way range from first-time efforts in non-OECD countries to additions to existing sites in developed countries; they include a mix of last-generation and cutting-edge technology. Their progress toward completion has been mixed; delays continue in Finland and France, but steady advancements are being made in China. Common problems among delayed projects include poor project coordination, productivity management, and quality conformance. The more successful projects all appear to be adhering rigorously to schedule milestones, cost control, and high labor productivity.

In this light, it is fortunate that the nuclear renaissance—the economic revitalization of the nuclear power industry, grounded in next-generation technology and practices that yield more effective return on investment, such as construction modularization and simpler reactor design—has begun slowly. This gives owners; original equipment manufacturers (OEMs); and engineering, procurement, and construction (EPC) groups time to work out the details of mobilization and construction and to improve the quality of project planning and execution preparedness. In the U.S., the test beds for demonstrating effective project management execution include the Southern Company and SCANA projects now under way, and TVA's

Exhibit 3
Global Construction of New Nuclear Plants

Note: Units still classified as under construction or planned for completion by 2020 are included—even Japanese units despite their uncertain fate.
Source: World Nuclear Association, July 2012; selected adjustments based on plant-specific considerations and aggregate country plans
completion of the long-idled Watts Bar 2 project. Since the Southern Company and SCANA projects are the nuclear renaissance’s first new-build efforts in the U.S., they are under intense scrutiny: If they are safely completed close to planned cost and schedule estimates, more plants will follow. If not, the door may be closed for some time.

Unfortunately, large capital projects have a long history of underperformance caused by a number of issues, including poor estimating, incomplete design, escalating material costs, productivity shortfalls, quality non-conformance, and insufficient project oversight. Current new-build projects are not immune to these problems, either. In these projects, the engineering and construction consortia are likely working together for the first time; the team must rely on a largely international supply chain; and finding sufficiently experienced managers, technical support, and craft workers is difficult. As a result, the estimated US$7 billion to $8 billion cost of a single new nuclear unit can easily be put at risk.

Successful construction of a nuclear plant hinges on the ability of its owners to develop and deploy effective project management capabilities, including project planning, progress measurement, and direct oversight, as well as the detailed performance metrics and insightful reporting processes necessary to achieve a successful project outcome. A robust project capabilities framework that addresses all the activities required to complete construction, from project initiation through commissioning and closeout, can provide owners with a model for project management success, if it is effectively implemented (see Exhibit 4).

By itself, however, a well-designed project management framework will not ensure success. All too often, it is the failure to put the framework into practice that leads to trouble. Owners often face constraints in resources, limits to process rigor and controls, and infrastructure inadequacy. A poorly defined relationship between the owner and the EPC consortia can also place both parties in a confrontational relationship just when greater partnership and collaboration are necessary. The owners and the EPC consortia often rely on a narrow reading of the contract and how it governs the execution of the project, even though it may only provide guidance and it cannot factor in all circumstances that might arise. Finally, the parties involved may ignore the lessons of prior megaprojects, tainting the entire project environment with excessive hubris. These factors occur regularly, regardless of project type; any or all of them can be impediments to successful completion of large projects.

Well-defined project management capabilities are critical if owners are to provide effective oversight of their projects, whether they be uprates or new builds. (See “Capabilities for Managing Projects,” page 14.) Only when owners embed this capabilities framework in their delivery models and management processes and view it as a fundamental element of success can they be assured of managing their projects successfully.

Exhibit 4
A Project Management Capabilities Framework

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Source: Booz & Company analysis
Capabilities for Managing Projects

During the last cycle of nuclear plant construction, extending through the 1980s and 1990s, the nuclear power industry was plagued by extensive cost overruns and schedule delays that it cannot afford to repeat. It must learn from experience and adopt much more rigorous approaches to project planning, execution, and oversight. These enhanced capabilities will need to include:

- **Thorough up-front planning.** The projects built during the last cycle suffered from incomplete design and a “fast-track” approach to construction. This time around, plant design must be essentially finalized to support definitive scope, cost, and schedule baseline definition and enable work packages to be fully prepared and readied for field execution, which is critical to project success.

- **Robust risk management.** In the past, the analysis of project uncertainties and the allocation of project risk was often overly simplified and unrealistic. Owners and engineering, procurement, and construction firms now need to recognize that detailed, ongoing risk analysis is a prerequisite to successful projects and that risk apportionment must be effectively managed.

- **Integrated project governance.** Construction of nuclear plants must involve complicated multiparty arrangements if these projects are to be completed on time and within budget. Success depends on ensuring that the consortium’s objectives, accountabilities, and incentives are aligned through structures and processes that enable integration and visibility.

- **Rigorous project controls.** Without continuous performance review, any project can quickly spiral out of control. An ongoing, exhaustive analysis of cost and schedule performance that provides detailed insight into the factors that might affect the project’s performance is essential to ensuring its success.

- **Hands-on project management.** Parties to the contracts that govern the construction of plants often assume that they adequately define accountabilities and provide protection for how performance is to be delivered. Although these contracts can provide guidance, they are no substitute for direct and continuous project oversight.
• **Tailored delivery model.** Plants are often built using coordination models that are not well suited to meeting the inherent complexities of the project. Successfully completing these megaprojects requires that seamless stakeholder, home office, and site collaboration occur to support project management and performance execution.

• **Targeted productivity focus.** Quality-related shortcomings in work execution that create the need to do the work over again have been a principal cause of cost and schedule changes and overruns. Anticipating just how such problems can occur and maintaining close oversight of the work performed are key to achieving the project’s planned productivity levels.

• **Strict change control.** Complexity and lack of clarity into the scope of projects create the basis for change notices and additional costs. Unexpected project cost and schedule changes can be avoided by adhering closely to the existing design and by demanding “must-have” versus “nice-to-have” qualification of any potential changes.

Developing and executing on these capabilities can enable owners and EPCs to build and deploy the skills necessary to deliver the next cycle of nuclear projects closer to planned cost and schedule estimates. One need look no further than the problems experienced in building the Olkiluoto reactor in Finland, France’s Flamanville reactor, and the Tennessee Valley Authority’s Watts Bar 2 reactor to recognize that mastering these capabilities can make a meaningful difference in project performance. Making sure that every project meets its expectations and commitments will go a long way toward ensuring that nuclear power’s much-ballyhooed renaissance can finally be realized.
The nuclear industry is no stranger to intense public and regulatory scrutiny, and strong reactions to the Fukushima accident were to be expected. The industry’s reaction to the storm of criticism that followed demonstrated just how confidently and transparently it can deal with catastrophes. But the level of scrutiny will undoubtedly remain high in the post-Fukushima environment. Therefore, the industry must reassure both watchful regulators and the global public that the current nuclear operating fleet is safe. And it must be willing to demonstrate to the public that it is willing to submit to an increasingly rigorous regulatory regime. In doing so, however, owners must also recognize that the regulatory prescriptions demanded after Fukushima will likely be far less onerous than the diagnosis might have required.

The nuclear industry also needs to remind itself and its constituents (including the general public) of its track record. It has delivered world-class operating performance and served as a model for safe and reliable operations over many decades. This gives it the political capital needed to participate in the coming debates on the future role of nuclear power.

But things also need to visibly improve. All eyes are on a number of projects in progress around the world, including the Southern Company, SCANA, and TVA projects under construction in the U.S. and the various new builds, power uprates, and life extension initiatives under way in multiple other countries. Everyone is also watching to see whether the industry can maintain its world-class operating performance. Leaders simply cannot withstand the reputational cost of anything close to a repeat of the prior cycle of nuclear construction.

The capabilities of intelligent risk management and high-touch project execution are most critical in this context. Owners and operators will need both capabilities to build the next round of new plants within established cost and schedule frameworks and to achieve the high levels of quality in construction and operations that they need. Building these capabilities is a critical step in establishing a “right to play” in energy generation and enabling the nuclear industry’s future.
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We believe passionately that essential advantage lies within and that a few differentiating capabilities drive any organization’s identity and success. We work with our clients to discover and build those capabilities that give them the right to win their chosen markets.

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