

## NUCLEAR WORKFORCE PLANNING: PREPARING FOR THE LONG HAUL

The aging utility workforce has been the topic of much discussion over the past several years. The impending retirement of a significant portion of the energy industry's highly skilled workforce threatens the reliability of our energy infrastructure and is forcing new ways to think about not only staffing, but also how to leverage technology and automation and employ creative approaches to structuring work. The concern is compounded for the nuclear industry, which requires a highly specialized workforce that can not only ensure continued nuclear safety and security, but also deal with a high degree of regulation and oversight.

### CHALLENGING DEMOGRAPHICS FOR THE NUCLEAR INDUSTRY

The worldwide nuclear generation expansion is proceeding with little abatement. The International Energy Agency projects that about 60 gigawatts will be added to the world's nuclear generation inventory by 2020.<sup>i</sup> Indeed, about 35 nuclear units totaling over 29 gigawatts are in construction worldwide.<sup>ii</sup> The Nuclear Regulatory Commission expects about 22 applications for 33 new units in the United States alone,<sup>iii</sup> which are not included in this projection. This expansion is in addition to the existing base of more than 104 nuclear reactors in the United States<sup>iv</sup> and 22 reactors in Canada.<sup>v</sup> Further, observers expect that applications for relicensing of most, if not all, existing U.S. nuclear reactors will be made over the next ten years.

The human capital requirements of the nuclear power industry are monumental, driven both by this expansion and the need to replace retiring Baby Boomers at existing plants. Our recent experience is that a median of over 700 people (full-time equivalents) staff single-unit plants and about 1,000 at two-unit plants.

In addition, top quartile plant staffing is creeping upward, increasing demand for new workers.

This is a large, highly skilled workforce that must be expanded to accommodate new plants. Further, a recent study found that about half the electric utility workforce will be eligible for retirement in the next five years.<sup>vi</sup> And with the current U.S. nuclear power plant employee averaging 48 years of age, nuclear operators must implement a backfill strategy for workers at existing facilities.

### DEALING WITH STIFF COMPETITION FOR TALENT

The pipeline for these workers is thin, largely due to a lack of worker interest in the industry and a decline in the number of qualified entrants. This is attributable in large part to four principal factors.

First, the perception of the nuclear industry has had difficulty recovering from the Three Mile Island and Chernobyl incidents and has discouraged some from entering the nuclear workforce.

Second, there is a broad perception that the U.S. educational system has not kept pace in producing graduates possessing the rigorous technical qualifications required to be nuclear plant workers.

Third, the nuclear Navy—long a feeder for experienced technical talent—has been steadily shrinking.

Finally, cost control efforts, which have decreased nuclear plant employment figures over the past decade, may have discouraged some from looking for jobs in what was perceived previously as a static or declining industry.

*Challenging  
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A few nuclear operators have recently begun to refill the employee pipeline, but they face stiff competition from other industries, other utility functions (e.g., fossil generation, transmission, and distribution), and other participants in the nuclear development process, including vendors, engineering firms, and the U.S. Nuclear Regulatory Commission itself.

Assessment and Planning	On the Job Action	Recruiting and Assimilating
<ul style="list-style-type: none"> <li>Quantify staffing shortfall</li> <li>Elevate issue to senior leadership</li> <li>Develop succession plans</li> </ul>	<ul style="list-style-type: none"> <li>Increase communications</li> <li>Add electronic infrastructure and web-based tools</li> <li>Redesign safety programs</li> <li>Cross-train</li> </ul>	<ul style="list-style-type: none"> <li>Institute flexible work arrangements</li> <li>Partner with schools and starting earlier in the education cycle</li> <li>Target non-traditional pools and talent channels</li> <li>Improve marketing and introduce “sober selling” to reduce churn</li> </ul>

Figure 1. How Some Utilities Are Dealing with an Aging Workforce

Most utilities are generally aware of their aging workforce problem, however, only six percent of U.S. nuclear power plant operators believe that their workforce is its most challenging issue, falling behind plant reliability, regulatory issues, obsolescence, and environmental issues, and only slightly ahead of competitiveness.<sup>vii</sup> Moreover, less than half of utilities—whether investor-owned, municipal, or cooperative—have a plan to address their workforce issues. For many, the response is narrow and tactical (see Fig. 1).

### THINKING IN PHASES: THE INDUSTRY’S PERSONNEL NEEDS WILL CHANGE OVER TIME

Workforce planning in this environment must move beyond the vision of training and staffing under a static model. Securing and training the new nuclear workforce will require a long-term plan that contemplates each phase of the anticipated nuclear build-out as well as technology changes to existing plants that will alter work and improve productivity of operators of existing facilities (see Fig. 2). Utilities will need to think carefully about when to integrate new employees into certain phases of develop-

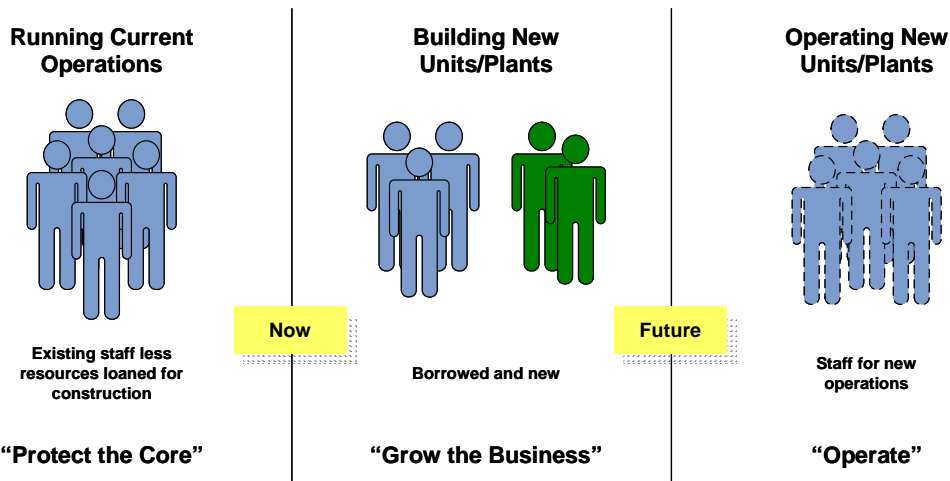


Figure 2. Nuclear Industry Human Capital Needs Over Time

ment to permit them to become familiarized with a particular technology. Further, skills and capabilities required may differ over the organization’s progression toward a steady state of operating both new and older units.

### USING A TAILORED AND HOLISTIC APPROACH

The immediate response of an organization might be to focus solely on staffing or human capital needs. Instead, nuclear companies should use an integrated approach, one that bridges every aspect that impacts the nuclear assets as well as the labor needed to run them.

The response will also vary depending upon characteristics and strategies of the individual nuclear operating company (see Fig. 3). This mix of characteristics will dictate an organization’s approach to staffing these functions.

	Challenging but less complex	Challenging and complex
Construction plans	Existing fleet/units only	New construction
Portfolio complexity	Single unit Single technology	Multiple units Different technologies
Geographic dispersion	Centralized	Dispersed
Local and regional economics	Few opportunities for high-paying, skills-based jobs	Stiff competition from other industries and occupations

Figure 3. Differing Contexts for Nuclear Players

For example, mobility and the potential for job progression between facilities may provide some attraction for some job candidates. The ability to draw talent from engineers and constructors building new nuclear units—who will become intimately familiar with the new technologies during the construction process—could enhance the pool of qualified labor available for future needs. Unionization may play a role as well, and utilities will have to partner with their la-

bor unions to provide for gain-sharing in exchange for workforce flexibility. Conversely, different technologies within a company’s nuclear fleet, both present and prospective, might restrict scale economies in human capital.

Regardless of situation, nuclear operators will have to do more—and more flexibly—with less, optimizing across job families, skills, and locations to ensure operating needs are met.

### A DIFFERENT KIND OF WORKFORCE

The pool of talent has different approaches to work that will both benefit and challenge utilities and especially nuclear operators. We noted earlier the challenges in attracting talent to the nuclear industry. But as a “carbon-friendly” generation technology, many Gen X-ers and Millennials may find the industry enticing as the “next big thing.”

While the first generation of nuclear workers not only sought stability, certainty, and attractive compensation, but was also comfortable with shift work, this next generation of potential nuclear employees has different traits, including:

- Transience (temporary and tentative in commitment)
- Flexibility, independence, and adaptability
- Desire for inclusion in decisionmaking
- Frustration with bureaucracy and red tape
- Comfort with technology

Nuclear plant construction and operations, however, are highly structured, process-driven, and highly regulated activities. There is little room for improvisation in many nuclear positions, as these are currently structured and defined. Firms must be innovative in creating positions and opportunities that challenge and unleash the capabilities of this next generation of nuclear workers without compromising security, safety, and regulatory compliance.

In addition, workers nearing retirement will be more vulnerable to productivity loss, just as shift work, physical labor, and other demands become more taxing—and less attractive—to them. Still, they will remain valuable resources and possess both tacit and explicit knowledge.

Nuclear operators can codify the experience of these valuable employees by developing a strategy of knowledge transfer and management to help bridge the next generation of labor into the nuclear workforce. Creativity in work structuring, performance incentives, and health management as well as a focus on process improvement and reducing physical demands through technology will be key to retaining these employees during this generational shift.

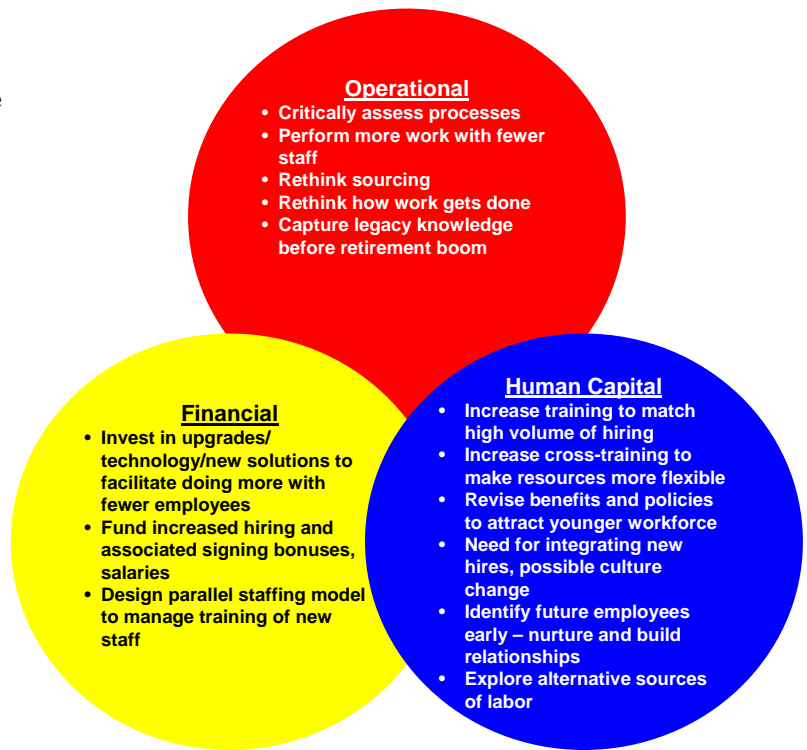


Figure 4. Multi-Faceted Issues in Staffing the New Nuclear Industry

### LEVERAGING A NUCLEAR MANAGEMENT MODEL

ScottMadden has been providing nuclear staffing and operational support to leading nuclear operators for more than two decades. Two key elements of a successful nuclear management model—process management and business planning—provide this more holistic approach to an aging nuclear workforce (see Fig. 5).

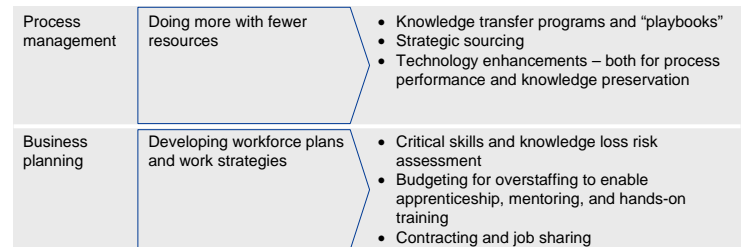


Figure 5. Process Management and Business Planning Leverage Points

We recommend a near- and long-term plan to deal with these programs. Near-term business plans, emphasizing all aspects of the employee life cycle, are needed over the next two to five years. This is especially vital in dealing with critical skills losses like reactor operators, which require recruiting highly skilled individuals and completing a long training cycle.

A longer term planning horizon of three to ten years is required to strategically re-examine and re-invent how work is done and implement process improvements and technology upgrades.

## KEEPING A CHALLENGE FROM BECOMING A CRISIS

This challenge will not come in an instant. Attrition can slowly and subtly whittle away at organizational effectiveness and increase the risk of operational problems. Key questions managers must answer include:

- What are our expected nuclear workforce needs over the next five to ten years, and how aware and engaged is senior leadership in evaluating and monitoring our human capital situation?
- Have we identified all potential critical skill losses by area – e.g., radiation protection, engineering, reactor operator, chemistry technicians, etc?
- Do we have a resilient, multi-faceted game plan—assessment, retention, development, and recruiting—in place to shore up those skill loss vulnerabilities and fill the labor pipeline?

- Do we have a strategy, tools, and an implementation plan for capturing tacit and explicit knowledge from our aging nuclear staff and transferring it to our new workforce?
- How have issues and possible consequences of the change in composition of the nuclear workforce been factored into each facet of nuclear planning and operations, from staffing to training to operating process to capital projects (especially technology upgrades)?

A measured, long-term view will enable nuclear operators to effectively fight the demographic wave hitting the industry, but there are other benefits as well. The influx of talent to the nuclear industry can bring innovative thinking and energy to the way the nuclear business is run and ensure another generation of safe, reliable, and cost-effective nuclear energy.

i World Nuclear Organization, at <http://www.world-nuclear.org/info/inf17.html>.  
 ii Nuclear Energy Institute.  
 iii Nuclear Regulatory Commission, at <http://www.nrc.gov/reactors/new-licensing/new-licensing-files/expected-new-rx-applications.pdf>.  
 iv Nuclear Energy Institute, at [http://www.nei.org/resourcesandstats/nuclear\\_statistics/usnuclearpowerplants/](http://www.nei.org/resourcesandstats/nuclear_statistics/usnuclearpowerplants/).  
 v Canadian Nuclear Association, at [http://cna.ca/english/Nuclear\\_Facts/Nuclear\\_Energy\\_Booklet-EN/2007/Reactors\\_Canada\\_2007.pdf](http://cna.ca/english/Nuclear_Facts/Nuclear_Energy_Booklet-EN/2007/Reactors_Canada_2007.pdf).  
 vi L. Lave, M. Ashworth, and C. Gellings, "The Aging Workforce: Electricity Industry Challenges and Solutions," THE ELECTRICITY JOURNAL (Jan. 2007).  
 vii Electric Power Research Institute.

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**ScottMadden, Inc.**

**2626 Glenwood Avenue  
Suite 480  
Raleigh, NC 27608  
919-781-4191**

**Ten Piedmont Center  
Suite 805  
Atlanta, GA 30305  
404-814-0020**

**scottmadden.com**

Figure 6. An Approach to Effective Nuclear Workforce Management

