

Building a Nuclear Culture in the Middle East

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Many Middle Eastern nations have expressed an interest in or are already pursuing civilian nuclear power programs as a means of diversifying their energy sectors. With signed engineering, procurement, and construction (EPC) contracts in hand, some nations have initiated fast-track approaches to developing a regulatory structure and constructing multiple units.

Creating a national nuclear power program is far more complex than simply hiring a contracting firm and turning the key, however. It is people, not contracts, that build and operate nuclear programs; the greatest challenge each nation faces is in developing a successful “nuclear culture” within the workforce.

The Middle East in particular faces a difficult task due to its limited base of nuclear capabilities and its unique labor market. Recruiting a workforce will require leveraging nationals, supplementing with international nuclear expertise, and augmenting with imported labor. Consequently, a nuclear job site in the Middle East will contain a mix of languages and cultures unmatched by other sites around the globe.

Based on the experiences of recent new nuclear construction projects and operating nuclear sites elsewhere in the world, Middle Eastern nations would do well to focus on three key initiatives as they seek to establish a nuclear culture:

- Developing formal education and training programs to provide subject matter skills and a strong awareness of nuclear culture norms
- Implementing communication and change management processes to constantly reinforce and internalize proper behaviors
- Creating performance measurement and improvement systems to promote a culture of continuous improvement

Ultimately, successful nuclear power programs in the Middle East will be judged not by their ability to construct plants to cost and schedule, but by their ability to develop a reputation for meeting and exceeding the high standards of the nuclear industry and facilitate the construction and operation of additional facilities.

Nuclear Culture Building: The Core Competence

Middle Eastern nations have options for acquiring certain types of expertise: They can leverage the regulatory expertise of US and European nuclear authorities and the design and construction experience of several large international consortia of contracting firms. Establishing a nuclear culture within the workforce is different, however: It cannot be outsourced, and over the long term, building such as culture will be the core competency of any successful nuclear program.

A strong nuclear culture equates to a workforce that is focused on quality, safety, accountability, and performance. Nuclear quality must be the ultimate priority. Nuclear quality standards require that facilities are designed, built, operated, and decommissioned in the safest manner possible. Meeting these standards involves a range of impli-

cations for the nuclear workforce. For example, nuclear professionals must respect the significance of safety-related equipment, strictly adhere to procedures and specifications, know how to seek clarification when necessary, be highly detail-oriented, and be able to proactively identify and correct non-compliance conditions.

The Institute of Nuclear Power Operations (INPO) has outlined several guidelines in their white paper, “Principles for a Strong Nuclear Safety Culture.” A strong nuclear culture will extend these same nuclear safety principles to radiological safety, industrial safety, and environmental safety. Accountability and optimizing individual performance are critical concepts: Each staff member must recognize that they are accountable for ensuring the highest level of quality and safety, from the most senior executive to operations, maintenance, and support staff.

EPC Contractors: Not the (Only) Answer

Middle Eastern nations have awarded EPC contracts to large international firms that have significant expertise in design and construction. However, these contracts may neglect human resource development, arguably the most crucial aspect in the success of a nuclear construction project. During the construction phase, regardless of the rigor of an EPC contract, the facility owner still takes on substantial operating, regulatory, and financial risk, and therefore must plan for and provide significant nuclear safety oversight in-house.

Once a nuclear plant becomes operational, nuclear culture weaknesses often manifest as a root cause of poor performance. Disregard for procedures among skilled laborers and imprudent decision making among senior management are examples that have led to extended forced shutdowns at troubled nuclear facilities. Strict attention to a nuclear safety culture must be maintained throughout a plant’s operating life. This is even more critical in regions without extensive operating experience.

The Next Nuclear Workforce: Just Getting Started

Due to the relative inactivity of the nuclear industry over the past few decades, today's workforce has little to no experience in nuclear construction and does not necessarily appreciate the standards of excellence required by the nuclear industry. Similarly, many nuclear suppliers have downsized their operations, resulting in a lack of experienced personnel to meet the demand for critical components at new plants.

When the US and Europe began building nuclear plants in the 1960's, they were able to recruit experienced personnel from their nuclear navy fleets and research reactors. The picture is vastly different for regions just starting to build nuclear facilities today: Skilled employees are scarce and there is increasing international competition to attract them—not merely for work in the nuclear field but in adjacent industries such as oil & gas. Nuclear facility owners and licensees thus will struggle to recruit and retain talented contractors during the construction effort and staff for the transition to operations.

Addressing the Melting Pot

Building a nuclear labor force in the Middle East also poses its own set of challenges. While most countries will want to ensure that nationals play a key role in the management and operations of nuclear plants, facility owners will need to supplement both labor and management ranks with international nuclear expertise in order to scale construction activities quickly and ensure safe plant operations. In addition, most Middle Eastern countries lack a sufficient in-country work force for large infrastructure projects and will need to import labor. Consequently, a nuclear job site in the Middle East will contain a confluence of languages and cultures unlikely to be matched by other world regions.

Importing a significant portion of the labor force introduces another complexity: Mixing western and eastern business cultures. An aware and questioning attitude on the part of every worker is an important characteristic to ensure nuclear safety; culti-

vating such an attitude must overcome culturally engrained behavioral norms. For example, in Asian nations—a likely source of imported labor—individuals are often unwilling to disagree with authority figures and may seek to avoid conflict with the majority. Facility owners will need to be aware of culturally-based behaviors that could pose a threat to nuclear safety.

Given that the Middle East nuclear labor force will be a blend of nationals, imported labor, and international nuclear experts, each nation will need to implement strategies that focus on instituting formal education and training programs, establishing communications and change management processes, and developing performance measurement and improvement systems that will foster the desired nuclear culture. In developing plans for each of these critical building blocks, facility owners must incorporate processes that address language and cultural barriers inherent in a multinational workforce.

Step One: Formal Education and Training

From the day an EPC contract is signed, there should be a focus on building formal training programs and recruiting the workforce that ultimately will have responsibility for the safe operations of a plant. While training is only the first step in building a nuclear culture, it ensures technical competence and a strong awareness of the standards of excellence required by the nuclear industry. Aspiring nuclear operators should plan to dedicate significant resources to training.

Facility owners will need a nuclear “training academy” to educate the management, reactor operators, engineers, and skilled labor that will build and operate a nuclear facility. Leveraging government and educational partners to build the academy can align the job creation and economic interests of various stakeholders.

Middle Eastern nations can look to the Institute of Nuclear Power Operations (INPO) and the World Association of Nuclear Operators (WANO) for guid-

ance, as both have a long history of assisting nuclear plant operators. INPO and WANO are repositories of best practice information from nuclear operating sites worldwide and can provide guidance in a number of areas, including the development of engineering, management, and operator training programs.

Additionally, skilled laborer training will need to be tailored to the cultural and language needs of the workforce. As an example, training courses that teach nuclear safety as the highest authority, rather than supervisors, can help break down pre-established behavioral norms.

Step Two: Communications and Change Management

Building on the foundation provided by formal training, proper communication and change management programs transform employees from simply understanding nuclear culture to internalizing the behaviors expected of an experienced nuclear professional.

Hiring the right mix of leaders is critical to a nuclear buildout. Recruiting the right balance of nuclear and large construction project experience at the senior leadership level can ensure that consistent communications permeate the organization from the top down. For example, hire a chief nuclear officer with broad experience in engineering, operations, quality assurance and training, and a chief construction officer with significant experience in managing billion dollar projects. Without such a balance in leadership, decision-making can alternate between two extremes: risk adverse to a fault on the one hand and too schedule-driven on the other. Inconsistent messages from senior management can result in confusion regarding management's commitment to nuclear safety among the workforce.

Senior management must continually deliver a safety-first mantra and reiterate nuclear safety rules and procedures to ensure that proper behaviors are internalized. Non-verbal communication

mechanisms can be equally effective. By having a daily presence on the facility floor and calling attention to non-compliance issues, safety hazards, or deviations from proper usage of personal protective equipment, senior management can demonstrate the seriousness of nuclear safety to personnel.

Communication and change management programs should be tailored for each management level, with specific attention given to first-line supervisors whose efforts form the primary link of the communication process with labor crews. Supervisors must be trained to communicate "safety first" constantly, provide sufficient worker oversight, and ensure workers follow specifications and procedures, identify non-compliance issues, and rigorously document work every time.

On job sites such as in the Middle East, a comprehensive program to address language barriers is also a must. Example initiatives can include hiring multi-lingual supervisors, providing training in multiple languages, and having all critical plant signage in multiple languages.

Step Three: Performance Measurement and Monitoring

Implementing performance measurement and improvement systems reinforces the internalized behaviors of a strong nuclear workforce by fostering a continuous improvement mindset that supports a questioning attitude, encourages continuous learning, and shares best practices.

While the concept seems simple, monitoring nuclear culture and designing initiatives to address deficiencies can be an elusive process. As a first step, during plant construction, project managers must provide significant contractor oversight. Outsourcing nuclear culture management to a contractor or a third party can contribute to near-term and long-term safety culture weaknesses, as contractors are incented to meet cost and schedule targets, rather than enhance workforce safety culture. Owner personnel who will be involved in both construction and operation must take ownership of

the monitoring process immediately, and keep their finger on the pulse of the organization at all times.

Given that a nuclear culture can prove difficult to measure, facility owners should use both internal auditing groups and independent firms to obtain information regarding the safety consciousness of its workforce. The condition report (CR) process is one example of a robust internal auditing program that the US operating nuclear fleet has built to track, trend, and correct plant deficiencies, including issues such as equipment not meeting specifications or human performance errors. The CR process requires nuclear plant management and staff to identify problems, perform root-cause analyses, track issues to completion, and record trend codes to facilitate tracking and correction of related future issues.

The CR process is also capable of providing a clear indication of which workers are hesitant to raise safety issues. With this information, management can develop a targeted cultural change program, such as requiring these individuals to identify at least one non-compliance condition, regardless of magnitude, each time they enter the plant.

To obtain a more qualitative picture of the workforce's nuclear culture, facility owners also can solicit independent firms to conduct surveys. Example questions might include:

- Does management put nuclear safety first at all times?
- Does management cultivate a questioning attitude?
- Do workers adhere to procedures all of the time?
- Do workers fear retribution for raising safety concerns?

Tracking these results and developing programs that directly address each indicator can help embed a continuous improvement mindset, directly improving and reinforcing an optimal nuclear culture.

Additionally, by leveraging the performance monitoring and measurement programs of experienced nuclear operators, facility owners can build robust performance improvement systems. For example, recognizing the need for checks and balances on corrective action programs, most nuclear operators have built programs where workers can raise safety concerns anonymously, mitigating the fear of retribution that can arise in these environments.

Summary

The construction and operation of new nuclear facilities is an important step in diversifying energy supply for the Middle East—as well as reflecting on each nation's ability to execute commercial mega-projects. Given the complexity of nuclear facilities and the unique conditions of the Middle East, building a robust nuclear culture in the region and at each project site will be essential to success. By developing programs that strictly address the three core building blocks of nuclear culture—formal education and training, communication and change management processes, and performance measurement and improvement systems—countries in the Middle East can overcome the challenges of these projects and ensure their long term energy and economic goals are met. ❖

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