

Sourcing the Future: Procurement Strategies for Next-Generation Nuclear Energy

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The global nuclear energy industry is expanding as utilities extend the operating life of existing reactors, governments pursue new nuclear construction, and developers advance small modular reactor projects. These trends make procurement strategy more important because qualified suppliers, compliant documentation, and resilient supply chains directly affect project cost, schedule, safety, and regulatory confidence. Nuclear procurement differs significantly from routine commercial buying because the rules are strict, safety is critical, and errors can have significant safety, regulatory, and project consequences.

Whether an organization is building a new Small Modular Reactor (SMR), upgrading a power plant, or managing nuclear materials, it needs a disciplined plan for identifying, qualifying, and monitoring suppliers. This article explains what procurement teams should know about nuclear suppliers and how to find qualified partners.

What Makes Nuclear Suppliers Different

Organizations cannot purchase nuclear-grade components from just any source. Suppliers must follow strict requirements to ensure that each item performs as intended under demanding service conditions. These expectations also apply to distributors, service providers, and organizations supporting procurement-related activities.

The Nuclear Quality Culture

In the nuclear field, a supplier's most important asset is its quality assurance (QA) program and the safety culture that supports it. Each step of design, procurement, manufacturing, inspection, testing, storage, and shipping must be documented and controlled under rigorous standards.

- **ASME NQA-1:** This standard is a widely recognized benchmark for nuclear quality assurance in the United States and in many international nuclear supply chains. Developed by the American Society of Mechanical Engineers (ASME), ASME NQA-1 establishes 18 requirements that address activities such as organization, design control, procurement document control, inspection, testing, nonconformance control, audits, and records.
- **Commercial grade dedication (CGD):** When a commercial item is selected for a safety-related nuclear application, the purchaser or dedication entity must establish critical characteristics and verify those characteristics through documented inspection, testing, analysis, or technical evaluation. This process provides reasonable assurance that the item is acceptable for its intended nuclear safety function.

How to Find Qualified Commercial Nuclear Suppliers

Finding qualified suppliers for commercial nuclear projects requires more than locating available vendors. Procurement teams must identify potential sources, verify that each supplier's quality program applies to the intended scope of work, and confirm that objective evidence supports the supplier's ability to meet nuclear safety, regulatory, technical, and documentation requirements. Industry directories, certification lists, shared audit programs, and professional networks are useful starting points; however, they should be used within a structured qualification process rather than as stand-alone approval methods. The resources below can help procurement teams screen supplier candidates and determine where additional review, audit activity, or commercial grade dedication planning may be needed.

Industry Buyer's Guides and Directories

The sourcing tools below progress from broad market identification to stronger qualification support. Directories help identify potential candidates, certification lists help confirm quality-system status and scope, and shared assessment programs can support deeper supplier review.

- **ANS Buyers Guide:** The American Nuclear Society (ANS) publishes an annual buyers guide that includes companies across nuclear-related categories such as radiation detection, engineering services, and waste management.
- **NPP Supplier Directory:** The NPP Supplier Directory is a specialized resource for civil nuclear procurement that allows supply chain teams to search and filter global companies by country and technical category.
- **NuclearMarket Database:** NuclearMarket provides information that can help procurement professionals review market activity, identify supplier candidates, and connect with nuclear-sector subcontractors.

Certified Organization Lists

Certification lists are useful screening tools, but they do not by themselves establish that a supplier is qualified for a specific procurement scope. Procurement teams should use them to confirm certification status, scope, expiration, and applicability before completing supplier qualification review.

- **ASME Certified Companies List:** The ASME Certification Program portal can be used to identify companies that hold active NQA-1 certifications and to review the applicable certification scope.

Trade Organizations and Assessment Programs

Professional organizations and supplier-assessment groups can help procurement teams identify supplier candidates, understand industry expectations, and reduce duplicate audit effort. Participation in these groups supports screening and qualification review, but it does not replace the purchaser's responsibility for procurement-specific supplier approval.

Industry assessment and audit-sharing organizations: Groups such as NIAC and NUPIC support supplier assessment, shared audit coordination, and access to supplier oversight information. These organizations can help procurement teams understand common oversight practices and reduce duplicate audit effort, but they should remain part of a purchaser-controlled supplier qualification process.

- **NIAC:** The Nuclear Industry Assessment Corporation (NIAC) was originally established in 1994 as the Nuclear Industry Assessment Committee and later reformed in 2015 as a California nonprofit corporation. NIAC supports a shared supplier assessment program for nuclear industry suppliers. Its members use standardized procedures and checklists to evaluate suppliers against applicable requirements such as 10 CFR Part 50, Appendix B; 10 CFR Part 21; 10 CFR Part 71, Subpart H; 10 CFR Part 72, Subpart G; ANSI N45.2; ASME NQA-1; and related nuclear quality criteria. NIAC does not replace each member's supplier approval process; instead, it helps reduce duplicate assessments and allows assessment results to be shared with authorized member companies that have a bona fide business relationship with the assessed supplier.
- **NUPIC:** The Nuclear Procurement Issues Corporation (NUPIC) is a cooperative utility-led organization formed in 1989 by domestic and international nuclear utilities. NUPIC evaluates suppliers that furnish safety-related components, services, and commercial-grade items to nuclear utilities. Its members share joint supplier audits, supplier performance information, and audit schedules to support approved supplier list maintenance. The NRC periodically observes selected NUPIC audits and continues to rely on the effectiveness of the NUPIC joint utility audit process as one method for evaluating supplier quality assurance program implementation.

Regional Supplier Qualification Considerations

Once potential suppliers are identified, procurement teams should evaluate how regional regulatory structures shape supplier qualification. The United States relies on a legally binding regulatory framework administered by a federal agency, while many overseas markets combine government-backed nuclear programs with international certification systems. These differences affect contract strategy, supplier oversight, documentation expectations, and risk management.

United States Regulatory Framework

In the United States, finding and qualifying nuclear suppliers is closely tied to federal regulation, licensee responsibility, and independently owned utilities. The primary regulatory and consensus-standard frameworks for nuclear quality management systems include 10 CFR Part 50, Appendix B and ASME NQA-1, as follows:

- **10 CFR Part 50, Appendix B:** This federal regulation, issued by the U.S. Nuclear Regulatory Commission (NRC), establishes quality assurance criteria for nuclear power plants and fuel reprocessing plants. Suppliers supporting safety-related work may be subject to procurement, documentation, inspection, test control, nonconformance, corrective action, and audit requirements that flow down from the licensee's quality assurance program.
- **ASME NQA-1:** This standard provides detailed quality assurance requirements and guidance that organizations commonly use to implement nuclear quality programs aligned with 10 CFR Part 50, Appendix B regulatory expectations. Certification or documented compliance can support supplier qualification, but procurement teams must still evaluate scope, applicability, and implementation effectiveness.

United States Market Structure

- **Independent utilities:** Most U.S. nuclear power plants are owned by private companies. Procurement teams may use cooperative audit networks, such as NUPIC, to share supplier audit information while maintaining their own responsibility for supplier approval and procurement control.
- **Commercial grade dedication:** Because some nuclear-qualified supply options are limited, procurement teams may use commercial items in safety-related applications only after verifying critical characteristics through an appropriate commercial grade dedication process.

International Supplier Qualification Context

Outside the United States, nuclear construction is often shaped by national government priorities, state-backed developers, export-credit structures, and international management-system standards. Procurement teams should understand how these structures affect supplier selection, documentation expectations, and long-term lifecycle support.

International Regulatory Framework

- **ISO 19443:** Many organizations in European and Asian nuclear supply chains use ISO 19443, a nuclear-sector quality management standard based on ISO 9001:2015. ISO 19443 adds requirements and expectations related to items and services important to nuclear safety, safety culture, counterfeit and suspect item prevention, graded application, and control of external providers. Certification can support supplier screening, but procurement teams must still evaluate whether the certification scope matches the specific item or service being purchased.
- **IAEA safety standards:** The International Atomic Energy Agency (IAEA) publishes safety standards and guidance that many countries use to develop national nuclear regulatory expectations. These documents can influence management systems, supply chain oversight, leadership responsibilities, and safety-culture expectations for nuclear organizations.

International Market Structure

- **Government-backed vendors:** In countries such as France, South Korea, China, and Russia, nuclear projects may be supported by state-owned or government-backed entities. Integrated vendor packages may include reactor design, major components, fuel services, construction support, and preferred domestic suppliers. This approach can simplify some sourcing decisions, but it may also create challenges and dependencies related to technology transfer, export controls, localization, lifecycle support, and geopolitical risk.

Key Differences at a Glance

The table below summarizes the regulatory and market differences discussed above and highlights why supplier qualification strategies may differ between U.S. and international procurement environments.

Comparison of U.S. and Overseas Nuclear Supplier Qualification Factors

Feature	United States Perspective	Overseas Perspective
Main quality framework	10 CFR Part 50, Appendix B and ASME NQA-1	ISO 19443, IAEA safety standards, and national regulatory requirements
Industry structure	Private utilities and independent suppliers	State-owned, government-backed, or nationally supported vendors

Sourcing style	Items and services are procured through supplier-specific qualification, audit, and procurement controls	Integrated vendor packages may include reactor design, major components, fuel services, and preferred suppliers
Regulatory risk	Regulatory enforcement, civil penalties, reportability concerns, and potential licensing impacts	Government-to-government requirements, export controls, localization expectations, and standards alignment challenges

Practical Procurement Takeaways

The following checklist translates the article’s sourcing and qualification concepts into practical procurement actions. It should be used after the procurement team has defined the item or service, applicable safety classification, regulatory requirements, and quality assurance flow-down obligations.

Summary Checklist for Nuclear Procurement

Step	Action Item	What to Look For
1. Verify quality program	Check the supplier’s QA program, certifications, and applicable scope.	Look for ASME NQA-1 compliance, ISO 19443 certification where applicable, and documented implementation evidence.
2. Review audit history	Evaluate recent audits, findings, corrective actions, and supplier performance trends.	Confirm that corrective actions are timely, effective, and traceable to objective evidence.
3. Screen export controls	Review export, import, sanctions, end-use, and licensing requirements.	Ensure compliance with NSG guidelines and applicable national export control requirements.
4. Plan CGD activities	Define critical characteristics and verification methods before purchasing commercial items for nuclear use.	Confirm that inspection, testing, analysis, or technical evaluation supports the item’s intended safety function.

5. Preserve traceability	Maintain procurement, inspection, test, nonconformance, corrective action, and receipt documentation.	Ensure records are complete, legible, retrievable, and linked to the supplied item or service.
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Organizations can reduce procurement risk by periodically reviewing supplier lists, confirming qualification evidence, and aligning sourcing decisions with applicable nuclear quality, export control, and procurement documentation requirements. Procurement personnel should work closely with the nuclear quality management team to ensure that supplier evaluation, approval, and acceptance activities are supported by complete objective evidence and appropriate documentation.

Conclusion: Securing the Future Nuclear Supply Chain

Successfully managing nuclear procurement requires a balance of strict quality control, supplier oversight, and global regulatory awareness. The contrast between U.S. requirements such as 10 CFR Part 50, Appendix B and ASME NQA-1 and international frameworks such as ISO 19443 shows why a single, one-size-fits-all sourcing approach is unlikely to be effective.

Procurement teams should build distinct verification pathways for domestic and overseas vendors, confirm supplier capability through objective evidence, and preserve traceability from procurement planning through receipt acceptance. In nuclear sourcing, supplier confidence must be based on documented evidence, not assumptions about capability.

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