

# 20th Annual Vendor/Contractor Profile Special Section

AMEC . . . . .pp. 76-77	GE Hitachi Nuclear Energy . . . . .pp. 16, 50-51, 174
American Crane & Equipment Corp. . . . .pp. 92-93	The GEL Group, Inc. . . . .p. 112
AREVA Inc. . . . .pp. 5, 53	General Plastics Manufacturing . . . . .p. 107
Barnhart Nuclear Services . . . . .p. 100	Holtec International . . . . .p. 94
BHI Energy . . . . .pp. 138-139	Hurst Technologies Corp. . . . .p. 137
Bigge Crane and Rigging Co. . . . .pp. 134-135	Hydratight Limited . . . . .p. 142
BIRNS, Inc. . . . .p. 117	HydroAire Service, Inc. . . . .pp. 8-9, 54-55
Black & Veatch . . . . .pp. 90-91	HYTORC Industrial Bolting Systems . . . . .p. 101
Burns & McDonnell . . . . .p. 57	Integrated Power Services . . . . .pp. 132-133
Candu Energy Inc. . . . .p. 73	Kinectrics, Inc. . . . .pp. 130-131
CB&I . . . . .pp. 110-111	Konecranes Nuclear Equipment & Services LLC . . . . .p. 59
Cutting Edge Services Corp. . . . .p. 88	L-3 MAPPS . . . . .pp. 140-141
Doosan HF Controls, Corp. . . . .pp. 74-75	Ludlum Measurements, Inc. . . . .p. 79
DP Engineering Ltd. Co. . . . .p. 95	Major Tool & Machine . . . . .p. 66
Enercon Services, Inc. . . . .pp. 102-103	Miller Pipeline . . . . .p. 128
F&J Specialty Products, Inc. . . . .pp. 114-115	Mirion Technologies . . . . .p. 67
Fairbanks Morse Engine . . . . .p. 85	Mitsubishi Nuclear Energy Systems, Inc. . . . .pp. 96-97
Fluor Corporation . . . . .pp. 122-123	MPR Associates, Inc. . . . .pp. 86-87

Pages 50-147 contain advertisements and “advertorial” information about products and services provided by the companies in the nuclear industry listed below:

NAC International . . . . .p. 106	SCHOTT Electronic Packaging, A Division of SCHOTT North America, Inc. . . . .pp. 64-65
NSL Analytical Services, Inc. . . . .p. 78	Siempelkamp Nuclear Services, Inc. . . . .pp. 108-109
Oregon Iron Works, Inc. . . . .pp. 120-121	SLINGMAX® Rigging Solutions . . . . .pp. 144-145
PCI Promatec . . . . .p. 124	SSM Industries, Inc. . . . .pp. 118-119
Performance Improvement International . . . . .pp. 56, Cover 3	Structural Integrity Associates, Inc. . . . .p. 113
Petersen Inc. . . . .pp. 98-99	System One . . . . .p. 125
Quest Integrity Group . . . . .p. 72	Team Industrial Services, Inc. . . . .pp. 82-83
Radiation Protection Systems, Inc. . . . .pp. 62-63	Thermo Fisher Scientific . . . . .pp. 70-71
Reef Industries, Inc. . . . .p. 143	Thermo Scientific - CIDTEC . . . . .pp. 68-69
RIZZO Associates . . . . .p. 146	Transco Products Inc. . . . .p. 129
Rolls-Royce . . . . .pp. 80-81	Tri Tool Inc. . . . .p. 104
Rosemount Nuclear Instruments, Inc. . . . .pp. 126-127	Underwater Engineering Services, Inc. . . . .p. 58
RussTech Language Services, Inc. . . . .p. 116	Utilities Service Alliance, Inc. . . . .p. 147
Sargent & Lundy LLC . . . . .pp. 7, 89	Westinghouse Electric Company LLC . . . . .pp. Cover 2, 52
Saulsbury Industries . . . . .p. 105	Worthington Industries . . . . .p. 84
Schneider Electric Gutor Technologies . . . . .p. 136	Zachry Nuclear Engineering, Inc. . . . .pp. 60-61

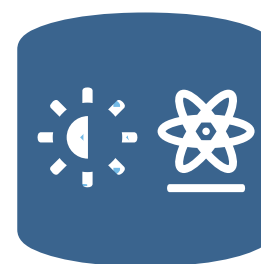
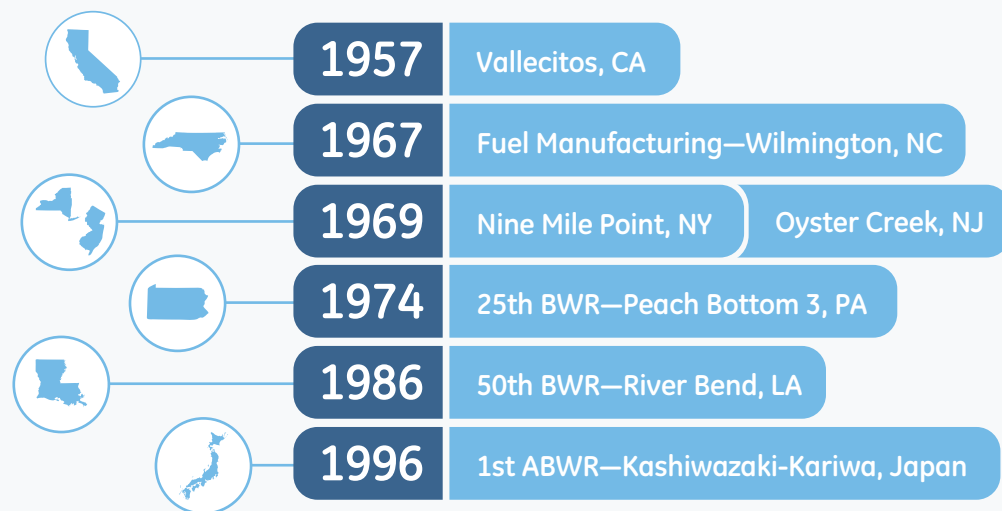
# Focusing on tomorrow for over 50 years.

For decades, GE and Hitachi have been at the forefront of nuclear technology. The formation of the GE Hitachi global nuclear alliance in 2007 brought together our respective design expertise and long history of delivering reactors, fuel and services. Today as GE Hitachi, we continue to address industry needs, meet urgent requirements and achieve long-term goals by working in close collaboration with our customers. As the industry evolves, we are continuously finding better ways to provide reliable power now—and in the future.

[ge.com/nuclear](http://ge.com/nuclear)

## Building

Setting the industry benchmark for facility design and construction since 1957



## Enhancing

Helping utility customers achieve safe and reliable operation, improve plant efficiency and reduce dose levels



### First-Generation III: ABWR

Represents proven technology, performance and longevity with a higher power rating to reduce capital cost per installed kW



### PAMS

Eliminates obsolescence risk via a customized parts management solution



### Global Nuclear Fuel

Provides highly reliable, engineered fuel that improves savings and uptime



### ESBWR

Uses natural circulation and fully passive safety systems to provide over seven days of core fuel cooling with no electricity or human action following a total station blackout

## Innovating

Developing technology that has played a key role in optimizing plant performance, safety and profitability



**2012**

### Global Laser Enrichment

Working to develop third-generation, laser-based uranium enrichment technology

**2012**

### Spent Fuel Pool Level Monitor

Delivers continuous, accurate readings of pool levels from up to 1,000 ft.

**2013**

### Stinger

Performs in-vessel inspection, reducing dose during critical path activities

**2014**

### PRISM

Declared a credible option for managing UK's plutonium stockpile by the UK Nuclear Decommissioning Authority

## Westinghouse Manufacturing: Meeting Customer Needs Around the Clock

For nuclear utilities, response time for emergent issues is critical, especially during an outage. In the midst of a recent outage, a utility discovered that some reactor coolant pump (RCP) bolts needed to be replaced. The bolts were not standard replacement parts and had to be custom manufactured on deadline in order to meet the outage schedule.

Knowing that Westinghouse has the capabilities to manufacture major components, the utility contacted Westinghouse to provide the RCP bolts. Westinghouse's manufacturing facilities are staffed around the clock, and the company's skilled welders, machinists and manufacturing technicians were able to safely manufacture high-quality parts to meet the customer's outage schedule and deadline.

Westinghouse's world-class, global manufacturing capabilities include: precision machining with heavy and light Computer Numerical Control System (CNC) mills and lathes; large horizontal and vertical



*An air tank mid-frame is prepared for fabrication by a Westinghouse fabrication mechanic.*

CNC boring mills; heavy crane capacity (up to 200 tons); fuel-handling equipment manufacturing, nuclear fuel and components manufacturing; instrumentation and control, and electro-mechanical products. Westinghouse welders, machinists and technicians are experienced in working with numerous metals, including stainless steel, carbon and alloy steels, Inconel®, Monel®, Stellite™ and zirconium alloys. A variety of precision manufacturing, welding and machining processes are used in our state-

of-the-art global manufacturing facilities.

At Westinghouse, safety, quality and customer support are our top priorities. Westinghouse's manufacturing quality assurance programs are top notch, employing a number of non-destructive examination (NDE) methods, including magnetic particle, liquid penetrant, visual, radiographic (RT) and ultrasonic testing to ensure optimal quality.

Westinghouse employs the best welders, machinists and manufacturing technicians in the industry, and they are on hand to support critical needs around the clock. Whether a replacement part is needed, a damaged component is found during an outage, or you're placing your next routine order, you can be sure that Westinghouse has the facilities and the experience to deliver what you need.



*A machine-arch, gas tungsten welding process called hard surfacing is performed on a Stellite™ product at a Westinghouse manufacturing facility.*



# Engineering Solutions to Improve Plant Performance

**Did you know ...** AREVA offers a diverse team of engineering and hardware solutions as an extension of your team? And we understand that the real success is in an ongoing relationship — one where we work together to make the right decisions for your plant.

We combine a unique blend of engineering expertise with equipment and system knowledge, rigorous project management experience and regulatory expertise — all driven to reduce risk while saving time and money. The combination of nuclear steam supply system engineering and field service capabilities with secondary-side expertise allows AREVA to deliver a total-plant perspective.

With customer-focused innovation, AREVA can deploy the technology and resources to lower your total costs and improve your facility's performance. We pledge uncompromising support for the long haul as you realize your vision for highly reliable, high-quality and safe nuclear power. To learn more about AREVA's solutions and commitment to operational excellence, visit: [us.aveva.com](http://us.aveva.com)



## Major Solutions Include:

- Cyber Security Solutions
- Digital Control Systems
- Electrical Distribution Equipment
- Engineer of Choice
- Fire Protection
- Flexible Operations
- Global Testing Centers
- Integrated Electrical Systems Upgrade
- Integrated Procurement Solutions
- Major Systems Installations and Modifications
- Mechanical Products
- Nuclear Parts Center
- Plant Modifications
- Post-Fukushima Regulatory Solutions
- Total Motor Solutions
- Variable Frequency Drives

**AREVA**  
forward-looking energy

# Emergency Response Is What We Do. Engineering Expertise Is How We Do It.



## Critical Pump Seizes

A low head safety injection pump rotor seized in its casing, bringing a nuclear power plant to critical operation status and requiring emergency repairs. Hydro's Chicago nuclear qualified repair service center was engaged to work on the pump 24/7. From decontamination all the way through testing, Hydro's engineering and operations team responded quickly, providing a lasting solution at a critical time. Flexibility, qualified and thorough engineering analysis, and essential resources led to fast and reliable uptime – and a very satisfied customer.



Rotor was damaged due to pump running dry for approximately 30 minutes.

## Engineering Pumps for Better Performance and Longer Life

### The Hydro Difference

Hydro has built its business by bringing a high level of engineering expertise and service to customers around the world.

As an independent pump engineering and rebuilding company, Hydro has the unique capability of analyzing and understanding various OEM designs as well as their successes or failures in specific applications and operating environments. Based on extensive empirical data, Hydro is able to improve the original design for its intended service. Because we are independent, we offer unbiased recommendations in every repair situation. We are committed to our customer – not our brand.

Our mission is to work hand in hand with our valued customers to optimize the performance and reliability of

their pumping systems by evaluating and understanding root causes of pump degradation or failure and by providing unbiased engineering analysis, quality workmanship and responsive field service for improved plant operation.

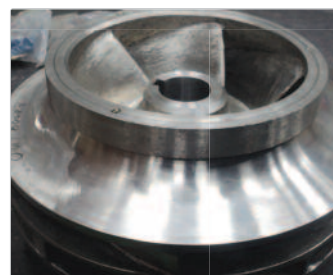
### We are Pump Experts

Engineering expertise is the foundation of our business. Our engineers and technical staff have extensive experience in the pump industry and with a broad spectrum of pumping equipment. This diverse engineering experience combined with use of the latest manufacturing and design technologies and our knowledge base of proven successes over more than 40 years of providing aftermarket services allows us to not only repair the pump but to improve it.



### Pump Decontamination and DCI

While the damaged pump was being decontaminated at a dedicated facility, numerous spare parts from the plant's inventory were reviewed by Hydro's engineering team. Equivalencies such as dimensional and functional conformity were studied.



### Spare Parts Analyzed

A spare OEM impeller supplied by the customer ostensibly manufactured to the same pattern and drawing numbers initially appeared to be a drop-in replacement. However, upon close inspection, Hydro's engineering team discovered the OD and vane underfiling geometry deviated from the OEM's specs. Expected loss of hydraulic performance due to this deviation was calculated and brought to the customer's attention, with suggested additional improvements.



### Diminished Axial Float Diagnosed/Adjusted

While analyzing the pump assembly, engineers noted that the impeller's overall exit width was larger than spec, obstructing lowering of the casing's upper half. To meet the drawing requirements, machining the shroud was recommended. Evaluations and justifications confirmed that the original design's mechanical strength, axial thrust, and hydraulic performance would not be negatively impacted.



### Final Testing and Turnaround

Hydro's performance test lab had been on standby throughout the repair process, with the preliminary test layout. When repairs were completed, the pump was immediately tested and approved by the customer. The pump was shipped to the customer only eight days after its arrival, and was up and running immediately after successful results of pre-service tests.

## Our Comprehensive Services

Nuclear Pump Repairs | 24/7 Emergency Services | OEM Goulds Pumps, Parts & Accessories  
Field Service Support for Installation & Start-up | Certified Performance Testing  
Pump System Reliability | Engineering Services | Customer Training

## We're On It.

To learn more about Hydro's comprehensive services, please contact us at 800-223-7867 or visit us at [hydroinc.com](http://hydroinc.com)

HydroAire Inc., A Hydro Company | Chicago, IL  
800.223.7867 | [www.hydroinc.com](http://www.hydroinc.com)



# The Benefits of PII's Organization Specific Training



Do you want Error-Free® operations for the extended plant life?

If so, Performance Improvement International's organization specific training (OST) in Error-Free® technology may be your solution.

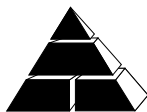
Based on PII's 27 years of comprehensive R&D, our OST courses help staff in all disciplines and at any level to understand how, when, and why they make errors. We consider your staff's experience level, personality and attitude, and any previous or existing training programs. Because PII's OST courses are customized to the specific needs of the organization, we can provide training that addresses your company's unique needs and challenges.

**Contact PII today** to discuss how our customized Error-Free® organization specific training can benefit your organization.

## PII's OST courses include:

- Error-Free® Analytical Modeling
- Error-Free® and Injury-Free Behavior
- Error-Free® Communication
- Error-Free® Contract Preparation
- Error-Free® Contractor Management
- Error-Free® Corrective Actions
- Error-Free® Decision Making & Problem Solving
- Error-Free® Engineers
- Error-Free® Enterprise Waste Reduction
- Error-Free® Instant Root Cause Analysis
- Error-Free® Job Observations
- Error-Free® Leadership
- Error-Free® LOP Management
- Error-Free® Management Accountability System
- Error-Free® Managers
- Error-Free® Negotiation
- Error-Free® Operation & Maintenance
- Error-Free® Performance Monitoring & Trending
- Error-Free® Planning
- Error-Free® Procedure Design, Development, & Use
- Error-Free® Project Management
- Error-Free® Psychologically-Based O&P RCA
- Error-Free® QA/QC
- Error-Free® Reviewers
- Error-Free® Self-Assessments
- Error-Free® System Commission Testing
- Equipment Error-Free® Troubleshooting
- Equipment Failure Mode Analysis
- Equipment Root Cause Analysis

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**Performance Improvement International**

# NUCLEAR SOLUTIONS From Burns & McDonnell

**Burns & McDonnell is focused on providing services to the nation's operating fleet of nuclear utilities. More than 80 percent of our engineers have spent much of their careers working full-time in the nuclear fleet and have lived the nuclear culture.**

"When it comes to understanding the safety and operational culture of our nuclear fleet, we understand, we've lived it," says Glenn Neises, Chief Nuclear Officer for Burns & McDonnell. "There is no substitute for direct experience."

Burns & McDonnell has experienced engineers and project managers deployed in offices throughout the U.S. "We are

local and committed to the success of our clients wherever they are because we are familiar with their needs," Neises says.

As a 100 percent employee-owned firm, Burns & McDonnell is committed to the success of each and every project because "you are our client, both personally and professionally," Neises adds. "Ownership means we care about making sure every project is executed to perfection. Our clients notice this attention to detail.

"Burns & McDonnell has more than 4,500 employee-owners working in engineering and construction services across 11 divisions. We bring a broad experience base to the nuclear industry, which results

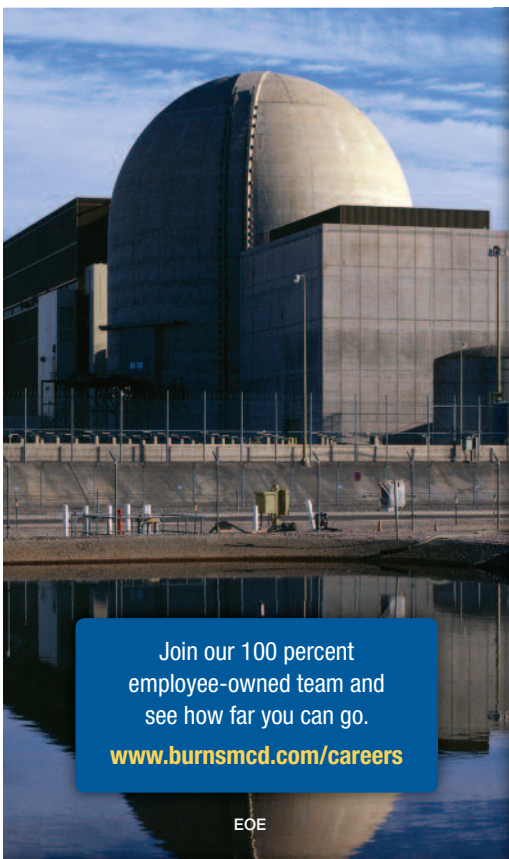
in innovative solutions for the most complex problems."

Burns & McDonnell has revenue of more than \$1.5 billion annually, half of which comes from construction projects. "We can do any size project from the smallest study to the largest design-build project," Neises says.

For more information, visit:



[www.burnsmcd.com/nuclear](http://www.burnsmcd.com/nuclear)



Join our 100 percent employee-owned team and see how far you can go.  
[www.burnsmcd.com/careers](http://www.burnsmcd.com/careers)

EOE

## ENGINEERING NUCLEAR SOLUTIONS

Providing on-time, on-budget, high-quality solutions — modifications, calculations, studies, analyses.

**Let us make you successful.**

*Engineering. Integrity. Excellence.*



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Engineering, Architecture, Construction, Environmental and Consulting Solutions

**INNOVATIVE MAINTENANCE PRACTICES IMPROVE ASSET PERFORMANCE**

The prospect of new nuclear construction is exciting, but operating nuclear plants will require diligent management of facility assets for years to come. Innovative maintenance practices will be essential to keeping plants operating safely and efficiently. For over twenty years, Underwater Engineering Services, Inc. has provided quality technical services and outage support. In 1988, UESI developed a unique approach to the underwater inspection and repair of safety related coatings that remains in use around the world. Today, UESI is working with its industry partners to develop new maintenance processes that take advantage of advances in robotic technology to

lower maintenance costs, shorten outage schedules, and reduce radiation exposure.

As the nuclear industry moves into its next phase, UESI will continue to provide the kinds of quality technical and engineering services critical to meeting regulatory and safety requirements. Our services and capabilities include:

- ASME IWE code inspections
- Underwater coating assessment and repair
- Wet welding to ASME/AWS requirements
- Diving services in the suppression chamber, reactor vessel & fuel pool
- Robotic solutions
- Intake and discharge maintenance

- Project Management
- QA Oversight
- Staff Augmentation
- Engineering Assessments
- Maintenance Program Management



Underwater Engineering Services, Inc.



**Specialized Services for the Nuclear Industry**

UESI Nuclear Services provides specialized services uniquely suited to the nuclear industry. Work can be performed under our 10CFR Appendix B Program to UESI or site procedures.

- Manned Diving & Remote Intervention
- Diving Services for RV, Fuel Pool, Suppression Pool
- Underwater Coating Inspection & Application
- ASME Section XI Code Inspections (IWE & IWF)
- ANSI & NACE Nuclear Coating Inspectors
- Condition Surveys and Asset Management
- Wet & Dry AWS or ASME Code Welding
- Nuclear Coating Experts
- Buried Pipe Coating Assessment
- QA Oversight & QC Inspection
- Project Planning & Management
- Heavy Marine Construction
- Intake & Discharge Diving Services
- Deactivation & Decommissioning



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A Greenman-Pedersen, Inc. Company





With over a half century of nuclear crane experience, **Konecranes Nuclear Equipment and Services** continues to develop engineering solutions that are safer and easier to use.

Our newest product is a robust, seismically qualified, Single Failure Proof Vertical Cask Transporter (VCT). It integrates a hoist unit which conforms to ASME NOG-1 criteria requiring redundancy and increased design factors.

This VCT is capable of moving a transfer cask outside the fuel building to perform cask stack-up and MPC transfer. The benefits are increased safety, faster processing time, less manual intervention and reduction in worker exposure.

When a VCT is combined with the family of Konecranes equipment including: Single Failure Proof Fuel Building Cask Handling Crane, Fuel Handling Hoists, Refueling Machine, Spent Fuel Bridge and Reactor Crane, then this extensive pool to pad lineup provides the greatest overall value.

Our highly qualified technicians perform the services to keep critical plant equipment operating reliably throughout its lifetime. Konecranes

designs, manufactures and services nearly every single piece of permanent plant lifting equipment found in a nuclear facility.

**Parts and Service for OEM Brands:**

- P&H®
- Dwight Foote™
- Kranco™
- CMS™
- Broadline
- Shepard Niles®
- Provincial™

**We provide parts and service for all makes and models of cranes.**



## KONECRANES NUCLEAR EQUIPMENT & SERVICES LLC

Worldwide suppliers of nuclear lifting equipment and services



**EQUIPMENT**

Our wide range of products are designed specifically for operation in nuclear applications.

**MODERNIZATIONS**

We provide modernization services for all brands of cranes, hoists and material handling equipment.

**PARTS**

- Any OEM part for any brand of overhead crane or hoist
- Re-engineered parts
- Commodity/consumable parts
- Remanufactured parts (motor rewinds, brakes, etc.)

**QUALITY**

Our quality control program ensures that each nuclear crane and component is designed to meet or exceed all mandated standards.

**SERVICE**

We provide service for all brands of cranes, hoists and material handling equipment. Services include outage support, inspections, repairs, and maintenance.

• **RAILQ**

RailQ generates 3D and 2D graphs of the runway rails and identifies misalignment and other problems of your cranes.

• **ROPEQ**

Konecranes RopeQ wire rope inspection is a visual and Non-Destructive (NDT) rope inspection service that examines what you cannot see with a visual only inspection.

**FIND OUT MORE:**

Toll Free: 1.866.261.9975  
[www.konecranes.com](http://www.konecranes.com)



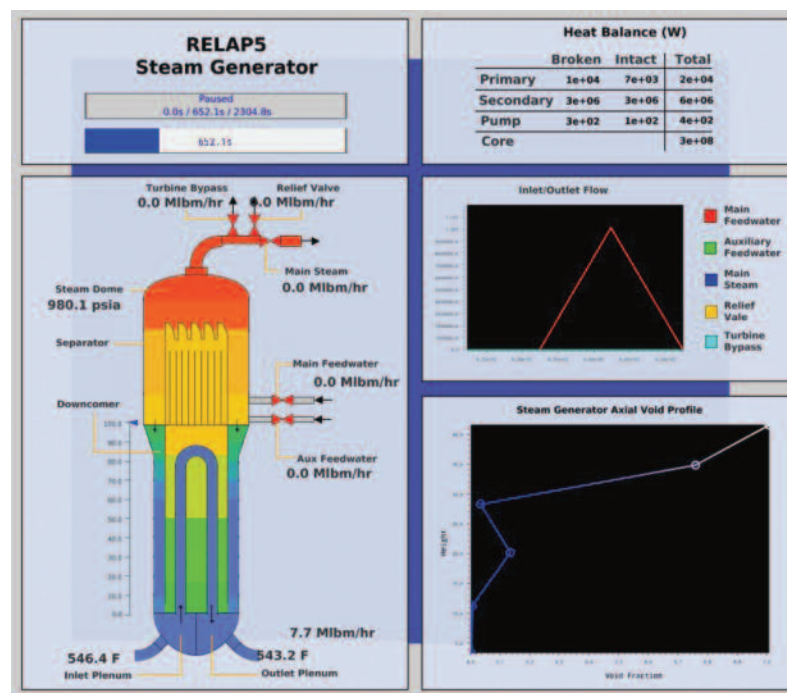
**KONECRANES®**  
 Lifting Businesses™

# Company Profile: Zachry Nuclear, Inc.

For more than three decades, Zachry Nuclear, Inc. has provided engineering, design and project management services to the operating U.S. nuclear fleet, with extensive PWR and BWR experience at the majority of the U.S. Commercial Fleet. The technical knowledge, experience and capabilities of the staff assist plant owners in support of a wide variety of operational, regulatory, maintenance, and upgrade needs.

Headquartered in San Antonio, Texas, Zachry Nuclear has offices located throughout the United States in Stonington, CT; Charlotte and Cary, NC; Richland, WA; and Chicago, IL. They offer mechanical, electrical, controls and civil/structural engineering professionals and designers who are knowledgeable and experienced in power plant systems; engineering analysis and modification package development; and startup of power plant systems and components. Zachry Nuclear is a qualified nuclear QA supplier; all services are performed in accordance with their Nuclear Quality Program, which complies with 10CFR50 Appendix B and ASME NQA-1 (1994), and has been successfully audited by NUPIC.

Zachry Nuclear's full range of engineering and design services are backed by years of nuclear power plant system experience and practical application of time-tested solutions. Their engineers, designers, project managers and system analysts have an impressive combination of training and experience. When you have a design need, Zachry assembles a fit-for-purpose team for the job, taking into account employees' specialties, education,



skills and expertise. Zachry utilizes industry-recognized design tools and processes, including an in-house Failure Modes and Effects Analysis (FMEA) procedure that fully evaluates proposed system modifications to ensure they will operate effectively and without error. The Numerical Applications Division (formally NAI) has consistently provided the industry with state-of-the-art modeling techniques and approaches for containment response and area heat-up during both design and beyond design basis events. This division of Zachry Nuclear provides a wide spectrum of engineering analysis services including thermal hydraulic, radiological, chemical, core physics and safety analysis, and is the leading developer of nuclear software including Proto-FLO™, Proto-HX™, Proto-HVAC™, Proto-Sprinkler™, CentralStor™, RADTRAD-NAI™ and GOTHIC™ computer code and applications. GOTHIC™, as applied by Numerical Applications, has become the industry standard for containment

modeling and analysis, and has been extensively utilized in operating and new plant licensing activities. Their team also has considerable experience using industry-standard software tools such as RELAP and RETRAN.

The Zachry team delivers high-quality design with the utmost care and strict adherence to safety and regulatory requirements. With a focus on cost-effective operations, Zachry engineers investigate plant performance problems; assess compliance to code and regulatory requirements; perform feasibility studies; develop conceptual designs; evaluate the cost and effectiveness of plant upgrades; and prepare detailed plant design changes including specifications and drawings for plant construction and modifications.

\* This product incorporates technology developed for the Electric Power Industry under the sponsorship of EPRI, the Electric Power Research Institute.

## Best People. Best Tools. Best Results.

# ZACHRY



Zachry Nuclear Engineering provides engineering analysis services including thermal hydraulic, radiological, chemical, reactor physics/core design and safety evaluations. We are a leading developer of software used in more than 90% of the U.S. nuclear fleet, including GOTHIC™, Proto-FLO™, Proto-HX™, Proto-HVAC™, Proto-Sprinkler™, CentralStor™ and RADTRAD-NAI™.

Zachry developed and maintains the industry-standard GOTHIC™ analysis code, utilized for critical operating plant assessments including analyses of containments, fuel pools, reactors, primary and secondary piping/systems and buildings/compartments. We are pioneers in the systematic integrated approach to fluid system analyses including: system performance prediction; component capability analyses; licensing/design basis requirements; component in-service-testing acceptance criteria; maintenance periodicity; and 89-13 requirements. Zachry also investigates system and equipment performance, evaluates improvement options, and verifies the capability of plant systems under normal and accident conditions.

Combining the most experienced people with the best tools available creates optimal solutions. Contact Zachry today to find out how we can support your analysis needs.

**What qualifies Zachry to help you? Scan QR code to find out.**



### ZACHRY NUCLEAR SERVICES

- AOV Program Support
- Industry Open Phase Issue Support Supplemental Diesel Generators ELAP (FLEX Strategy) and FLEX Modifications
- Analysis (GOTHIC™, Hydraulic, Electrical and Safety)**
- RCP Seal Replacement
- Small Modular Reactor Event Analysis
- Digital Upgrades
- Rad Monitoring Systems
- Detailed Engineering & Design

\* This product incorporates technology developed for the Electric Power Industry under the sponsorship of EPRI, the Electric Power Research Institute.



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**Radiation Protection Systems (RPS) has been developing and implementing engineered controls for radiological and hazardous material applications since 1978. We offer equipment and custom integrated systems that make working in the radiological or hazardous workplace safer, easier and more efficient.**

Our clients include every U.S. and Canadian Commercial Nuclear Utility, every major U.S. Department of Energy (DOE) site, U.S. Department of Defense (DOD), Center for Disease Control (CDC), Universities, pharmaceutical & biopharma research, and manufacturing companies. Our roots are in both military and civilian nuclear programs commencing with development of the Naval nuclear programs of the 1950's and continuing into the commercial power reactor field. Today RPS continues to develop sophisticated techniques and engineering methods to confine, contain and control hazardous contaminants.



Engineering Controls are defined as devices, systems, or components that will minimize workplace hazards to reduce risks and exposure to both the worker and the environment. When properly designed and integrated into the work process, engineered controls perform without inhibiting operations. They improve productivity by minimizing the reliance on personnel protective equipment (PPE). Both OSHA and the NRC require the proactive use of engineered controls over other administrative controls. For radiological applications, the most commonly used controls are ventilation, containment, and shielding.

Ventilation is a well-proven and extraordinarily-effective engineered control, and it constitutes the keystone of RPS' services and products. We offer a full line of portable High Efficiency Particulate Air (HEPA) filtration units and carbon adsorber systems. When properly applied, these air cleaning systems can effectively control contamination at its source, reduce the spread of contaminants, and minimize personnel exposure while increasing worker safety and efficiency. RPS' extensive line of ventilation units and accessories incorporate "industry best practices" as defined by the American Conference of Governmental Industrial Hygienists (ACGIH) - Industrial Ventilation Standards and the Nuclear Air Cleaning Handbook. The quality and function of our suite of ventilation products reflects the decades-long experience and expertise of our design and engineering staff. As testament, RPS' ventilation products/systems have the lowest "Life Cycle Costs" of any like ventilation products available in the market today. Over 95% of our ventilation units carry the CSA Mark<sup>1</sup>, further assuring customers that our products are of the highest quality and built with safety in mind.

The effectiveness of ventilation is greatly enhanced through the use of containment devices, which is why RPS also offers a full range of both standard and custom-engineered containments to augment our extensive ventilation product line. These products include Perma-Con® (our modular stainless-steel building system), hoods, gloved work stations, and flexible-membrane barrier systems.

Last but certainly not least, Shielding is essential for the keeping occupational radiation exposure as low as reasonably achievable – ALARA. RPS can provide both temporary shielding as well as engineered permanent shielding. We offer a complement of lead blankets, lead-free blankets, pipe wraps, storage containers, and other shielding products. Our extensive engineering and customization capabilities allow us to provide innovative, cost-effective shielding solutions for nearly any application.

**With today's increased pressure to reduce exposure and respirator usage, RPS' engineered controls offer a safe and cost-effective way to minimize exposure and improve worker and workplace efficiency.**

<sup>1</sup>The CSA mark demonstrates to our customers, whether they are distributors, retailers or end users, that a sample of our product has been certified to applicable standards including standards written or administered by the American National Standards Institute (ANSI), Underwriters Laboratories (UL), CSA Group (CSA), NSF International (NSF), and other North American and global organizations.



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24 Hour Emergency Hotline: 860.863.4545

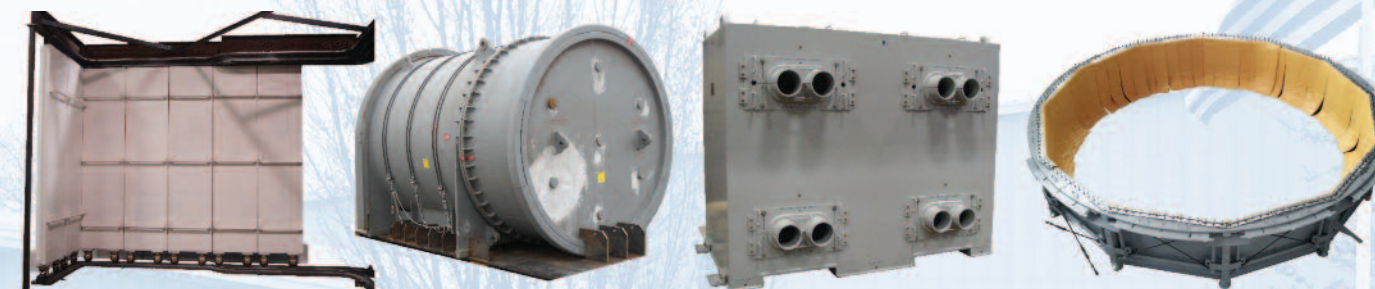
## VENTILATION

RPS produces a high quality line of portable High Efficiency Particulate Air (HEPA) purification and filtration units. These range in size from portable units with a capacity of 125 CFM to large temporary and permanent units with capacities of up to 26,000 CFM. A complete line of accessories including filters, charcoal adsorbers, flexible duct, connectors, stainless steel couplings and adapters are also offered. RPS carries a JIT inventory of ~\$1,000,000 for the convenience of our customers.



## SHIELDING

Broad experience has made RPS the leader in ionizing radiation shielding services. Our engineering staff has more than 100 years of experience in custom design of shielding through the application of Pb, steel, water, borated poly and ceramic (non-metal) based technology.



## CONTAINMENT

RPS manufactures backdraft hoods, Perma-Con® modular panel enclosures, gloved enclosures, ventilated workstations, isolation chambers, and other customized products which may be used to contain nuclear, biological, or hazardous materials during work processes. These products prevent the spread of contaminants, protecting the operating personnel and the environment.



Please visit our website [www.radprosys.com](http://www.radprosys.com) for a more comprehensive listing of our products and services.

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24 Hour Emergency Hotline: 860.863.4545

## Post Fukushima: Major Improvement in Severe Accident Containment Integrity of Nuclear Power Plants

THE international nuclear industry and its regulators are working intensely on adapting safety specifications following the 2011 Fukushima meltdown in Japan. The post-accident analysis has shown clearly that higher specifications and safety margins for the containment and its core components are mandatory, especially with regard to severe accident containment integrity. Electrical Penetration Assemblies (EPAs) are critical safety components.

Here in the United States, the international technology firm SCHOTT is at the forefront of nuclear safety technology with glass-to-metal sealed EPAs that perform consistently beyond severe accident conditions throughout the lifetime of a reactor. SCHOTT's EPAs allow the safe conduction of electricity and data through the fire-protective, pressure-resistant and tightly-sealed containment walls of Nuclear Power Plants (NPPs).

In March 2014, the US Nuclear Regulatory Commission (NRC) issued an Information Notice warning about the potential for Teflon degradation in reactors, and as far back as 1982, research sponsored by the NRC confirmed that organic polymer seal degradation is a containment failure mode during reactor over-pressurization. These are well known problems in the industry, however, SCHOTT glass-to-metal EPAs do not degrade over time in reactor containments.

SCHOTT's Eternaloc™ penetrations are sealed with glass, which allow them to survive significant accelerations and remain resistant to temperature, radiation and aging for periods much longer than the 60 year design lifetimes of the latest NPPs. Today, over 10,000 SCHOTT EPAs are installed in more than 50 NPPs and nuclear submarines worldwide, and they have remained maintenance-free since the early 1960s. After an extensive analysis of the Fukushima accident, results showed that extreme temperature and pressure levels overstressed the epoxy seals of the electrical penetrations at the plant, which is suspected to have led to the leakage of explosive hydrogen, according to TEPCO.

Current moves to increase global nuclear safety standards post-Fukushima aim to avoid another Fukushima-type accident where reactor penetrations were shown to be a weakness in containment.

SCHOTT North American Director Joe Hale said: "It is clear that the regulatory organizations are evaluating and raising stan-

dards for reactor penetrations as a result of the Fukushima incident. SCHOTT EPAs exceed severe accident conditions and are therefore the best product to use." "We do not want reactor penetrations to be the weak link in containment safety," said Hale. "We want these components to exceed severe accident conditions not just today, but decades after the reactor is operational. It is therefore essential that non-aging glass-to-metal seals are used as they do not degrade like organic compounds or Teflon, and will perform consistently after being subjected to a reactor lifetime of pressure, radiation, heat and severe accident conditions."

Recently, Hale participated in a panel with representatives of the NRC, the Institute of Electrical and Electronic Engineers (IEEE), and the American Society of Mechanical Engineers – key bodies which set and regulate nuclear standards - at the American Nuclear Society's (ANS) Annual Meeting in Reno, NV. During the panel session he explained why SCHOTT EPAs are critical safety components and exceed current high safety standards, as well as severe accident conditions.



Hale presented why SCHOTT's glass-to-metal sealing technology is the best technology for nuclear penetrations worldwide: "The reliability of our EPAs is far superior, and their non-aging properties make them a better component than one using epoxy or Teflon seals."

Furthermore, Hale pointed out that SCHOTT's Eternaloc™ penetrations are ideal for Generation 3+, Generation 4, and Small Modular Reactors, commenting: "Our EPAs perform well in high-pressure, high-temperature applications, where they maintain their integrity and do not age over the lifetime of the reactor." SCHOTT's glass-to-metal EPAs have been subject to stringent testing at Wyle Laboratories in Huntsville, Alabama in 2012.

The EPAs passed an extensive qualification test program per IEEE Standards 317 and 344, including full survivability in conditions analogous to an earthquake reaching a magnitude of 12 on the Richter Scale. The seismic test program exceeded the seismic Westinghouse AP1000 test plan 60-year qualification of EPAs by at least 400% for vertical seismic requirements and 575% for horizontal requirements.

The LOCA qualification test consisted of a 7-day LOCA simulation with chemical spray and temperature up to 232 degrees Celsius and pressure of 65psig. The severe accident test consisted of a series of high-pressure leakage tests up to 300psig, which is five times higher than what is required for generation 3+ nuclear power plants (60psig).

SCHOTT EPAs performed well throughout the seismic test program and qualify for IEEE 344-1987, IEEE 344-2004, and the seismic portion of IEEE 317-1983 (R2003). The performance range of these EPAs is significant, having also withstood over 400 bar and 400 degrees Celsius in previous tests.

SCHOTT recently developed a new type of EPA for Vattenfall's Forsmark 3 nuclear reactor in Sweden because the operator had defined new, modified safety scenarios. The EPAs were designed to withstand submerged conditions under 13 meters of water for at least 30 days, together with pressures of up to 8.3 bar, and temperatures up to 185 degrees Celsius. In addition, the radiological exposure of the EPA during a severe accident scenario had to reach 1.87MGy at a dose rate of 2360Gy/h. The use of inorganic sealing material like SCHOTT glass for the pressure boundary of the EPA minimizes the effect of high radiological exposures.

SCHOTT EPAs excelled in performance for this important European project. As a result, the EPAs are in the prime position to be used in new US reactors with the high safety standards expected in these new builds.

SCHOTT's Business Unit Electronic Packaging is a worldwide leading supplier of hermetic feedthroughs and terminal headers for harsh environment applications that require the highest level of safety and reliability, i.e. EPAs for nuclear power plants.

For more information:

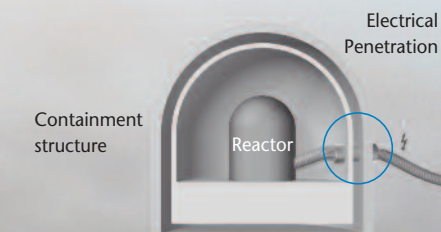
[www.us.schott.com/nuclear-safety](http://www.us.schott.com/nuclear-safety)

## The safety of the nuclear containment is only as strong as its smallest elements.

Because even small components have a big impact on the overall safety. Glass-to-metal sealed penetrations from SCHOTT are key for improved severe accident containment integrity.

**SCHOTT Eternaloc™: Small component – Big impact**

[www.us.schott.com/nuclear-safety](http://www.us.schott.com/nuclear-safety)



Electronic Packaging  
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Fax +1 508 765 7410  
[epackaging@us.schott.com](mailto:epackaging@us.schott.com)

**SCHOTT**  
glass made of ideas

# Nuclear Programs Fuel Major Tool & Machine's Growth

## Our Present...

Since 1946, Major Tool & Machine, Inc. has been providing engineering, fabrication, machining, assembly and testing services for critical application environments. Our customer-focused philosophy, coupled with continuous reinvestment in our capabilities, facilities and employees, has enabled us to evolve with and respond to the needs of our customers. Major Tool's best value approach provides our customers with the highest quality, competitively priced build-to-print services available.

Major Tool provides unsurpassed levels of capability and quality assurance. Maintaining over 600,000 sq. ft. of environmentally controlled manufacturing space under roof, Major Tool offers extraordinary capacity. Our continuous reinvestment in capital equipment allows us to provide prototype through production forming, welding, machining, assembly and testing services to meet the wide range of application specific shape, size and

configuration hardware required by the nuclear industry.

Our ability to execute this full spectrum of manufacture has allowed Major Tool to successfully participate in many critical government, industry and academia sponsored fission and fusion programs.

Our extraordinary capability, capacity and experience are driven by our commitment to quality assurance. Major Tool maintains ASME N, NPT, N3, NS, U and U2 certifications. Our Quality Assurance System is audited to ASME NQA-1, and is NRC 10CFR50, 10CFR71 and 10CFR72 compliant.

## Your future...

It is bright on the nuclear energy horizon. Major Tool is committed to our future, your future, and the future of our generations by championing the growth of nuclear energy and the safe, successful remediation and disposal of radioactive waste.

We are well positioned to usher in the

next generation of nuclear science and technology, and we will continue to apply all our resources and knowledge to provide our customers the quality critical hardware necessary to meet tomorrow's demanding nuclear requirements.

Nuclear power plant upgrades, next generation power plants, naval nuclear, radwaste transportation and disposal casks, canisters and tooling, fuel fabrication, magnetic and inertial fusion, and government, industry and academia supported energy sciences initiatives are all areas where Major Tool applies our hardware manufacturing expertise.

We look forward to the bright future that nuclear energy provides us all.

*For more detailed information on Major Tool & Machine, visit our website at [www.majortool.com](http://www.majortool.com). To schedule a visit to our facilities, or to discuss your specific requirements, please contact Joel Manship, Director of Business Development, at (317) 917-2633, or by email at [jmanship@majortool.com](mailto:jmanship@majortool.com).*

## Over 600,000 square feet of world-class nuclear capabilities.

At MTM, we provide manufacturing solutions to nuclear fuel cycle challenges.

- Uranium enrichment
- Fuel fabrication
- Commercial nuclear power
- Naval nuclear power
- Next generation fission and fusion systems
- Nuclear materials transport and storage
- Reprocessing, reuse, and remediation

How can we help you?



MTM  
Nuclear

a division of Major Tool & Machine

*We know nuclear ... front to back.*

**MajorTool.com**  
[sales@majortool.com](mailto:sales@majortool.com)  
317.636.6433



MTM's Quality Assurance Program is compliant to NQA-1, 10CFR50 Appendix B, 10CFR71 Subpart H, 10CFR72 Subpart G



**MIRION**  
TECHNOLOGIES

Mirion Technologies Sensing and Imaging Systems Divisions, featuring IST™ branded products, are present in a majority of the worldwide power generation facilities.

Mirion Technologies offers products with a range of operational safety and non-safety radiation monitoring equipment such as its IST, IST-Rees, and IST-Conax Nuclear® brands.

**Sensing Systems Division**

The Sensing Systems Division, maker of the IST and IST-Conax range of products, provides the nuclear power industry with in-core and out-of-core detectors and electrical penetrations. In addition, Mirion manufactures the associated electronics, temperature sensors, thermocouples, special purpose valves, connectors, cable/connector assemblies and electrical conductor seal assemblies.

**Imaging Systems Division**


The Imaging Systems Division is a global provider of highly specialized closed circuit camera systems used for inspection and surveillance in difficult and hazardous environments, supplying cameras for all stages of the nuclear life cycle, from construction through operation, to decommissioning and waste management. Our products are used in nuclear power plants, nuclear reprocessing plants and waste management facilities. The IST-Rees™ product line also includes a wide range of accessories, such as lighting attachments and positioning devices, that allow operators to carry out a variety of monitoring and inspection tasks. From small, low-cost cameras to high performance viewing systems, the Imaging Systems Division provides an imaging solution for the nuclear market.

**Mirion Technologies**

For more than 50 years, our products and services have helped to ensure the safe and efficient operation of nuclear facilities. Our customers rely on our solutions to protect people, property and the environment from nuclear and radiological hazards. Mirion's strength stems from its five divisions: Sensing

Systems, Imaging Systems, Health Physics, Dosimetry Services and Radiation Monitoring Systems. Our products and services include: dosimeters; contamination & clearance monitors; detection & identification instruments; radiation monitoring systems; electrical

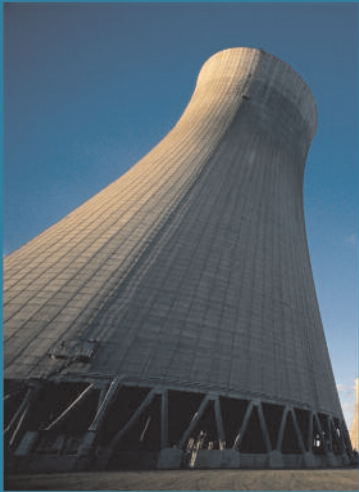
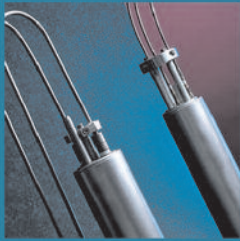
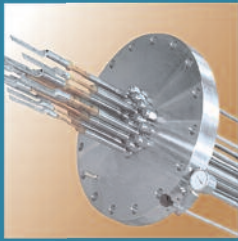





penetrations; instrumentation & control equipment and systems; dosimetry services; imaging systems; and related accessories, software and services. For more information about our products and services visit: [www.mirion.com](http://www.mirion.com).



**MIRION**  
TECHNOLOGIES


Sensing Systems Division  
Imaging Systems Division


Out-of-Core Detectors | In-Core Detectors  
Electrical Penetrations | CCTV Inspection and Surveillance Cameras & Systems











*Proven quality Solutions to meet your requirements.*

Featuring







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Horseheads, NY 14845 USA

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Fax: 607.562.4482

Email: [ist@mirion.com](mailto:ist@mirion.com)  
[www.mirion.com](http://www.mirion.com)



**The Best Camera for Many Applications.....  
The Only Camera for Some!**

Thermo Scientific – CIDTEC is the preeminent supplier of radiation hardened and high dynamic range scientific cameras incorporating proprietary Charge Injection Device (CID) technology for use in the most demanding imaging applications.



The Thermo Scientific **MegaRAD** series of cameras are capable of operating in high-dose radiation environments such as nuclear reactors, fuel inspection, hot cell monitoring, remediation, surveillance, and X-ray imaging applications.

These extremely resilient and compact video cameras are available in either monochrome or color formats with remote head cable lengths of up to 150-meters. Imagers are available in RS-170, progressive scan, and CCIR formats.

Thermo Scientific also offers intensified versions of the MegaRAD cameras for extremely low light level imaging, UV signal enhancement, and for the gating of high-speed events.

The **SpectraCAM** scientific camera series offers unprecedented dynamic range, exceeding 26-bits in some applications. These cameras exhibit low noise, excellent native UV responsivity, non-destructive readout capabilities, and user-programmable windowing capabilities. The Thermo Scientific RACID Exposure software supplies an intuitive interface to the SpectraCAM while providing the user with the desired data in a wide variety of formats at the touch of a button.

All of the Thermo Scientific CID based cameras offer unmatched anti-blooming, wide dynamic range, and UV sensitivity performance that has become synonymous with CID technology.

**Charge Injection Device**

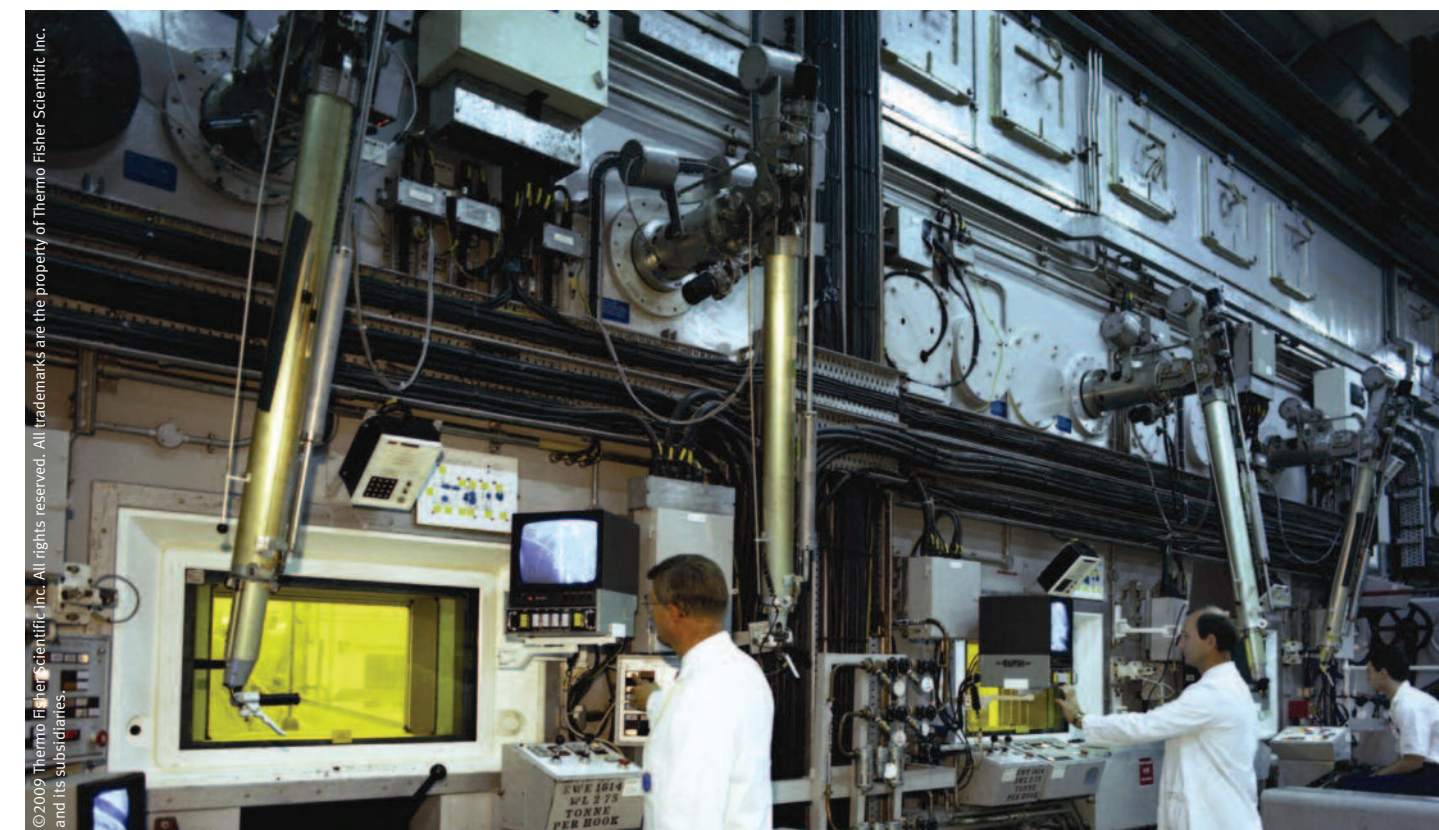
The Charge Injection Device (CID) is a solid-state imaging sensor with unique capabilities that make it well suited for applications where commercially available Charge Coupled Devices (CCDs) have difficulty. Like a CCD, the CID employs pixels to capture 2-D images, converting light into electronic charge, which is in turn displayed on a monitor or alternatively captured digitally on a computer. The CID architecture is designed to specifically be resistant to radiation damage, which is obviously a significant advantage for radiation tolerant and hardened imaging applications for the nuclear power, medical, dental, and aerospace industries. In addition, the inherent anti-blooming performance of the CID ensures accurate image detail even under extreme lighting conditions.

The CID is uniquely positioned to serve the growing imaging market and the challenges for higher levels of accuracy in the radiation tolerant inspection market, as well as machine vision, scientific imaging applications. Thermo Scientific - CIDTEC is the leading manufacturer of CMOS imagers using the CID pixel architecture, and Thermo Scientific provides imaging solutions to Original Equipment Manufacturers (OEMs) as well as directly to end-users throughout the world.

**Applications**

Thermo Scientific CID based video cameras and sensors provide solutions for the most demanding applications including:

- Radiation Hardened and Tolerant Video
- Spectroscopy
- UV Imaging
- Metrology
- Laser Profiling
- Medical Diagnostics
- Interferometry
- Aerospace
- Semiconductor Inspection
- Synchrotron Beam Profiling



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**Got Radiation?  
See what you've been missing**

The Thermo Scientific MegaRAD series of radiation hardened CID imaging cameras are capable of operating in high dose environments and provide excellent image quality to total dose levels over 100 times the tolerance of conventional solid state cameras.

- Color and Monochrome imaging to beyond 3 MegaRAD
- High resolution CID imager technology
- Small remote detachable head

Look closer at the Thermo Scientific line of radiation hardened cameras. Visit [www.thermo.com/cidtec](http://www.thermo.com/cidtec) or contact us today about new innovative imaging products.

Tel: 1-315-451-9410 • Email: [sales.cidtec@thermo.com](mailto:sales.cidtec@thermo.com)



**The world's only color rad hard camera**

Innovative Preamp per pixel CID design allows high radiation tolerance and excellent image quality even in low light conditions.

Part of Thermo Fisher Scientific



## Evolving to Serve You Better

We offer nuclear power customers a broad spectrum of high-level application solutions from a single point of contact. We work to bring superior products, services and the expertise you require. Choose from a variety of instrumentation, sold under the Thermo Scientific brand, to optimize your process.

Our products and services help power producers satisfy regulatory and safety requirements. They help customers achieve maximum efficiency and profitability to meet demand while generating low cost, clean and reliable power. Our integrated solutions assist you in exceeding customers' demands while delivering peace of mind.

Integrate Thermo Scientific products throughout your power process (see Fig. 1). Look to one company that can offer you solutions with a depth of products to fit your application and your environment throughout your operations.

Want to learn how Thermo Scientific products can benefit you and your plant?

**Contact us at:**  
+1 (800) 488-4399  
ussdi.customersupport@thermofisher.com

**Visit us at:**  
www.thermoscientific.com/nuclear

- Neutron Flux Monitoring
- Data Acquisition and Monitoring
- Level and Density Measurement
- Custom Radiation Shielding
- Industrial Hygiene
- Radiation Measurement & Protection
- Water Analysis
- Laboratory Informatics
- Radiation Tolerant Imaging (Inspection and Monitoring)
- Service and Training

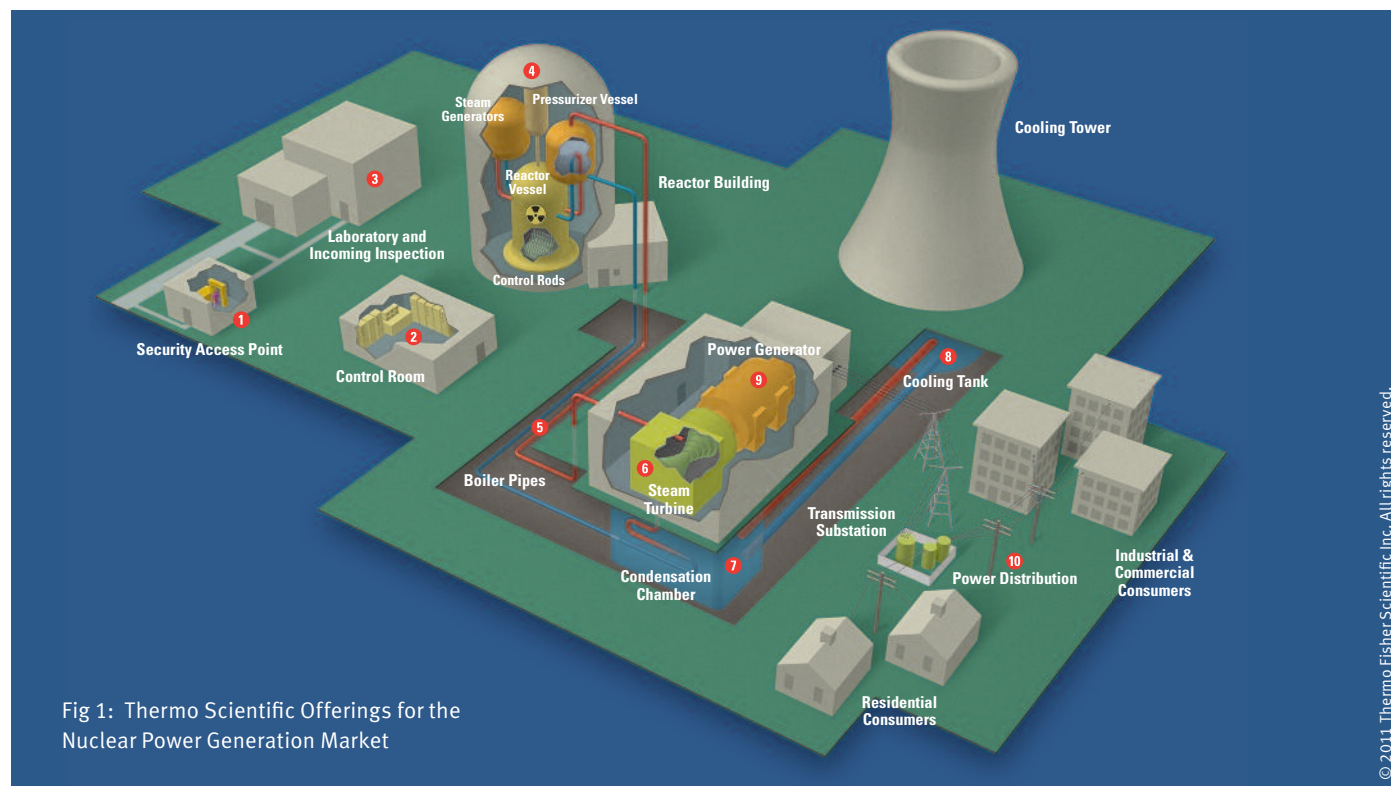


Fig 1: Thermo Scientific Offerings for the Nuclear Power Generation Market

### Thermo Scientific Products in Nuclear Power Generation

#### 1 Security Access Point

- Radiation measurement and protection monitoring

#### 2 Control Room

- Radiation measurement and protection monitoring
- Data acquisition, monitoring and management
- Alarm monitoring
- Neutron flux monitoring
- Reactor protection systems
- Audible count rate drawers
- Boron dilution monitoring
- Thermal margin monitoring
- Class IE qualified safety-related cabinets
- Class IE qualified power supplies
- LCD digital meters

#### 3 Laboratory and Incoming Inspection

- Radiation measurement and protection monitoring
- Data acquisition, monitoring and management
- Weld and alloy verification
- Informatics

#### 4 Reactor Building

- Radiation measurement and protection monitoring
- Data acquisition, monitoring and management
- Level measurement
- Radiation hardened solid-state camera (black/white or color)
- Ex-core neutron flux detectors for source range, intermediate range and power range reactor power monitoring
- Class IE safety-related post-accident qualified cable assemblies
- Audible count rate during shutdown maintenance periods
- Installed gamma area monitors
- Boric acid storage monitoring
- Water analysis monitoring

#### 5 Boiler Pipes

- Cooling water and condensate flow measurement

#### 6 Steam Turbine

- Radiation measurement and protection monitoring
- Data acquisition, monitoring and management

#### 7 Condensation Chamber

- Data acquisition, monitoring and management
- Level measurement

#### 8 Cooling Tank, Cooling Tower and Reservoir

- Data acquisition, monitoring and management
- Influent and discharge flow measurement
- Density and level measurement
- On-line water analysis

#### 9 Power Generator

- Data acquisition, monitoring and management

#### 10 Power Distribution

- Data acquisition, monitoring and management

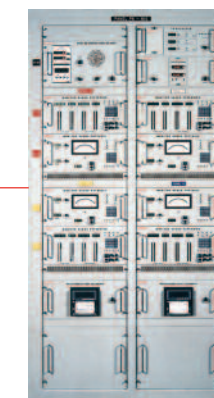
**Thermo**  
SCIENTIFIC

## The power of one

Why have more than 150 nuclear reactors in 16 countries replaced their aging, obsolete instrumentation systems with Thermo Scientific Nuclear Instrumentation Systems? Because this innovative solution is far more reliable and less costly than any other technology available. Our NIS uses a single-fission chamber-based detector assembly to provide four separate applications in one powerful system – Source Range, Intermediate Range, Power Range, and Post-Accident Monitoring. It has a proven 40-year qualified life, eliminating the need to periodically replace shorter-lived detector assemblies. Plus, it has demonstrated high immunity to electromagnetic interference and noise, meeting stringent RG 1.180 requirements. Which explains why it's quietly revolutionizing nuclear instrumentation and being supplied to new nuclear power plants under construction in three countries.

## the work of four

- Learn more at [thermoscientific.com/nuclear](http://thermoscientific.com/nuclear) or call +1 (800) 488-4399 or +1 (858) 450-9811.



Thermo Scientific Nuclear Instrumentation System integrates four essential applications in one detector assembly.





## Quest Integrity Group Inspects Buried and Inaccessible Piping in Nuclear Plants

Quest Integrity Group is a global leader in the development and delivery of asset integrity management and asset reliability solutions for the power, refining and chemical, pipeline and syngas industries.

The nuclear industry focus is on inspection and assessment of

buried or inaccessible piping utilizing HYDRA™, an ultrasonic-based intelligent pigging technology.

HYDRA addresses the nuclear industry initiative on buried piping integrity and satisfies NEI 09-14 inspection requirements.

The tool is compact and lightweight making it easily transported into and around a plant, and since the tool is bi-directional, only one launch location is required. HYDRA navigates complex piping circuits, providing 100% inspection coverage of the interior and exterior surfaces.

The tool detects and records wall loss damage such as pitting, corrosion or erosion, and deformations such as denting, ovality, swelling or bulging with superior accuracy. In addition to providing high quality inspection data, Quest Integrity can also conduct a full fitness-for-service evaluation per ASME FFS-1 using its proprietary LifeQuest™ Fitness-for-Service software.



**Ensure your buried piping integrity.**

In today's operating environment, it's more important than ever to satisfy NEI 09-14 inspection requirements for your buried and underground piping systems.

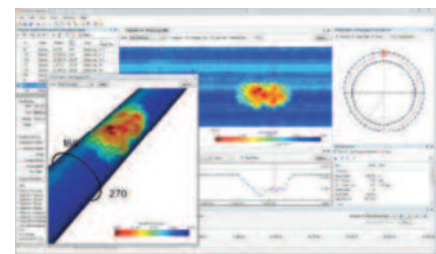
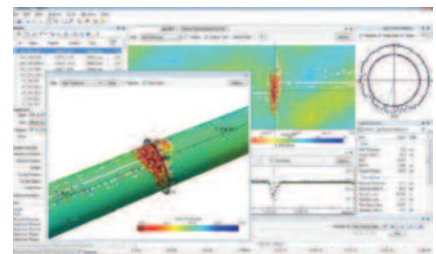
Quest Integrity offers a comprehensive solution that ensures 100% inspection coverage of your buried piping using HYDRA™, our proprietary, ultrasonic-based intelligent pigging technology.

Pipes are inspected for defects and degradation including:

- Pitting (interior or exterior of pipe)
- Corrosion (interior or exterior of pipe)
- Corrosion under insulation (CUI)
- Flow-accelerated corrosion (FAC)
- General wall thinning
- Denting or ovality
- Bulging or swelling

Ensure your buried piping integrity to NEI 09-14 inspection requirements.

[www.QuestIntegrity.com/nn](http://www.QuestIntegrity.com/nn)  
+1 253 893 7070



HYDRA is a cost-effective in-line inspection solution for buried or inaccessible piping. The inspection results are generated and provided to the client within hours, enabling nuclear plant managers to ensure piping integrity, minimize operational and safety risk and comply with industry initiatives for inspection.

Additional information and animation can be viewed at:  
[www.QuestIntegrity.com/HYDRA](http://www.QuestIntegrity.com/HYDRA)  
+1 253 893 7070

# Candu Energy Pump Seals for LWRs: increased operational safety, performance & reliability

For years, Candu Energy experts have designed and fabricated specialized mechanical pump seals for CANDU reactors on four continents. We have taken that experience and tailored our design to meet light water reactor (LWR) design requirements, with installations in nuclear stations around the world.

Along with our full suite of engineering and field services solutions, Candu Energy specialty pump seals have unmatched service life. Our customers have confidently replaced their original pump seals with our top-performing designs to increase operational safety, performance and reliability.

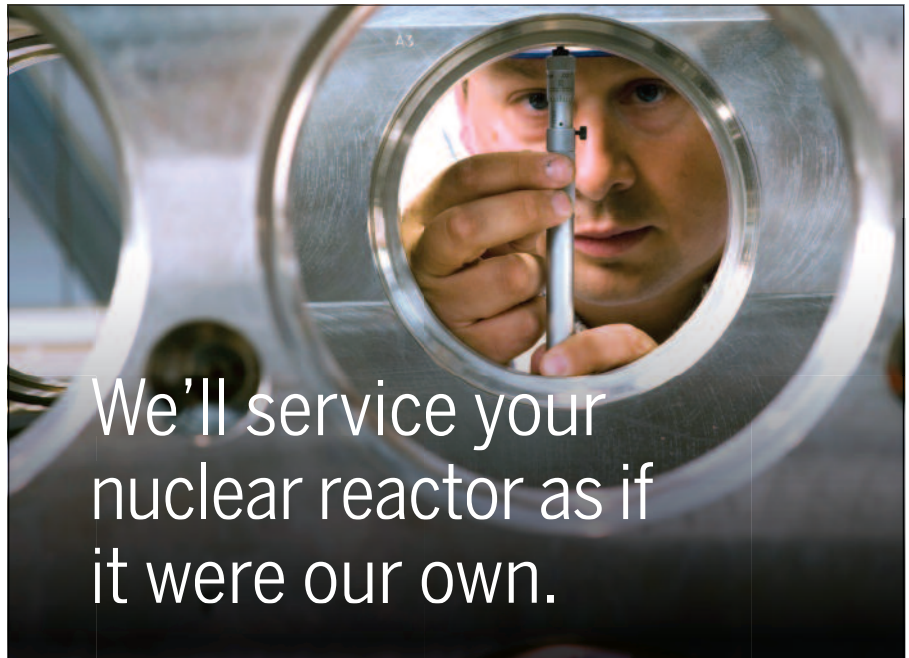
Our precision-engineered, application-specific pump seals use specialty materials and unique high-temperature-resistant elastomers to significantly exceed original seal manufacturers' performance specifications. For each installation, our experts visit customer sites to ensure pump seals are custom-designed to match exacting specifications. Candu Energy pump seals operate reliably for numerous fuel cycles, resulting in reduced maintenance costs as well as reduced radiation exposure to maintenance personnel.

All of our four basic designs can be customized to meet rigorous standards for each reactor. Candu Energy pump seals are a proven success in the field; they are significantly more reliable and durable than others offered in the market.

All our pump seals come with comprehensive operating and maintenance documentation, and training programs for plant staff. Highly experienced technicians provide on-site service support including flatness measurement and

lapping; refurbishment and assembly of pump seals and seal cartridges; and operation of pump seal maintenance equipment.

For more information, visit [www.candu.com](http://www.candu.com) or email [info@candu.com](mailto:info@candu.com)



## We'll service your nuclear reactor as if it were our own.

Our history of developing and designing reactors to produce safe nuclear energy dates back over 50 years. With such breadth of experience comes a level of expertise that proves invaluable in servicing both heavy and light water reactors.

Candu Energy is a choice that makes sense, from a reliability, innovation and business standpoint.

In our capacity as an original equipment manufacturer and through our affiliation with AECL, we offer a full suite of engineering and field services solutions that meet the highest safety and regulatory standards.

Look to Candu Energy for both heavy and light water plant management programs, life extension projects, as well as a full range of operational and maintenance services.

We design and build nuclear reactors. It just makes sense that we're the best choice to service and maintain them.

[www.candu.com](http://www.candu.com)

**Candu**   
Powering prosperity.

## Doosan HF Controls leads the way in responsive I&C solutions to US and International plants.

Doosan HF Controls headquartered in the Carrollton, Texas USA is an I&C solution provider that has supplied and serviced Instrumentation and Control (I&C) systems to American and international clients for over 50 years across the fossil and nuclear markets. Doosan HF Controls has become a major nuclear supplier as it expands its business portfolio.

For example, Doosan HF controls has become the major supplier of nuclear I&C to the Korean nuclear program, supplying nearly 90% of I&C for Korean Hydro and Nuclear Power company's most recent new build programs. Our mid-sized company is a huge plus when your plant needs experienced, responsive solutions and service. Our quick response times allow us to assess your needs and recommend build and install I&C solutions. Our experienced field service team and extensive training capabilities will assure a successful installation with committed robust long-term technical support.

### NRC Approved Plant Controls

Doosan HFC achieved an important milestone when the U.S. Nuclear Regulatory Commission (NRC) approved the Doosan HF Controls **HFC-6000** product line for safety applications in early 2011. This accomplishment provides potential customers with the highest level of confidence in the licensability and success of upgrade projects. Our company maintains a 10CFR50 Appendix B quality assurance program, so you can rest assured that our systems meet or exceed NRC standards.

This NRC approval of the **HFC-6000** system gives mature plants a new path towards safe operation with modern controls, providing American and international companies with clean, reliable electricity into the future. We also received approval from the Korean nuclear authority, KINS, as further confidence in the nuclear integrity of our platform. Outside of the nuclear market, **HFC-6000** Safety Control System is qualified for mission critical or safety control systems, such as in utilities, petrochemical and pulp and paper mill industries. We have a Triple Modular Redundant (TMR) version of **HFC-6000** having SIL 3 certification from TUV Rheinland and SIL 2 certification for Double Modular Redundant (DMR). These approvals give Doosan HF Controls the flexibility to address your diverse I&C solution needs.

### FPGA Integration

As I&C technology evolves, HFC continues to move its platform forward. FPGA Safety applications are being integrated into our newest technology. FPGA technology is already used in most of our current modules and we continue to expand its use where it makes sense. Such an approach in our field proven system, with the flexibility and scalability your systems demand, makes HFC a good choice for fault tolerant, state of the art class 1E safety grade systems which are back fit capable or available for new system installs.

### Nuclear Systems Deployment

With over five decades of innovation and manufacturing of control systems in hundreds of installations around the world, gives us the expertise in the deployment of Plant I&C (both for nuclear safety and non-safety systems). Our current **HFC-6000** platform is a flexible and modular design that allows it to be utilized for a variety of nuclear plant I&C solutions. Some of our current products are:

- Reactor protection system (reactor trip and ESFAS)
- Emergency diesel generator load shedding and sequencing
- Qualified display and processing systems or post-TMI control room applications, such as ICCMS
- Safety-grade Sequence of Events (SOE)
- Plant-wide control systems
- Automatic seismic reactor trip systems
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## After the Fission Stops – Planning for Nuclear Power Decommissioning

By Guy Winebrenner

2013 marked a significant change in the US commercial nuclear power industry, as decisions were made to shut down five operating reactors at four sites. In addition, the Oyster Creek plant is scheduled to shut down in 2019, and several other reactors are in jeopardy of closure for economic reasons. These decisions are taking place at a time when the industry and the Nuclear Regulatory Commission have been focusing on license extensions for operating plants rather than planning for plant decommissioning.

Before the decommissioning process begins, it is essential to decide the end-state for the site and determine the schedule for decommissioning. To date, many of the reactors that have been closed have been placed in SAFSTOR status, allowing the decommissioning process to take place over a thirty-year period. Lately, however, local and state political entities, along with non-governmental organizations (NGOs), have pressured nuclear plant owners to accelerate the decommissioning process to restore sites for other uses, sooner rather than later.

Many stakeholders are involved in the decommissioning process. Political entities tend to focus on the ultimate use of the site and the potential for job creation. Sites in desirable locations, such as on the Pacific coast or on Lake Michigan, are sought after by governmental entities for public use. Environmental NGOs and regulators are concerned with the radiological and environmental cleanup of the site, and the restoration of the site to conditions that are consistent with the post-decommissioning use of the site, as well as the character of surrounding properties. The NRC is focused upon the decontamination of the site and the proper disposal of irradiated plant materials. In order to gain the necessary regulatory approvals, the concerns of each of these stakeholders must be taken into consideration when planning for the decommissioning of the plant.

Regardless of the overall decommissioning plan, one of the first steps involves removal of spent fuel from the reactor for cooling and then storage. Where there is not already an independent spent fuel storage installation (ISFSI) at the site, one will need to be built to

accommodate fuel from the fuel storage pool after it has cooled adequately to be transferred to dry cask storage. Since the design, licensing and construction of an ISFSI takes several years, the planning for fuel storage must begin early in the decommissioning planning process. An alternative is to move the partially cooled fuel to an off-site ISFSI at a secure location, such as another nuclear power plant site. This will continue to be an issue until the DOE develops its statutory-mandated site for long-term fuel storage.

Although the NRC, through its Office of Federal and State Materials and Environmental Management Programs, has primacy on the approval of decommissioning plans, the requirements of other federal, state and local agencies must be considered when developing a comprehensive closure plan. Consequently, it is important to engage a consultant with experience in dealing with all of these agencies early in the planning process.

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Few, if any, scientific arenas have seen the proliferation of man's knowledge and innovation as has the world of radiation. In little more than 100 years, mankind has learned ever more about radioactive energies since its discovery in the late 1890's. In the early part of the 20th century man's focus was centered around the atomic bomb and its immense capability for destruction. By 1945 scientific efforts were focused on propulsion and the large scale generation of electricity. In the USA, Westinghouse designed the first fully commercial Pressurised Water Reactor (PWR) of 250 MWe, Yankee Rowe, which started up in 1960.

During these early days of man's relationship with radiation a young student named Don Ludlum was at Kansas State University, learning to become an electrical engineer. After graduating KSU in the early 1950's Don Ludlum went to work in the radiological industry. In only five years, Mr. Ludlum had earned the position of Chief Engineer at the Eberline Company.

In 1961 Don Ludlum set out to begin his own radiological company, based on the principles of trust and customer care.

Mr. Ludlum incorporated Ludlum Measurements in 1962 understanding that it's better to have ten small contracts rather than one large one.

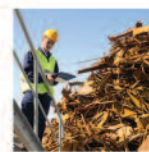
Don Ludlum is still president of Ludlum Measurements, Inc., now a global radiation detection company located in Sweetwater, Texas. Ludlum Measurements, Inc., employs more than 500 people worldwide and has grown to become one of the leading suppliers of such equipment in the U.S. with exports reaching throughout the world.

***“It's better to have ten small contracts rather than one large one.”***

Ludlum Measurements, Inc., maintains its dedication to customer care. Regardless of name or size, Ludlum Measurements, Inc., lives up to the promise to do everything possible to provide and assist its customers with the very best customized radiation detection and measurement solution for whatever their needs may be.

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for any and all industries that make use of radioactive isotopes. With a thorough understanding of operational mandates and regulations, Ludlum Measurements, Inc., works diligently to help companies



satisfy their respective rules and safety practices. Ludlum Measurements, Inc., continues to design and manufacture innovative instrumentation for ind-

ustries as diverse as scrap metals recycling to health and medical physics.

Science and technology will continue to push man's progress into the future. As we grow the industries that improve



our lives, Ludlum Measurements, Inc., will continue to meet the need for detection and measurement of the radiation we use every day.



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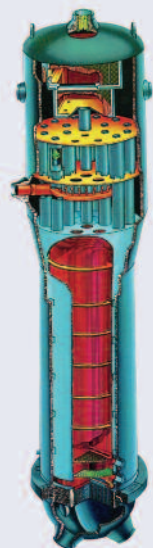


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Rolls-Royce inspection personnel perform nearly 200 steam generator inspections for the nuclear power generation industry on a yearly basis. Our unique capabilities, knowledge of power generation systems and experience performing specialty inspections are utilized at facilities around the world to provide customers critical information about plant health and operation.

### Foreign Object Quick Facts

**821** - Average number of foreign objects found in steam generator internals per year.

**78%** of all objects found are metal in composition.

Metallic object makeup:  
 49% - Wire  
 20% - Gasket  
 18% - Machining Remnant  
 13% - Misc. Metal Objects

## RE-DEFINING STEAM GENERATOR INSPECTION

Foreign Objects Search and Retrieval (FOSAR) is used by the global nuclear industry to ensure safe, reliable and predictable energy generation. Foreign objects in the steam generator of a pressurised water reactor can lead to primary and secondary side contamination leaks; increased radiation exposure, forced outages and ultimately decreased plant availability.

Reduced radiation exposure to plant personnel is of paramount importance and continues to drive the development of customised, advanced technical solutions for the inspection of steam generators around the world.

In 2012, Rolls-Royce was asked by a customer to develop remote in-bundle inspection capabilities that would not only enhance inspection quality and further reduce potential equipment damage; but most importantly would minimise the radiological hazards for inspection personnel posed by manual inspection techniques.

#### Project requirements included:

- The delivery of remote inspection capabilities to minimise exposure reduction when compared to typical manual inspection techniques
- The provision of the same high quality inspection images as the currently accepted industry standard
- The ability to inspect square pitched steam generator

Through technical innovation, and drawing from proven industry experience in the development and delivery of bespoke inspection and retrieval technology for areas with limited access and complex geometries, Rolls-Royce developed the REPTIL remote in-bundle inspection system.

Based on existing Rolls-Royce manual In-bundle inspection technology, the development of REPTIL focused on the automation of the following three inspection attributes:

- **Probe translation** – A robust cog assembly utilises integrated rivets on the ultra slim (2.4mm wide) Brooks In-bundle Camera System (BICS) for probe deployment and retraction; removing technicians from the inspection platform for a large majority of the inspection, maximising ALARA/ALARP techniques to reduce technician radiation exposure by up to 80% when compared to manual inspection techniques.
- **Guidetube Translation** – the BICS probe is automatically fed into new guidetube sections for increased inspection range within the steam generator; eliminating the risk of foreign object intrusion associated with manual techniques.
- **In-bundle Rotation** - Remotely operated in-bundle rotation capabilities allow for smoother inspection data collection, providing more reliable high quality data for review by subject matter experts.

These unique remote capabilities have enabled the majority of steam generator in-bundle inspections to be completed from a low dose area or outside of the containment building entirely, significantly reducing radiation exposure for plant personnel.

The REPTIL system has been successfully deployed in over 16 steam generators in France since its inception into the market in 2013.

2014 will mark a milestone for both Rolls-Royce and the US nuclear industry when the system is deployed in the US for the first time during the autumn outage season.



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Our line of specialized industrial services includes bolting/torquing, concrete repair, emissions control, exchanger services, field machining, fitness for service, heat treating, hot tap/line stop, isolation test plugs, leak repair, manufacturing/engineering, mechanical integrity, NDE/NDT inspection, specialty welding, turnkey tank program, valve insertion, and valve repair.

We employ only the best, most qualified technicians to ensure each and every job is completed to the highest standards every time. Our quality management system requires ongoing technical training for all personnel. Additional training and documentation are required based on specific technical job requirements.

In addition to our services, Team's ISO-certified engineering design and manufacturing facilities provide

the highest quality pipe repair, leak sealing and hot tapping hardware, sealants and related products. A company-wide commitment to quality control, safety and quick response drives the manufacturing of all Team products 24/7/365.

In our 40 years of experience in inspection, maintenance, repair, and compliance, we've come across a variety of unique business and industry challenges. We provided solutions for each of these challenges, which we then utilized to better our team, better our services and better our processes. Whether our customers are working on a capital expansion project in a nuclear power plant, planned maintenance in a paper mill, emergency repair to a mining massive loader assembly, or a scheduled turnaround in a refinery, more than likely one of our technicians has performed similar work in a similar situation.

Our customers have grown to count on Team when the going gets tough. However, we approach any project, big or small, with the same intensity to ensure each job is completed safely and to the highest standards every time. That is why HSE&S and quality are the core driving forces

behind everything we do at Team. We maintain management systems and documented work procedures designed to assure compliance with all applicable laws, regulations and internal requirements, as well as to facilitate the continuous improvement of our processes, products, and personnel. Our highest priority at Team is the safety of our employees, clients, and other contractors. We are committed to safety excellence and strive daily for Zero injuries and incidents.

Today, we are rapidly growing our global footprint across a wide range of industries - with service locations in five continents. We recognize that our global success is ultimately measured by our customers' trust and confidence, which can only be earned through continuing outstanding service. Team's trained and certified technicians are available worldwide 24/7/365. From single part repair to turnarounds and shutdowns - planned or unplanned - Team has the training, experience, technology and know-how to deliver high-quality maintenance, inspection, and testing services anytime, anywhere.



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## WORTHINGTON ACQUISITION OF WESTERMAN STRENGTHENS U.S. MANUFACTURING OF UF6 CYLINDERS

**Worthington Industries, a diversified metal processing company and manufacturer of tanks and cylinders, announced in 2012 it acquired Westerman Companies. The acquisition adds to Worthington's footprint in the energy industry and supports growth for the company's offering of UF6 cylinders and other nuclear power plant component products.**

### ABOUT WORTHINGTON

Worthington Industries was founded by John H. McConnell, a young steel salesman, who saw an opportunity for custom processed steel. He purchased his first load of steel by borrowing \$600 against his 1952 Oldsmobile and founded Worthington Industries in 1955.

Following several years of growth in steel processing, Worthington purchased a small cylinder facility in 1971, which formed the cornerstone of what is today Worthington Cylinders, a global manufacturer of pressure vessels and related products. Led since 1996 by John P. McConnell, the founder's son, Worthington Industries leads the diversified metal processing industry with a focus on the Golden Rule, valued employees, stability and innovation. The company's strategic growth plan has resulted in 12 acquisitions in the last three years, several of which are rooted in Worthington's expertise of manufacturing

cylinders and tanks for highly regulated markets.

### SUPPORTING ENERGY MARKETS: WESTERMAN NUCLEAR

Worthington expanded its energy portfolio by acquiring **Westerman Companies** in September 2012, adding to Worthington's capabilities and experience of the oil & gas and nuclear sectors. One of the divisions acquired was **Westerman Nuclear**, the world's largest producer of enriched uranium hexafluoride (UF6) storage and transportation cylinders for the nuclear industry, and the only manufacturer in North America.

Westerman was founded in 1909 and has manufactured products for the nuclear market since 1986. In addition to serving nuclear markets, Westerman carries the distinction of being the oldest continuous manufacturer of oil and gas wellhead equipment in the Appalachian region, offering planning, design engineering and

precision manufacturing to both oil & gas and nuclear markets.

### STRENGTH IN MANUFACTURING SYNERGIES

The acquisition adds to Worthington's footprint in the energy industry, and supports growth for the company's offering of UF6 cylinders and other nuclear power plant products. Worthington seeks to strengthen U.S. manufacturing of UF6 cylinders, and will complement Westerman's proud tradition of supporting U.S. private and public sector needs, including Westerman's historic role in manufacturing the UF6 cylinders used in the Megatons to Megawatts program. Combined with the heritage of Westerman Companies, Worthington is proud to serve the nuclear industry, supporting the nuclear fuel cycle with enriched uranium storage & transportation cylinders, radioactive waste containers and custom power plant components. For more information, call 1.800.338.8265.



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	NA, N, N3, NS NPT, PP, U	ISO 9001:2008, NQA-1 10 CFR 50 APPENDIX B ASME SECTION III & VIII	
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All nuclear certifications are currently held with Westerman Inc.

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Fairbanks Morse Engine designs, manufactures and tests medium speed diesel engine generator sets to comply with Nuclear Regulatory Commission (NRC) requirements. Emergency Diesel Generator (EDG) sets supply electrical power to safely shut down the nuclear reactor in the event of a loss of normal offsite power, coolant accident or other operational anomaly. Typically installed in groups of two or more for redundancy purposes, the EDGs are designed utilizing the same stringent requirements as all other safety systems inside the plant.

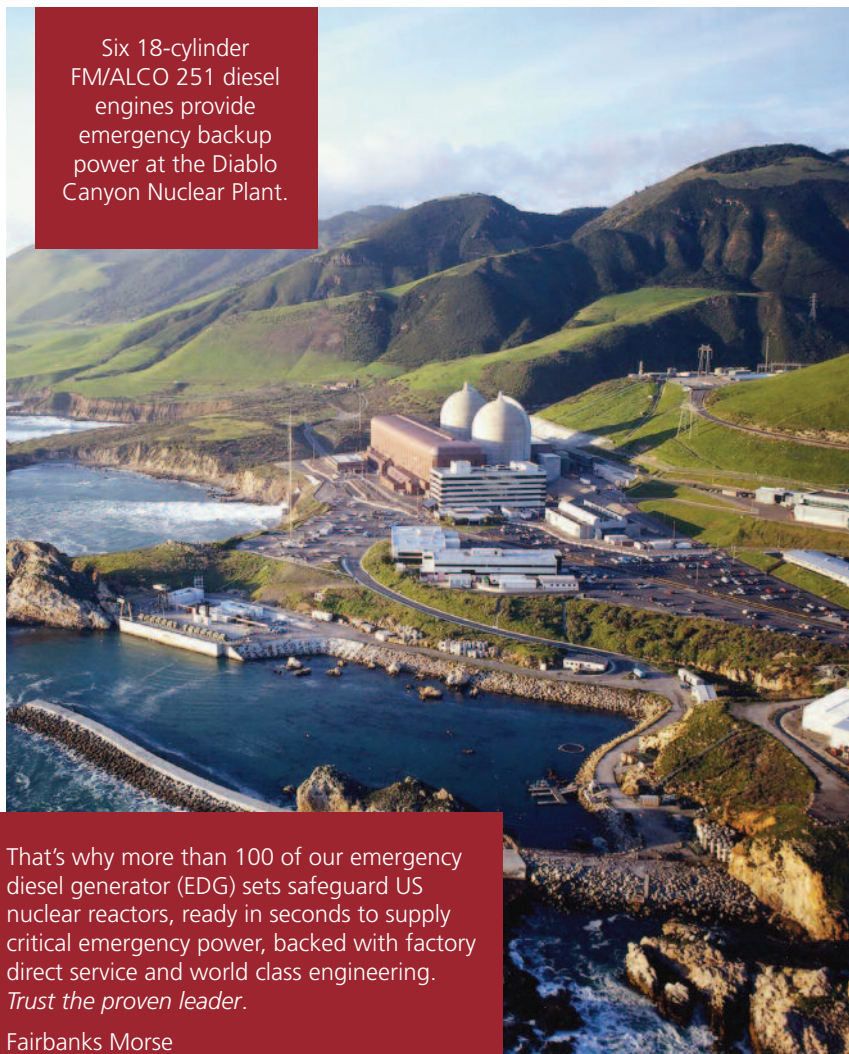
Nuclear power plants are designed to shut down safely in response to electrical grid disturbances by using power generated on-site by the EDG.

However, an extra level of redundancy is required in the event that the EDG set cannot generate sufficient power to maintain safe conditions. A completely separate station blackout (SBO) diesel generator set provides this necessary power until safe operating conditions are restored.

Fairbanks Morse Engine maintains a commercial-grade nuclear dedication program, approved by the Nuclear Utility Procurement Issues Committee (NUPIC), and also satisfies the requirements of 10CFR50 Appendix B and 10CFR21.

### Our EDGs are proven in places where normal is anything but

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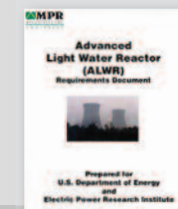


1964

Harry Mandil, Bob Panoff, and Ted Rockwell leave Admiral Rickover's Naval Reactors to start MPR.



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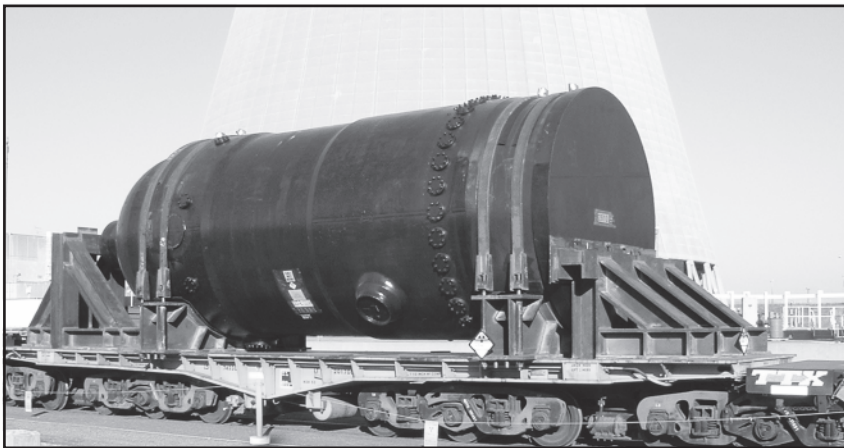
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Since its establishment in 1964, MPR has focused on delivering excellence and value to nuclear industry clients. Five decades later, MPR has remained true to its core values, providing solutions to overcome challenges that have a lasting impact on our clients' success.

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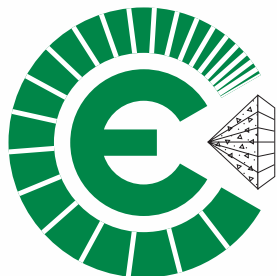
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## Our Nuclear Commitment

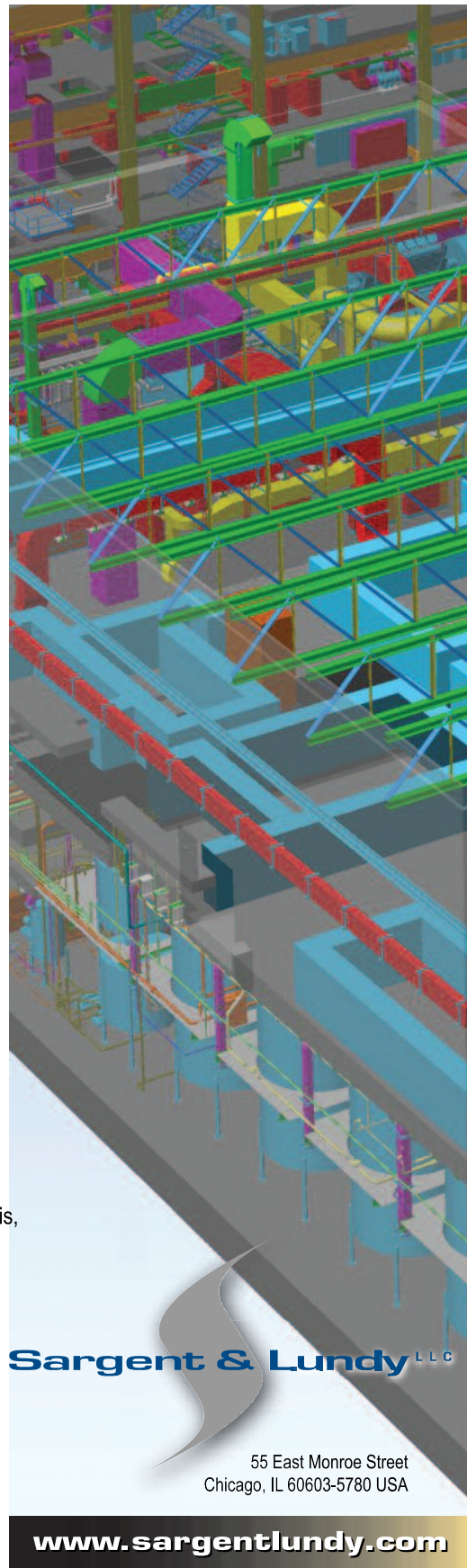
Nuclear power clients have been a primary part of our power focus since 1954, pretty much when it all started. Nuclear clients have good reason to have confidence in our capabilities, not only from our quality, expertise, and focus, but also from knowing we will be here for them when needed with what they need, as we have been for 60 years. Owners enlist our broad support as their preferred engineer and rely on our expertise for specialized problem-solving. Our ongoing and recent activities encompass emerging issues, leading edge initiatives, and nuclear plant design and licensing activities such as:

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## Pathway to Success: How Project Management Can Help Nuclear Power Facilities Succeed



Across the United States nuclear utilities face fierce competition from low cost natural gas and subsidized renewable energy resources. In addition, flat demand growth and marginal electricity prices finds many nuclear utilities with limited capital to address increasing regulatory hurdles and growing project backlogs. The challenges facing the nuclear sector are further compounded by the loss of utility project management expertise due to aging workforces and retirements.

Viewed holistically, the negative impacts caused by the inability to properly manage capital project execution are now challenging the economic viability of some nuclear plants. A robust and rigorous project management process can significantly mitigate these negative impacts, freeing up resources to focus on operations and power generation.

Black & Veatch possesses the experience and required balance of economic and technical understanding to successfully manage large capital projects. With nearly 100 years of managing projects on-schedule and on-budget, our teams of seasoned professionals serve as strategic advisors to utilities while providing a full range of EPC capabilities.

Key features of Black & Veatch's project management capability include:

- Planning projects with the end user in mind
- Use of innovative tools, processes and team work create a culture of project success
- Seamless integration of project controls, project management, engineering management and construction management from project initiation through final acceptance

For nuclear power plant owners, Black & Veatch emphasizes the importance of managing the risks inherent to any project. Developing a fully defined project scope is critical to identifying risks that can ultimately derail a budget and timeline. Based on decades of global experience, Black & Veatch has developed a planning contingency model that considers project specific and systemic risk factors to quantify the uncertainties that remain.

"Calibrated with information gathered across our global footprint, final observed risk factors are often within 2 percent of the projections the model generates for contingency," states Jon Gribble, Nuclear Director. "These same tools can also be

applied for utilities that want us to manage projects, thereby creating opportunity for knowledge transfer to their personnel."

In addition to its experienced project professionals, Black & Veatch deploys a robust and rigorous project management approach necessary for success, including:

- Budgets tracked by individual procurements, as well as by category of work activities and labor type
- Skilled project cost controls professionals that accumulate cost updates on a weekly or hourly basis and provide feedback to track progress against the plan
- Advanced project software programs to develop intricate, resource loaded schedules
- Sophisticated reports and tools to anticipate adverse trends and analyze emerging events associated with a variety of solutions

"Black & Veatch prides itself on the skills and focus that our professionals bring to each and every clients' project," said Dean Oskvig, President of Black & Veatch's energy business. "Whether as a consultant, an owner's representative or contractor, we will help better position utilities with nuclear assets to succeed in this challenging market by reducing or eliminating their project risk."

“Whether as a consultant, owner’s representative or contractor, we will help position utilities with nuclear assets to succeed in this challenging market by reducing or eliminating their project risk.”

— DEAN OSKVIK, PRESIDENT,  
BLACK & VEATCH'S ENERGY  
BUSINESS

# Experience & Certainty

**Know the end result is success ... from the start.**

From day one, you can expect your challenging nuclear project to be completed on time, on budget, with no surprises. Black & Veatch delivers the most complex projects – both new build and operating plants – with reliable, disciplined, tested processes that have earned clients' vote of confidence, time and time again.

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# American Crane & Equipment Corporation

## COMMITTED TO THE NUCLEAR INDUSTRY

American Crane & Equipment Corporation, a privately held U.S. company with headquarters in eastern Pennsylvania, is proud to be celebrating its 40th year of business! Since 1972, American Crane has been one of the most innovative manufacturers of high quality specialty lifting equipment for nuclear applications. The design and manufacture of custom equipment, with special attention to the rigorous standards of nuclear quality assurance, has been the company's primary business focus.

American Crane's conceptual design for single failure proof cranes provides up to 350 tons capacity with the ability to meet requirements for design and manufacture of higher capacities through 1,000 tons. By successfully providing the majority of single failure proof crane upgrades for dry spent fuel storage in the United States, American Crane has proven its expertise in supplying equipment for the nuclear industry.

The SAFLIFT™, one of American Crane's patented products, is used for dry spent fuel processing operations. The SAFLIFT™ eliminates seismic stack-up stability risk and reduces ALARA concerns when transferring the canister to the cask. Extensive experience with nuclear power plant requirements has enabled American Crane to meet its customers' specifications and schedules. Over the years, customers have included nuclear utility businesses, Department of Energy sites and laboratories, military facilities, and aerospace companies.

American Crane has made other significant investments to meet the nuclear industry's demand for high quality cranes and next generation equipment design. For instance, to accommodate the demands of the specialty lifting equipment market, American Crane has increased its operations and work force to include three locations near Philadelphia, PA. This manufacturing expansion and increase in highly skilled labor has the scalability to meet future market demands.

As a supplier to the nuclear industry, American Crane has maintained a Quality Assurance Program since 1996 that meets both 10 CFR 50, Appendix B, and ASME NQA-1 standards. American Crane's quality program has been audited by commercial nuclear utilities, NUPIC, and DOE contractors.

Entrust your future crane needs to one of the nuclear industry's most innovative and committed leaders.



SAFLIFT™

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### KEYS TO AMERICAN CRANE'S NUCLEAR SUCCESS

- Resumé of Completed Projects
- Company-Wide Focus on Nuclear
- NRC Licensing Experience
- Mature Appendix B QA Program
- In-house Engineering Staff
- Extensive Seismic Background
- Sufficient Manufacturing Capability

### LOCATIONS DOUGLASSVILLE, PA

- Corporate Headquarters (107,000 sq.ft.)
- Service, Parts & Standard Crane Division (20,000 sq.ft.)

### LESTER, PA

- Manufacturing Support Division (100,000+ sq.ft.)

### PRODUCTS & SERVICES

- Custom Cranes and Material Handling Equipment for Most Applications Including Nuclear, DOE Aerospace, Explosion Proof, and Single Failure Proof
- Standard Pre-Engineered Industrial Cranes
- Full Line of Industrial Hoists
- Specialized Equipment Including Bridge Maintenance Travelers
- Lift Beams and Grapples
- Field Service Support

### ENGINEERING

- Mechanical and Machine Design
- Structural Design and Analyses
- Dynamic Modeling and Seismic
- Failure Modes and Effects Analyses
- AutoCad, MathCad, Solidworks, SAP2000, and ANSYS
- Complete Control System Design
- Remote Systems
- Automated Systems
- Software Development including Real Time Graphics
- Complete Licensing Success with NRC
- Support for 50.59 Evaluations

### MANUFACTURING

- State-of-the-Art Material Preparation
- Certified Welders per AWS D1.1/AWS D14.1
- In-House Electrical Panel Building Shop
- UL508 Certified Panel Shop
- Machine Shop with CNC Capability
- One of the Largest Boring Mills in the Northeastern United States (X=30', Y=14', Z=5')

### SERVICE

- Load Testing up to 200 Tons
- On-site Support
- Product Support
- Outage Support
- Retrofit and Upgrades
- Inspections
- Resident Technicians for Continuous Site Support
- Training

### SPARE PARTS

- Dedicated Spare Parts Group
- Parts available for American Crane and other OEM's equipment.
- Authorized Stacking Distributor of Budgit, CM, Chester Hoist, Coffing, Gorbelt, Little Mule, Munck, Shaw-Box, YALE & more.
- Custom Fabrication for Unique Parts
- Nuclear Safety Related Crane Parts
- Engineering Support
- In-House Machining

### QUALITY ASSURANCE

- 10 CFR 50 Appendix B/NQA-1 Quality Program for Nuclear Projects
- NUPIC Audited
- Welding controlled to AWS D1.1 or D14.1
- SNT-TC-1A Qualified NDT Personnel
- Graded Controls Based on Customers' Requirements
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- QA Program & Testing (10 CFR 50 App. B and NQA-1)
- Engineering Solutions including Seismic Analysis and Design
- In-House Manufacturing & Machining
- Installation, Site Services, Outage Services & Parts
- Upgrades & Rebuilds of Our Equipment and OEMs

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## Holtec International: a global leader in power generation technologies and nuclear waste management.

Holtec International provides engineered equipment and services under 10CFR50, 10CFR71, and 10CFR72 regulations and IAEA standards (where applicable) to nuclear plants around the world. Holtec prides itself on the substantial number of awarded turnkey contracts wherein Holtec engineers, manufactures, and installs the equipment.

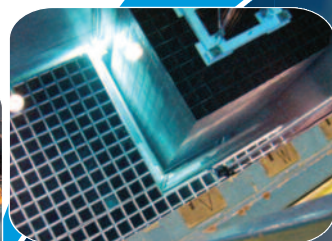
Holtec is a proven innovator that continually discovers how to stay a generation ahead. Holtec essentially invented the ultra-high-density wet storage technology during the 1980s and is credited with pioneering the Multi-Purpose-Canister (MPC) technology in the 1990s (Holtec was the first in the U.S. to license and manufacture systems that employ the MPC technology). The technical staff employed by Holtec formulates innovative solutions to operational and technological problems. The company secures, on average, five patents each year. One of our recent innovations is the HI-STORM FW, which is uniquely designed to maximize storage capacity and heat load, minimize occupational

dose, permit storage of severely deformed or canisterized fuel, and to be extremely resistant to deleterious flood and wind. The HI-STORM FW basket is manufactured entirely from METAMIC®-HT. This advanced material provides structural support, neutron absorption, enhanced heat transport, and is low weight. The basket is configured to hold either 37 PWR assemblies (MPC-37) or 89 BWR assemblies (MPC-89), in addition to VVER 440, VVER 1000, or RBMK fuel types. Holtec is also proudly licensing the underground storage system, HI-STORM UMAX, which is essentially impregnable to the post-9/11 terrorist threats. In addition to wet and dry systems for managing spent nuclear fuel, Holtec also provides custom engineered steam surface condensers, feedwater heaters, and safety related heat exchangers designed by Holtec's Heat Transfer Division (HTD).

Holtec's vertical integration allows control over quality, schedule, and cost and provides customers fully integrated solutions. It allows designers and fabricators to work closely during the

project development and manufacturing phases to incorporate lessons learned. Holtec Manufacturing Division is a wholly-owned plant in Pittsburgh, Pennsylvania with over 850,000 sq. ft. of manufacturing space, 400 tons of lift capacity, state-of-the-art machinery and all needed ASME nuclear and non-nuclear stamps (N, N3, NPT, R, U, NR). Holtec expanded its manufacturing capabilities with the purchase of two aluminum manufacturing plants in Ohio and the purchase of METAMIC® LLC. With these acquisitions, Holtec has synergized the ongoing R&D work in powder metallurgy and the manufacturing savvy of the Ohio plants to develop and offer a new generation of supermetals to users in need of advanced materials, fabricated and extruded at Holtec's Orrvilon Fabrication Facility.

Holtec International is headquartered in Jupiter, Florida with the Corporate Technology Center located in Marlton, New Jersey. Holtec has operational centers around the globe. To learn more about Holtec, call Joy Russell at 856-797-0900 Ext. 3655.



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**DP ENGINEERING** is a full service engineering & consulting firm providing solutions to the Nuclear Industry. Our diverse teams of professionals possess the experience you can count on to thoroughly understand each project's unique challenges. Through strategic teaming with selected industry recognized EP&C and nuclear-component providers, we provide complete solutions for plant upgrades. You can depend on us to deliver the highest quality of engineering products, address current nuclear industry regulations, and deliver solid, successful service time and time again.

- Our growth continues with experienced and new graduate professionals.
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- We are recognized for our quality and responsiveness.
- We understand your needs, and work as a team with your staff.

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- Large Motors
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- Lost Phase Detection (Byron Event solutions)
- MasterPact Circuit Breakers
- Seismic Qualification
- Electrical System Analysis
- HVAC Design And Analysis



## Mitsubishi Replacement Components and Services Extend the Operating Lives of Nuclear Power Plants

For more than fifty years, Mitsubishi Heavy Industries (MHI) has provided electric utilities with a wide range of reliable products and services designed to prolong the operating lives of nuclear power plants. Mitsubishi Nuclear Energy Systems Inc., (MNES), the U.S. operations office for MHI, brings a combination of U.S. and Japanese nuclear energy expertise to partner with the nuclear fleet utilities. Based in Charlotte, NC, MNES is positioned to provide state of the art engineering and technologies in cooperation with MHI.

### Reactor vessel closure heads

Replacing the reactor vessel closure head (RVCH) on a nuclear power plants will extend its operating life and improve plant efficiency. Since 1996, the company has successfully designed, manufactured, and delivered 39 replacement reactor vessel closure heads (RRVCHs) with Alloy 690 penetrations to global customers. Mitsubishi has the facilities and expertise to manufacture replacement RVCHs using tools and processes the company has developed over the past half-century. Mitsubishi can support its utility customers during the full replacement project from initial design and planning to final testing.

### Control rod drive mechanisms

Mitsubishi has designed, manufactured and delivered over 1,400 control-rod drive mechanisms (CDRMs) around the world in the past two decades, helping electric utilities prolong the operating life of nuclear power plants. At its modern factories, Mitsubishi fabricates and assembles head adapters, latch assemblies, latch housings and rod travel housings for replacement CDRMs. Mitsubishi's reliable and proven manufacturing technologies provide utility customers with the highest quality replacement components.

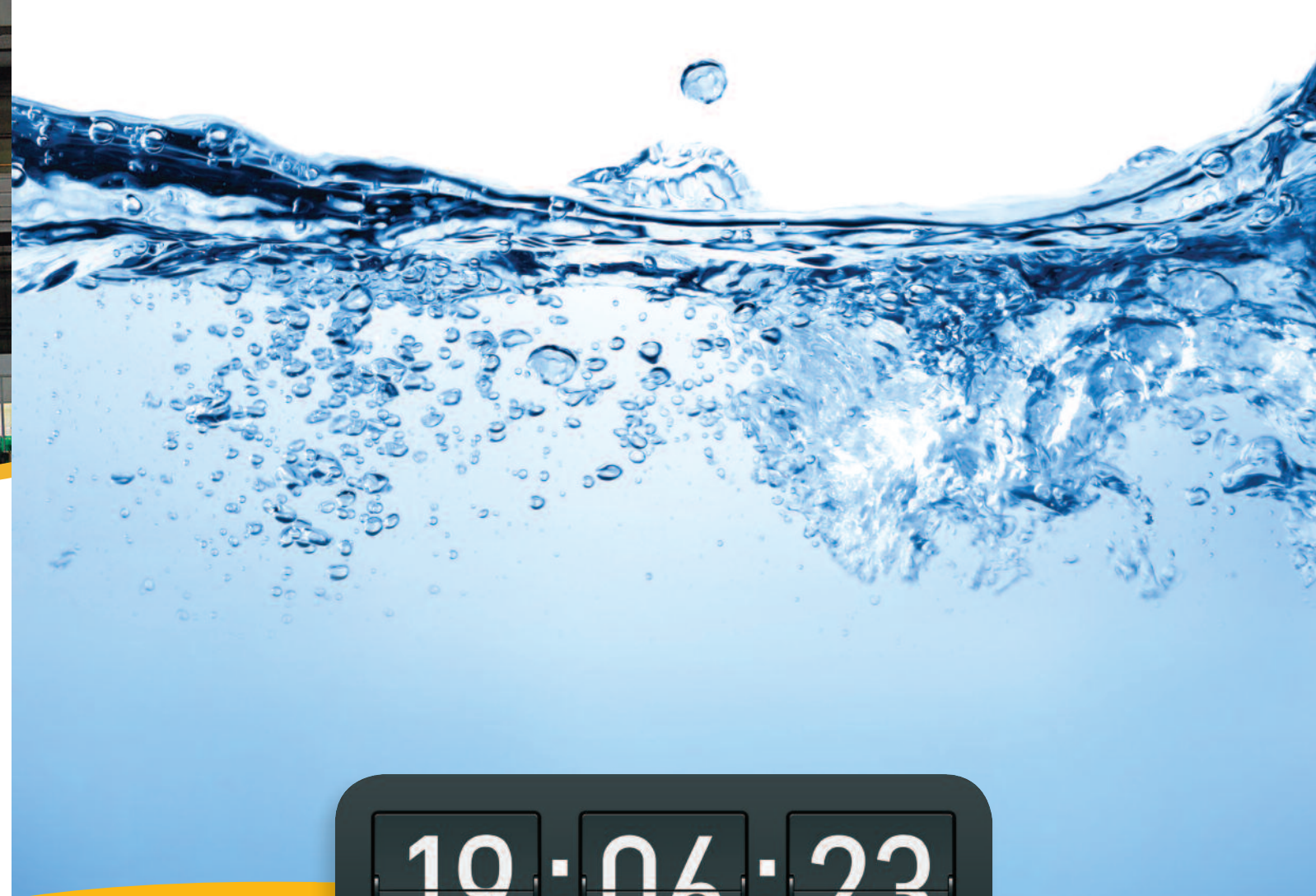
### Water jet peening of alloy 600 materials

Mitsubishi's Water Jet Peening (WJP) technique mitigates stress corrosion cracking in the various nozzles contained within the reactor vessel and extends the operating life of a nuclear power plant. The entire WJP process is conducted underwater during plant outage, with no foreign materials or heat introduced into the reactor. Because the WJP equipment is controlled remotely, the occupational dose exposure is extremely low. Mitsubishi has successfully provided more than three dozen WJP applications and operates a complete training center for WJP services.

Please visit our website at [www.mnes-us.com](http://www.mnes-us.com) for more about these and other services designed to prolong the operating life of your utility's nuclear power plants.

Your Energy. Our Experience.

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## Extend Life

Mitsubishi's Water Jet Peening (WJP) technique mitigates stress corrosion cracking in the various nozzles contained within the reactor vessel and extends the operating life of a nuclear power plant. The entire WJP process is conducted underwater during plant outage, with no foreign materials or heat introduced into the reactor. Because the WJP equipment is controlled remotely, the occupational dose exposure is extremely low. Mitsubishi has successfully provided more than three dozen WJP applications and operates a complete training center for WJP services. Make Mitsubishi your plant renewal partner.

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**Petersen Inc.** has been the industry leader in custom steel manufacturing for the nuclear industry for decades. How? By creating solutions to difficult problem and helping our customers meet their high demand project timelines by producing high quality products efficiently and in-budget.

**HISTORY**

Petersen Inc., of Ogden, Utah opened its doors in 1961 and has been manufacturing products for industries worldwide since that time. For over 50 years Petersen Inc. has been the company to go to when custom fabrication, design, engineering, and field installation are required for difficult projects. Over the years we have become the industry leader in the field of fabrication and precision machined components.

Petersen Inc. has been chosen as a partner in high-profile projects such as the Department of Energy's Hanford Waste Treatment Plant, Savannah River MOX facility, WIPP, Zion, West Valley, Kewaunee, APS, ORNL, LANL, LLNL, INL, and others.

The Petersen Inc. fabricated Melters will be the heart of the Hanford Waste Treatment Plant which will be the world's largest chemical radioactive waste treatment plant.



Up to 53-million gallons of radioactive waste is anticipated to be processed through the melters.

Petersen Inc.'s participation in the Department of Energy's MOX Services project at the Savannah River Site is constructing storage components, gloveboxes, and other associated equipment for the facility which converts weapons grade plutonium into fuel for electricity generating power plants.

The Petersen Inc. involvement with Energy Solutions and NAC at the Zion, West Valley, Kewaunee, APS, locations is in providing Dry Fuel Storage casks and

equipment, including Vertical Storage Casks; a steel-lined reinforced concrete storage cask.

Petersen Inc., is a major supplier of containers for many industries including Nuclear, Aerospace, Commercial, Petrochemical, and is proud to be a



part of the clean-up of waste generator sites around the country, helping to make it a cleaner and safer environment for future generations. Petersen Inc. fabricates RLC's, SWB's, and TDOP's for Nuclear Waste Partnership LLC, (NWP) at the Department of Energy's WIPP site which allows us to provide storage containers of various sizes and specifications to anyone who purchases them through NWP.

**CERTIFICATIONS**

- ASME NQA-1
- ISO9001-2008
- NRC Subpart H of 10CFR71
- ASME {U} {U2} {S} {R}
- AS9100

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# THE NUCLEAR INDUSTRY'S RIGGING AND TRANSPORTATION EXPERTS

**T**he unique nature of the nuclear power industry demands vendors with the skills and experience that can consistently perform at extremely high levels. Barnhart's Nuclear Services Group has proven its rigging and transportation expertise in seventeen years of working with the nation's leading nuclear energy producers, contractors, and engineers.

**LIFE EXTENSIONS, UPGRADES, AND MAJOR MAINTENANCE REQUIRE THE HANDLING OF CRITICAL COMPONENTS WITHIN OPERATING PLANTS.** To perform this work during planned outages, a thorough knowledge of major construction techniques, advanced structural engineering, and ALARA is required. It is also crucial that the company has practical working knowledge of the demanding requirements of nuclear protocol, such as NuReg 0612. Barnhart exceeds that criteria and has developed unique tools and methods to perform the movement of major equipment such as:

- RPV Closure Heads
- Feedwater Heaters
- Steam Dryers
- Moisture Separator Reheaters
- Condensers
- ISFSI Installations
- Pressurizers
- Transformers

**RIGGING SUPERVISION, LIFT PLANNING, HEAVY RIGGING, AND CRANE SERVICES** are provided through their team of professional supervisors, engineers, and project managers. Barnhart ensures the safety, quality, and timely completion of plant outages. Often they are called upon to participate in the "Readiness Planning" of various operating plants. These plans serve to limit downtime during emergency outages by coordinating the engineering, rigging plans, and transportation schedules. In some cases, heavy rigging in nuclear power facilities presents the challenge and opportunity for development of custom designed rigging tools. Barnhart's ISO9001 certified engineering and fabrication capabilities provide solutions, from concept through completion, to handle major components safely and on schedule.

**EXPERIENCED AND CERTIFIED FOR HAZMAT SERVICE,** Barnhart also brings a working knowledge to the transportation of contaminated components to burial or processing. Barnhart's Heavy Lift Terminal in Memphis serves as a transfer point and waste processing facility of Studsvik Energy Solutions. Barnhart provides transportation of such components by barge, rail, or road. Barnhart rounds out their experience by providing warehousing services to support the Pooled Inventory Management (PIM) program administered by Southern Company. The PIM program is a mechanism for nuclear plant owners to jointly procure and store critical plant spare equipment. Permanent PIM management resides at the Barnhart facility coordinating the maintenance and handling of the inventory by Barnhart personnel. To learn more about Barnhart's work experience in the nuclear industry, visit [www.barnhartcrane.com](http://www.barnhartcrane.com).

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## Optimizing Bolting Processes on ICI Flanges

HYTORC is the World's oldest and largest manufacturer of industrial bolting systems. With a focus on improving safety, quality and schedule, they are constantly developing innovating bolting systems and working with end users to streamline their bolting processes. In February of 2014, HYTORC worked together with a large nuclear power plant in the United States to optimize the bolting process on their In-Core Instrumentation (ICI) flanges. The ICI's on this Class 1 safety related application had 8 flanges with 8 bolts per flange. For the highest level of safety and speed, HYTORC recommended the use of the HYTORC Nut, which ultimately provided productivity improvements and dose reductions of over 50%.

The HYTORC Nut has also proven to increase productivity and safety during

removal and installation of casings on many nuclear steam turbines. For large fasteners, the HYTORC Nut is the only system that is verified to improved outage safety, quality and schedule through an efficient hands-free cold stretching process. This patented mechanical innovation uses hydraulic tooling to mechanically stretch studs with pure tensile load. Main stop valves, control valves, turbine casings, man ways and ICI flanges are a few of the many applications that have been optimized with HYTORC Nuts. More than 10,000 HYTORC Nuts are installed on critical path bolting evolutions in nuclear power plants around the world.

HYTORC Nuts reduce dose and make the bolting process safer by providing a hands free approach to bolting. With the HYTORC Nut

system an operator can simultaneously tension multiple studs from a safe distance. Additionally, this patented bolt stretching method guarantees elimination of galling by eliminating nut rotation on loaded studs; this can provide tremendous savings of time and money during the disassembly process.

HYTORC produces Q1 safety related nuclear components for domestic and international nuclear sites. HYTORC designs custom bolting solutions in New Jersey and facilitates design specification, training and installation with worldwide distribution and local support. For more information please email [info@hytorc.com](mailto:info@hytorc.com) or call +1-201-512-9500.

Mike Dolan  
Chief Engineer

## ENERCON Ranked in Top 2 in U.S. for Nuclear Engineering Firms by ENR

ENERCON is a leading provider of licensing, environmental, and engineering services in support of new nuclear power plant deployment programs including siting, technology selection, owner's engineer, and diverse technical services for new nuclear power plants. On behalf of U.S. utility clients, ENERCON has written license applications for the siting, construction and operation of numerous NPPs, and has also performed a variety of other related strategic consulting services.



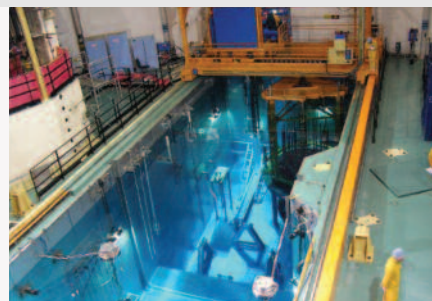
ENERCON has provided extensive support to clients in completing studies to select potential nuclear power plant sites, evaluating a broad range of issues and requirements associated with proposed plant locations including seismic and geotechnical design issues, access to water, population and demographics, ecology, access to transmission and rail corridors, and public acceptance.

ENERCON has performed engineering analysis, assessments and evaluations, and prepared system designs and modification packages, as well as provided licensing support and third party reviews for approximately 75% of operating U.S. NPPs.



As the first generation of commercial nuclear power plants ages, ENERCON has supported clients' efforts to obtain regulatory approval for the life extension of their plants.

ENERCON is a leading provider of detailed design engineering of security systems for the commercial nuclear fleet.



ENERCON performs a broad range of sophisticated safety analyses encompassing thermal hydraulics, finite element, criticality safety, transport, and radiological dose analyses.

ENERCON provides clients with support in the areas of Radiological/Health Physics and Emergency Preparedness, as well as Decommissioning and Site Remediation focused on facility characterization and demolition, environment and hazardous waste clean up, and license termination.



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**Corporate Headquarters:** Atlanta. **Other locations:** Albuquerque, Ann Arbor, Baton Rouge, Birmingham, Chattanooga, TN, Chicago, Dallas, Denver, Duluth, GA, Germantown, MD, Houston, Humble, TX, Kansas City, Northern New Jersey, Oakland, Oak Ridge, Oklahoma City, Orlando, Palm Beach Gardens, Pittsburgh, Sacramento, San Clemente, Tampa, Tulsa, Washington, DC, Wilmington, DE. Doing business internationally as ESI-Energy Consultants, with offices in Abu Dhabi. [enercon.com/locations](http://enercon.com/locations) for details.



## TWENTY-FOUR/SEVEN

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There are many professions that demand excellence during the workweek. That won't suffice for our industry. With nuclear power, there are no days off. And all the days have 24 hours. That's why we have 28 strategically located offices and over 1500 employees available to assist our clients 24/7 on a wide range of technical issues. This is just one example of our culture at ENERCON, and it is best summarized by our credo: *Excellence – Every Project. Every Day.* Our focus on excellence has helped us become one of the largest and most respected engineering and environmental firms serving the commercial nuclear industry.

With long term contracts in place to support most nuclear power plant operators, we have become known as the "go to company" for resources and technical expertise. ENERCON offers you unparalleled experience in licensing and construction of new nuclear facilities, operating and upgrading existing nuclear facilities, as well as the planning and activities required to shutdown facilities no longer required to operate.

Our recent acquisitions of TALISMAN and MARACOR have significantly expanded our resources and capabilities in the regulatory, licensing and PRA areas. TALISMAN specializes in providing support to licensees that are addressing complex issues before the NRC. MARACOR focuses on supporting the nuclear power industry to help manage plant risk activities. These two additions help set us apart from the competition.

Give us a call, visit our new website or email us directly. We are ready to respond to your needs. We are committed to *Excellence—Every project. Every day.*



*Excellence—Every project. Every day.*

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# Service Performance Profile: TVA - Sequoyah Nuclear

**Faced with an emergent need to replace a Reactor Coolant System primary check valve at the Sequoyah Nuclear Plant, TVA turned to Tri Tool to deliver quality services in an expedited time frame.**

During a recent refueling outage, replacement was required of a critical 6" stainless-steel Reactor Coolant System primary check valve. The valve was approximately 24 inches long and 600 lbs. and was located in a tight, congested area. Special considerations were required as the valve and associated piping were very contaminated.

Because of successful prior project experiences, the utility called on Tri Tool Services. Working closely with the site Projects and Modifications Contractor, Tri Tool responded with a crew of pipefitters, machinists and welders within 24 hrs.

Alongside radiological control personnel, Tri Tool had to remove the old valve with a minimum of debris to remain within the plant requirements for Foreign Material Exclusion. Personnel safety considerations associated with the task were integrated into the Job Safety Analysis while

developing the action plan for mitigation of the project's operational and radiologic hazards.

Utilizing Tri Tool's Model 212B BevelMaster® ID beveler and Model 608 SB Clamshell lathe the existing valve cut-out and removal was precisely executed to exacting customer specifications.

Tri Tool's welders were tested and pre-qualified to TVA's Quality Program and the replacement check valve was installed through a teaming effort of Tri Tool and utility personnel. The fit-up was extremely critical and was closely monitored by the site's QC and QA personnel.

The project was completed with no safety or human error issues due to the diligent and thorough (albeit emergent and rapid) planning efforts of Tri Tool and the entire site team.

All work was performed with zero Safety or Human Performance issues. The valve was installed in compliance with ASME Section XI, Repair/Replacement requirements.

Post welding of all large bore welds required an In-Service Inspection of the final weld profile.



Tri Tool's welders at Sequoyah Nuclear were tested and qualified to TVA's Quality Program and welds performed by them exceeded all acceptable, prescribed standards.

Additionally, the welds were subjected to 100% radiographic testing acceptance criteria as called out in ASME Section IX, and all initial welds done under these requirements by Tri Tool's welders exceeded all acceptable, prescribed standards.

Contact TRI TOOL for rapid response, unequalled support, excellent equipment and our total commitment to safe, error-free performance.

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## OUR ERROR-FREE COMMITMENT

Tri Tool is the trusted service partner to nuclear sites across the nation. With our culture of safety, integrity and hard work we consistently deliver error-free project results. Call today to speak with a Nuclear service expert.

"The professionalism of their project manager, machinists and welders was exemplary and the quality of their work was beyond compare... I will continue to work with Tri Tool and would highly recommend this company."

David Charles Haney  
Modifications Manager, TVA - Sequoyah Nuclear

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# INNOVATIVE SOLUTIONS



Built on the legacy and hard work of the Saulsbury family and its loyal employees “the next step” in the growth of Saulsbury Industries has led them in the direction of the Nuclear Power Industry. The mission will remain the same while the objective will be to provide the Nuclear Industry with the “Saulsbury Difference”.

The Saulsbury Nuclear Services team has set out to distinguish itself in the market by combining Saulsbury’s long established core values with the nuclear team’s deep history in delivering customer service and stakeholder value.

### EPC Project Capability

- Civil
- Structural
- Mechanical
- Electrical

### General Plant Maintenance

- Mechanical
- Electrical
- I&C
- Condensers
- Heat Exchangers
- Valves
- Pumps
- Motors
- Turbines
- Painting & Coating

### Regulatory Upgrades

- Sump Pump Modifications
- Fukushima Modifications
- NFPA 805 Modifications
- Security Modifications

### Support Services

- BOP Scaffolding, Insulation, etc.
- RP, HP and Decontamination
- Facilities Management
- Access Authorization
- In / Out Processing
- Sub-contractor Management
- Field Execution Management
- Work Package Development
- Estimating, Planning, Scheduling
- Project Controls
- Field Supervision and Engineering
- Labor, Safety & Procurement Management
- Professional, Technical, Clerical

### Contract Models

- Time & Material Projects
- Managed Task Projects
- Incentivized Based Work Structure
- Seconded Labor Pricing
- Target Pricing
- Fixed Lump Sum Pricing

### Transmission & Distribution

- Switchyard Distribution
- Sub-Stations

### Life Cycle Modifications

- Service Water Piping
- Feedwater Heater Replacement
- MSR Replacement
- Reactor Head Modifications
- Extended Power Updates
- FAC Replacement
- Analog to Digital Modifications
- Condenser Life Extensions
- Wireless Control Systems
- Control Room Upgrades

### Decommissioning

- Electrical and Mechanical System Modifications

### Used Fuel Storage

- ISFSI Pads, Pathways & Fuel Building

## “Do it Right or Make it Right”

*Our Nuclear Services Division is founded on its unyielding commitment to:*  
**SAFETY | EXECUTION | QUALITY | SCHEDULE & COST PREDICTABILITY**  
*with the end goal being to meet and exceed customer expectations.*



## NUCLEAR SERVICES

CORPORATE OFFICE: (432) 366-3686

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## Providing Spent Fuel Storage & Transportation Excellence

### Longevity

NAC is approaching a half-century of comprehensive experience in the design, licensing and deployment of technologies to manage the most radioactive contents on Earth.

### Economical innovation

When your project requires packaging or transportation of challenging nuclear materials (including greater than class C (GTCC) waste, high level waste and spent nuclear fuel), NAC provides you innovative solutions with a commitment to nuclear packaging excellence – offering risk-mitigating, ALARA-friendly,

and operation-enhancing solutions. NAC's project objectives put safety, economic value and business integrity at the forefront of our solutions. This commitment to excellence has been exemplified with the development and implementation of the MAGNASTOR® (Modular, Advanced Generation, Nuclear All-purpose Storage) system, the first licensed and delivered multipurpose spent fuel dry storage technology that accommodates 37 PWR or 87 BWR spent fuel assemblies, exhibiting superior economics, safety and dose reduction on a per-assembly basis.

### Transport excellence and assurance

Because of our immense worldwide spent fuel transport experience, NAC is able to incorporate unique operational and licensing features into our multipurpose storage systems, which assures licensing and transportability. In fact, NAC is the first vendor to submit a transport license application to the NRC for the ultra-high capacity category of multipurpose canister systems. MAGNASTOR's transport package, MAGNATRAN™, is well-ahead in the licensing queue, assuring early availability.

### Building on our legacy

NAC's legacy of facilitating efficient management, transport and disposition of challenging nuclear materials is evident at nuclear sites worldwide. With the important role nuclear power plays in meeting increasing global energy needs, the safe packaging, storing and transportation of nuclear materials is more vital than ever before. Casting its progressive innovation strategy, NAC will continuously develop and license economical technologies to safely manage the nuclear fuel cycle in order to support a sustainable nuclear future.

### For more information, please contact:

George Vaughan  
Vice President Sales  
404-775-5045  
gvaughan@nacintl.com

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**LAST-A-FOAM FR-3700: The #1 Protective Foam for Crash and Fire in Type A/B Containers**

General Plastics Manufacturing Company has protected nuclear transportation packages from fire and collision since 1971. The company's polyurethane **LAST-A-FOAM® FR-3700** Series foam combines exceptional impact mitigation with excellent fire protection properties, making it ideal for insulating and isolating radioactive nuclear materials from shock, impact and fire damage in crash situations. In particular, this foam offers proven long-term performance as an insert in radioactive material (RAM) transportation packages.

"The regulations governing RAM packages often require energy absorption of 30-foot free drops and exposure to a 1,475°F, 30-minute fire under accident conditions," explained Rick Brown, PhD., nuclear packaging manager at General Plastics. "Our FR-3700 series foam is one of very few materials that can support the RAM package design in mitigating both mechanical and thermal energy."

The LAST-A-FOAM® FR-3700 formulation is specially designed to allow predictable impact absorption. In a fire situation, the foam produces an intumescent, insulating char layer that isolates and insulates hazardous cargoes from excessive heat, even when exposed to fuel, diesel fuel fire conditions.

Available in densities ranging from 3 to 40 pounds per cubic foot, these CFC-free, flame-retardant polyurethane foams are specified by nuclear package design engineers as among the best solutions for the protection of hazardous payloads.

If customers prefer to build their own inserts for Type A and Type B nuclear containers, General Plastics will CNC-machine FR-3700 Series foam to fit their particular design. In addition, the company offers foamed-in-place FR-3700 foam using the customer's container and specifications. Once the foam is cured, the container is shipped back to the customer.

"After 40-plus years of successful use, our FR-3700 series foam has proven to be the most effective material for impact mitigation and fire protection for these applications," Brown stated. "Customers worldwide rely on its unique properties, performance, quality and life cycle traceability to protect and transport their nuclear waste."

General Plastics is certified to ISO 9001:2008/AS9100C, and ITAR-compliant. Its extensive quality assurance program satisfies the demanding requirements of the aerospace industry, the Nuclear Regulatory Commission and the U.S. Department of Defense. General Plastics meets such demanding quality systems as NQA-1 and MIL-I-45208A.



## Protective Performance Over the Long Haul

### Four Decades of Proven Protection

General Plastics Manufacturing Company has produced more than 40 different designs of impact limiters, overpacks, impact pads and missile shock-isolation pads over the past four decades.



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MANUFACTURING COMPANY

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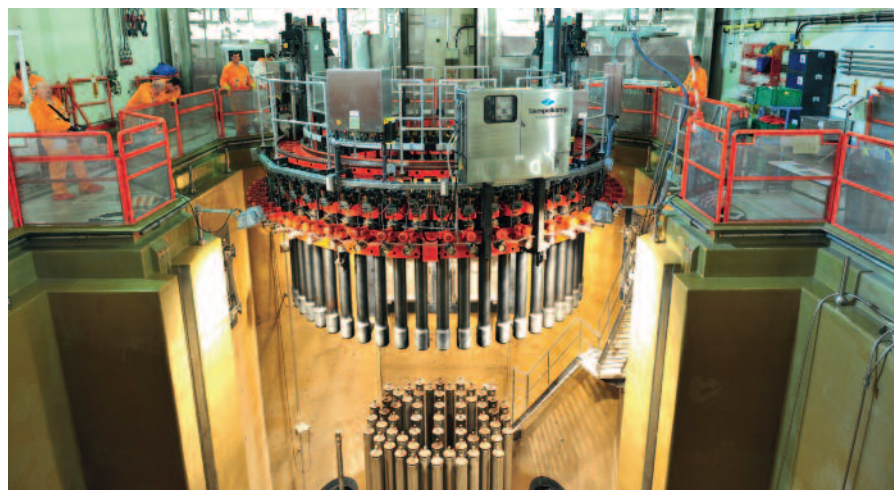
[www.generalplastics.com/nuclear](http://www.generalplastics.com/nuclear)

## Tailor-made product and service solutions for efficient and safe nuclear plant life time management

Countries such as Finland, China, Russia, Great Britain, France and the USA count on nuclear power and will increasingly secure their energy demand through a new generation of low CO2 emission nuclear power stations. Siempelkamp's nuclear technology business unit meets the highest safety standards all over the world with products and comprehensive services for the life cycle management of nuclear facilities. The basis: well over 40 years of experience in nuclear technology and many successfully completed projects distinguish Siempelkamp as a recognized partner for operators of nuclear plants.

### Extensive product and service range

As a company of the Siempelkamp Group, Siempelkamp Nuclear Services, Inc. (SNS) offers operators of nuclear facilities state-of-the-art products which serve the purpose of improving cost-effectiveness and satisfying the highest safety requirements. The focal point of our extensive product and service range is the provision of equipment and products for use around the "Reactor Island", equipment support for operating plant maintenance and newly built, decontamination and decommissioning as well as comprehensive services for all life time phases of nuclear facilities.



### Professional and experienced staff

SNS is located in West Columbia, South Carolina and has access to over 500 professional staff which is dedicated to products and services supporting the nuclear industry to meet the demands of the US based fleet. Siempelkamp's excellent reputation is not only owed to the product range, but also to staff. With their high level of specification, SNS develops solutions of the highest level worldwide which satisfy all technical and economic quality standards. The company places great emphasis on the continuous further qualification of its specialists in order to maintain all performances at the highest level.

### High quality and tailor-made solutions

With respect to all tasks, from problem analysis to planning and execution, customer satisfaction is of the highest priority for Siempelkamp. That is why SNS offers tailor-made solutions and - using efficient resources which the company is able to expand at any time through the corporate link - guarantees fast execution with a high level of transparency and planning reliability for all projects. User-friend-

ly operation, operational reliability, environmental compatibility and the cost/benefit aspect are some of the decisive criteria for all of the processes and solutions developed by Siempelkamp.

### Portfolio for nuclear installations

Siempelkamp offers numerous customized solutions for the safe operation, new constructions, as well as retrofits of nuclear facilities. Our products ensure efficient as well as optimized inspection and process flows in nuclear power plants:

engineering | stud turning and tensioning tooling | stud cleaning devices | refueling machines | cranes (incl. polar and refueling) | lifting devices | sealing heads | H2 recombiners | hot cell technology | shielding devices | core catcher cooling elements | casks/containers for radioactive waste | waste handling facilities | transport/handling systems | calculations e.g. design/service life evaluation | consulting | assembly/start up.

Even for the decommissioning and dismantling of nuclear power plants SNS provides a full range of technologies and proven equipment as well as services:

dismantling facilities | mechanical segmentation | thermal cutting | sampling facilities | engineering | project planning/execution | calculations: decommissioning cost determination / 3D activation process.



**Siempelkamp**

Nuclear Services

Contact us and learn more about:

**Siempelkamp Nuclear Services, Inc.**

3229 Sunset Boulevard, Suite M  
West Columbia, SC 29169  
Phone: 803.796.2727  
Fax: 803.939.1083  
sns@siempelkamp.com

[www.siempelkamp-sns.com](http://www.siempelkamp-sns.com)  
[www.siempelkamp.com](http://www.siempelkamp.com)



## Components and services for nuclear facilities

Planning, manufacture and supply of a highly reliable equipment range for operating plants and new build:

refueling bridges | core internal and reactor head lifting devices | stud turning and tensioning tooling | cranes including polar | sealing heads | H2 recombiners | core catcher cooling elements | waste handling facilities



**Siempelkamp**

Nuclear Services

### Products and Services for Nuclear Power Plants

Compliance with the highest requirements in safety and quality is our business. We supply services, equipment and life-time support within the nuclear power industry. Our extensive know-how and experience over many years forms the basis for our successful delivery.

Phone: 803.796.2727 | Fax: 803.939.1083 | [sns@siempelkamp.com](mailto:sns@siempelkamp.com)  
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# POWERFUL SOLUTIONS

## For the Nuclear Power Industry

## SAME PLANT, MORE POWER

### Solutions in Nuclear Power Upgrading

CB&I's nuclear power uprates generate more power from operating plants, meeting growing energy demands with existing resources. We've helped our clients add more than 4,000 MW to the U.S. power grid.

With more than 30 years of upgrading experience, CB&I is unrivaled in understanding the nuclear power life cycle. No matter your need, CB&I can help you accurately identify your plant's ideal uprate capability and tailor a strategy for modifications, while meeting today's environmental and regulatory requirements.

Whether the solution is building a new nuclear plant or increasing the efficiency of an existing one, CB&I puts the power of nuclear to work for you.

- ENGINEERING, PROCUREMENT AND CONSTRUCTION**
- UPGRADES, UPRATES AND RESTARTS**
- LICENSING SUPPORT AND SAFETY ANALYSIS**
- MAINTENANCE AND MODIFICATION**
- SPENT DRY FUEL STORAGE**

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As one of the largest nuclear engineering and maintenance contractors in the U.S., CB&I's diverse nuclear solutions are backed by a legacy of more than 60 years of industry leadership and an uncompromising commitment to safety. CB&I has been a pioneer in new plant design and support services to the operating fleet, supplying:

- Engineering and design
- Construction and maintenance
- Licensing
- Pipe fabrication
- Modularization
- Startup and test
- New plant services

CB&I leads the industry in power uprates, with a thorough understanding of the overall nuclear plant life cycle, including the nuclear steam supply system and balance-of-plant thermal cycle, original plant licensing bases, environmental impacts, equipment-aging impacts, margin use and regulatory requirements. With more than 70 uprate projects and studies completed, CB&I has added more than 4,000 MW to the U.S. grid.

### CB&I Highlights

- NYSE: CBI
- 60+ year legacy in nuclear industry
- 55,000 employees worldwide

With expertise in comprehensive plant support, our staff is in tune with the nature and importance of nuclear plant needs at every level. CB&I offers the most complete suite of EPC services and is one of the only providers of fully qualified designers and fabricators of tanks, piping and systems to meet the new post-Fukushima requirements. In fact, we were called upon to design, fabricate, and install the Simplified Activated Water Retrieve and Recovery (SARRY) System currently in use at the Fukushima Daiichi site.

CB&I's nuclear services start at the preliminary planning phase and continue through post-construction testing and turnover to operations. Our designs can be qualified to meet seismic, missile and other post-Fukushima considerations.



Sanmen Units 1 and 2, China

Safety continues to be a CB&I core value. Our award-winning safety program promotes a culture of involvement and dedication with a goal of zero incidents for everyone involved in our projects.

### CB&I Activity Highlights

- Plant licensing bases/configuration management verification
- Plant modifications including complex and significant impact mods
- Plant evaluations for power uprates and potential degraded or non-conforming conditions
- BWR and PWR plant projects
- Plant outage and continuous maintenance support for 50 of the 104 nuclear power reactors in the U.S.
- Independent spent fuel storage installations (ISFSI)
- Decommissioning and dismantlement projects
- Buried commodities replacement (piping, tanks, etc.)
- Plant structures, systems and components evaluations
- Emergency plant support via 24-hour hotline: 617-589-7827



# The GEL Group INC

## Nuclear Services



- NUPIC Approved
- Chemistry
- Radiochemistry
- Radiobioassay
- RETS-REMP Support
- 10CFR61 Waste Characterization
- Certified in Over 25 States
- Supporting over 50% U.S. and Canada Nuclear Power Plants
- Secure Web Access to Data
- Consulting Services



- Groundwater Modeling
- Air Effluent Modeling
- <sup>14</sup>C Gaseous Measurement
- Groundwater Assessment and Remediation
- Isokinetic Flow Evaluation
- Indoor Air Quality Studies
- REMP Program Support
- Stack Testing
- Hydrographic and Land Surveying
- Geophysical Services

## Innovative Analytical and Environmental Services

Headquartered in Charleston, South Carolina since 1981, The GEL Group, Inc. provides streamlined solutions to the nuclear industry. From laboratory analysis and engineering, to geophysical services, GEL can save you time and resources and develop solutions and data that you can trust.

### GEL Laboratories, LLC

GEL Laboratories, LLC offers one of the widest arrays of chemistry, radiochemistry, and radiobioassay services available in any single facility in the United States. In addition, GEL's quality program is one of the most highly audited programs in our industry. GEL Laboratories' clients include over 50 US Nuclear Power Plants.

GEL provides the nuclear industry with comprehensive chemistry and radiochemistry services including:

- NUPIC audited and approved laboratory
- NQA-1 programs
- Fully MARLAP compliant data packages
- Fully interactive "Web Based" sample management, data assessment and cost tracking system
- Environmental REM-RETS analytical support
- Rad-Waste analytical support as required under 10CFR61
- Radiobioassay for plant personnel

- Plant atmosphere testing for C-14 as required by NRC REG Guide 1.21
- Fast sample turnaround times for waste and analytical chemistry samples

**For more information please contact:**

Robert P. Wills, RRPT  
 robert.wills@gel.com  
 office: (843) 556-8171  
 cell: (843) 906-5929

### GEL Engineering, LLC

GEL Engineering, LLC offers environmental and engineering services for both interior and exterior operations and environments at nuclear facilities. These services include environmental support, engineering support, stack testing, and land and hydrographic surveying.

GEL also develops unique testing methods to assist facilities with creating programs specific to their plant's needs including isokinetic flow evaluation and <sup>14</sup>C measurement.

GEL's <sup>14</sup>C measurement method includes direct measurement and analysis of <sup>14</sup>C samples. This sample collection and analysis protocol allows for differentiation and quantitation of organic and inorganic forms of <sup>14</sup>C and can accommodate a wide range of <sup>14</sup>C activities. GEL provides on-site sample collection from gas

decay tanks, containment atmospheres, and other discharge vents and stacks for <sup>14</sup>C effluent samples. The samples are then transported to the GEL Laboratory for analysis. This turnkey service allows utilities to adequately support the reporting requirements of RETS/REMP programs.

GEL has successfully performed these services for many plants across North America which have produced very favorable dose modeling data.

**For more information please contact:**

Jim Posda  
 james.posda@gel.com  
 office: (843) 769-7378  
 cell: (843) 697-2199



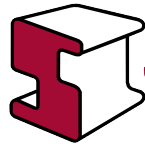
Nuclear power plant operating practices/experience and related decision making are highly scrutinized by many stakeholders. At the same time, your customers rely on you to keep the power on. Structural Integrity can provide engineering, NDE and training solutions to help you meet your demands so you can focus on delivering power.

With over 30 years in business in the power industry, you can rely on us to help you and take some of the burden off your shoulders. We're a company you can trust to work hard and to provide innovative, top quality, high value solutions on every project.

Your customers count on you for the energy that powers their lives. And you can count on Structural Integrity for solutions that will help you keep the power flowing.

There are many ways we can help your plant perform its best:

- **BWR and PWR Internals** programs, evaluations and inspections
- **Run/Repair/Replace Decisions** including component operability/JCO support
- **Fatigue Management** including analysis and monitoring
- **Seismic Re-evaluation** to address post-Fukushima issues
- **Underground Pipe & Tank Integrity** program development, data management, inspections, evaluations and monitoring
- **Materials and Corrosion** to assist in root cause evaluation
- **PWSCC/Alloy 600 and IGSCC** mitigation and repairs
- **Vibration** analysis and instrumentation
- **Nondestructive examinations** using state of the art equipment and techniques
- **License Renewal** programs and support
- **Nuclear Fuel** programs and analysis
- **Training** programs on-site or online from industry experts



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# F&J SPECIALTY PRODUCTS, INC.

*The Nucleus of Quality Air Monitoring Programs*

## Company Profile

F&J endeavors to ensure its air flow measurement instruments are accurate, reliable and maximize automation for the convenience of the air sampling specialist.

F&J has a standard business strategy to implement current technology in the development of air sampling and air flow calibration instruments.

F&J combines advances in hardware and software technologies to simplify the data collection process for the benefit of its customers.

F&J is a certified ISO 9001 air sampling instruments provider whose contributions to air sampling design ensures the air sampling specialist has the best tools to meet the ever increasing regulatory challenges in a limited manpower environment.



# F&J SPECIALTY PRODUCTS, INC.

*The Nucleus of Quality Air Monitoring Programs*

## F&J Advanced-Technology Instruments



**GAS-60810D Series**  
Ambient Air Monitoring System



**WC-VFD**  
World Calibrator



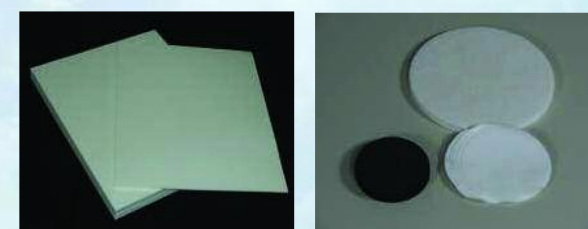
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Contact Information  
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Fax: 352.680.1454  
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USA

**Contact:**  
tel: 352.680.1177 / fax: 352.680.1454 / [fandj@fjspecialty.com](mailto:fandj@fjspecialty.com) / [www.fjspecialty.com](http://www.fjspecialty.com)

## WHAT WE DO

RussTech Language Services, Inc. specializes in technical, legal, and commercial language support for more than 100 languages and dialects worldwide. RussTech provides:

- Translation
- Interpreting
- Transcription
- Proofreading
- Consulting
- Glossary Development
- Negotiation Support
- Desktop Publishing

## WHAT SETS US APART

Unlike in some translation companies, every RussTech translator is a native speaker of the targeted language, and all draft translations are edited by a second linguist. Our language experts are able to offer 24-hour on-call support

for clients traveling internationally, as well as social courtesy training on best practices for your international business exchanges.

## PROJECT MANAGEMENT

RussTech specializes in managing large and complex translation projects, distinguished by our ability to produce consistent terminology and style across multiple documents. As a RussTech client, you will have your own dedicated project manager who works specifically to meet your individual language support needs.

## QUALITY GUARANTEED

At RussTech we stand behind our commitment to unparalleled customer service and dedication to every project. As a woman-owned small business now celebrating our 20<sup>th</sup> anniversary, we guarantee you will receive the very best language support at a competitive price.



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specializes in providing *translation* and *interpreting*  
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As an ISO 9001:2008 certified global leader in cutting edge lighting systems, we've been trusted to provide solutions for demanding nuclear applications since 1977. Today our innovative, rugged lights are used in more than 83% of the nuclear power stations in the U.S., and all across the globe. We deliver a full range of advanced lighting solutions, from brilliant Seismically-qualified Emergency lights, High Bay lights, and Fuel Pool lights, to Reactor Core Refueling lights and Underwater Camera lights.

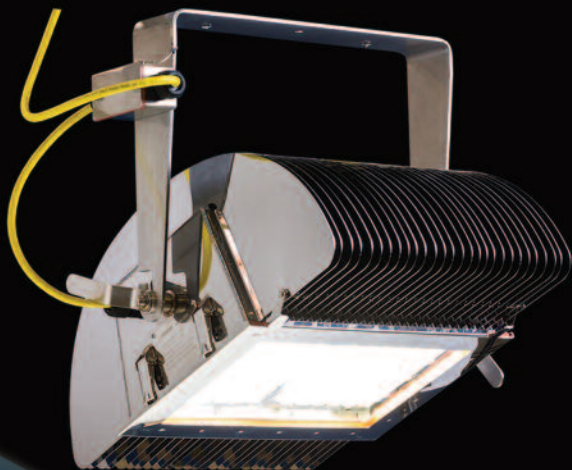
Our Quality System complies to the requirements of NRC 10CFR50 App. B., "Quality Assurance Criteria For Nuclear Power Plants and Fuel Reprocessing Plants," and our custom engineered products are stringently tested to enhance safety and radically decrease downtimes during fuel movement, inspection and maintenance.

Our new Emergency Lighting Fixtures (ELFs) are helping plants worldwide achieve B.5.b (EA-02-026) Post-Fire Safe-Shutdown. These powerful systems provide up to five times more standby illumination than required by the NRC and are seismically qualified.



BIRNS ELF-LED™

## Introducing A Quantum Leap In High Bay LED Lighting



BIRNS Quantum™

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- Powerful, wide area lighting for safer, more efficient working conditions
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- 109,000 hour lamp life; low 210W power draw
- Robust IP56-rated 430 stainless steel housing
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BIRNS' Quality Management System is  
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NRC 10CFR50, App. B Compliant

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**Over 40 Continuous Years as a Nuclear Safety Related Fabricator & Installer**

SSM Industries, Inc. (formerly Schneider Sheet Metal) is the largest Safety Related HVAC designer / fabricator / supplier / installer in the United States. SSM entered the nuclear industry over forty (40) years ago as the metal fabrication division of Schneider Power.

The Power Division of SSM Industries Inc. provides design, qualification, fabrication, and installation support to utilities in today's nuclear market. Over \$100 million of safety and non-safety related HVAC ductwork and components have been designed, tested and fabricated by our existing personnel at our facility. We have supplied equipment to virtually every Commercial Nuclear plant in the United States, as well as Nuclear Plants worldwide.

SSM Industries fabricates and installs an average of over 5 million pounds of ductwork a year to facilities including Commercial Nuclear Power Plants, Department of Energy (DOE) facilities, laboratories and hospitals.

Our nuclear qualified product line extends from the fan to the diffuser, and all the HVAC products in between.

Together with Westinghouse and CB&I, we were a part of the design team responsible for completing the AP1000 Containment Building HVAC Duct and Supports system. In addition, we are providing HVAC equipment for new ongoing nuclear construction.

SSM maintains a complete 10 CFR 50 / NQA-1 (including all Supplements) Quality Assurance Program. SSM is listed in the NUPIC data base as a pre-qualified vendor to supply Safety Related HVAC equipment and services, including the commercial dedication of components fabricated by others, to all commercial nuclear plants.

SSM is committed to maintaining a safe, incident-free work place. Whether at our offices, manufacturing facilities, client facilities, or the construction site, safety is the first priority. Established good safety standards and best practices are implemented and enforced to accomplish this. Safety is a shared responsibility at SSM in which each and every employee must take ownership of his or her own safety and the safety of their co-workers.

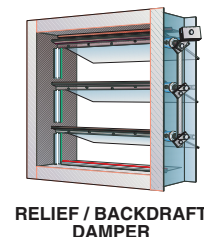
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 Pittsburgh, PA 15255  
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 www.ssmi.biz



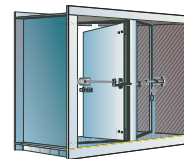
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**• HVAC SYSTEM COMPONENTS**

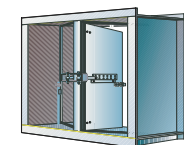
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  - ☑ Balancing
  - ☑ Bubble-Tight
  - ☑ Control: Manual, Electric & Pneumatic
- ☑ Diverter
- ☑ Fire & Smoke
- ☑ Guillotine
- ☑ HELB
- ☑ Isolation
- ☑ Tornado



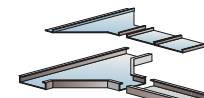
RELIEF / BACKDRAFT DAMPER



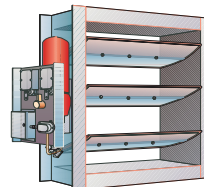
TORNADO DAMPER



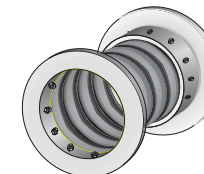
HELB DAMPER



CABLE TRAYS AND COVERS



ISOLATION DAMPER



FLEX CONNECTION

Grills, Registers & Diffusers

- ☑ Ductwork & Supports
- ☑ Fans: Axial & Centrifugal
- ☑ Filters & Filtration Units (incl. HEPA)
- ☑ Flexible Connections
- ☑ Grilles, Registers & Diffusers
- ☑ Housings
- ☑ Heat Exchangers
- ☑ Cooling Coils
- ☑ Louvers
- ☑ Plenums
- ☑ Sleeves

**• RADIATION SHIELDING**

- ☑ Doors & Barriers
- ☑ Penetration Seals

**• MATERIAL PROCESSING**

- ☑ Material Bins, Tanks & Chutes
- ☑ Ladders & Sorting Platforms

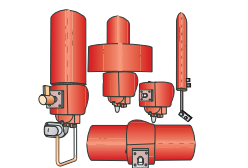
**➤ SERVICES ◀**

- ☑ Field System Walk downs
- ☑ Engineering Support
- ☑ Installation Supervision & Craft
- ☑ Component and Total System Testing, Adjusting & Balancing
- ☑ Commercial Dedication of client selected Equipment or Components as well as Stock Materials & Supplies

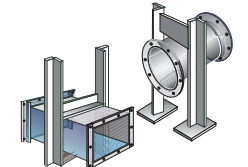
Complete Seismic & Environmental Qualifications

1E Qualified

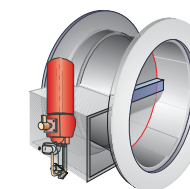
Complete 10 CFR 50 Appendix B NQA-1 Q/A Program



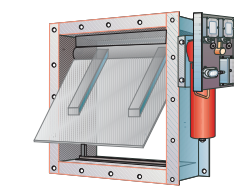
Actuators Pneumatic, Electric, & Electrohydraulic ("fail safe")



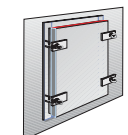
DUCTWORK & SUPPORTS



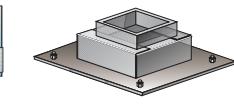
BUTTERFLY DAMPER



BUBBLE - TIGHT DAMPERS (Class 0, ASME AG-1)

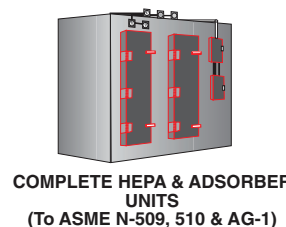


HIGH PRESSURE ACCESS or PLENUM DOOR

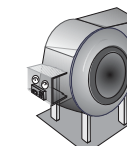


REMOVABLE FIRE RATED BARRIER

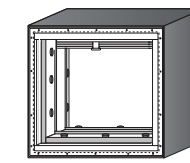
SSM-PL/11



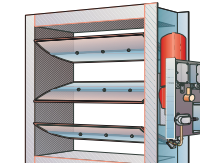
COMPLETE HEPA & ADSORBER UNITS (To ASME N-509, 510 & AG-1)



COMPLETE FAN ASSEMBLIES (To ASME N-509, 510 & AG-1)



INTERNAL EXPANSION AIRFLOW RATED 3hr FIRE DAMPER



CONTROL DAMPER

Grills, Registers & Diffusers

**SSM INDUSTRIES Inc.**  
 3401 Grand Ave. - Pittsburgh, PA 15225-1507  
 Tel: (412) 777-5101 - Fax: (412) 771-5382  
 E-mail - m.saucier@ssmi.biz



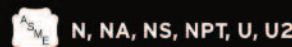
## WHEN EVERY DETAIL MATTERS.

Nuclear experience makes an infinite difference. With that experience comes attention to detail. With attention to detail comes predictability, capability and excellence. At Oregon Iron Works, Inc., (O.I.W.) we build first-class hardware, on time, as promised, with more than 2,000,000 manhours of production logged under nuclear Quality programs. Vast capabilities, combined with our strict Quality Assurance program, means we consistently deliver the oversight and detailed documentation the world's most critical customers demand. When it must be right, it must be O.I.W.

- 320,000 SF Fabrication, Machining & Integration
- 150 Certified ASME Welders, 10 ga. to 12 inch
- Stainless, Inconel, Carbon, Nickel, Titanium, Hastelloy
- 160 Ton Shop Lift Capacity
- CNC Machining, 10 lbs to 100+ tons
- Mechanical Assembly, Integration, Controls
- EPRI Compliant Commercial Grade Dedication



**OREGON IRON WORKS, INC.**  
NUCLEAR PRODUCTS DIVISION



Clackamas, OR USA  
Vancouver, WA USA  
503.653.6300  
www.oregoniron.com  
sales@oregoniron.com

ASME NQA-1 • 10 CFR PART 50, APP B

## DIVERSITY FUELS THE FIRE



Oregon Iron Works, Inc. (OIW) is an Oregon corporation founded in 1944 and has been under its current ownership and management since 1975. OIW's facilities are equipped with state-of-the-art manufacturing and fabrication equipment.

We continue to invest in capital expansion such as this new 8-meter, 5-Axis Horizontal Boring Machine. While other companies have struggled to survive in these tough economic times, OIW continues to grow and expand our capabilities. New machine capabilities, robotic welding cells, and facility improvements continue to help us serve industries as diverse as major bridge construction, water control equipment for the Army Corps of Engineers and specialty products for the Nuclear industry. This diversity gives us the experience to help our customers with

out-of-the box solutions to a wide variety of problems while maintaining class leading Quality standards.

## Innovate.



When the product demanded a high quality, vacuum tight, distortion free weld, OIW evaluated virtually all weld processes to produce parts correctly the first time. We developed specialty robotic weld procedures and techniques that precisely control the welding arc to minimize distortion and assure defect free results. Unique robotic programming techniques eliminated the need for precise positioning of the parts allowing fast set-up times with disparate products. The unique properties of this process allow us to maximize production and Quality benefiting everyone.

## Fabricate.



No product is too big or too small for OIW. Our state of the art fabrication facilities regularly turn out products weighing from 100 lbs. to 1,000 tons in all metals including Stainless, Carbon and specialty alloys. Our customers can rely on our experience to build it right the first time, as promised.

## Integrate.



When the product demands fabrication, machining, and integration into a complete operating piece of machinery, OIW is the right choice. Our experienced craftsmen integrate sophisticated products for the Marine industry, the Nuclear supply chain, Commercial products and critical launch support equipment for the Aerospace industry.

**OREGON IRON WORKS, INC.**  
SMALL COMPANY SERVICE ... BIG COMPANY CAPABILITIES

Innovate. Fabricate. Integrate.

## We are Fluor. Taking on tough challenges for more than 100 years.

Fluor is a global leader in engineering, procurement, construction, maintenance, and project management. Active across six continents, we work with governments and multi-national companies to design, build, and maintain many of the world's most complex and challenging projects.

We are a solutions-based company with the technical expertise and financial strength to meet the most difficult assignments. Fluor is known as a company that is reliable, delivers projects on time and within budget, has an outstanding safety record, and adheres to the highest ethical

standards. Our proven track record of overcoming engineering and environmental challenges has earned us the reputation of being dependable and resulted in well-established client relationships. Our contributions and achievements stimulate economic expansion and improve the quality of life for millions of people around the world.

For the past 70 years, Fluor has provided engineering, procurement, construction, and maintenance (EPC&M) services to the nuclear industry. In the United States, Fluor designed three nuclear power plants, constructed 10 nuclear power plants and supported construction on another 10 nuclear units during the 1970s and 1980s. Fluor expended its services in the 1990s at many of the operating commercial nuclear plants in the United States by providing major capital modification and maintenance services, as well as decontamination and decommissioning, resulting in more than 90 million hours worked. Our past and ongoing commercial experience includes the maintenance, modification, decommissioning, and related operating plant support services for 90 nuclear reactor units. All of this work was performed in accordance with the rigorous requirements of 10CFR50. Fluor currently supports the nuclear industry with full service EPC&M capabilities for nuclear new build projects, operating plant modifications, operations and maintenance services, and decommissioning services.



*Where innovation meets retirement.*

**Fluor's Power business** –  
Nuclear, Operations and Maintenance,  
Renewables, Alternate Technologies,  
and Fossil Generation

## Retiring Soon?

Fluor is committed to client life-cycle management.

As nuclear facilities approach retirement, Fluor provides utilities and government agencies with decommissioning services that enable clients to achieve aggressive closure goals.

We have an extensive nuclear experience portfolio and a team of veteran subject matter experts. Fluor is prepared to mobilize and address unique technical, human, political, and regulatory challenges with innovative solutions that work.

[www.fluor.com](http://www.fluor.com)

Contact us before time runs out.

[power@fluor.com](mailto:power@fluor.com)

**FLUOR**<sup>®</sup>

## ENHANCED CLIENT TRUST AND ENGAGEMENT

Fluor is committed to our Clients' success. Since contract initiation, Fluor has closely aligned with Pacific Gas and Electric Company to foster an integrated culture of Client/contractor performance. Strong initial alignment and consistent communication has allowed Fluor to implement an effective program focused on safety excellence, quality, cost savings, supplier diversity, and sustainability. What's more, it led to enhanced Client trust in Fluor's capabilities and ongoing engagement.

Fluor team members like Curt Lefferts, director of nuclear operations and general manager of maintenance services, work hard for our Clients every day – aligning priorities and objectives and promoting a strong project culture.

Since 2010, Fluor has provided maintenance support to Pacific Gas and Electric Company's Diablo Canyon Power Plant in San Luis Obispo, California. Situated on the coast, Diablo Canyon is a safe, clean, reliable and vital energy resource for California providing low-cost, carbon-free electricity for more than three million people.

[www.fluor.com](http://www.fluor.com)

*Fluor was recently honored by receiving the Pacific Gas and Electric Company Generation Supplier of the Year award.*

**Fluor's Power business** –  
Nuclear, Operations and Maintenance,  
Transmission, Renewables, Alternate  
Technologies, and Fossil Generation

**FLUOR**<sup>®</sup>



## ***Pioneering Passive Fire Protection Systems in the Nuclear Industry for More Than Three Decades***

PCI Promatec offers an unmatched library of products and designs qualified to meet the rigid standards of fire safety in the nuclear industry, from the development of our own line of penetration seals to the acquisitions of other industry leaders, including Bisco/Brand, ICMS, and Techsil.

We offer qualified systems for fire, pressure, radiation, security and flood seals. Additionally, through our exclusive agreement with 3M, we have qualified 1-3 hour electrical raceway fire barrier systems that fully comply with the most rigid USNRC requirements.

Our NQA-1 Quality Assurance program has passed the rigorous audit process of NUPIC every year since its inception. Our Target Zero safety program is the best in the industry.

As a wholly-owned division of Performance Contracting Group (PCG), we offer financial stability as "One of the Top 10 Specialty Contracting Firm in the USA," as ranked by *ENR Magazine*.

Our core staff averages 25 years experience in nuclear passive fire protection, making PCI Promatec "the authority" in this industry.

Our customer base includes the majority of nuclear plant owners in the USA, DOE, and a number of international utilities in Asia and Europe. In an average year, we do business with over 50 facilities with services ranging from technical support to full turnkey contracts. With contracts successfully completed from \$1,000-\$20,000,000, no job is too large or too small.

If you have a need, we have a solution. Call Mike Jordan at 281-933-7222, email PCI Promatec at [info@promatec.com](mailto:info@promatec.com) or visit us on the web at [www.promatec.com](http://www.promatec.com).



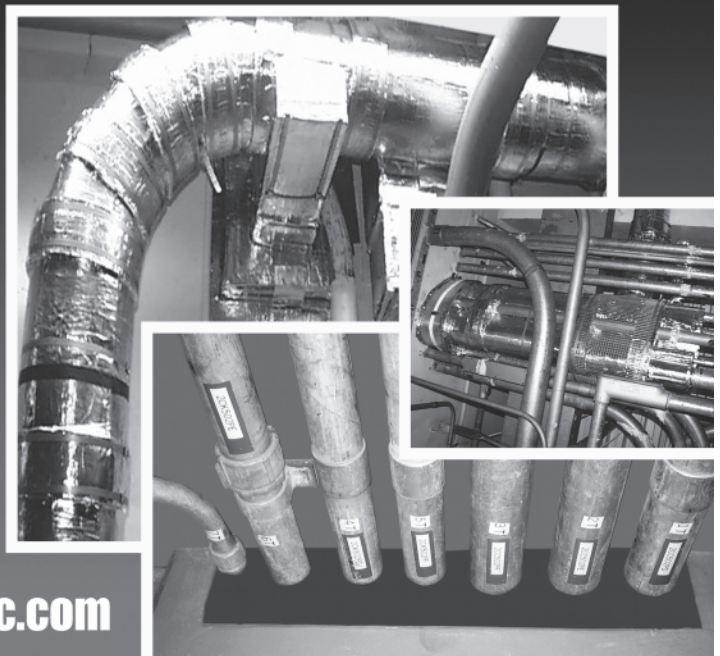
## **Your Complete Source for Passive Fire Protection Products and Services For More Than 30 Years!**

<b>Installation</b>	<b>Engineering</b>
<b>Project Management</b>	<b>Quality Assurance</b>
<b>Training/Certification</b>	<b>Fire Test Support</b>

- Fire, pressure and radiation penetration seals
- 3M Interam™ flexible fire wrap systems for Appendix R circuit protection, fully qualified to USNRC Letter (GL) 86-10, Supplement I
- Fire, blast, moisture, and impact-resistant wall systems for zone separations and other applications
- Nuclear-dedicated greases, lubricants, compounds and other chemicals by Dow Corning® and others

Our innovative passive fire protection solutions are the nuclear industry standard, installed in 100+ facilities worldwide.

**281-933-7222 [www.promatec.com](http://www.promatec.com)**



- ✓ Immediate access to great nuclear talent
- ✓ Integrated managed staffing and quality solutions
- ✓ A team who knows the industry inside and out



With System One, you don't have to choose.

### We're experts in nuclear.

When it comes to contingent workforce management solutions, System One has the experience you need – more than 30 years of it, in fact. We help nuclear utilities, service providers and OEMs address resource issues, assure compliance and get work done.

From startup and commissioning to vendor management and outage support, System One covers the full production lifecycle.

### Choose the right partner.

Onsite or in the field, we combine high quality with rapid response to support a full range of recruiting needs and quality solutions.

**system|one**

Leaders in technical outsourcing solutions  
systemoneservices.com

t 877.505.SYS1 (7971)  
inquiry@systemoneservices.com

### Services

- Licensing & Regulation, including Renewal
- New Construction, Startup & Commissioning
- Design Basis Evaluations & Modifications
- Operations & Maintenance
- Engineering
- Technology Implementations & Development
- Emergency & Outage Support
- Plant Condition Assessments
- Asset Management Strategies
- Quality Assurance & Quality Control
- Field Inspection
- Nondestructive Testing

## Smart, Seamless Contingent Workforce Management

*System One customizes nuclear solutions for complete coverage.*

System One helps nuclear firms address critical challenges, including:

- workforce planning and recruiting
- safely maintaining infrastructure
- adopting and integrating the smart grid.

### Much more than a technical staffing firm

For more than 30 years, nuclear has been the core of our business. Specializing in staff augmentation, managed staffing and VMS technology, System One offers fully-integrated energy solutions.

### Building the future

We provide project management and resources for construction and capital expenditures. In addition to hands-on design-build support, System One specializes in owners' representation.

### Condition assessments

We provide asset management to support critical decisions about maintenance, repair and upgrades.

- **Quality Assurance & Quality Control:** for key projects and ongoing programmatic support
- **Field Inspection:** in-house and mobile with integrated lab services
- **Nondestructive Testing:** NDE services across diverse methodologies

*System One combines the flexibility to address short-term resource issues and the innovation to help nuclear firms plan for the future.*

### Rapid response outage support

Every year System One provides hundreds of specialized professionals

to support shutdown activities, all with complete procedural integrity.

### Professional engineering support

System One delivers professional engineering support (mechanical, electrical, structural, I&C, environmental and more) across a full range of critical plant systems and components.

### Optimizing your platform

System One helps utilities prioritize and integrate smart grid technology investments.

### Choose the right partner.

Take the guesswork out of nuclear solutions with System One.

**system|one**

systemoneservices.com  
inquiry@systemoneservices.com

## Emerson Process Management raises the bar with the Rosemount 3150 Series of Nuclear Pressure Transmitters

*The new series seamlessly replaces the Rosemount 1150 Series with improved performance*

Pressure measurement is mission-critical in nuclear power plants, and for 40 years the Rosemount 1150 Series of nuclear safety related pressure transmitters has been an industry standard. The Rosemount 1153 was the first pressure transmitter on the market qualified to both IEEE Std. 323™-1974 and IEEE Std. 344™-1975, and together with the Rosemount 1152 and the Rosemount 1154, continues to be one of the most popular model families in nuclear plants around the world.

And now you can have the proven safety and performance of the Rosemount 1150 Series while taking advantage of the latest technological innovations to operate your plant even more confidently. Introducing the Rosemount 3150 Series of Nuclear Transmitters, the culmination of extensive, continued investments in improved core sensing technology, electronics design and overall transmitter performance. The series upholds a tradition of unmatched product quality in nuclear sensing and leverages the dependability, functionality and performance levels that you expect from Rosemount solutions.

### FULLY ANALOG ELECTRONICS

100% analog, the Rosemount 3150 Series does not use microprocessor-based electronics. This analog design improves security and reliability

and helps the operator reduce risk. With no digital parts or connections, you have the ultimate in cyber security. In addition, the Rosemount 3150 Series provides superior radiation tolerance. With consistent, reliable performance even in the harshest environmental conditions, the Rosemount 3150 Series minimizes your exposure to risk factors like software verification & validation (V&V), and evolving regulatory requirements.

### IMPROVED SENSOR TECHNOLOGY

With Emerson's patented floating capacitance sensor design, you can improve transmitter performance and reliability and extend calibration and maintenance cycles.

### IMPROVED QUALIFICATION PEDIGREE

You can depend on reliable and accurate performance of the Rosemount 3150 Series in critical current and future safety applications because Emerson's extensive, robust testing meets higher qualification test profiles which envelope those of the legacy Rosemount 1150 Series. The transmitters have successfully completed fully sequential qualification test programs per IEEE Std. 323 and IEEE Std. 344. Versions are also available tested to meet RCC-E-2002 and KTA 3505-2005 standards for use in countries where those standards are used to license plants.



Rosemount 3154 Pressure Transmitter

### IMPROVED CAPABILITIES FOR HARSH ENVIRONMENTS

With the Rosemount 3150 Series, you can operate confidently in critical safety applications. The transmitters are designed to operate in environments from mild to severe or harsh for both legacy and Gen 3 reactor technologies.

### ELECTROMAGNETIC COMPATIBILITY

The Rosemount 3150 Series meets both USNRC Regulatory Guide 1.180 Rev 1 and EN 61326.

### SCOPE OF THE CHANGEOVER

Designed as "drop-in" replacements for the Rosemount 1150 Series transmitters, the Rosemount 3150 Series has the same process connection dimensions, electrical connections, and mounting bracket hole dimensions as its predecessor.

All Models in the Rosemount 1150 Series, including the Rosemount 1159 remote diaphragm capillary system, will ultimately be superseded by the improved Rosemount 3150 Series.

### TRANSITION SCHEDULE

The chart at left shows the schedule for replacement of each member of the Rosemount 1150 Series with the new Rosemount 3150 Series models.

### GET ALL THE DETAILS ONLINE

To make sure you select the best model for your plant, check out the product comparison tool at [www.RosemountNuclear.com](http://www.RosemountNuclear.com). With it you can make model-by-model comparisons on qualification levels, design basis event profiles, EMC qualification tests performed, normal operating performance and physical and functional specifications. You can also find help with your equivalency documentation.

As always, Emerson stands ready to assist you with timely technical support and will continue to dedicate our organization to supporting your nuclear qualified measurement needs for the life of your plant.



**Risks can come from any direction. I need to trust my instrumentation to perform reliably in both normal and accident conditions.**

# YOU CAN DO THAT

**ROSEMOUNT®** Stay prepared for anything with the Rosemount 3150 Series of 100% Analog Nuclear Pressure Transmitters. When it comes to your operation's safety, the stakes have never been higher. That's why we've taken the industry standard in nuclear pressure transmitters, and improved on it. The Rosemount 3150 Series builds on the trusted, proven performance of the Rosemount 1150 Series, yet offers enhanced capabilities and proficiency under all operating conditions. Count on Rosemount measurement to keep you moving in a safe direction. Visit [www.RosemountNuclear.com](http://www.RosemountNuclear.com) to obtain product documentation.



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EMERSON. CONSIDER IT SOLVED.™

		2014	2015	2016
	Rosemount 3152	Now Available		
	Rosemount 1152 N	Orders No Longer Accepted		
	Rosemount 1152 L		Apr. 2015	Last Shipments
		Oct. 2014		
	Rosemount 3153	Now Available		
	Rosemount 1153B		Apr. 2015	Last Shipments
		Oct. 2014		
	Rosemount 3154	Now Available		
	Rosemount 1154H		Apr. 2015	Last Shipments
	Rosemount 1154			Last Shipments
	Rosemount 1153D			Last Shipments
		Oct. 2014		
	Rosemount 3159	Now Available		
	Rosemount 1159		Apr. 2015	Last Shipments
		Oct. 2014		

Note 1: ● = Last order date for Rosemount 1150 Series product.  
 Note 2: ◆ = Last quotation date for Rosemount 1150 Series product.

## With Miller Pipeline, the leaks stop here.

Whether it's circulating water or safety related piping, Miller Pipeline has a cost effective solution that can be installed quickly and professionally. The flagship of Miller's service offerings in nuclear power plants has been our internal joint sealing product, WEKO-SEAL®, which is used to provide corrosion protection from brackish water or terminate troublesome leaks at joints.

The WEKO-SEAL is a cost effective solution that provides outstanding long-term results in part because of the installation techniques we use when placing them. Their design and the physical properties of the seal itself, which is made from a flexible EPDM (Ethylene Propylene Diene Monomer) rubber compound is held in place with hydraulically expanded stainless steel retaining bands that ensure a bottle tight installation.

The WEKO-SEAL® is installed via man-entry in pipelines with penetration

distances in excess of 1,000 feet. The WEKO-SEAL comes in a variety of widths but can also be used for continuous coverage of any distance through our Sleeve/Seal capabilities.

In addition to the WEKO-SEAL, we offer a cured-in-place pipe (CIPP) that is used to reline an existing pipeline of virtually any size or configuration.

The resins used in our CIPP can be designed to meet specific service requirements. Whatever the need might be, or whatever product used, our technicians work closely with staff engineering personnel to formulate and execute all desired outage objectives.

For over 25 years, Miller Pipeline has served the nuclear industry by providing inspection services, coating repairs, ultrasonic testing, internal joint sealing corrosion prevention, maintenance, video inspection and pipeline cleaning, pipe relining and replacement and

more. Miller Pipeline is an industry leader in a number of various trenchless technologies which ensure little to no disruption to above ground facilities or operations. All of Miller Pipeline's technicians are confined-space trained and certified to comply with all requirements of 29CFR 1910.146 Federal OSHA's Permit Required Confined-Space Regulations. Our technicians can quickly gain unescorted access and are able to perform all required activities with short notice.

At Miller Pipeline we understand the stress of refueling outages and view our role as an extension of plant personnel to achieve assigned tasks, on time and in a professional and safe manner.

For additional information regarding Miller Pipeline please visit our website at [millerpipeline.com](http://millerpipeline.com) or call us at 800-428-3742.



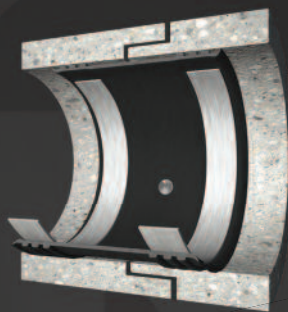
# Miller Pipeline

The industry's leader in internal joint sealing.

[millerpipeline.com](http://millerpipeline.com)

### Specialized Outage Services:

- WEKO-SEAL® Internal Joint Seal
- CIPP Installations
- Pipeline Assessment Services
- Certified Coating Applications
- Corrosion Prevention/Maintenance
- UT Testing
- Video Inspections
- Detailed Inspection Analysis

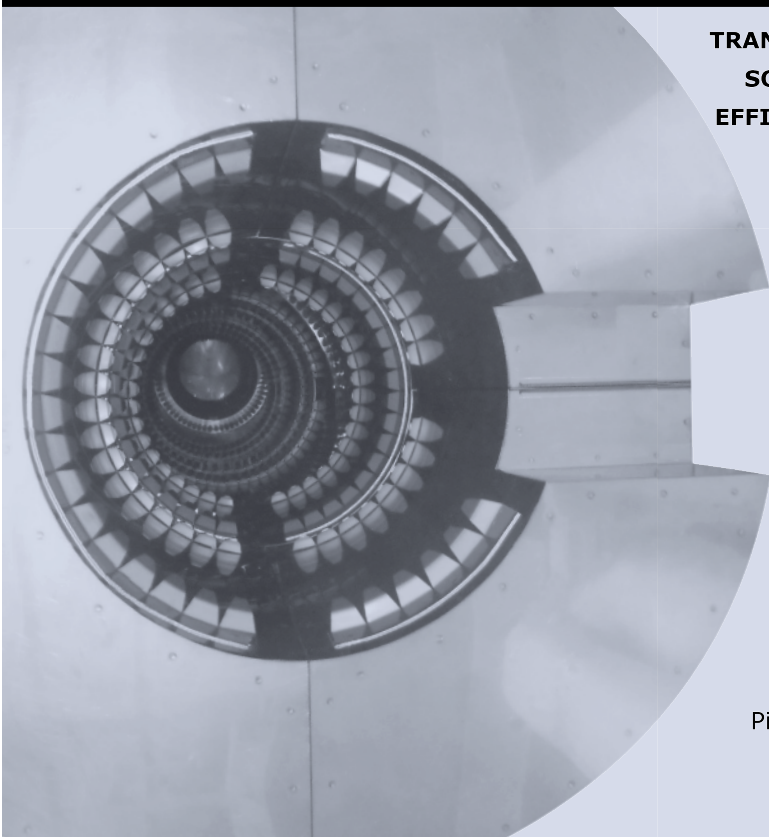


Cross section model of WEKO-SEAL®

Contact a representative in your area.  
Call 800.428.3742 or email [info@millerpipeline.com](mailto:info@millerpipeline.com)



# HOW DO YOU SEE YOUR INSULATION NEEDS?



**TRANSCO'S VISION FOR INNOVATIVE PRODUCT SOLUTIONS IS IMPROVING THE SAFETY & EFFICIENCY OF NUCLEAR PLANTS WORLDWIDE**

Transco is deploying innovative new 3D field measurement techniques to provide:

- World class insulation fit up
- Efficient installation
- Reduced on-site modifications

Cutting-edge research and design processes result in rigorously tested products with proven field performance

Pioneering new product development initiatives are introducing unique solutions for difficult problems facing the nuclear industry

## METAL REFLECTIVE INSULATION

Designed using proven testing, installation experience and lessons learned from decades of successful projects, Transco's insulation provides reliable thermal performance.

## RADIATION SHIELDING

Transco has custom designed shielding solutions that address radiation concerns at the location of the source custom designed for any system configuration.



## PASSIVE FIRE PROTECTION

Transco offers a full-line of products for sealing electrical, mechanical, and structural penetrations (fire, flood, ventilation, and/or radiation boundaries) as well as a full range of qualified radiant energy barrier materials.

## TRANSCO'S MRI IS IDEAL FOR:

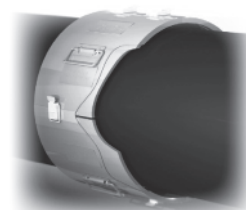
- GSI-191 Fiber Reduction
- Major Equipment Upgrades
- New Plant Construction
- Ongoing Maintenance/ Outage Activities

## TRANSCO'S SHIELDING:

- For use on piping, vessels and equipment
- Optimizes valuable plant space
- Lowers dose exposure to plant personnel
- Reduces maintenance costs

## TRANSCO'S FIRE PROTECTION PRODUCTS:

- Meets latest test standards for fire and flood
- Simplified Installation
- Consistent Quality
- Cost Effective



# Transco Products Inc.

IMPROVING PLANT SAFETY AND EFFICIENCY THROUGH INNOVATION

## Expert Nuclear Support / Unique Facilities



Kinectrics Head Office

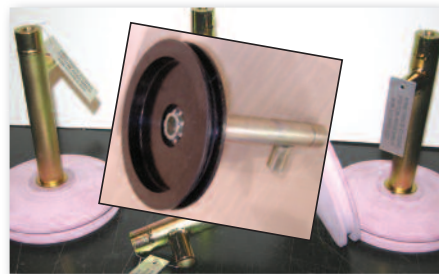
### Kinectrics - Dedicated to Nuclear Reliability - Worldwide!

Kinectrics' expert teams of qualified experienced professionals provide comprehensive, specialized capabilities for the nuclear industry and OEMs supplying the nuclear fleet.



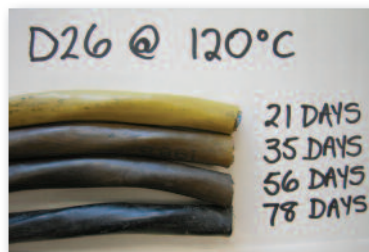
Ovens for Thermal Aging

Our Nuclear Products and Engineered Services, Generation Life Cycle Management, Environmental Technologies and Electrical / Mechanical Testing business areas deliver broad-based services from fully-equipped, accredited lab facilities, and on-site, to support reliable nuclear operations.



Reverse Engineering

Kinectrics' experienced technical specialists can accurately assess asset and component condition and remaining life, find, dedicate, and qualify replacement parts, and test / qualify components to rigorous regulatory standards.



Materials Testing

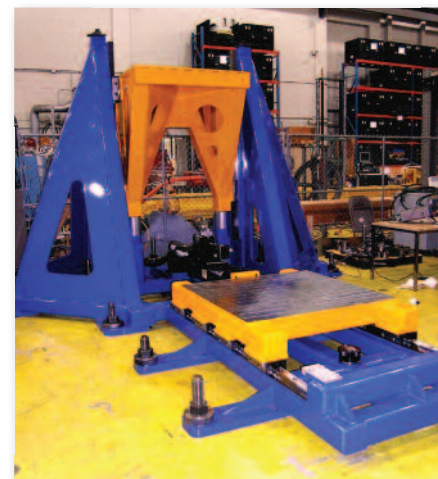


EQ Testing

### Equipment Qualification (EQ) / Commercial Grade Dedication (CGD) / Reverse Engineering

Qualified nuclear components are essential to maintain safe plant conditions and, mitigate consequences in the event of an accident. Kinectrics' unique laboratory and analytical capabilities are employed in each qualification activity and CGD process.

We develop and optimize client EQ test programs. Kinectrics can also accurately evaluate critical characteristics of obsolete components and parts to provide a direct replacement that is the same in form, fit and function as the original. Excellence in core competencies in electrical engineering, analytical chemistry and related technical areas expand Kinectrics services beyond those of other international laboratories.



RIM Table for Seismic Testing

### Kinectrics US Inc.

Based in Cincinnati, Ohio, **Kinectrics US Inc.** provides focused local EG and CGD support for the existing nuclear fleet and new build programs throughout North America, incorporating our team's long-established experience with US nuclear standards and regulations.

**EQ and CGD specialists in both the US, and at our Canadian lab facilities, have qualified thousands of safety-related electrical and mechanical components.**

### A History of Technical Excellence

Kinectrics has earned an international reputation for excellence in supporting the commercial nuclear power industry since its inception over 50 years ago. In 2014, Kinectrics continues to build on over 100 years of success in the electricity generation industry.

### Kinectrics Facts

- Over 400 highly-qualified staff in North America
- Over 25 independent test facilities, labs and, field inspection services
- Central state-of-the art facilities = 300,000 sq. ft.

### Quality Assurance

Kinectrics is registered to ISO9001:2008, NUPIC-audited, and maintains a 10 CFR 50 Appendix B program. Our technical testing and certification services meet or exceed a wide range of national and international industry standards.



KINECTRICS



## GENERATING SUCCESS—FOR OVER 100 YEARS

Kinectrics is celebrating over 100 years of success in providing advanced technical expertise to the electricity generation industry.

For nuclear, our unique engineering and testing capabilities include complete outage support, inspection and equipment qualification, nuclear plant chemistry and many other industry-accredited services.

- Life Cycle Management and Plant Life Extension
- Genuine Nuclear Parts and Equipment Qualification
- Inspection and Maintenance Systems and Services
- Materials Characterization and Forensic Analysis
- Plant Chemistry and Nuclear Waste Management
- Regulatory Affairs and Licensing
- Decommissioning Planning and Risk Management



KINECTRICS

KINECTRICS\*USE



Division of Kinectrics Inc.



A Kinectrics Company

kinectrics.com

kinectrics.us

axiomndt.com

candesco.com

# Rewinding a 13.8 kV, 93,000-lb. motor is easy —

Finding a service partner that has completed multiple quality audits based on the NUPIC checklist is the hard part



IPS has years of experience repairing safety- and non-safety related nuclear motors up to 13.8 kV and weighing over 93,000 lbs.



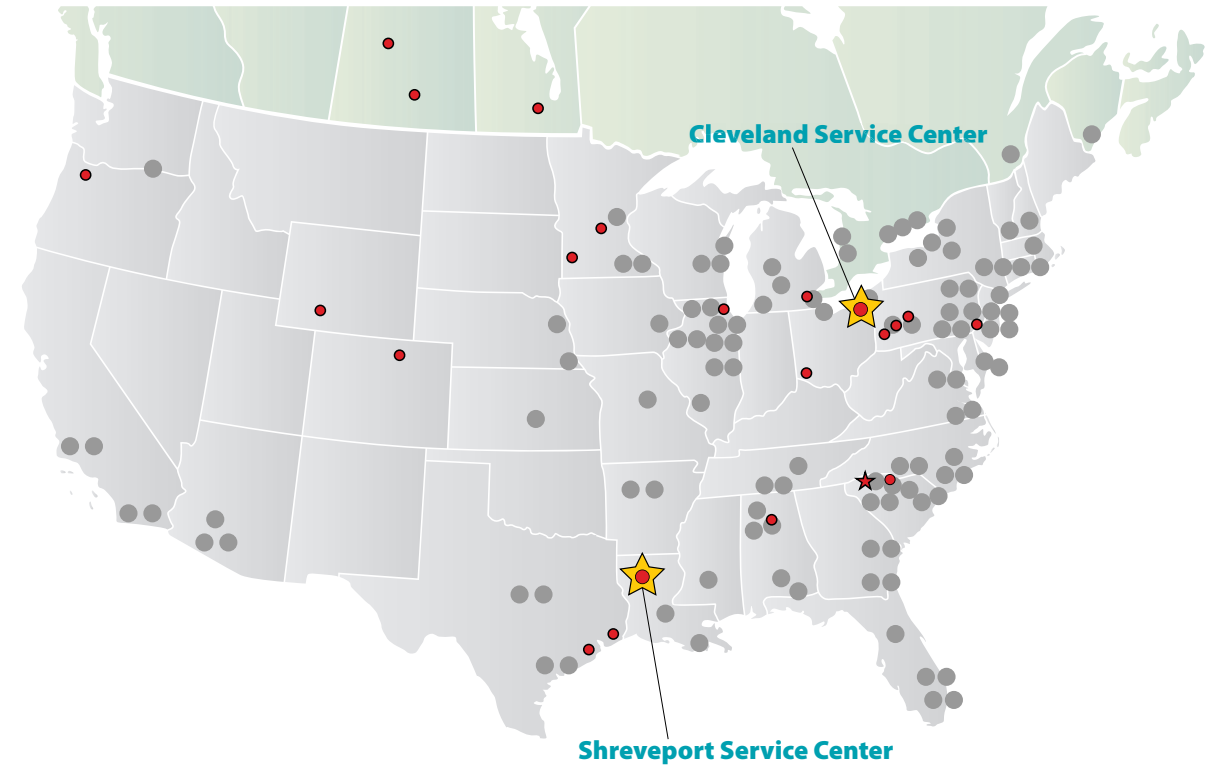
- Multi-location 10CFR50 Appendix B and 10CFR21 programs
- Unified Safety, Quality and Lean culture
- Engineered insulation systems to 15 kV
- In-house coil manufacturing up to 15 kV
- IEEE 429 underwater AC Hi Pot to 13.8 kV
- Experienced field service department
- Decontamination services and contaminated equipment repair available
- Dedicated motor storage facilities



To learn more about IPS Nuclear Services and our motor test and repair process, contact Tony Oubre, IPS Nuclear Services Project Director, at 864.451.5600 or nuclear@ips.us.

[www.ips.us/nuclear](http://www.ips.us/nuclear)

## Nuclear Service Coast-to-Coast



★ IPS Nuclear Repair Centers ● Nuclear Reactors ● IPS Regional Service Centers



IPS nuclear repair centers in Cleveland and Shreveport have dedicated clean rooms for winding and repairing nuclear motors, applying best practices for Foreign Material Exclusion (FME).

IPS offers safety and non-safety related nuclear motor repair services, including radiologically contaminated motors, through its Cleveland and Shreveport nuclear repair centers. Both locations comply with applicable federal regulations and nuclear standards, including 10CFR50 Appendix B and ANSI N45.2, as well as 10CFR21.

The IPS Nuclear Services Quality Assurance Program offers one standard for safety, quality and repairs at both service centers, allowing IPS to service utilities with multiple

nuclear power plants to the same standards and specifications from either service center. The IPS Cleveland and Shreveport nuclear repair services are accessible through any of the eighteen IPS regional service centers coast to coast.



[www.ips.us/nuclear](http://www.ips.us/nuclear)



Our VPI and B-stage coils are manufactured in our environmentally-controlled clean room, using our automated taping process and CNC spreader to ensure uniform tape application and precise duplication of coil geometry.

# Bigge Utilizes World's Largest – 7,500 Ton Capacity Super Crane

Bigge Crane and Rigging has manufactured the world's largest-capacity crane at radius that has forever change large scale modular construction. The first of Bigge's Super Heavy Lift Cranes have been deployed in the US at new Westinghouse AP1000 sites at both V.C. Summer and Plant Vogtle.

Bigge's Super Heavy Lift Cranes have unequalled capabilities - Bigge offers the only machine in the world capable of sitting in a single location and making every large scale super lift on a single or multi unit nuclear power plant site.

Imagine the flexibility of having a crane hook capable of lifting any load, anywhere, at any time on your project.

With a Bigge Super Heavy Lift Crane...

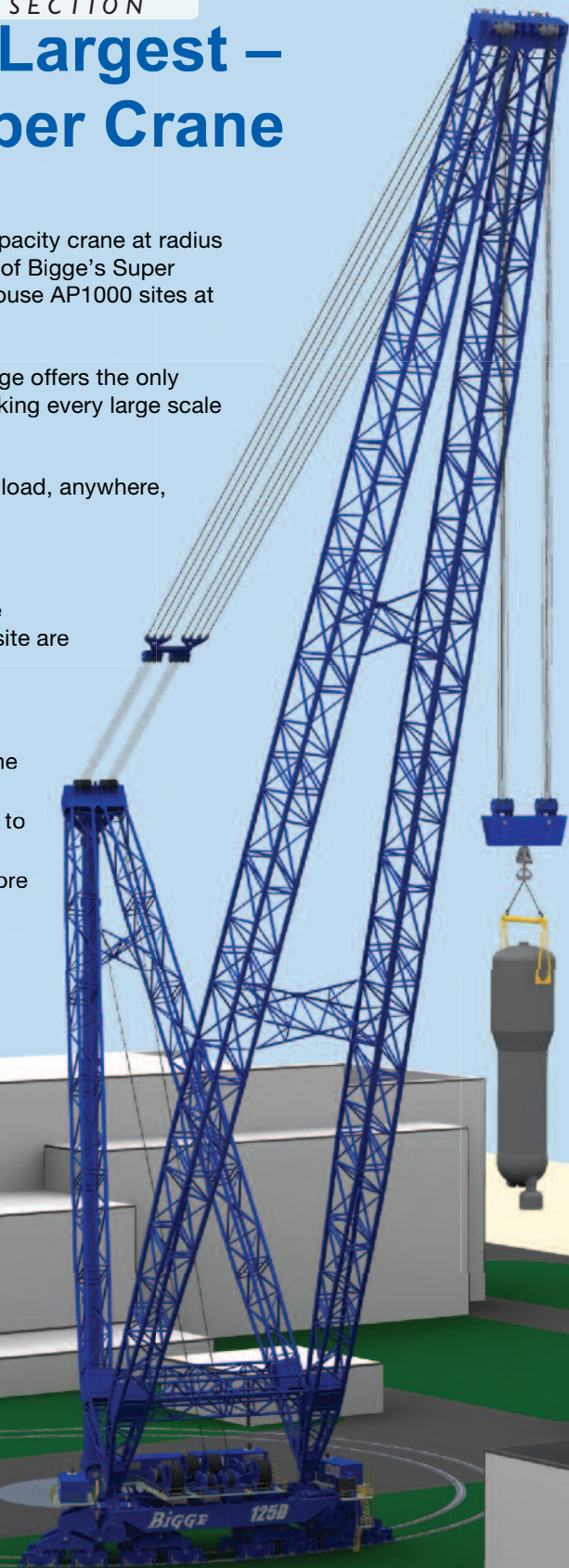
- Multiple heavy lift machines and/or multiple locations will not be required – all locations on both units of a two unit construction site are able to be serviced by one crane, from one location
- No loss of service from crane relocation down time
- Construction erection sequences will be much more flexible
- Construction schedules can be managed in real time knowing the crane capacity and availability are not a constraint
- Excavations will no longer need to be completed and filled prior to having heavy lift equipment ready for service
- Module heavy lift pre-assembly and staging locations can be more flexible and conveniently located

## Sample load capacities of Bigge's Heavy Lift Crane

Configured with 560' of main boom and 210' of fixed jib

Radius* (Feet)	Capacity (Short Tons)	Radius (Meters)	Capacity (Tonnes)
240	4,000	73	3,640
640	836	195	760
790	500	241	455

\* From center of rotation



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 CRANE and RIGGING CO.  
 Established 1916

Please contact:  
 Richard Miller, Vice President  
 +1 510-638-8100  
[biggsolutions@bigge.com](mailto:biggsolutions@bigge.com)

[www.bigge.com](http://www.bigge.com)

**Gutor**  
technology

**Schneider**  
Electric



At Schneider Electric™, every step of your GUTOR™ UPS's life cycle – from pre-sales and design, through to final testing and after-sales services – is custom-tailored to meet your specific needs.

## Providing in-depth expertise for nuclear projects: GUTOR supplies Class 1E systems

GUTOR Electronic LLC, a Schneider Electric company, is pleased to announce contracts with Westinghouse Electric Company to supply Class 1E battery chargers, inverters and voltage regulating transformers for four AP1000® reactors currently being built in the United States.

Serving the nuclear market over 30 years:

- GUTOR battery charger and inverter systems installed in over 100 reactors in 20 countries
- Contracts for 51 new build commercial reactors in the last 15 years
- Multiple contracts for QL1 systems for US DOE sites
- Dedicated nuclear industry team
- 10CFR50 Appendix B, 10CFR21 and ASME NQA-1 compliant

For many years a leading supplier of industrial UPS systems to the oil and gas sector, the GUTOR technology has become a leader in the fossil and nuclear power sectors as well.

GUTOR systems are highly regarded for their performance and reliability in critical industrial applications.

GUTOR Electronic LLC  
[www.schneider-electric.com/gutor](http://www.schneider-electric.com/gutor)

Headquarters  
Hardstrasse 72-74  
CH-5430 Wettingen, Switzerland  
Phone: +41 (0)56 437 34 34  
Fax: +41 (0)56 437 34 44

North America Nuclear Area Sales Managers:

Tom Stomerski  
525 Boulder River Drive, O'Fallon, MO 63368  
Phone: +1 (636) 294 5198  
[tom.stomerski@schneider-electric.com](mailto:tom.stomerski@schneider-electric.com)

Michael May  
635 Plainfield Rd, Knoxville, TN 37923  
Phone: +1 (865) 230 - 3582  
[michael.may@schneider-electric.com](mailto:michael.may@schneider-electric.com)

## Industry Leading Activities in Digital Controls

Demonstrating Hurst Technologies continued leadership in nuclear I&C, noteworthy current and recent projects include:

- Gen IV reactor I&C design and licensing activities, development of digital-based protection.
- New plant licensing and design addressing safety related loss of phase essential power monitoring and protection.
- I&C for standard plant designs for NRC certification.
- Turnkey design/build digital control system for high-power research reactor.
- Margin recovery power increase based on improved ultrasonic flow meter.
- ERF computer system conceptual design for multi-unit plant addressing obsolescence and plant remaining life.
- Upgrade safety-related turbine-driven pumps with digital controls and electric actuators.
- Upgrade EOP setpoints to accommodate Fukushima-based requirements.

Part of Hurst's commitment to industry leadership involves leading or participating in numerous standards committees, technical conferences, and regulatory compliance workshops. In January, Hurst expanded on that commitment by conducting the benchmarking and training workshop, Instrument Setpoints and Uncertainties, and plans to conduct a second workshop, "Plant Computer and Digital Control System Configuration Management," in 2015.

**Setpoints workshop a success.** Representatives from ten nuclear plants gained an understanding of methodology, techniques, and

requirements in determining instrument loop uncertainties and setpoints. The first day consisted of learning and reviewing the basics – definitions, the relationship of setpoints to safety analysis and criteria, error sources, multiple loop error models, loop analysis, and uncertainty calculation techniques. The second day was devoted to practical examples from four of the basic plant measurement categories, pressure, temperature, level, and flow. Representatives from two nuclear plants delivered presentations on their experiences and practices.


**Configuration Management (CM)** is still an issue that many plants struggle with, even as its importance grows because of physical and cybersecurity concerns, NRC

regulations, NERC security and reliability rules, new grid and market management processes and organizations, and inadequate configuration management tools provided with OEM control systems.

Hurst's offerings in configuration management include evaluation of DCS vendor CM tools, conceptual strategy development, functional specifications, assessment of current practices, benchmarking of industry leading strategies, and project management.



For more information, contact Bill Sotos at [Bills@hursttech.com](mailto:Bills@hursttech.com), or call Bill or Timothy Hurst at 979-849-5068.



# HURST

## TECHNOLOGIES

Control Systems Engineering & Consulting

The road to success

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- MODIFICATION PACKAGES
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- CYBERSECURITY
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# The Evolution of Scaffolding



Excel Modular Scaffold

**NO TOOLS REQUIRED!**

Using the Excel Modular Scaffold System can reduce your plant's craft wrench time as much as **25%!**

## BHI Energy Offers a **FREE** Excel Scaffold Material Program

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- Welding & Machining
- Facilities Maintenance



### Technical Services

- Professional & Technical Staff Augmentation
- Radiation Protection
- Radiological Engineering



You may know us as Bartlett, PEM, SUN Technical, WeldTech or AMES. While our company name has changed, our brand remains synonymous with the quality services we have provided the nuclear industry for more than 35 years.

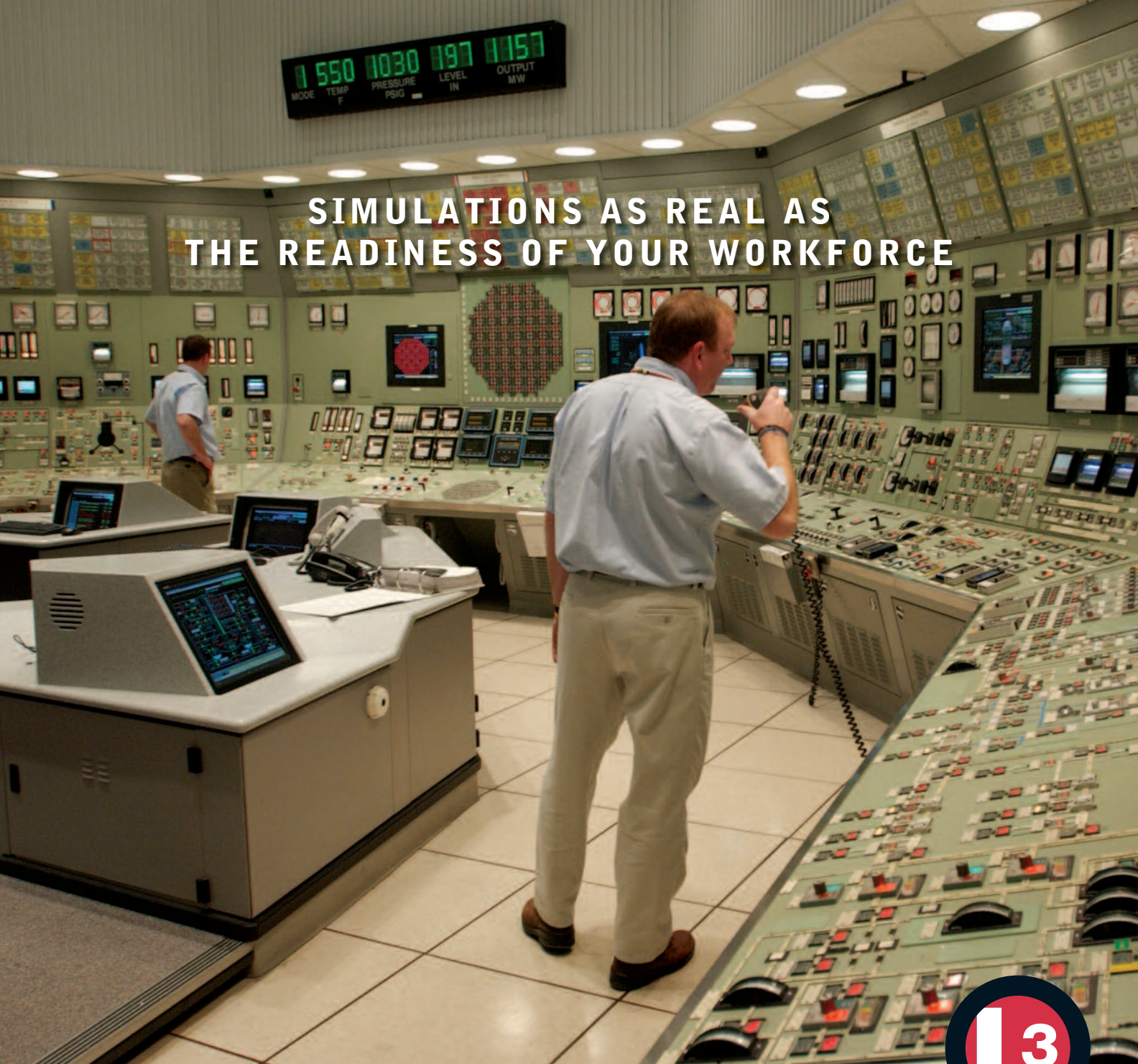
Our commitment to safety, customer service and delivering proven solutions to our customers reside at the core of our business.

[www.bhienergy.com](http://www.bhienergy.com)

## High-fidelity Power Plant Simulators for Safe Operations Today and Tomorrow

When you're looking for improving your power plant's performance and reliability, you'll want the right simulation experience to get you there. One company has the dedication to produce true-to-life power plant simulators that ensure that your personnel have the knowledge required to safely and efficiently operate your power plant.

### SIMULATIONS AS REAL AS THE READINESS OF YOUR WORKFORCE



For more than 40 years, L-3 MAPPS has worked with leading utilities, plant designers and research organizations to create superior training and engineering systems and has established itself as the world's pre-eminent manufacturer of power plant simulators. L-3 MAPPS is a company of people with ideas and vision, with a desire to create value through innovation and with the experience to achieve success.



Full Scope Power Plant Simulator

#### DOING IT RIGHT

Providing more than just training devices, L-3 MAPPS' simulator solutions - powered by the unparalleled Orchid® suite of simulation products - will elevate your operation and engineering teams to new heights in addressing plant design issues, procedural deficiencies and reliability improvements. L-3 MAPPS simulators provide superior real-world power plant training. L-3 MAPPS offers a variety of products and services, including full scope simulators, classroom simulators, engineering simulators, part-task trainers, severe accident simulation, simulator retrofits and upgrades, and more. L-3 MAPPS provides design to completion turnkey systems, specific components, and simulator design tools as required by the customer. The company's simulators offer the highest quality in modeling fidelity and training to provide trainees and instructors with user-friendly tools for learning, operating and mastering complex power plant systems.

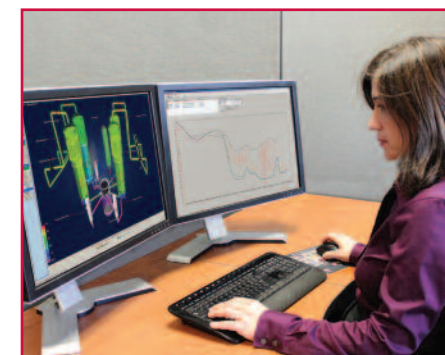
The superior training environments of L-3 MAPPS simulators provide clear advantages for obtaining operator licenses/certification, optimizing plant operating procedures and reducing costs. Operators trained on L-3 MAPPS simulator environments acquire the skills necessary to increase plant performance, minimize downtime, and provide confident emergency response. Real-time responses to operator actions

and interactive instructor controls ensure maximum training effectiveness and adaptability.

Simulator uses include interactive team training, severe incident management, plant design testing, and start-up/shutdown optimization. Any scenario, no matter how complex or dangerous in a real plant, can be reproduced, monitored and varied in real time, providing a highly valuable tool for training, plant engineering and emergency response.

#### YOU'RE IN CONTROL

L-3 MAPPS' unique knowledge transfer program allows customers to gain expertise and total confidence in the operation, modification and maintenance of the simulator using a state-of-the-art simulation environment. Users can directly implement simulator changes to reflect plant modifications, evolve their training programs and expand simulator use into other areas such as engineering training, emergency response organization training, etc.



Simulation-driven 3-D Trainer

#### USES AND ADVANTAGES

Cost-effective training for:

- Experienced operators and new recruits
- Overall plant and individual system operation and control
- Improving soft skills such as "command and control", three-way communication, team interaction and performance in the most realistic simulator control room environment
- Emergency plan implementation and incident management
- Skilled response to equipment malfunction and plant transients
- I&C familiarization through DCS and plant process computer operation



Orchid® Touch Interface Classroom Simulator

#### MORE BENEFITS


- Full visual implementation of whole plant simulation allowing users to have complete control over simulated plant design in an intuitive, easy-to-use manner
- State-of-the-art simulation environment for development, operation and management of your simulator with a fully visual, interactive graphic user interface including control room soft panels and plant system models
- Operations optimization with just-in-time training on plant start-up, shutdown and infrequently performed evolutions, etc.
- Fewer unplanned outages due to operator error or equipment malfunction
- Improved plant safety
- Analysis of plant response to equipment and/or instrument failure
- Efficient plant design planning and testing
- DCS and plant process computer verification and validation
- Ease of simulator upgrade and ability to keep current with plant
- Multiple configurations on one simulator
- Portability of simulation for classroom training

To see how more than 40 years of expertise in advanced simulation can make a very real difference to you today and tomorrow, visit [www.L-3com.com/MAPPS](http://www.L-3com.com/MAPPS).



L-3's superior training environments use Orchid® simulation products to give plant operators the skills to handle any emergency response situation. No matter how complex or dangerous, any scenario can be reproduced, monitored and varied — realistically and in real time. To see how more than 40 years of expertise in advanced simulation can make a very real difference to you today and tomorrow, visit [www.L-3com.com/MAPPS](http://www.L-3com.com/MAPPS).





Because you know  
Biach, you already  
know us.

## It has to be Hydratight

Biach, now part of Hydratight, pioneered the first nuclear tensioning system. Today, Hydratight operates in more than half of the world's nuclear plants, including 80% in the USA. As one company, we provide specialized bolted joint integrity products and services that ensure leak-free performance, reliable operation and shorter, more predictable outages. To find out more contact [solutions@hydratight.com](mailto:solutions@hydratight.com).

[hydratight.com](http://hydratight.com)

**hydratight**

### One Company, Total Support, Complete Solutions

For more than 30 years, Hydratight has provided world-class solutions to the nuclear industry, setting international standards in joint integrity for its customers on a global scale.

Hydratight's activities range from the design and manufacture of products for sale and rental, to training, software development and the provision of on-site services carried out by competent and experienced technicians. Hydratight's people are the key to its success, working closely with customers to ensure a total understanding of their requirements.

#### What makes Hydratight different?

Hydratight plays a leading role in the multifaceted and demanding world of nuclear power, providing services to improve safety and cost effectiveness in a competitive industry.

The nuclear power industry demands leak-free joints and as such has adopted a 'right first time' philosophy. Hydratight provides solutions to nuclear contractors and to help them achieve ALARA objectives, and has led the way in meeting the needs of nuclear plant facilities through their range of specialist products and services.

#### Hydratight's Reactor Pressure Vessel (RPV) Head Tensioning

The newest addition to the Hydratight range, the Self Contained Tensioner (SCT) tensioner brings greater safety, reduced manpower and shorter downtime to a critical task.

When opening the Reactor Pressure Vessels (RPV), speed, accuracy and safety are critical requirements. The third generation RPV stud tensioning system, with a self-contained tensioner (SCT) system delivers on all. Both the single and two stage design SCT delivers fast results, with pressurization times of less than 45 seconds. The accuracy of the SCT is tremendous at +/- 1 bar at 690 bar maximum pressure. In addition, safety is enhanced using the SCT with minimized RAD exposure and a variety of safety features built in.

#### Hydratight- Field Machining

In response to customer demand, Hydratight tested and delivered the world's largest OD mounted clamshell for use on cutting and prepping a 15' diameter steam generator. The MM180 is flexible, offering quick adjustments between cutting, beveling, counter, boring, and flange facing. Hydratight also offers a full range of field machining equipment including pipe sever and bevel, flange facing, base milling, shaft turning, and custom engineering solutions.

#### Manway Multi-Stud Tensioning (MST) and Handling Systems

Hydratight's MST systems are capable of simultaneously tensioning every single stud in a joint. By designing the MST in segments, the operator is able to quickly and easily connect each segment to the joint and link them together to provide same time loading. The MST provides a very accurate and fast closure system with applications on pumps, valves and steam generators. In addition, Hydratight offers a safe and reliable system to remove and replace manway covers.

Hydratight is the leading supplier of on-site machining, bolting, and heat treating equipment and nuclear qualified technicians in the Nuclear industry. Hydratight application solutions include, steam generators, reactor coolant pumps, FAC and Process Piping, Feedwater Heaters, MSR's, Turbine solutions, and more.

Visit: [hydratight.com/nuclear](http://hydratight.com/nuclear)

# NUCLEAR CONTAINMENT SYSTEMS FOR NEW CONSTRUCTION, MAINTENANCE, AND OUTAGE PROTECTION

## GRIFFOLYN® CONTAINMENT PRODUCTS

Griffolyn® internally reinforced polyethylene laminates have been designed for a wide range of prospective applications. For more than 30 years, Reef Industries has been providing the nuclear industry with construction, maintenance, and outage protection with a variety of contamination control products. Griffolyn® is performance engineered to be highly resistant to tears and punctures with an exceptional outdoor service life. Whether storing or protecting equipment or isolating and containing contaminated materials, Griffolyn® products can be designed and fabricated to your project requirements.

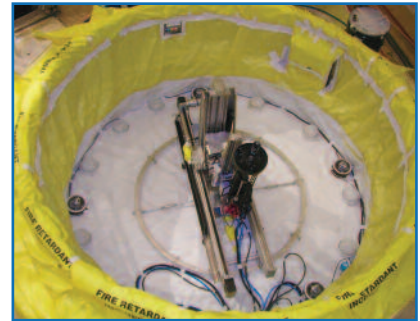
## ADVANTAGES

- Maintain schedule
- Stay on time and within budget
- Reduce cost

## REDUCE COSTS AND IMPROVE SCHEDULING FOR YOUR CONSTRUCTION AND MAINTENANCE REQUIREMENTS

All Griffolyn® materials are performance engineered for the most difficult applications while providing an exceptional ability to withstand extended exposure to weather. Griffolyn® products can protect your investments year round. These high quality plastics can be produced with specialized properties including fire retardancy for safety applications around critical

materials or work areas, or anti-static and corrosion protection for sensitive equipment. Cover your investment and protect it with Griffolyn®.



FOR MORE INFORMATION VISIT  
[www.reefindustries.com](http://www.reefindustries.com)  
 OR CALL TOLL FREE 1.800.231.6074

## SPECIAL FEATURES

- Reinforced polyethylene laminate resists punctures and tears
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- Anti-static
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**CUSTOM EQUIPMENT COVERS, BAGS & TUBING**



**Ideal for construction, outage protection and maintenance**

- FIRE RETARDANT
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- CORROSION INHIBITORS
- HEAT SHRINKABILITY



**Customization Options**

- Engineered Configurations
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# SLINGS TO THE MAX

Slingmax® Rigging Solutions is a technology and marketing company, associated with the best companies in the rigging business inside and outside the USA.

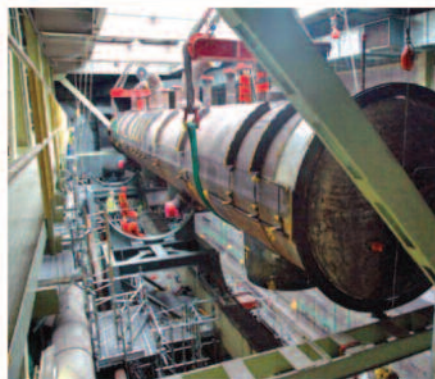
The Slingmax® family of products includes the Twin-Path® brand in synthetic slings and the CornerMax® brands for cut protection for synthetic slings. Our Gator-sling™ brands are well-known multi-part wire rope slings.

Our technology results in a competitively priced product line that is far ahead of any competition. Our built-in sling inspection and safety features are not available anywhere else. And this technology is backed up by the most extensive testing program in the sling industry. Our policy of continuous improvement is well documented.

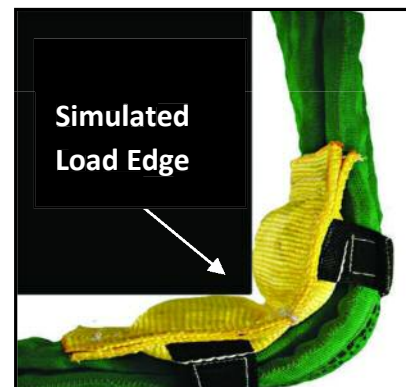
Here are some important features of our products.

- **Check-Fast® overload indicator built-in to Twin-Path® slings**
- **K-Spec® fiber is the longest lasting composite fiber for slings**
- **Rifled Cover™ technology for consistently strong slings**
- **Repairable at over 40 locations worldwide**

The Power of... **SLINGMAX®**



## Cut Protection Pads for Synthetic Slings



CornerMax® Pad

Washington River Protection Solutions in Richland, Washington prepared a report for the U.S. Department of Energy (DOE) entitled **“Synthetic Sling Failure – Evaluations and Recommendations”**. In this document, 12 accidents caused by the cutting of synthetic slings are investigated. The report also provides recommendations to prevent similar recurrences.

Slingmax® offers two cut protection products, CornerMax® Pads and CornerMax® Sleeves. Both were recognized in the document as the only sufficient cut protection pads on the market today. The following quotes are excerpts from the original document.\*



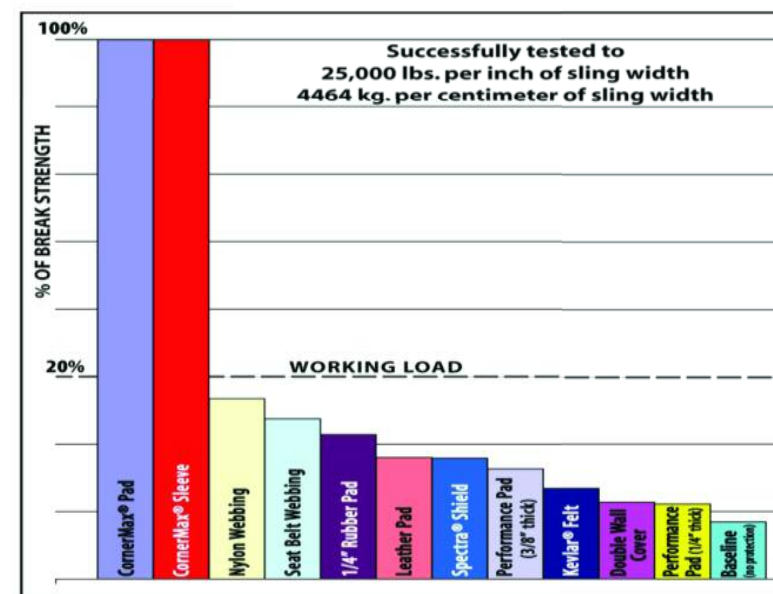
CornerMax® Sleeve

*“Too many accidents have occurred because “abrasion resistant” protection devices were used in cases which required “cut resistant” protection devices.”*

*“A high majority of sling protection device manufacturers on the market do not supply information on the effectiveness of their products. Without this information, a blind decision is ultimately being made in hopes that the chosen protection will not fail.”*

*“There are four major manufacturers of sling protective devices. Of these, only one company offers protection specifically designed to prevent the sling from being cut, along with testing information and a maximum rated load for which the sling protection would work.”*

Slingmax® CornerMax® cut protection devices have been engineered and tested for a rating of 25,000 lbs. per inch of sling width. Take the “guesswork” out of your rigging protection by specifying CornerMax® Pads and CornerMax® Sleeves. For more information on CornerMax® cut protection products please visit [www.slingmax.com](http://www.slingmax.com)



\*Full Report: <http://www.osti.gov/bridge/servlets/purl/966779-KTqxAi/966779.pdf> (RPP-RPT-42583, Rev. 0, pg. 3, 4)



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# RIZZO CELEBRATES 30 YEARS OF INTEGRATED SERVICES TO THE NUCLEAR INDUSTRY

**RIZZO Associates (RIZZO)** is excited to celebrate 30 years of business! Founded in March of 1984, the company has grown from a small humble group to a world respected authority on geotechnical and seismic issues. RIZZO's staff of experts are nimble and responsive to our clients' schedules and regulatory drivers, while applying the best in talent and expertise to our projects.

RIZZO'S NPP SERVICES operate world-wide and encompass new build site selection and siting, seismic analysis, operating plant post-Fukushima recommendations implementation for seismic and flooding, structural analysis, and environmental impact assessments.

RIZZO is an award-winning, highly focused firm specializing in all aspects of the civil engineering and earth sciences fields for the power generation facilities, dams, mining, and tunneling markets. RIZZO has worked around the world on unique, challenging, and technically demanding projects.

We have taken our 30th Anniversary as an opportunity to reengineer our logo and streamline the company name, to better align with how we are recognized in the industry. Although our look has changed, the company's core remains intact, dedicated to the success of our clients and their projects.

## CORPORATE HEADQUARTERS



500 Penn Center Blvd., Pittsburgh, PA 15235 USA  
 Phone: +1 (412) 856-9700  
 Fax: +1 (412) 856-9749  
[www.rizzoassoc.com](http://www.rizzoassoc.com)

## AMONG OUR PROVEN CAPABILITIES ARE THE FOLLOWING:

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- Soil Structure Interaction, Settlement,  
& Bearing Capacity
  - Subsurface Investigations:  
Geotechnical Field Investigation, Drilling  
& Testing Programs
- COL & PSAR - Chapter 2 Site  
Characterization
- Probabilistic/Deterministic Seismic  
Hazard Analysis (PSHA) &  
Faulting Studies
- Seismic Margin & Risk Assessment
  - Tsunami Analysis/Flooding
- IAEA and NRC Regulatory Support
  - Seismic Qualification of  
Equipment & Piping
- Environmental Impact Assessments
- Foundation Design, Excavation &  
Dewatering for Safety Class Structures

## ASSISTING THE NUCLEAR INDUSTRY IN MEETING TODAY'S REGULATORY RISK RECOMMENDATIONS

SEISMIC PROBABILISTIC RISK ASSESSMENTS  
 FLOOD HAZARD ASSESSMENTS  
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