

## Plant Modification Services



### Challenge

Plants consistently need engineering services for plant modifications, inspections, and repair to meet inspection and assessment requirements. However the right team or trained personnel are not always available or experienced in nuclear services and repair. Not having the right team of professionals on board is related to incorrect work, equipment failure, failed inspections, and safety risks. Additionally, inexperienced teams lead to additional time in the outage schedule and critical path and overall cost inefficiencies.

### Solution

#### Integrated Solutions with First-Time Quality

Framatome's plant modifications team is dedicated to providing the highest quality for the company's modification packages. The team delivers decades of plant design and modification experience for various nuclear plant designs. Our project experience includes mechanical and structural analyses, electrical and I&C analyses, BOP and NSSS modifications, and risk and safety assessments. Using Framatome's unique experience in all phases of design and nuclear operation, our plant modifications team can ensure cost-effective and workable solutions to any operational issues. The combination of engineering, product and field services capabilities allows Framatome to deliver total plant solutions to you.

### Customer benefits

- Plant modification services backed by the breadth of Framatome's resources and vast experience
- Work to utility procedures and processes, including the Standard Design Process, under Framatome's overarching quality and human performance standards and infrastructure

### Features

- Engineering analyses
- Field support provided for modification installation and closeout
- Licensing upon request
- Managed task capabilities
- Nuclear Steam Supply System
- Project management, studies and equipment supplies
- Support for EPC projects, providing engineering resources for SGT partnership
- Wide ranging expertise including BWR and PWR modifications

**Your performance**  
is **our** everyday **commitment**

## **NSSS Design Change Package**

- 10CFR72.48 Evaluations
- Access Hole Cover Repair
- Alloy 600 Primary Water Stress Corrosion Cracking (PWSCC) Mitigation
- BWR and PWR Refueling Equipment Upgrades
- BWR Auxiliary Hoist & Variable Frequency Drive (VFD) Upgrades
- BWR Control Rod Drive (CRD) Housing Repair
- BWR Refueling Platform Replacement
- BWR Work Platform
- CRD Stub Tube Repair
- Containment Hatch Modifications
- Containment Spray Full Flow Test Line Installation
- Control Rod Drive Mechanism (CRDM) Weld Repair
- Control Room LOCI Filter Replacement
- Core Spray Pipe Repair
- ECCS GSI-191 Containment Walk-Down
- Emergent Outage Support
- Emergent Repair Weld Nozzle
- Emergent Steam Dryer Repairs
- Enhanced CRDM Service Structure Modification
- GL-08-01 ECCS Gas Intrusion Analysis and Modifications
- Heater Drain Tank Water Hammer Modifications
- Heavy Component Haul Routes for Reactor Vessel Closure Head (RVCH) and Integrated Head Assembly (IHA) Replacements
- Implementation of Mechanical Stress Improvement Process (MSIP®) on Clad Carbon Steel RCS Piping
- Intergranular Stress Corrosion Cracking
- IHA Installation
- Jet Pump Riser RS-1 Repair
- LPRM Flow Hole Modification
- Low Pressure Injection (LPI) Cross-Tie
- MRP-227A Reactor Vessel Internals Inspection Program Implementation
- NDE for CRD Repair
- NRC Generic Letter 2008-01 ECCS gas void mitigation
- Permanent Cavity Seal Plate (PCSP) Installation
- Pressurizer Heater Bundle Replacement
- Pressurizer Heater Sleeve / Instrument Nozzle Replacement
- Pressurizer Replacement
- Pressurizer Thermowell Nozzle Abandonment & Relocation
- PWR CRDM Replacement / System Upgrade
- PWR Refueling Canal Leakage Mitigation with Framatome Sealant
- Reactor Coolant Pump Motor Refurbishment / Replacement
- RCP Jib Hoist Installation
- RCP Repair and Replacement
- RCP Seal Face Replacement

- RCS Interfacing Piping Nozzle Structural Weld Overlay
- Reactor Coolant System Zinc Injection Designs
- Reactor Pressure Vessel Flange Emergent Repair
- RCS Pressure-Temperature Limits Curve Update
- Reactor Vessel Under-Vessel Insulation
- RVCH Penetration Nozzle Repair
- Reactor Vessel Flange Work
- Reactor Pressure Vessel Flange Repair
- Reactor Vessel Bottom Mounted Instrumentation Nozzle Repair (Half Nozzle Replacement)
- RVCH Replacement
- Quick Turnaround Large Bore Shutdown Cooling / RCS Isolation Valve Replacement
- Steam Dryer Measurements
- Steam Dryer Modifications
- Steam Generator Bowl Drain Repair
- Steam Generator Tube Stabilizer Design Change & Justification for Continued Use
- Steam Generator Replacement
- Steam Generator Nozzle Dam Installation
- VFD Replacement for MG Sets

## **Balance of Plant Related Experience**

- 230kV Start-Up Transformer Installation and 4kV Cable Bus Upgrade
- Auxiliary Feedwater Room Cooler Replacement
- Control Room Annunciator Replacement
- Cooling Tower Upgrades
- Cyber Security — Plant Security Computer Firewall
- Dry Cask Storage and Horizontal Storage Modules Modifications
- Emergency Diesel Generator Power Upgrade Main Feedwater Pump Replacement
- Essential Cooling Water Pump Replacement
- Extended Power Upgrade
- Feedwater Booster Pump Replacement
- Feedwater Heater Replacement
- Heat Trace Freeze Protection Panel Replacement
- HVAC Chiller Replacement
- Incore Monitoring Computer Replacement
- Instrument Air Compressor Replacement
- Main Condenser Tube Replacements
- Main Generator / Main Transformer and Unit Auxiliary Transformer Protective Relay Upgrade
- Main Generator Stator Vibration Monitoring System
- Main Steam Atmospheric Dump Valve Replacement
- Measurement Uncertainty Recapture Upgrade
- Station Blackout Diesel Generator Installation
- Motor Control Center Bucket Upgrades
- NFPA 805 Circuit Analysis
- Security Communication System Upgrade
- Transformer Replacements
- Transmitter Obsolescence Replacements

## References



### Alliance Modifications — The Right Solutions

#### Emergency High Pressure Make-Up System

A utility was concerned that during an extreme fire event, the existing means for providing core cooling and decay heat removal to allow the plant to reach a safe and stable state were not available. Framatome designed and installed a new Emergency High Pressure Make-Up (EHPM) system for emergency injection to the reactor pressure vessel for all scenarios that involve a loss of other injection sources, mitigating an extreme fire event.

#### Time to Boil Equipment Hatch Closure Modification

Modified the equipment hatch railway splices to improve ramp retrieval and hatch closure duration due to time to boil concerns during plant outages. Modification of the ramp splice details allowed quicker ramp retrieval and saved 2-3 days of critical path for each outage.

#### Cost-Effective Design Change Package (DCP) for Wireless Communications

Wireless mod implemented at 10-20% of what it cost another utility, less than half industry average and without regulatory problems.

#### Fire Safe Shutdown — Manual Action Study / Evaluations

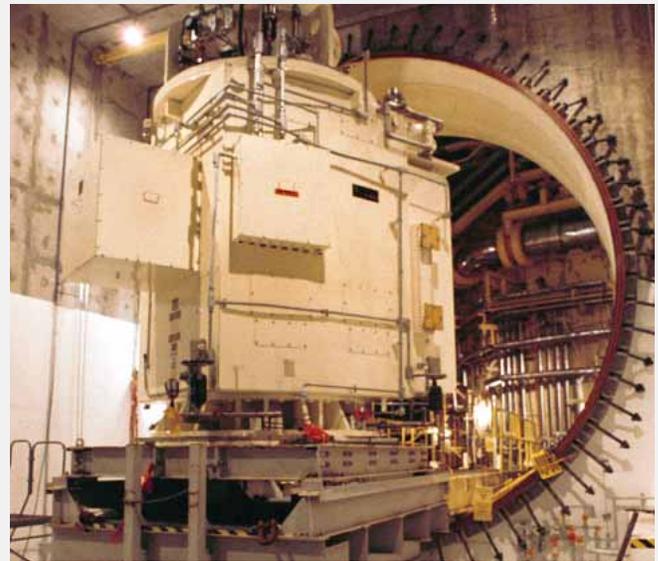
A utility customer was set to implement expensive hardened Meggitt cabling modifications (\$3M - \$4M) to eliminate Appendix R manual actions under NRC scrutiny. Framatome provided cable separation evaluations to avoid these modifications.

#### Solved SG 2C Preheater Bypass Problem

The utility thought they had blockage in the valve or AFW line. Framatome determined the cause was an incorrect valve stem ad been installed and incorrect maintenance due to poorly implemented old modification.

### FLEX Modifications

- BWR and PWR license extensions
- Completed a variety of electrical, structural, and mechanical modifications in support of NRC Order 12 049, for multiple plants / processes
- Design and build hardened containment vent system
- Provided engineering discipline support to fully justify and implement FLEX designs
- Supported customers to successfully implement FLEX modifications in accordance with NRC commitments
- Prepared FLEX engineering change control packages for plant modifications as EPC project
- Prepared licensing modification and program document to satisfy NRC requirements



### Stator Drop Recovery

- Fast-track recovery from the stator drop damage
- Multi-discipline team of 50 people assembled and deployed within days of the initiating event
- Full-scope assessments, scope development, engineering, engineering change packages, procurement, planning and work order/work package preparation
- Successful completion of restoration work to bring the affected unit back online ahead of original schedule

## References



### Bottom-Mounted Instrumentation Nozzle Repair

- After a UT exam showed the need for repair of a leaking BMI nozzle, Framatome quickly mobilized a team and prepared the engineering change documentation for the modification
- The modification consisted of removing a portion of the nozzle, welding a reinforcing pad around the penetration on the bottom head, machining into the weld pad and installing a replacement nozzle
- The emergent modification was completed 30 hours ahead of the baseline schedule

### Half Nozzle Repairs

- Framatome has performed numerous half nozzle repairs in response to the Alloy 600 PWSCC degradation in both BWRs and PWRs
- Framatome's field-proven technologies have been used on pressurizer heater sleeves, bottom-mounted nozzles and instrument nozzles
- The repair can be easily adapted to other nozzles in the fleet

### Emergency High Pressure Make-up Pump

- Designed a FOAK safe shutdown pump system in support of transition from Appendix R to NFPA-805
- Performed the initial scoping studies, preliminary analyses and conceptual design for all units on site with cross-tie capabilities
- Performed the detailed design and project completion including implementation and implementation design support
- Developed all the necessary modification package documentation

### FLEX Repower Modification

- Framatome provided a design that offers a flexible means to repower vital instrumentation and components upon an Extended Loss of AC Power (ELAP) after a Beyond Design Basis External Event (BDBEE) (e.g. large earthquake, tornado, hurricane, large flood, etc.)
- Framatome's tasks included performing initial scoping studies, electrical and civil analyses and the detailed design of FLEX repower modifications and deployed equipment
- Framatome deployed project resources to the plant to assist during installation phase of the project

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