

# Raising the Bar

AREVA's Innovative Baffle Bolt Replacement



**AREVA NP**

**A**  
**AREVA**



# Successful Demonstration

## Our Tooling Capabilities & Design Enhancements

As part of the nuclear industry's rigorous attention to safety, nuclear plant equipment is continuously monitored and inspected, and repaired or upgraded where necessary. Among the safety-related components regularly inspected are stainless steel baffle bolts that secure removable liner plates around pressurized water reactor vessels.

Leveraging our global experience and innovative methods, AREVA NP is at the forefront of this industry initiative. We offer nuclear plant operators a "roadmap" for baffle-to-former bolt evaluation that includes risk-based modeling, award-winning inspection capabilities and extensive replacement experience – allowing plant operators to intelligently and proactively plan examination intervals, replacement patterns and outage duration – all to control costs.

During our recent customer demonstration, attended by 16 representatives from five different U.S. utilities, the baffle bolt team did the following:

- Demonstrated our tooling capabilities and design upgrades for normal and contingency operations
  - » Normal bolt removal & installation
  - » Broken bolt / shank removal & installation
  - » Broken bolt / oversize threading & bolt installation
- Proved our schedule savings and field-hardened tooling
- Proved our electrical discharge machining (EDM) operations eliminate inherent foreign material exclusion (FME) risk from traditional machining operations

### The Results:

- Production rates were faster than originally advertised with normal bolt removal at 12 bolts per day vs. previous rate of 10 bolts per day using a single mast, and 24 bolts per day with dual mast system
- Outage schedules could be decreased
- EDM operations eliminated FME concerns



# Our History

## AREVA NP Has Replaced Over 8,700 Internals Bolts Worldwide

AREVA NP has been replacing reactor vessel internals bolts since the early 1980s. Our current tooling design takes advantage of our expansive database of lessons learned. Our tooling and processes are based on existing bolt replacement equipment that has been used on over 8,700 previous applications.

Replaced Over 8,700 RV Internals Bolts in the U.S. and Europe		
Replacement of Baffle & Barrel Bolts in the U.S.		
Nuclear Power Plant	Year	Number of Bolts Replaced
Oconee 1,2,3	1980s	288
ANO-1	1980s	216
Rancho Seco	1980s	216
Crystal River	1980s	348
Davis Besse	1980s	348
DC Cook	1990	1
Point Beach 2	1999	176
Ginna	1999	56
Ginna	2011	25
DC Cook	2013	28 Clevis Bolts

### Actions based on lessons learned:

- Improved the swarf filtration system which allows exhaust from filter to cavity
- Improved mast support system
- Designed and analyzed oversized contingency bolts
- Combined removal of lock bar and EDM of lock cup counterbore operations to reduce schedule
- Developed an impact driver to reduce number of stuck bolts

# Our Technology

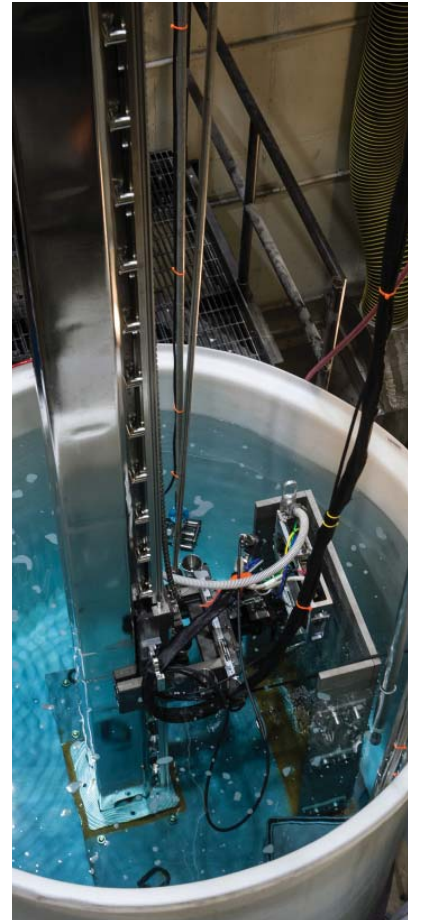
## Demonstrating Innovation

In 2016, tooling design experts in our Component Repair & Replacement team initiated a project to refurbish and upgrade our baffle bolt replacement tooling and processes based on lessons learned from our portfolio of internals bolt replacement experience and feedback from nuclear plant operators. This spring, AREVA NP is performing extensive testing to ensure tooling is ready to deploy and will meet our customers' expectations. We want to ensure that AREVA NP's technology is the best in the industry.

### Current capabilities:

- A 4-loop plant bolt design
- Contingency oversized bolt design
- Improved mast system
- EDM tools modified to remove lock bar and machine counterbore for lock cup in one operation
- Impact driver to reduce number of stuck bolts and decrease removal time
- Custom-designed and fabricated EDM swarf filtration systems
- Modified bolt installation tool to install bolt and crimp lock cup in one operation
- Successful replacement of normal bolts in <2 hours
- Ready to deploy equipment

Equipment is ready to deploy to support our customers



# Our Solution

## Your Experience

- Baseline production rates
  - » ~10 bolts per day with single mast
  - » ~15 - 20 bolts per day with dual mast
- Industry-best setup and teardown time vs. other baffle bolt replacement technologies
- Optimized bolt design for lower stress concentrations
- Crimp cup locking mechanism eliminates welding for installation
- Mast extension allows replacement with core barrel in the vessel
- Compact tool heads do not require hoists for removal
- Improved EDM filter system design for lower dose and high water clarity
- Extensive EDM experience for reliable production rates
  - » Eliminates risk of FME vs. conventional machining
  - » Eliminates machining issues from embrittled materials



AREVA NP's EDM – the best technology to eliminate FME concerns and machine highly irradiated baffle bolt material

AREVA in North America (AREVA Inc.) combines U.S. and Canadian leadership to supply high added-value products and services to support the operation of the commercial nuclear fleet. Globally, AREVA is present throughout the entire nuclear cycle, from uranium mining to used fuel recycling, including nuclear reactor primary circuit design and fabrication, and operating fleet engineering and services. AREVA is recognized by utilities around the world for its expertise, its skills in cutting-edge technologies, and its dedication to the highest level of safety. AREVA Inc.'s 4,100 employees are helping build tomorrow's energy model: supplying ever safer, cleaner and more economical energy to the greatest number of people.

## Our Team

Dedicated innovators and engineers working to address the industry's most challenging issues.



**Gerry Ottman**  
Senior Technical Manager  
Tel: (434) 832-4097  
Gerald.Ottman@areva.com



**John Sheppard**  
Tooling Engineering Manager  
Tel: (434) 832-4107  
John.Sheppard@areva.com



**Wade Markham**  
Principal Tooling Engineer  
Tel: (434) 832-2767  
Wade.Markham@areva.com



Visit our website to  
learn more:  
[us.areva.com/crr](http://us.areva.com/crr)

**AREVA Inc.**  
7207 IBM Drive  
Charlotte, NC 28262  
[us.areva.com/crr](http://us.areva.com/crr)

