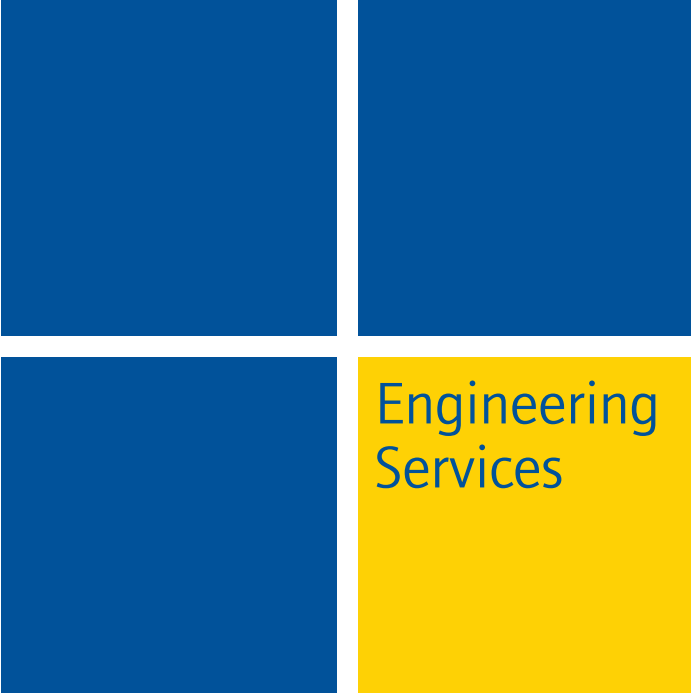


# Reactor Vessel Closure Head Replacement



Engineering  
Services

## Background

In response to industry events involving Alloy 600 material in reactor vessel closure head (RVCH) penetrations, a number of pressurized water reactor (PWR) utilities have, or intend to, replace the RVCH. In addition to the potential for eliminating material issues associated with Alloy 600, the RVCH replacement provides an ideal opportunity to implement upgrades to significantly reduce outage time and dose, as well as address personnel safety issues that may exist during reactor disassembly and reassembly.

Westinghouse has developed a program to design and implement RVCH upgrades integrated with the design and installation of the new RVCH.

We also have the capability to work with multiple suppliers, thereby providing our customers with schedule flexibility and technical alternatives.

## Benefits

Replacing the RVCH reduces the risk of head penetration cracking. Since Alloy 600 base materials and Alloy 182 weld materials are susceptible to primary water stress corrosion cracking (PWSCC), replacing these materials with less susceptible Alloy 690 and Alloy 152 is a risk-reducing option. Replacing the RVCH could:

- Reduce long-term operating and maintenance costs
- Reduce costly inspections and repairs and reduce the potential for an extended outage due to repairs
- Reduce outage time and personnel dose

RVCH replacement also provides an opportunity for head assembly upgrades. Upgrades help to:

- Reduce outage duration
- Reduce outage dose
- Decrease risks to personnel safety
- Improve equipment reliability to reduce outage delays and forced plant outages
- Reduce demand on critical outage resources (polar crane, labor, and containment lay down space)

## Description

Westinghouse can provide:

- Design engineering and licensing support (design change packages, safety evaluations, etc.)
- Hardware, such as lifting and handling components for new and old RVCHs
- Control rod drive mechanism (CRDM)/control element drive mechanism (CEDM) upgrades

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- Project management (for example, project oversight, implementation planning, and outage schedules)
- Installation services

For head assembly upgrade packages, Westinghouse has led projects at a number of plants ranging from ductwork reduction/optimization to implementation of integrated head packages (IHPs). IHPs eliminate the CRDM ductwork, provide an integral missile shield, simplify cable configurations, and provide a permanently attached head lift tripod, which allows the entire head assembly to be removed as one unit.

### Deliverables

We work closely with the customer to determine the level of support needed. To this end, we have created five levels of assistance:

Level 1 - Position for future replacement with reduced lead-time

Level 2 - Engineering/fabrication of replacement RVCH

Level 3 - Conceptual design of RVCH upgrade features

Level 4 - Complete upgrade package

Level 5 - Turnkey project

### Experience

Here at Westinghouse, we continue to be a leading provider of replacement RVCH services, performing detailed engineering and design studies, supplying integrated head assembly upgrade equipment, cooperating with global manufacturers on head and CRDM/CEDM supply, and completing the component handling and installation at the site for new RVCH components.

- We have managed RVCH assembly optimization projects from duct work reduction/optimization to implementation of simplified head assembly and IHPs.

- IHPs have been provided to Byron, Braidwood, Vogtle, Harris, South Texas, Doel, and Tihange during the original Nuclear Steam Supply System supply. The Seabrook, R. E. Ginna, and Wolf Creek head assembly upgrades were retrofit modifications. CRDM cooling system optimization projects have been completed for Sequoyah, Summer, and Waterford.
- We have designed and supplied component-handling equipment, including Department of Transportation-certified containers for storage and transportation of reactor coolant pump (RCP) internals, RCP motors, and temporary reactor vessel covers. We have also supplied component-handling equipment for the successful implementation of the Qinshan lower internals refurbishment project.

RVCH replacement and upgrade services have been, or are being provided to:

- |                      |                      |
|----------------------|----------------------|
| • ANO-2              | • Indian Point 2&3   |
| • Beaver Valley 1    | • Kewaunee           |
| • Calvert Cliffs 1&2 | • Millstone 2        |
| • Comanche Peak 1    | • Point Beach 1&2    |
| • Farley 1&2         | • Prairie Island 1&2 |
| • Ft. Calhoun        | • Surry 2            |
| • H.B. Robinson 2    | • Waterford 3        |

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