Integrated Head Assembly (IHA)
A Comprehensive Solution

What is the IHA?
It is the future. The focus of AREVA’s Integrated Head Assembly (IHA) is to extend the life of our customers’ plants with safe, reliable, innovative and efficient methods. Proven in the industry time and time again to improve safety, reduce duration of refueling outages, and lower personnel dose, this is one system enhancement you don’t want to overlook. The IHA, fabricated and installed by AREVA, is customized to serve the unique requirements of each and every plant in the U.S. and internationally — Combustion Engineering (CE), Westinghouse and B&W designs. Invest in your future with a simple yet innovative upgrade to your service structure with AREVA’s IHA.

Why is the IHA so important for the success of your plant?
Our customers can safely and efficiently improve performance and reduce outage durations by installing AREVA’s IHA. A typical IHA can reduce polar crane use by a factor of ten. In fact, we had a world record replacement outage at Salem in 2005. Our IHA has also received a Top Industry Practice award. The design replaces the existing components above the Reactor Vessel Closure Head (RVCH) to enable the entire RVCH to be removed during a refueling outage in far fewer steps than the current design requires. It reduces critical path time, maintenance costs and manpower by combining the RVCH and the majority of its supporting systems into a single removable unit.

Our customers have captured reductions of up to six critical path days — thus, critical outage resources can be made available to potentially decrease total outage duration even further. Easy installation features and 360° inspection access to Control Rod Drive Mechanism (CRDM) penetrations enable you to compress outage schedules and get your plant reconnected to the grid in a shorter period of time.

Developed with strong customer input, our IHA design addresses the main barriers to upper head maintenance that utilities may experience.

Features
- New Integrated Missile Shield
- Head Lifting Frame
- IHA Seismic Support System
- CRDM Cooling System
- Head Area Cable System
- Cable Bridges
- Reactor Head Vent-Piping
- Shielding and Work Access

The AREVA IHA design incorporates the experience and knowledge gained while performing refueling services for Westinghouse, B&W and CE operating plants. Our demonstrated performance in over 75 RVCH replacement projects worldwide and our continuous, active supply of NSSS components provides a solid foundation to make your IHA project a success.

Reliable experience.
New Integrated Missile Shield
Our IHA integrates the CRDM shield into the upper reactor vessel head assembly, eliminating the need for heavy concrete/steel missile shields that must be removed and take up valuable storage space in containment. The design of the missile shield is NSSS-design specific and depends on the CRDM maintenance requirements. In IHAs for some reactors, the missile shield will be an integral part of the lifting system. For others, it will be an integral part of the working platform. The IHA missile shield is designed to meet the requirements of the USNRC Standard Review Plan Section 3.5.2. Since it is positioned above the CRDMs as part of the assembly, there is no need to disassemble or remove the missile shield in order to lift the closure head.

Head Lifting Frame
Since the IHA Head Lifting Frame is permanently mounted, attachment and removal operations for the tripod are eliminated and valuable lay down space is conserved. The lifting frame consists of lift rods, shackle, clevises and pins. The design of an integrated tripod for the IHA lifting system is plant-specific and depends on the available space in the refuel cavity, RVCH travel path, and reactor head stand area. The IHA lifting system is designed to meet the requirements of ANSI N14.6 and of the USNRC NUREG 0612.

IHA Seismic Support System
The IHA seismic support system includes a supporting mechanism for individual rod drives and another supporting mechanism for the IHA components. The rod drive supporting mechanism transmits seismic loads from the individual CRDMs to the IHA supporting mechanism. The IHA supporting mechanism transmits the seismic loads from the individual rod drives as well as from the individual IHA components either to the reactor cavity walls or to the reactor head depending on the original NSSS design. The seismic loads that are transmitted to the reactor cavity walls are through the seismic tie-rods that are connected between the IHA and the reactor cavity walls. The seismic loads that are transmitted to the reactor head are through the supporting structure of the IHA. The IHA seismic support system does not alter the existing seismic load path. These load paths can be upgraded if required.

CRDM Cooling System
The IHA cooling system is self-contained in the reactor vessel head assembly, minimizing ductwork and piping. A compact integral set of ducts and fans cool the rod drives and the rod drive nozzles. Cool air is drawn from the side of the shroud inside the air baffle surrounding the rod drives and the hot air is discharged into a plenum through a set of ducts in the annulus region of the IHA. The cooling fans are directly connected to the plenum to discharge the hot air from the plenum into containment or, if required, can be directed into the existing containment cooling system. The rod drive cooling system in the IHA includes at least one cooling fan as a backup.

Head Area Cable System
A set of quick-connect couplings for the head area cable system reduces the outage time required to disconnect or connect cables from the rod drives. Cabling is disconnected only at easily accessible connector plates mounted along the circumference of the IHA. Cables inside the IHA remain with the IHA during lifting and storage. All head area cables are routed along the messenger wires that are installed inside the IHA and above the top of the rod drive pressure housings to provide permanent supports to the head area cables. If required, the rod drive cables are routed to meet IEEE separation criteria for IEEE Class 1E cables. All head area cables are supported along the messenger wires to the plant-specific seismic requirements. The messenger wires are designed to provide minimum disruption to the CRDM pressure housing removal process, if required.

Cable Bridges
Cable bridges support the cable bundles between the IHA connector plates and the primary shield walls. The cable bridges can be swung upward in order for the IHA to be lifted free of the reactor vessel. These cable bridges eliminate the need to remove and install cables or cable trays and protect the cables and connectors from damage. Cable bridges are designed to the plant-specific seismic requirements.

Feature details.
AREVA provides customized IHA products allowing you to choose the IHA features to maximize your return.
Reactor Head Vent-Piping
The IHA simplifies access to the head vent-piping interface by routing it inside the IHA and locating the disconnect/reconnect access on the same elevation as the connector plates. The head vent-piping can be disconnected at the interface flange on the connector plate level prior to removing the IHA from the reactor vessel.

Shielding and Work Access
The IHA includes integral shielding in critical areas to minimize exposure during refueling activities such as tensioning/detensioning. The integral stud-tensioner monorail eases tool-handling effort. Work platforms, ladders and removable access panels or doors are incorporated into the design to facilitate maintenance and inspection requirements. The modular, bolted design accommodates disassembly/reassembly without welding or cutting, in case of an extraordinary maintenance event.

Feature highlights
- Integrated missile shield
- Improvements to head vent routing & connections
- Integrated shielded work platform
- Integrated fans & ductwork
- Improvements to CCW line connections
- Integrated shielding around lower shroud
- Removable RVCH penetration inspection ports in insulation package

Summary of benefits
- Reduction of up to six critical path outage days
- Design addresses main barriers to reduced outage schedules
- Dose reduction of three-to-four person REM per outage
- AREVA's IHA design achieves the lowest personnel exposure in the industry for an RVCH replacement
- IHA installation performed within a normal refueling outage schedule
- Safety design reduces potential for personnel injury & promotes zero OSHA recordables
Quick response and fast service — without compromising safety.

AREVA’s IHA is designed with safety in mind. Numerous safety features are built into AREVA’s IHA to reduce the potential for personnel injury and to promote zero OSHA recordable accidents. For instance, the IHA incorporates the missile shield, eliminating six heavy lifts. The current CRDM cooling ductwork is eliminated, greatly increasing the safety margin for reactor-head disassembly/reassembly activities. Virtually all work associated with disconnecting systems from the RVCH is performed from the refueling floor or walkways on the IHA — eliminating the need for a safety harness. In addition, the lower shroud is shielded, eliminating the need for the transfer and installation of lead shielding while the reactor vessel head is in the refuel canal. Handrails are included around the service platform and folding batwings. Features such as these contribute to an outage dose reduction, increasing the safety margin for workers.

Reduced safety hazards + reduced dose = reduced stress

Our IHA design offers the potential for dose reduction between three to four REM per outage. Part of the design — the radiation shield surrounding the CRDM nozzles — replaces the need for temporary shielding around the lower shroud.

Key safety features of the IHA

- Cables uniformly routed along specified paths and contained in cable trays to prevent tripping hazards.
- Retractable cable bridges reinforced to support personnel load.
- A hoist rail system allows for easy installation of trolleys without a manbasket or work platform.
- Moveable radiation shielding around lower shroud eliminates temporary shielding installation.
- Removable RVCH insulation ports for faster, safer penetration inspection.
Our design, fabrication and installation experience provides you with the confidence of skilled expertise and the reassurance of dependable service.

Our IHA design eases access to vital reactor vessel head components and lowers maintenance time. A CRDM cooling system, head area cable system, reactor head vent-piping and integral work platforms, ladders and removable access panels are all incorporated into the IHA. And with cooling system and cable routing improvements, an easy cable connect/disconnect feature, minimized use of the polar crane, an innovative head-lifting frame, tailor-made cable bridges, and an optimal lay-down space, we can complete the IHA installation efficiently and reduce personnel resources and man-hours normally needed for a project of this scope.

AREVA also offers the following services in conjunction with the IHA:

- Total integrated outage services, including component installations design change packages
- Mechanical and electrical engineering analyses
- Fans, chillers, vent lines and valves, spare components
- Head area cable sets and bulkheads
- RVCH Insulation with access ports for visual and robotic inspections
- Permanent reactor cavity seal plates
- Self-contained rod drive cooling system to minimize ductwork and piping
- Simplified access to head vent-piping interface
- IHA replacement available as part of overall head replacement package
AREVA provides its customers with solutions for low-carbon power generation in North America and all over the world.

As the leader in nuclear energy and a significant, growing player in the renewable energies sector, AREVA combines U.S. and Canadian leadership, access to worldwide expertise and a proven track record of performance. Sustainable development is a core component of AREVA’s strategy.

Its nearly 5,000 U.S. and Canadian employees work every day to make AREVA a responsible industrial player helping to supply ever cleaner, safer and more economical energy to the greatest number of people.