DETAIL DESIGN

Information design by 600 Series Design

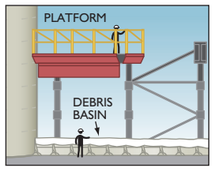
Nuclear Reactor Head Replacement

As nuclear generating stations get older, key components wear out and must be replaced, including steam generators and reactor pressure vessel heads. This can present a problem if the component is too large to fit through equipment openings in the containment building. Moreover, such projects must be done quickly to avoid long maintenance outages. Bechtel has conducted more than 20 steam generator and reactor head replacement projects, completing them efficiently and with an enviable safety record.

Recently, we set a new industry bench-mark, creating a construction opening, replacing the reactor head, and restoring the containment building in a mere 34 days. Here's how we made it happen:

Preparing for Reactor Shutdown:

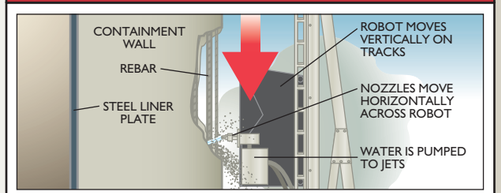
- A temporary access platform and a debris collection basin are erected outside the containment building.
- Hydrodemolition robots are set up—they'll be used to remove concrete.



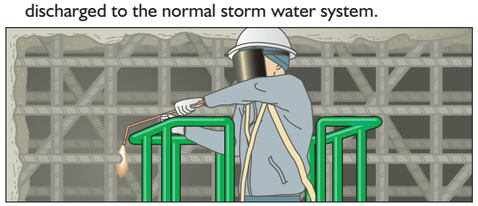
Shutdown!

Plant operators take the reactor offline, cool off the water in the reactor coolant system, and prepare the containment building for access.

Hydrodemolition



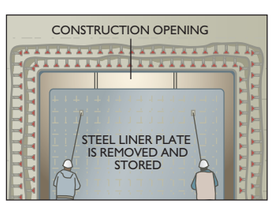
- Hydrodemolition uses ultrahigh-pressure water jets to disintegrate the outer concrete wall, exposing the rebar skeleton.
- Wastewater from the demolition is treated and discharged to the normal storm water system.



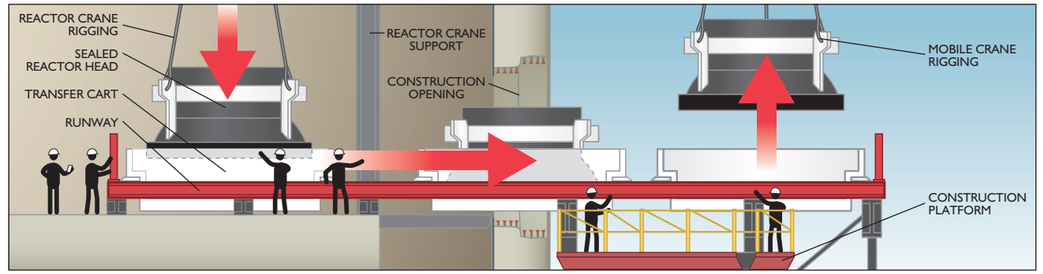
- The exposed rebar is tagged, cut, removed, and stored for later use.

Disassembly and Defueling

- Plant subcontractors disassemble the old reactor head, and Bechtel seals the head with steel plates to minimize environmental radiation.
- Fuel rods are removed from the reactor vessel and stored in the spent fuel pool.
- Once the reactor is completely defueled, the protective steel liner plate is cut and removed, completing the opening.



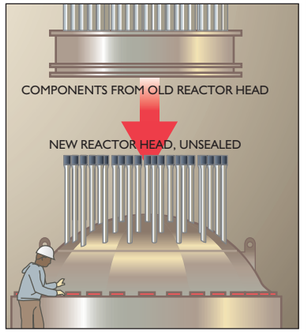
Removing and Replacing the Reactor Head



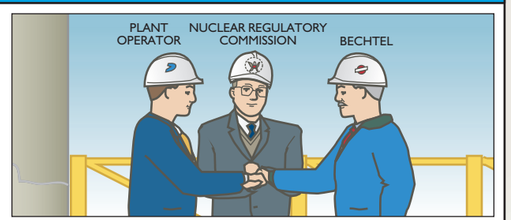
- A runway system and transfer cart are installed through the newly created opening.
- An existing crane inside the containment building and specialized rigging equipment lift the head and place it onto the transfer cart.
- Outside the containment building, a mobile crane lifts the head onto a hydraulic transporter designed for loads up to 80 tonnes.
- The new reactor head is installed by reversing the process, and the runway system and transfer cart are removed.

Assembly, Refueling, Restoring

- The new reactor head is assembled using mechanical components from the old reactor head.
- The steel liner plate section is welded back into place.
- After testing (including X-rays) to ensure the liner plate's integrity, refueling begins.
- The containment wall is restored by reinstalling the previously removed rebar and pouring new concrete into the opening.



Inspections, then Startup!



- The containment wall is pressure-tested to verify its integrity.
- Inspectors, from Bechtel, the plant operator, and U.S. Nuclear Regulatory Commission verify that the structure meets all safety standards.
- After other required plant maintenance activities, the plant is restarted.