**Background**

In order to provide a complete, integrated secondary services package, Westinghouse and Rolls-Royce, formerly Brooks, work together through a Joint Cooperative Agreement (JCA) that has been in place for approximately 15 years. This partnership allows resources, equipment and internal processes to be shared and encourages the development of new technology. The JCA provides Westinghouse customers a full steam generator package that combines Westinghouse cleaning technology with Rolls-Royce inspection capabilities.

The focus of the Rolls-Royce top of tubesheet (TTS) services is on the annulus and in-bundle regions of the steam generator at the tubesheet level. These services include:

- Performing component cleanliness inspection
- Locating and documenting anomalous conditions
- Locating foreign objects
- Removing foreign objects as directed by customer

**Description**

**Annulus Inspection and Retrieval (Remote and Manual)**

Rolls-Royce offers the exclusive ability to perform 100-percent visual examination of the annulus and wrapper regions of a steam generator remotely with the Shell to Wrapper Annulus Transport System Pan and Tilt (SWATS PT). Once installed in the steam generator, Rolls-Royce inspection technicians control SWATS PT and capture images from a low-dose or remote location outside of containment, reducing personnel radiation exposure by 50 percent.

Tooling used:

- SWATS 4 (remote)
- Video Probes (manual - reserved for a small percentage of areas that are inaccessible with SWATS 4)

**In-bundle Inspection and Retrieval**

Rolls-Royce has revolutionized in-bundle inspection and retrieval with the combination of the Brooks In-bundle Camera System (BICS) and the Manual In-bundle Guidetube System (MIGS). The guidetube system and rigid inspection probe penetrate the in-bundle region of both triangular and square pitch steam generators to provide high-resolution images.

Tooling used:

- MIGS (manual)
- Video Probes (manual)
- REPTIL (remote) - coming soon
Benefits

Rolls-Royce has unique capabilities, specialized tooling and unmatched experience performing steam generator inspections that give customers the following exclusive benefits:

- Inspect up to 100 percent of the annulus region while viewing up to six tubes deep into the high flow region
- Inspect up to 100 percent of the in-bundle region of triangular-and square-pitched generators
- Triangular- and square-pitch retrieval of foreign objects
- Inspection of TTS, as well as the bottom of the first support plate
- Reduce dose exposure to as low as reasonably achievable (ALARA) by using remote location for inspections
- Enhanced trending capabilities for improved maintenance planning with Component Information System (CIS)

The CIS database gives Rolls-Royce and Westinghouse customers the exclusive ability to view inspection data within minutes of the inspection, cutting characterization and decision-making time to a minimum. Images and tracking data are stored on a password protected, secure server and are accessible 24 hours a day, seven days a week from anywhere in the world. CIS allows customers to easily compare past inspection data with new inspection results for an increased understanding of system trends and improved maintenance planning for the future.

Experience

Rolls-Royce performs approximately 80 steam generator inspections for the nuclear power generation industry on a yearly basis. Westinghouse and Rolls-Royce possess unique capabilities, knowledge of power generation systems and experience performing specialty inspections that are utilized at facilities around the world to provide customers with critical information about plant health and operation.

- 821 – Average number of foreign objects found per year
- 78 – Percentage of all objects that were metal in composition and as large as or larger than standard wire
- 91 – Percentage of all attempted Priority 1 items successfully retrieved (Priority 1 items are classified as items that could be severely detrimental to the system if left in the system)

Classifications are not made by Rolls-Royce. Classifications are made by Westinghouse, site or third-party subject matter experts.