

Recommendation 337
Improving H-Canyon Throughput

Background

H-Canyon is a highly versatile facility that is a National Asset. It is capable of processing many forms of uranium and plutonium. However, that versatility comes with a cost. Each type of material that is processed must be fully analyzed for safety (safety documentation process), procedures must be written to ensure compliance to with the safety analysis, equipment must be modified, and people have to be trained, to name a few of the complications. The efficiency of these processes is instrumental in the timing of processing nuclear materials and the ability to shorten the schedule for site cleanup. However, the CAB understands that changing or upgrading the process takes funding which is always in short supply.

Discussion

H-Canyon is a complex chemical processing facility that takes many steps to process each type of material from beginning to end. The basic processes that most materials coming to the Canyon will go through are:

1. Receipt: The material must be off loaded from either a rail car (on site shipments only) or a truck into a holding area or directly into the Canyon.
2. Dissolution: The material is dissolved in nitric acid. If a material is being dissolved just to send it to the High Level Waste tanks (e.g., plutonium), it will skip to step 6.
3. Chemical cleaning: The dissolved liquid goes through a chemical process that separates out the aluminum which goes to waste.
4. Separation (first uranium cycle): The resulting partially cleaned up material now contains mostly uranium, the fission products, and a small amount of plutonium. This process separates these materials to allow the uranium to be further refined. The plutonium and fission products are sent to the High Level Waste tanks.
5. Refined Separation (second uranium cycle): The resulting uranium solution from step 4 will still have too many impurities to be used in fuel for a nuclear reactor, so it is further cleaned up in this step.
6. Waste Processing: There are several tanks used to store the waste streams, mainly depending on the plutonium content of the waste. When a batch is ready, and the High Level Waste system is ready to receive, the waste is transferred to the High Level Waste tanks.
7. Blend Down and Product Shipping: The refined uranium solution is then blended down with natural uranium solution that is shipped to SRS by the Tennessee Valley Authority (TVA). The final solution meets the TVA specifications (chemical purity and uranium enrichment) for their reactor fuel fabrication and is shipped off of SRS to TVA.

Each one of these steps is comprised of several, very highly technical and complicated steps, and uses several dedicated pieces of equipment depending on what type of material is being processed. There are several different shapes and sizes of SNF that will need to be processed to

be able to clean out L-Basin to allow it to eventually be emptied and deactivated. Each time a new shape, size, or content of material is processed in the Canyon, several things must happen, including, in some cases, changing equipment. For example, there are currently 2 operating dissolvers in the Canyon: one is used for SNF and the other for plutonium. Before a new type of SNF can start to be processed, the dissolver must be analyzed to ensure it is capable and safe to use it. In some cases, like High Flux Isotope Reactor SNF, the dissolver must be changed to allow the High Flux Isotope Reactor SNF to fit into the dissolver.

Also, each step has a specific amount of material that it can process at any given time (defined throughput). If the throughput of each process is different, bottlenecks can occur. For example, if the dissolver can process 100 units per day, the chemical cleaning can only process 50 units per day, and first cycle can process 110 units per day, then the chemical cleaning process is the bottleneck. The dissolver will have to slow down because the chemical process can't accept that much material. Then first cycle is sitting idle waiting for material to process. Balancing these processes (e.g., adding equipment, changing the chemistry of the process, or adding storage capacity) is important to be able to process the SNF and other materials faster to allow L-Basin to be deactivated sooner.

Determining what needs to change, and implementing those changes, takes time and money. Understanding exactly what needs to change and how long it takes to implement those changes is imperative.

The CAB recommends that DOE:

1. Analyze the full process from the safety basis, through processing, until the materials and by-products leave H-Area to determine the bottlenecks in the process. Provide a briefing to the CAB on the results of this analysis.
2. Analyze the cost and schedule impacts resulting from the identified bottlenecks to determine necessary modifications to the process to eliminate each bottle neck in cascading order (as one bottle neck is cleared, a new one will surface).
3. Add the actions identified in these analyses to the Integrated Priority List and provide sufficient priority to implement the most promising actions.