



TRA Warm Waste Treatment Facility Process Controller Replacement

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Changing the World's Energy Future

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What is warm waste?

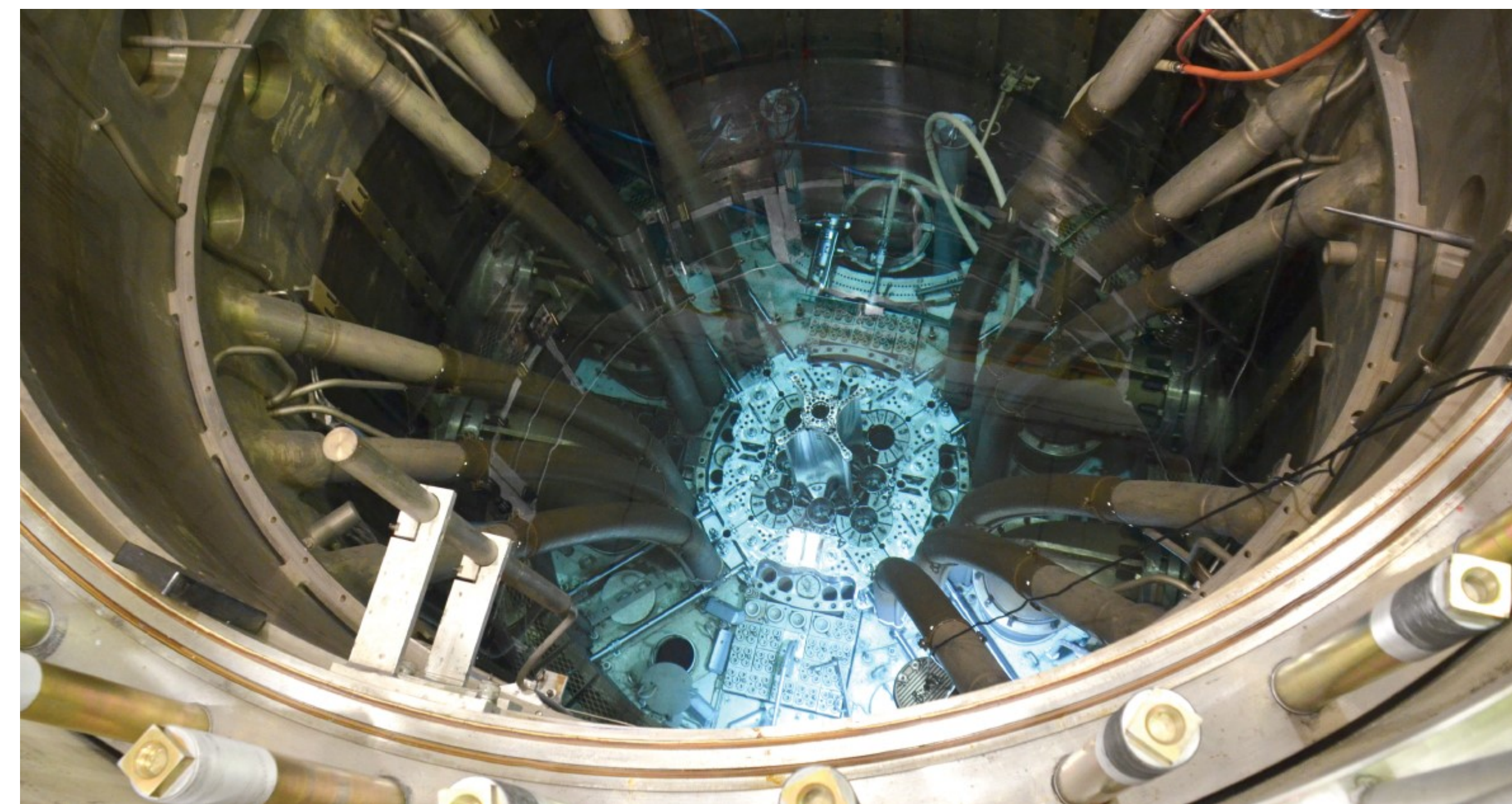
Warm waste water is low level radioactive waste water not containing significant chemical contaminants. The majority of ATR warm waste water originates from the primary coolant system which circulates water through the reactor vessel cooling it during operation. As the water circulates, radioactive material and dissolved radioactive isotopes may become suspended in the coolant water. This water is then labeled warm waste water.

What is the ATR Warm Waste Treatment System (WWTs)?

The ATR warm waste treatment facility is the location at ATR where warm waste is monitored and transferred en route to the ATR warm waste evaporation system. Warm waste water is pumped from the reactor building to the warm waste transfer system where the radioactivity level is monitored, then it is pumped out to the evaporation ponds. In the past there were a series of ion exchange tanks that were used to remove radioactive material from the water, but that process is now handled solely within the reactor building itself and currently WWTs strictly pumps water to different locations.

What does a process controller do?

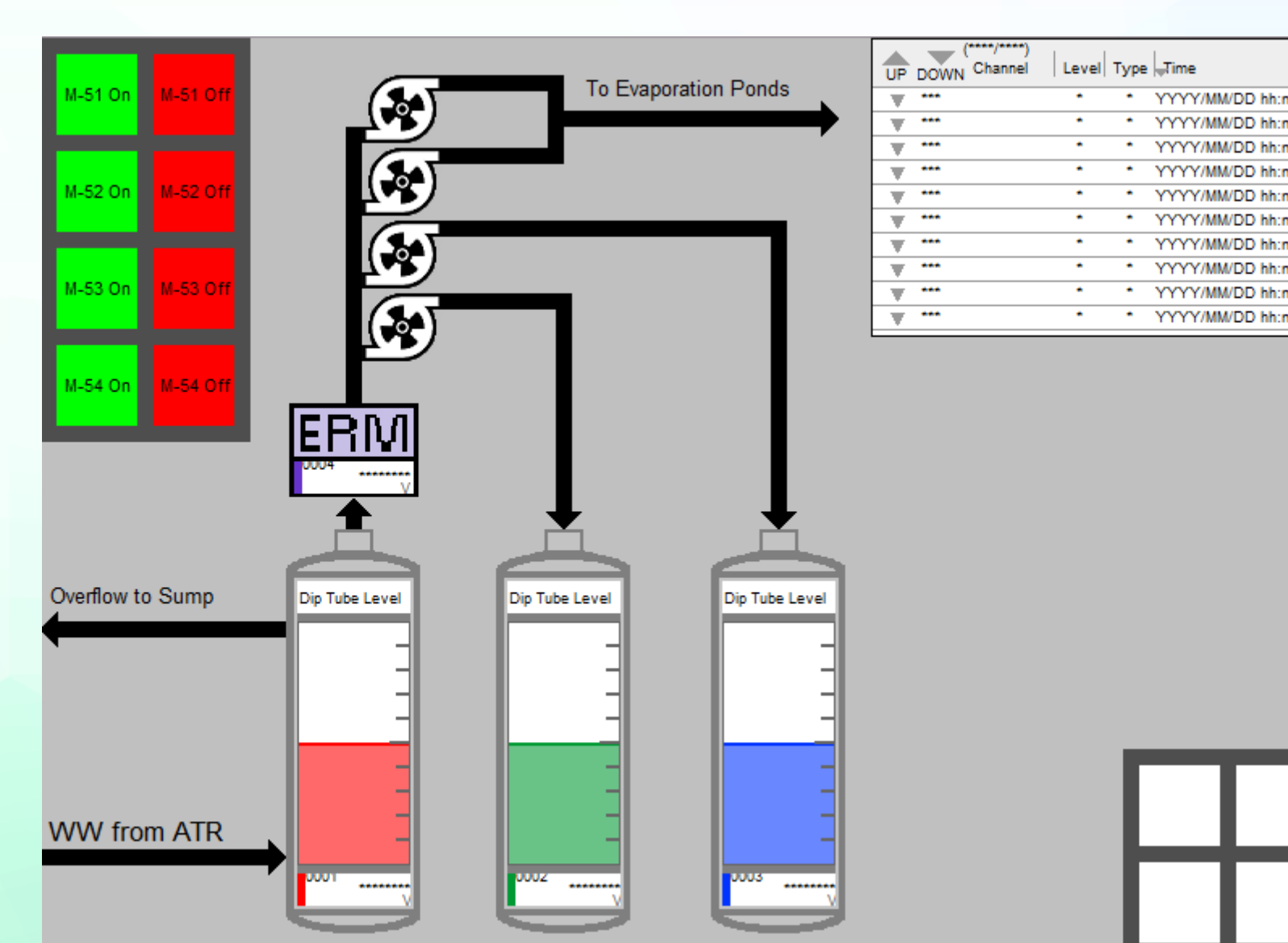
A process controller is a computer that autonomously handles all input and output operations for a specified system. In the case of the WWTs, the process controller monitors radioactivity levels received from the effluent radiation monitor (ERM), controls pump functions, and enables alarms when needed.



Interior of ATR vessel showing ATR core and primary coolant piping
Taken from: <https://www.energy.gov/ne/articles/idaho-national-laboratory-completes-sixth-core-overhaul-advanced-test-reactor>



Yokogawa GX-20 touchscreen paperless recorder
Taken from: <https://www.yokogawa.com/us/solutions/products-platforms/data-acquisition/panel-mount-recorders/touch-screen-gx10-gx20/>



Example of custom Yokogawa display screen

How did I go about replacing the existing process controller?

The process of upgrading any system on the ATR complex is a long and difficult process. At INL, engineering takes a graded approach to developing a new design and there are multiple steps that need to be followed precisely for the upgrade to be approved. At the start of my internship, my focus was on writing a new Functional and Operational Requirements (FOR) document for the WWTs Process Controller replacement. Writing this document required me to go into the WWTs building with equipment operators and an electrician to take various input/output measurements to verify the requirements of the new equipment. After the FOR document was written and submitted for review, I focused on programming the new process controller; a Yokogawa GX-20 touchscreen paperless recorder in order to help meet requirements detailed in the FOR. The images to the lower left depict what the physical unit looks like, as well as an example display screen that was created to meet certain specifications laid out in the FOR document. The next steps in the engineering process include creating a Technical and Functional Requirement (TFR) document, updating existing drawings, creating drawing sets, and researching what materials/equipment needed to install the data recorder. Additionally, the last step to implement the design before installation is the verification of the design and that the selected design will meet all requirements laid out in the FOR when implemented. I developed the Design Verification Matrix to assist in the verification/approval stage of the engineering process.