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Protecting People and the Environment

Nuclear Power Plant Effluents

Current Events

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Overview

- Nuclear power plants need to discharge radioactive effluents in small amounts in order to operate and have been doing so safely since initial start-up
- Rules limit the amount that can be released to ensure they are a fraction of what is received from background sources

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Dose

- A measurement of the energy imparted by radiation
- Conventional units used are mrem (millirem)
- Can be thought of as the overall risk from radiation to a person
- Average dose an individual receives per year from natural sources of radiation (sun, soil, etc.) is about 300 mrem.

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Regulations

- Focus on limiting the dose to people living around the site
- All NRC licensee's must limit does to the public to 100 mrem/year
- Nuclear power plants must limit dose to the public to 25 mrem/year
- Plants are designed to operate well below 25 mrem/year
    - Liquid discharge design criteria is 3 mrem/year

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Land Use Census

- How the public is exposed to radiation depends on how the land around the plant is used
- Plants annually perform a census to identify changes in how the land is used
- Looks for things such as large gardens, dairy cows, where residents are located, etc.

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Effluent Controls

- We are using ‘effluent’ as a generic term to describe radioactive material released from the site in gaseous or liquid form
- Effluent controls ensure that what is being released is monitored and controlled to ensure dose limits are met

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Effluent Controls

- Doses to the public are too small to measure directly
- Sites sample and analyze effluents from the plant piping or tanks they are being released from
- Information from the land use census used to model how an individual would be exposed to the effluent release
- Doses are calculated based on the model

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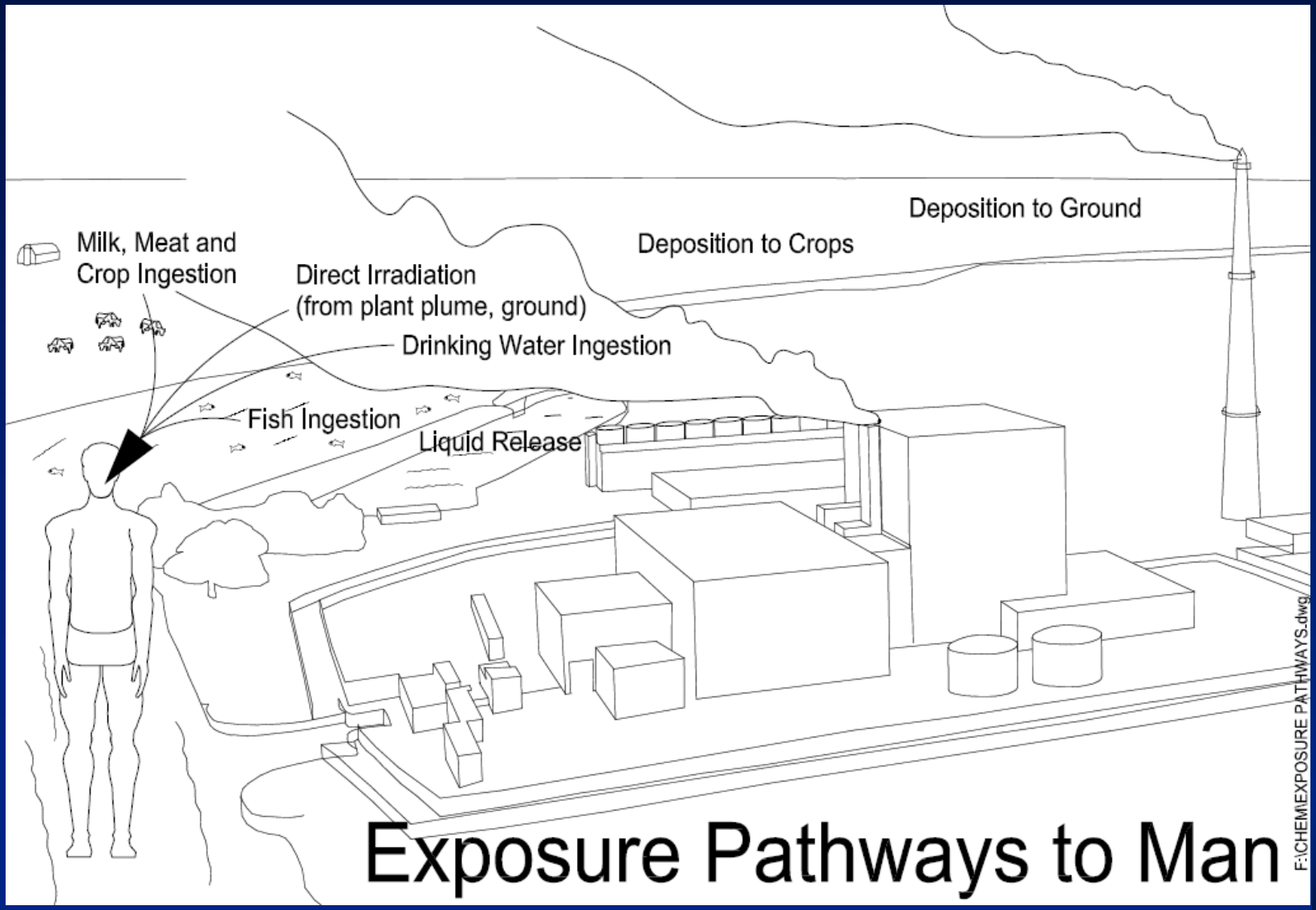
Effluent Controls



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REMP

Radiological Environmental Monitoring Program

- Measures radiation in the environment during the lifetime of the plant
- Determines if any measurable levels of radiation are from plant operation
- Determines if results are commensurate with the radioactive effluents

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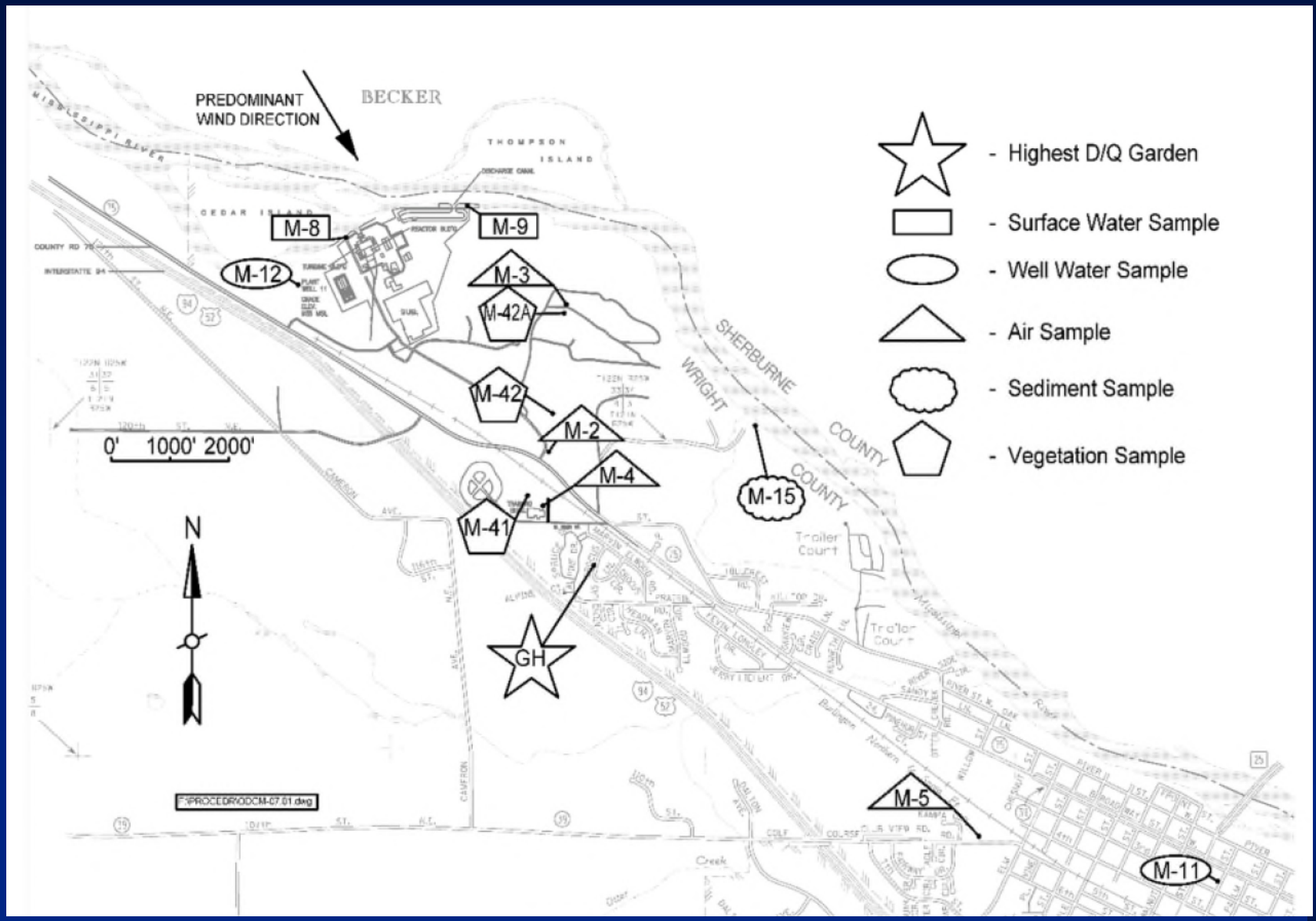
REMP



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GPI
Groundwater Protection Initiative

Industry standard is NEI 07-07

Revision 0 (ML072610036)

Revision 1 (ML19142A071)

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GPI

- Objectives include
  - Provide timely detection and effective response to inadvertent on-site releases to groundwater in order to prevent migration off-site and to quantify impacts on decommissioning
  - Improve communication with external stakeholders
  - Perform program oversight to ensure effective implementation

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GPI

- Site hydrology
  - How does the groundwater move?
- Risk ranking
  - Where is there potential for leaks?
- Groundwater monitoring
  - Monitoring wells established in strategic locations based on hydrology and risk ranking
- Remediation
  - Pumping contaminated water out of the ground for appropriate handling
- Communications
  - Protocols established between site and State/Local governments

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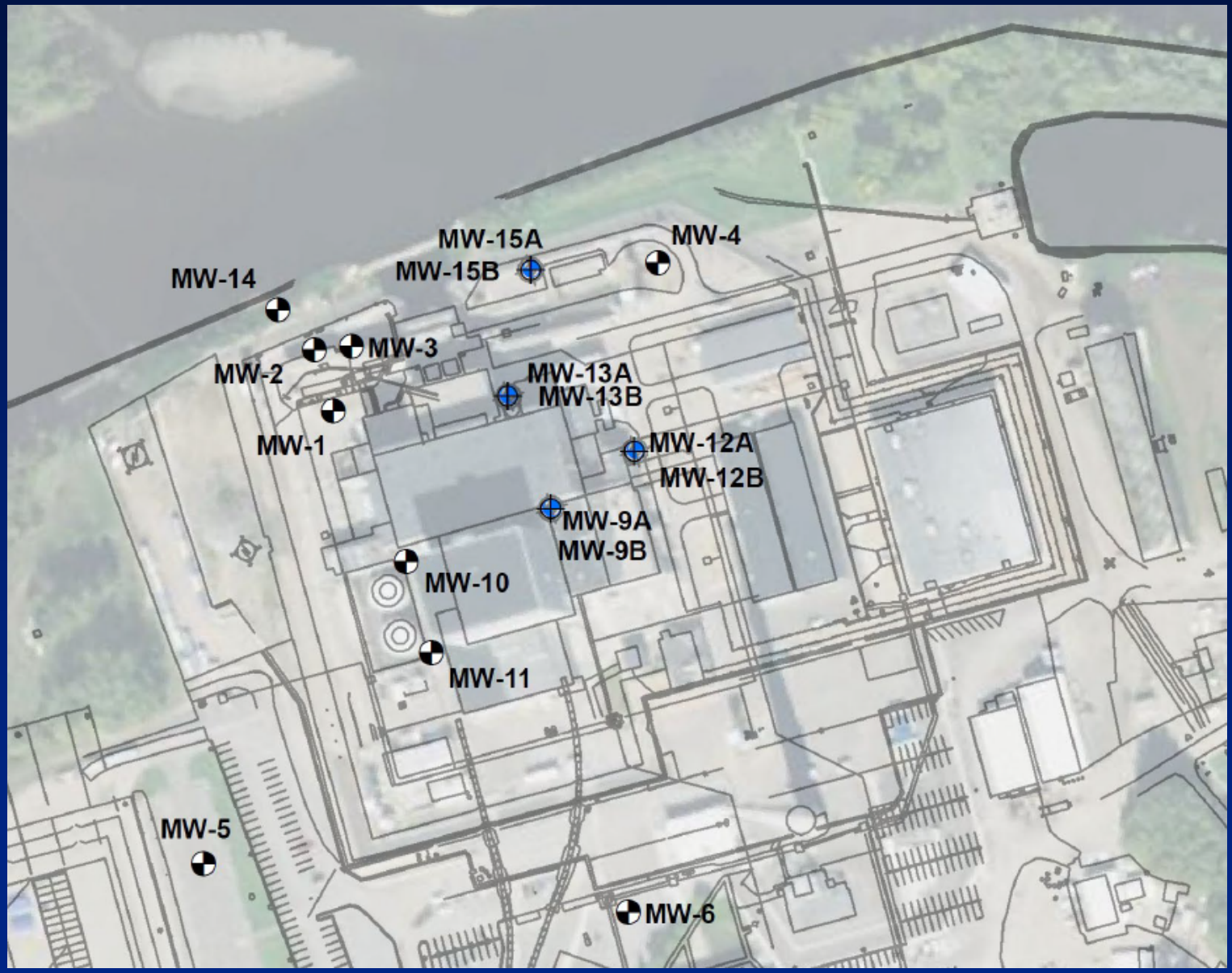
GPI



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Monticello Tritium Leak

- November 2022
  - Site identified elevated tritium levels in one of the GPI monitoring wells during routine monthly sampling
  - Site notified the State and NRC of the elevated levels
  - Sampling frequencies of nearby monitoring wells increased
  - Site started investigation to determine source of the leak

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Monticello Tritium Leak

- December 2022
  - Site identified source of leak in pipe that runs between the reactor and turbine buildings, which have a small gap between them.
  - Leak was captured and rerouted back into the plant
  - Site started recovering contaminated groundwater
    - Stored in tanks on-site and reused as plant make-up water
  - Site started installing additional monitoring wells

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Monticello Tritium Leak

- March 2023
  - Routine sampling of monitoring well indicated some of the leak was again making it to groundwater
  - Site shut down the plant to replace the section of pipe

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Monticello Tritium Leak

- Ongoing
  - Site continues to monitor location of tritium
  - Monitoring well sample frequency adjusted for each well based on current conditions
  - Evaluation for additional monitoring wells continues
  - Recovery of contaminated groundwater routinely adjusted for current conditions
  - Site's actions are aimed at preventing uncontrolled migration of the tritium off-site

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Monticello Tritium Leak

- Risk from off-site release
  - The amount of tritium leaked to the groundwater would not pose a health concern even if all of it reached the Mississippi River
  - Dose to a member of the public would be well below 1 mrem
    - Remember, 300 mrem/year from natural sources

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Monticello Tritium Leak

- Even though there is no health concern, it does not mean it is okay to do nothing
  - NRC expects effluents to be released in a monitored and controlled fashion
  - Recovery of contaminated groundwater to mitigate off-site release through groundwater is expected
  - Extensive monitoring of the groundwater will ensure that any off-site release through the groundwater will be appropriately accounted for
  - NRC will verify appropriate control

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Monticello Tritium Leak

- Monticello has not performed liquid discharges in a few decades and does not currently plan on discharging the recovered groundwater
- Storage of recovered groundwater is a major evolution
  - Pumping of groundwater must proceed to control plume
  - That water must go somewhere
  - Short term storage solutions being used while long term solutions are being developed

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Inspections

- The NRC has specialized inspectors perform periodic on-site inspections of the programs discussed today
- The NRC maintains at least two resident inspectors at each site to oversee the day-to-day operation of the site
- NRC will continue to follow the site's actions through the routine inspection program

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Annual Reports

Nuclear power plants are required to submit annual reports detailing effluent releases, on-site groundwater monitoring results, and REMP results.

These reports can be found at

https://www.nrc.gov/reactors/operating/ops-experience/tritium/plant-info.html

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Questions