Challenges Encountered With Elevated Tritium Values

Perry Power Plant

- GE BWR 6
- 3758 MWt
- Rated Power 1306 MWe

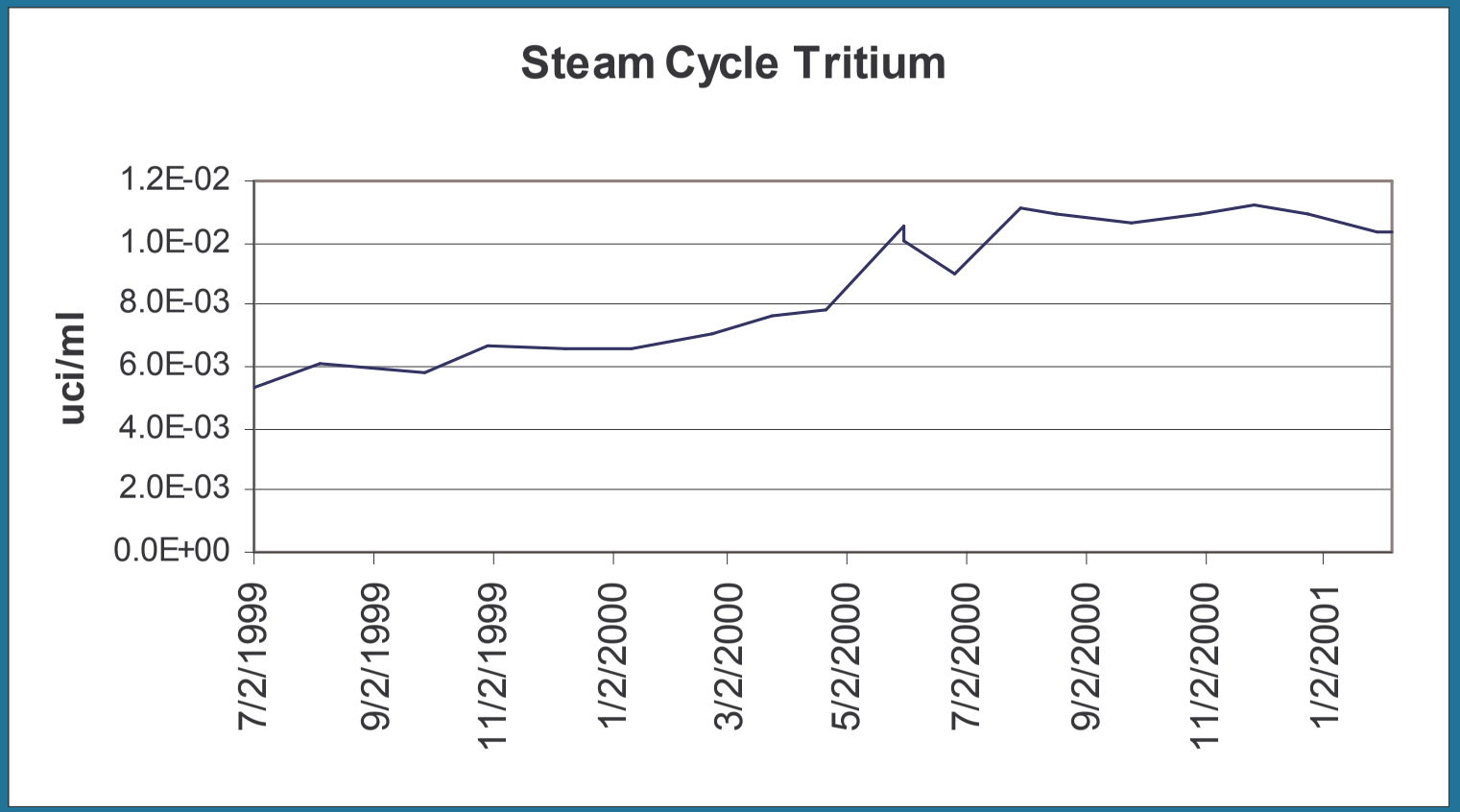
Sources of Tritium

- Activation of deuterium
- Directly from the fuel if a defect is present
- From control rod blade leakage
- In-adequate processing of Standby Liquid Control (SLC) waste in radwaste

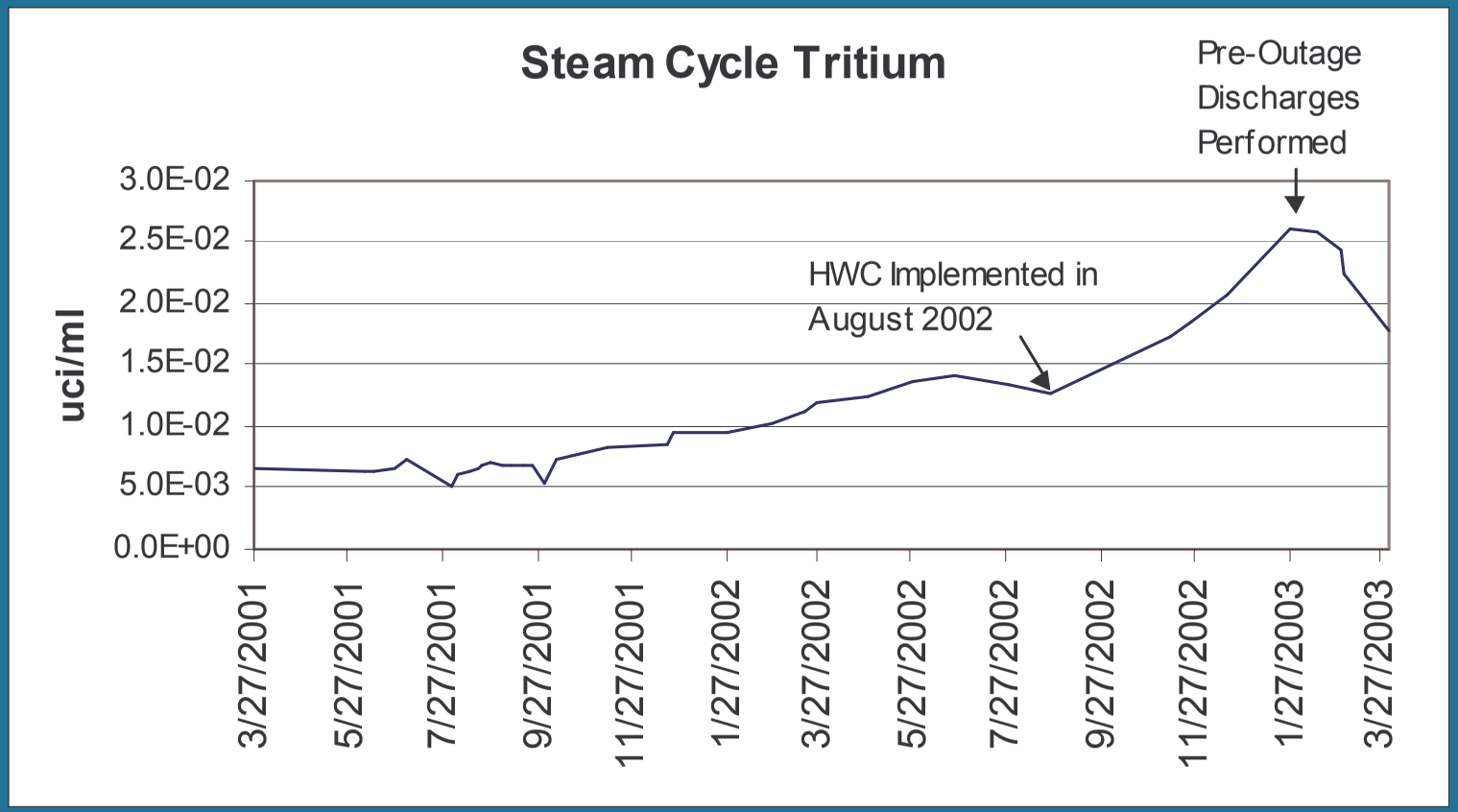
Tritium Concentration Changes During Cycle

- Historically tritium would build to an equilibrium value based on production rate from deuterium and the losses from steam cycle
- During Cycle 9, increases in control rod blade leakage and two small fuel defects contributed to an increase beyond equilibrium point

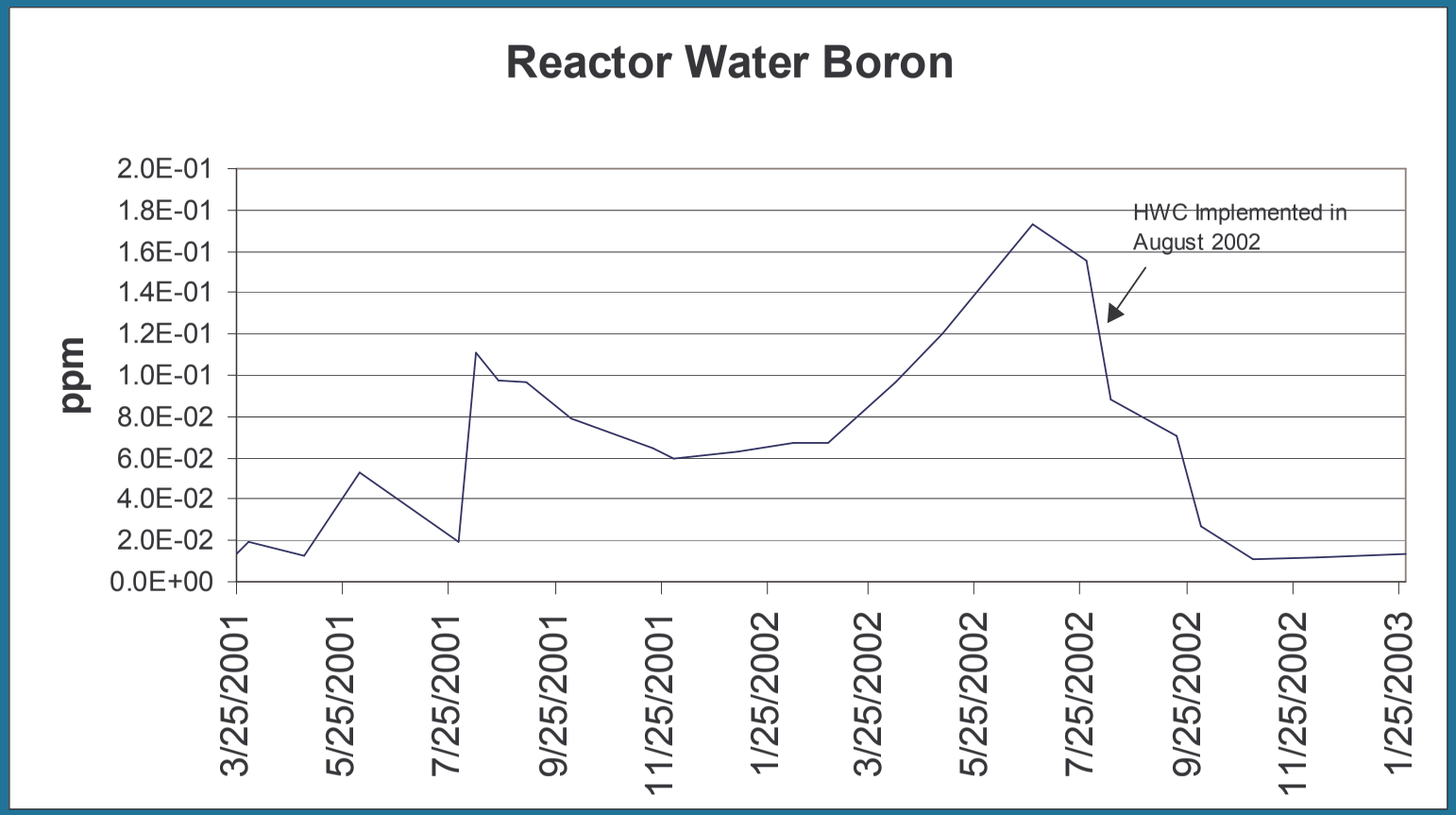
Tritium Trend for Cycle 8



Tritium Trend for Cycle 9



Reactor Water Boron Trend



Problems Encountered with Elevated Tritium

Tritium Detected in Turbine Building Supply Plenum Drains

- Influent air to Turbine Building is cooled with chilled water
- Condensate from the cooling coils is directed to storm drains
- Tritium was detected in drains at a level of 2.20E-06 uci/ml.
- Investigation determined that exhaust from plant vents was recycled back into the turbine building supply plenum

Elevated Tritium Caused a Reduction in Radwaste Discharge Flow

- In order to ensure compliance with effluent concentration limits a reduction in radwaste discharge flow was necessary
- $$Fmax = \frac{(0.64)\ (\text{dilution Flow})}{10\ (\Sigma\ C_i/EC_i)}$$
  - 0.64 Engineering factor to prevent spurious alarms
  - C_i Concentration of radionuclide
  - Ec_i Effluent concentration of radionuclide

Elevated Tritium Caused a Reduction in Radwaste Discharge Flow (cont)

- With a tritium value of 2.62 E-2 uci/ml and a Dilution Flow of 20,000 gpm this would calculate to a maximum discharge flow (Fmax) of 49 gpm. Discharge Duration at this flow rate is 12 hours.
- Tritium would have to decrease to 8.0 E-3 uci/ml to allow for a discharge at the maximum possible discharge flow of 160 gpm.Discharge duration at this flow rate is 3.6 hours.

Elevated Tritium Caused a Reduction in Radwaste Discharge Flow (cont)

- Outage Water Management Plan required 210,000 gallons of water to be discharged in less than 3 days
- At a discharge flow rate of 49 gpm it would take over 3 days to release this volume
- Pre-outage discharges were performed to decrease tritium to allow for discharge at a higher flow rate during outage

Controls for Tritium Established

- Concentration limits placed on condensate
- Discharges were performed prior to outage to reduce tritium
- 50.59 review was performed for the release of tritium to the storm drains
- Improved monitoring techniques for control rod blade leakage
- Composite Plans were written for outage