Australian Government

ANSTO

Australian Nuclear Medicine Production

ANM operating experience

WOSMIP Remote II, May 2021

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Science. Ingenuity. Sustainability.

Australian Nuclear Medicine Facility

LEU / LEU Mo-99m Supply chain

OPAL Reactor	Processing Plant (ANM)	Global distribution	Local distribution of finished goods	Hospital and Pharmacy	Clinical Imaging	Health Outcomes
LEU U^{235} targets irradiated in OPAL	Mo-99 separated and purified	Bulk Mo-99 Shipped to meet global demand	Tc-99m Generators dispensed and transported	Tc-99m eluted and combined with cold kits	Product administered to patients for imaging	Imaging helps diagnosis & leads to appropriate treatments
3-12 days	1 day	1 day	1 day	5 minutes	-	-

Challenging supply chain

ANSTO Mo-99 Production Update

- ANM facility: Approved for single batches of 12 target plates
- Hot commissioning from Sep 2018 (Bld 54 shut down)
- 2019 - operational issues affected Mo-99 supply & led to loss of customer confidence (OPAL shutdowns, ANM jammed gate valve)
- Domestic supply of Tc Generators maintained throughout COVID
- Aug 2020 – resumed international supply of bulk Mo-99
- Mar-May2021 – OPAL extended shutdown
- Production currently 3 to 4 runs pw – some are combined batches !
  - after 6 hours, dissolver opened & 12 more plates added (24 plates total)
- Leading to slightly higher releases

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Original ANM design included provision for:

- Duplicate production line (hot cells)
- Second bank of 30 carbon columns for xenon abatement
- Deferred construction

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Second Dissolution Cell installed

- Ventilation exhaust currently going through original bank of carbon columns
- May affect performance of the abatement system
- Project to separate the ventilation for a true ‘duty standby’ situation

Future Plans

- Gradually increase Mo-99 production to 5 & 6 runs/wk
- Bld 54 facility mothballed, may be re-purposed
- Install 2nd bank of carbon columns to serve DCell2 – est. cost $1.6M AUD
- OPAL scheduled for 10 year shutdown in FY24 (ANSTO will need to import Mo-99 for 6 months)

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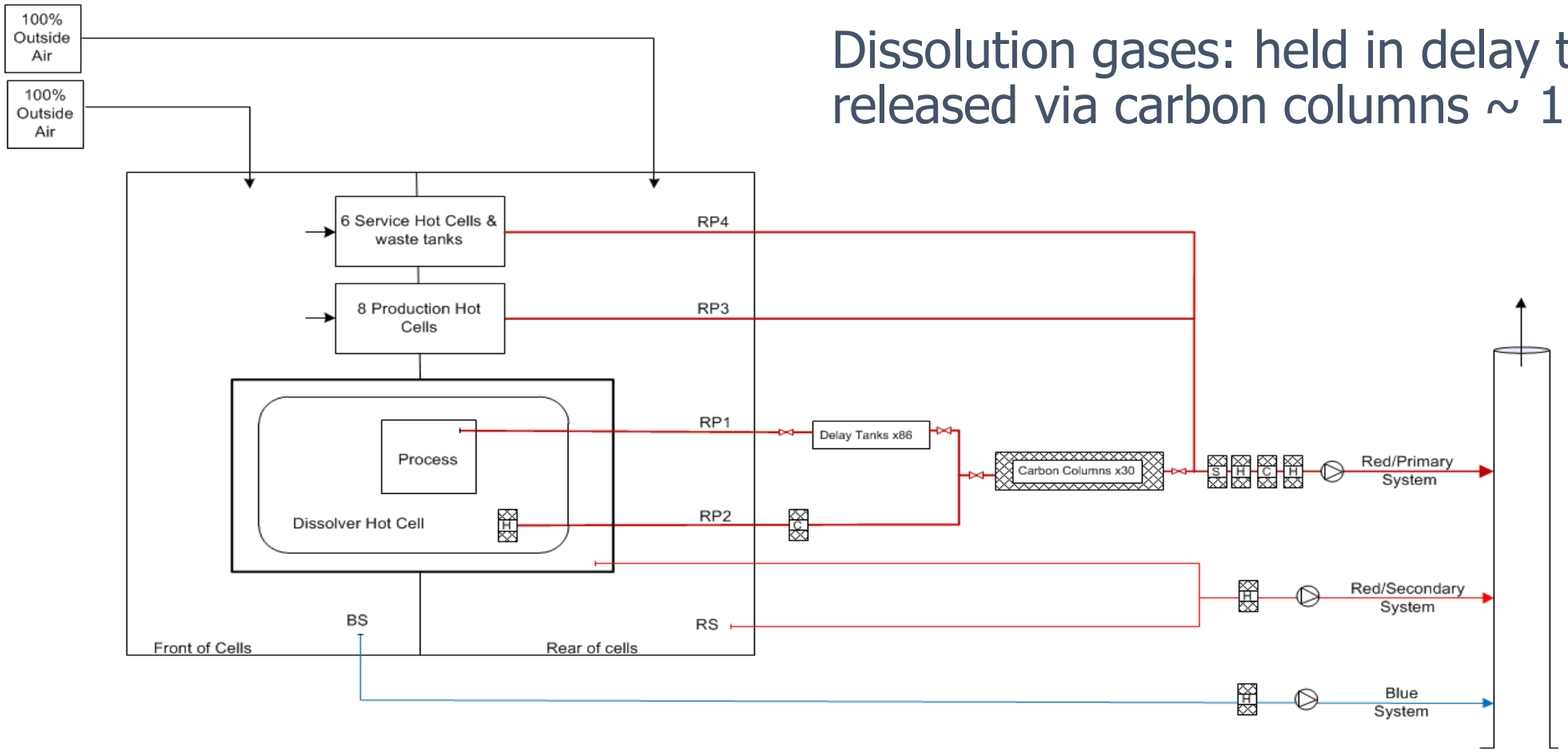
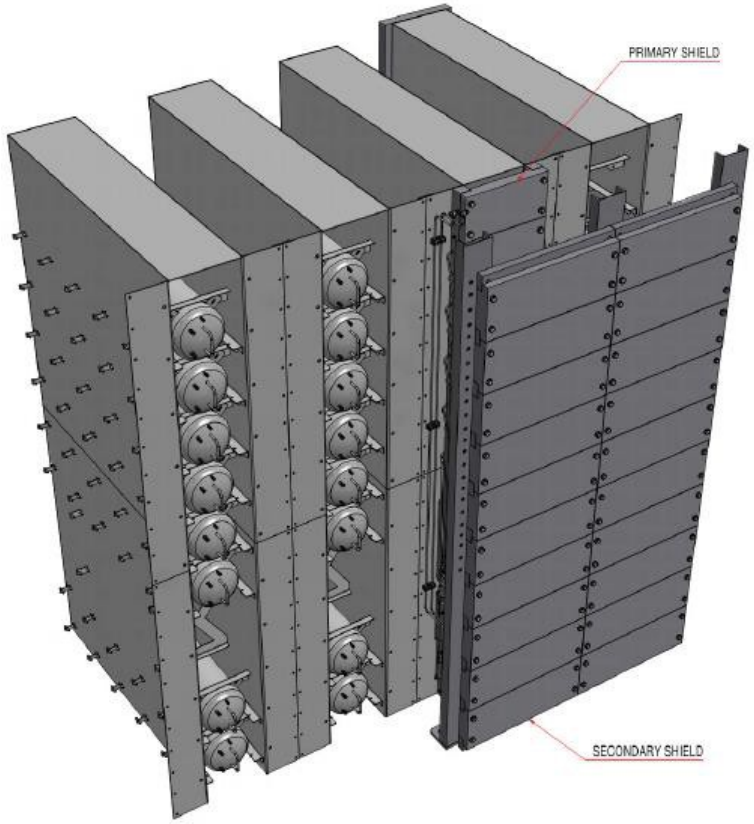
Active Ventilation System



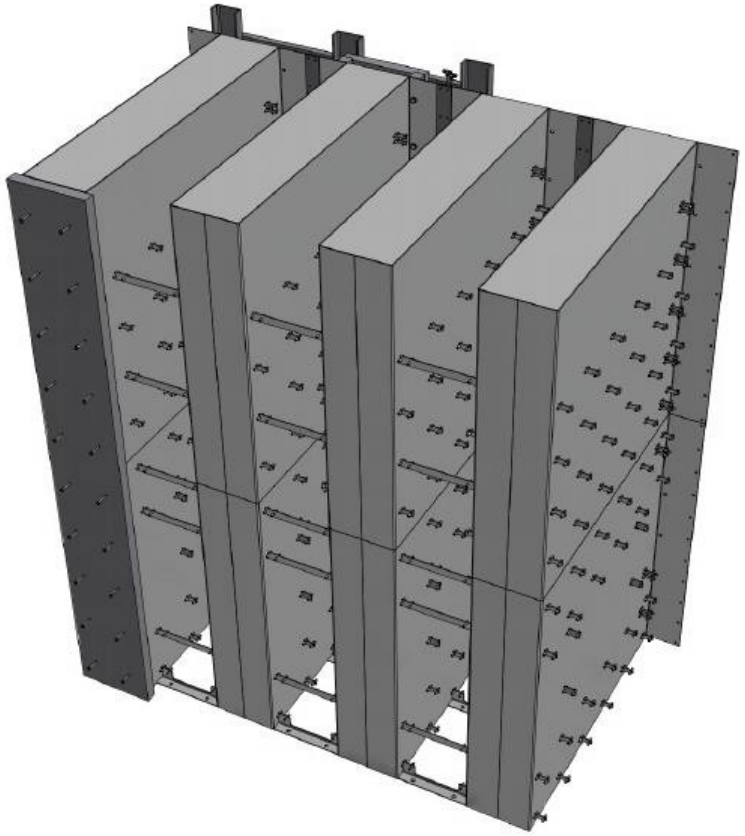
Dissolution gases: held in delay tanks ~7 wks; released via carbon columns ~ 15 days

ANM - General Ventilation Configuration

Vacuum Tanks



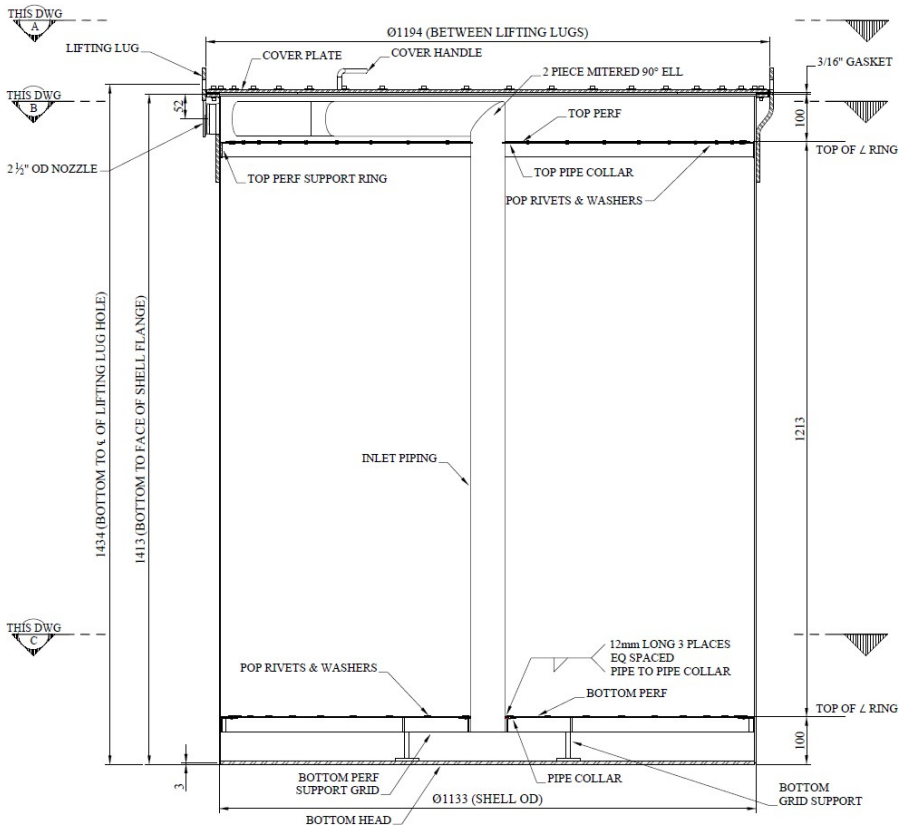
ISO FRONT

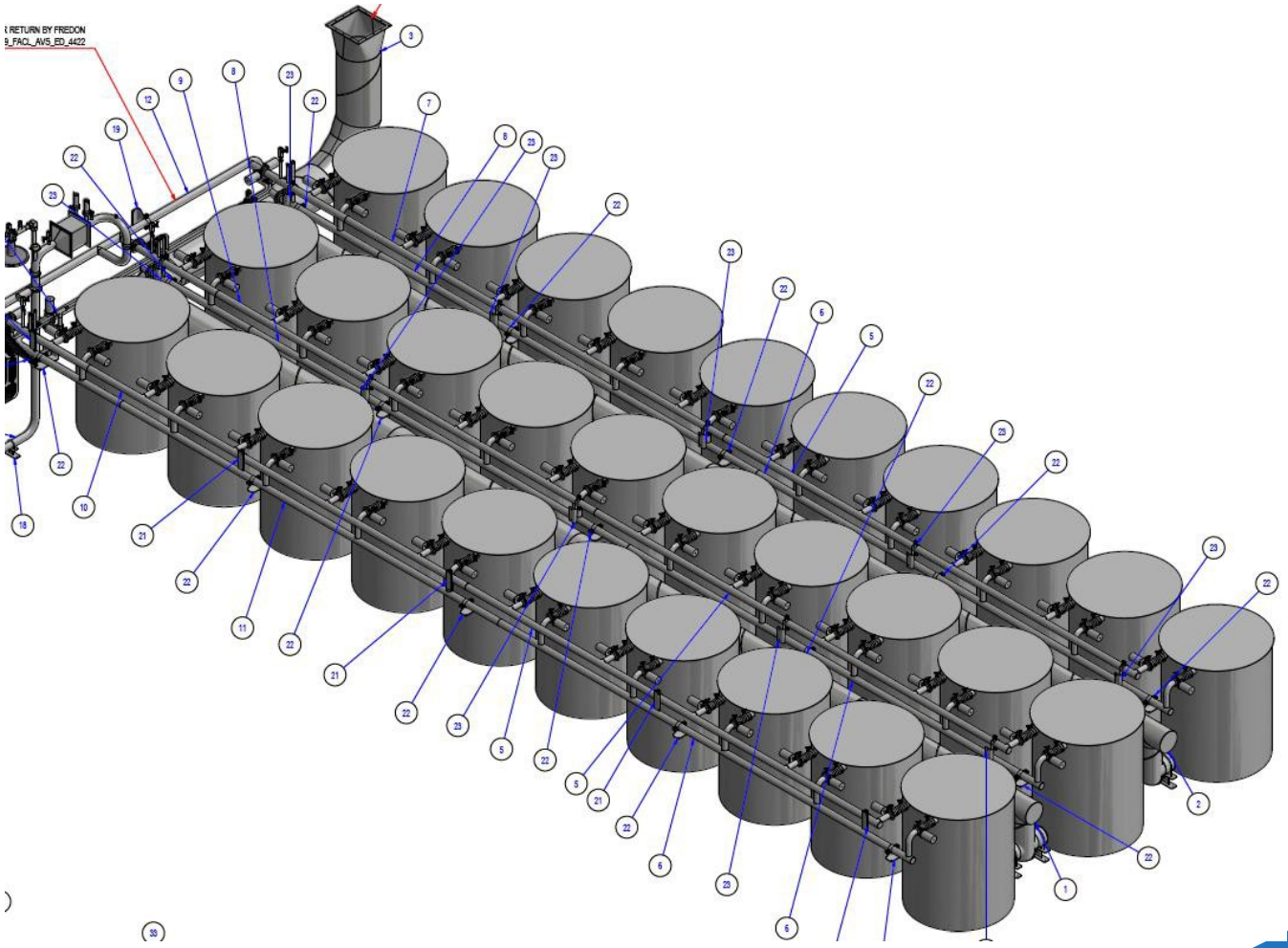


ISO BACK

Carbon Columns

Activated carbon is the most common adsorbent used for iodine and xenon abatement due to its reasonable cost and effectiveness





Carbon Column manufacture

Figure 9 - Inspection of Carbon Column Post Testing

Figure 8 - Removal of Carbon from Carbon Column post testing

Carbon Column installation – now active !

Linking Emissions to Production

Each run has its own characteristics depending on operational needs:

- working around OPAL monthly shutdown schedule - target irradiation times vary from 3-12 days
- 1.5 - 2 days from target dissolution to final product
- LEU target plates - 2 suppliers (CERCA, CNEA)
- Process yield (% product recovery) – affects waste/off-gassing
- Vacuum buffer tanks
- Double runs !

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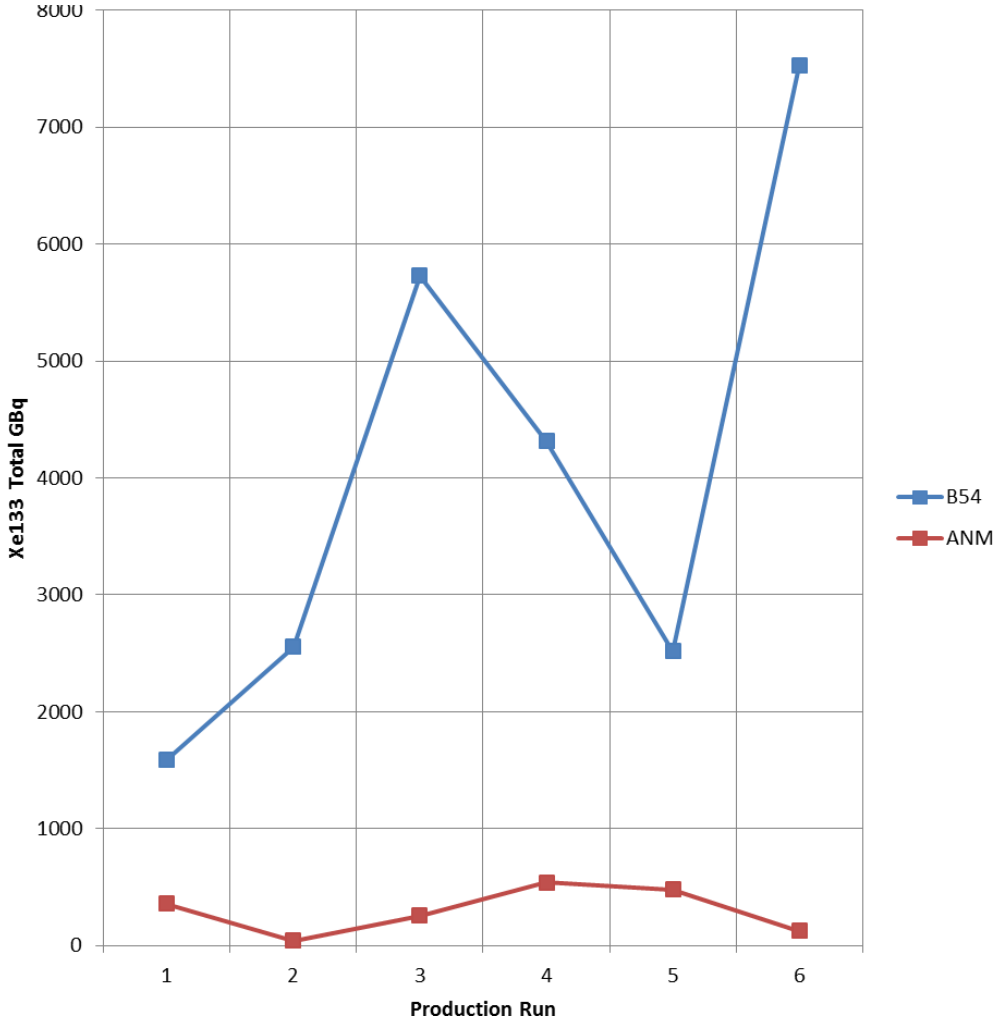
How do ANM emissions compare with Building 54?

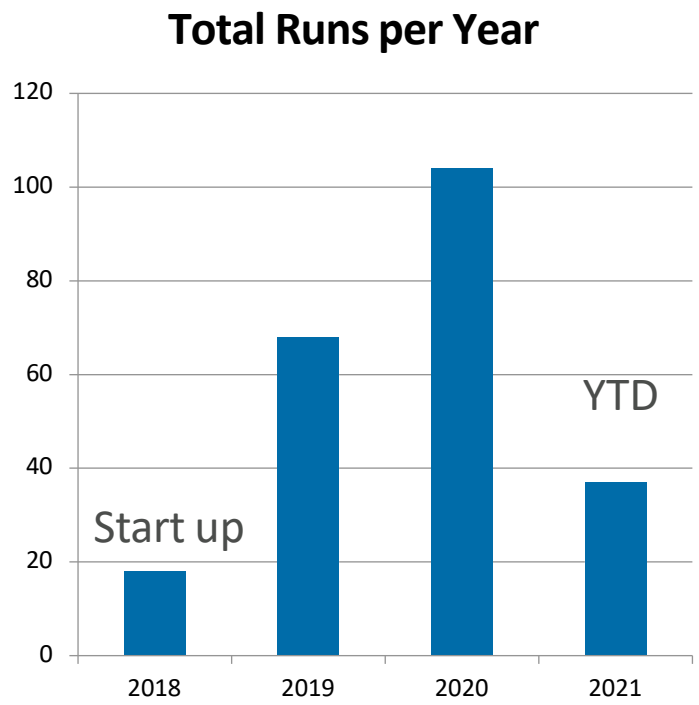


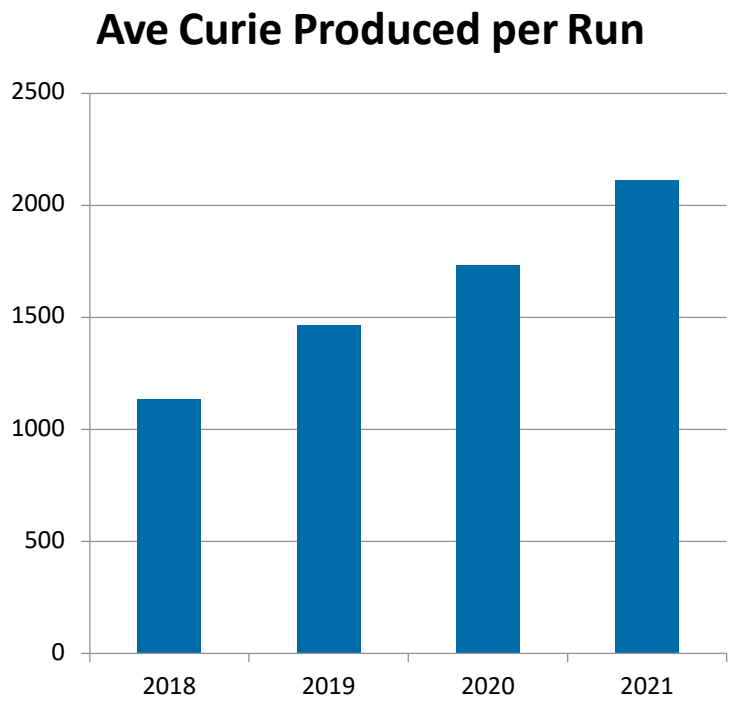
ANM initial commissioning runs

- Average Xe-133 emissions lower by ~ x13

- Placeholder for current data

ANM Performance





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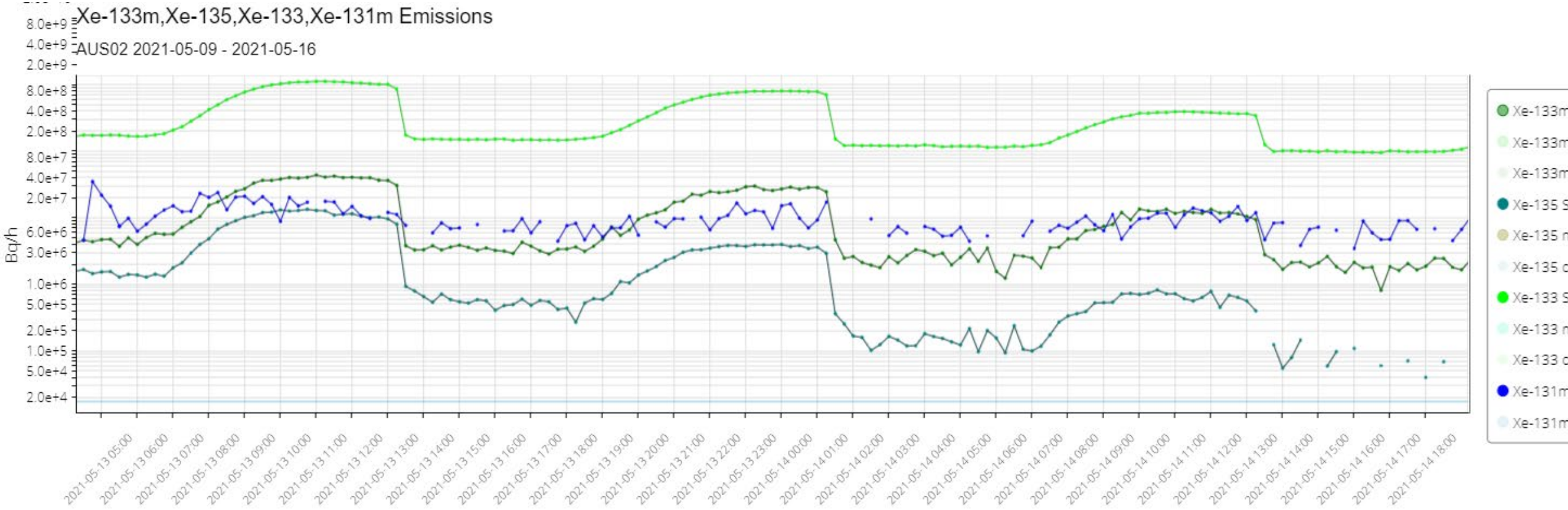
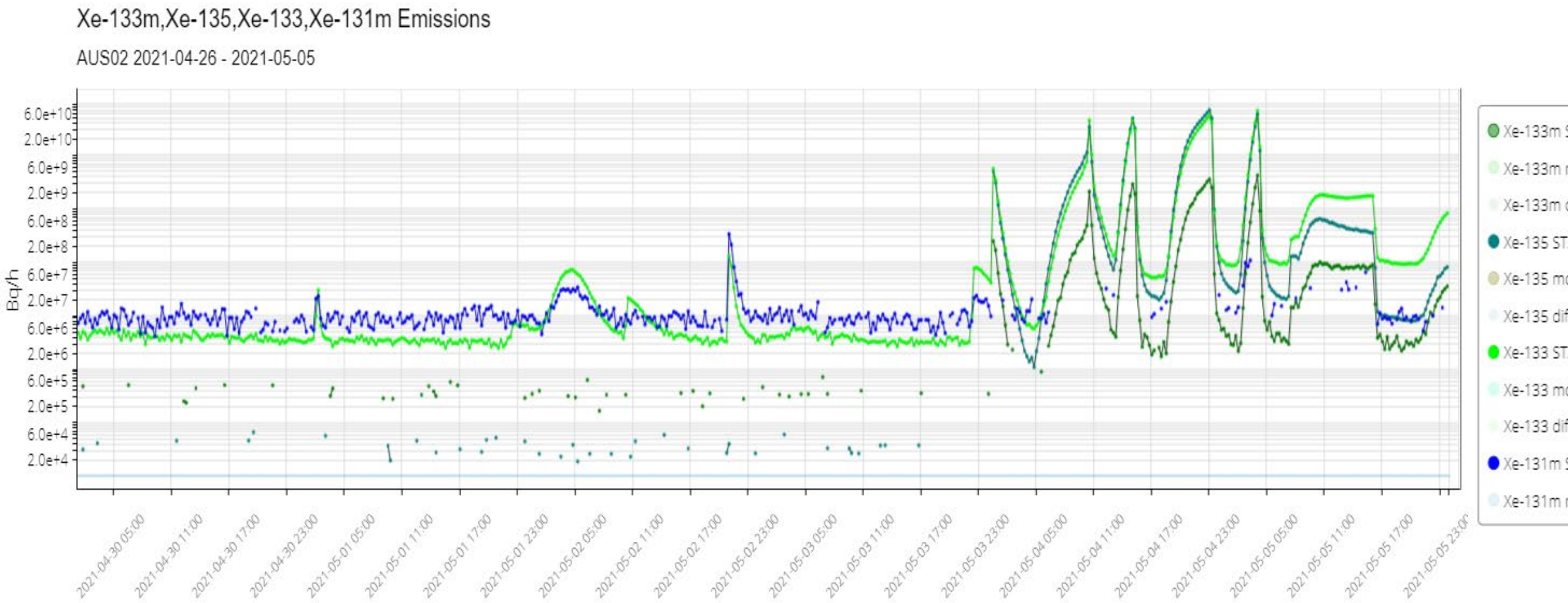
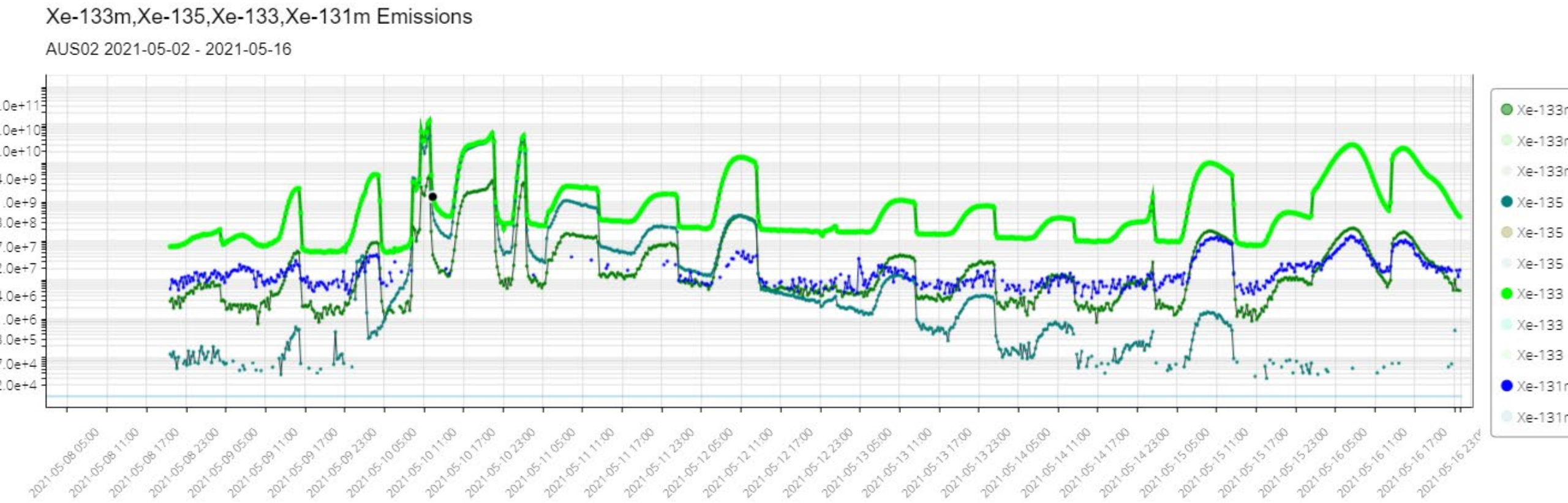
Series 1
ANM carbon columns ~ 12 hourly switch



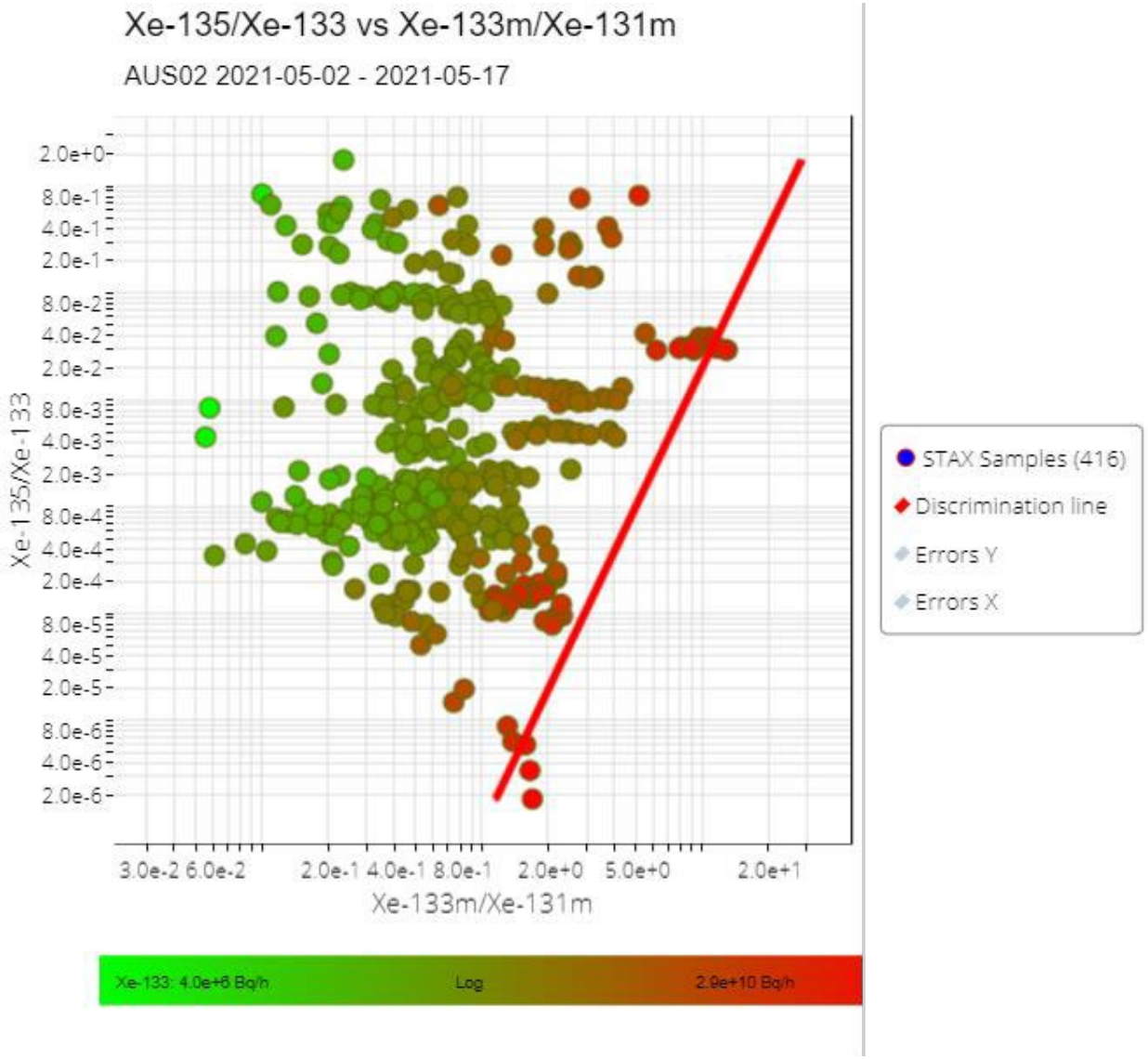
Series 2
ANM Start-up after 6 weeks off line



Series 3
Xe-135, Xe-133m decay



4 isotope plot (same data as series 3)



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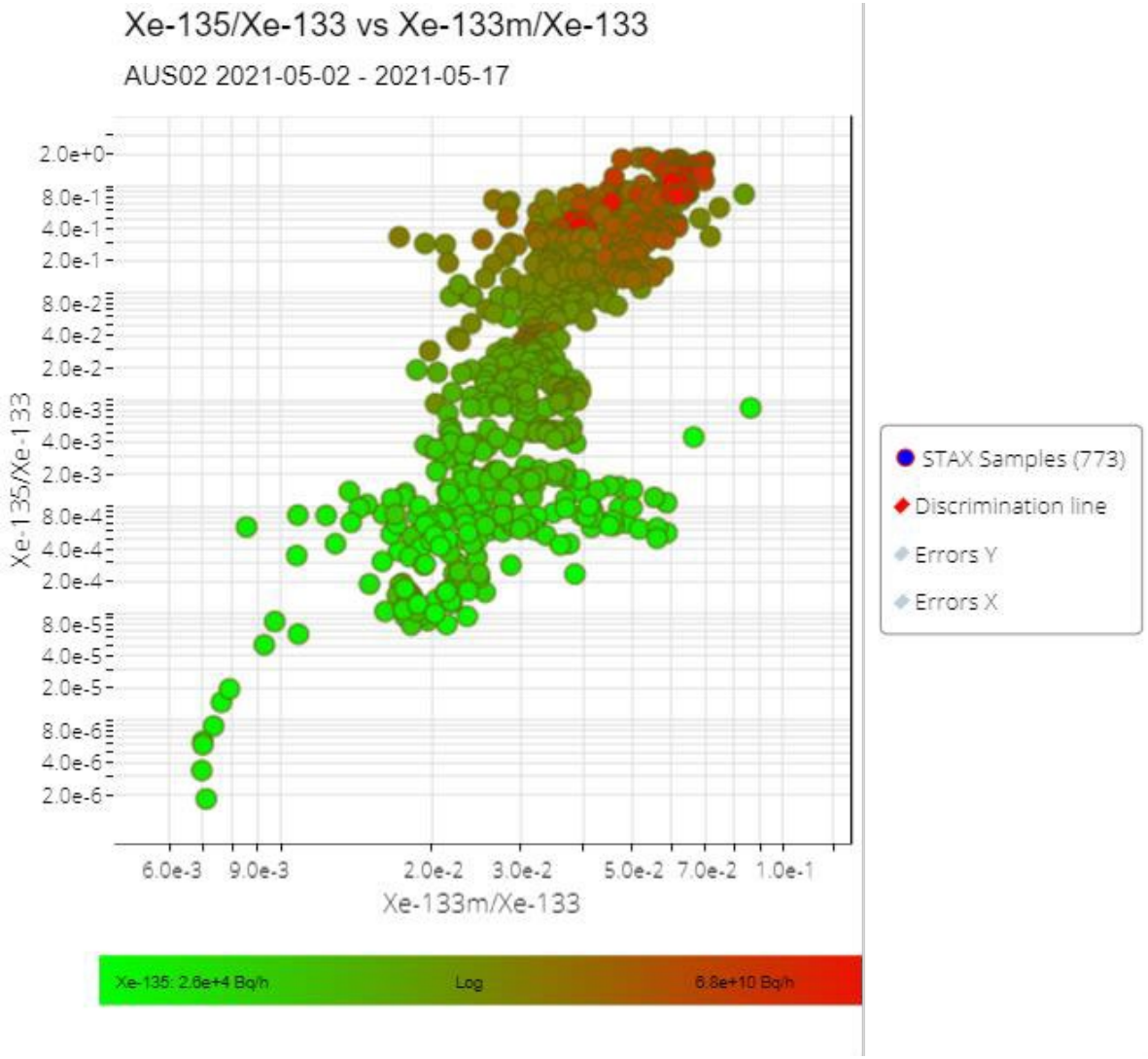
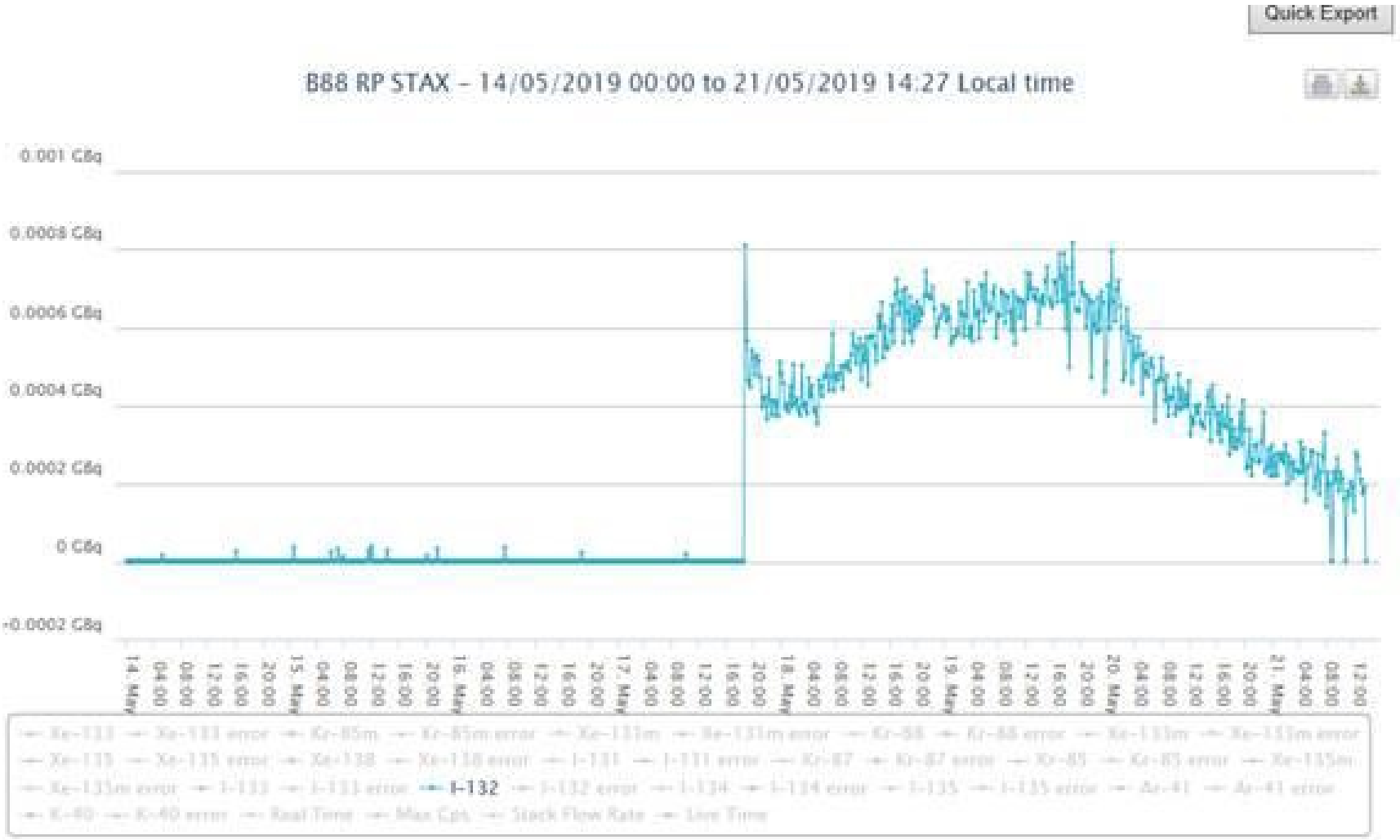


Iodine breakthrough



Thank you! Questions?

ANM stack

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