Source Term Analysis of Xenon

Project Update

June 2022
History of STAX

• STAX was developed through discussions at WOSMIP
  • Stack data with ATM can improve nuclear explosion monitoring
  • HPGe stack detection systems could provide useful info for production facilities
  • STAX project guidelines came from NDC discussions
The STAX project is…

- Establishing voluntary partnerships with facilities
- Purchasing and installing slightly modified commercially available stack monitoring systems in facilities
- Maintaining and optimizing system performance
- Developing data sharing agreements with facilities and NDCs to control access to data
- Developing tools to view, access, and use the data
Update in Belgium

- A Mirion built system was installed in IRE in December 2017
- Radioxenon emission data collected every 15 min is automatically transmitted to www.staxdata.net via encryption
- Some equipment maintenance has been required
- Data sharing ongoing with NDCs
  - Belgium, Canada, France, Germany, U.S., UK, Palau
- Recent and upcoming publications in the Journal of Environmental Radioactivity
  - Analysis of Environmental Radioxenon Detections in the UK, M. A. Goodwin, A. V. Davies, R. Britton, AWE, UK
  - Use of STAX data in global-scale simulation of $^{133}$Xe atmospheric background, S. Generoso, P. Achim, M. Morin, P. Gross and G. Douysset, CEA, France
  - Trends, events and potential sources of Xe-detections in the German radioxenon network A. Bollhöfer, S. Brander, R. Krais, S. Schmid, O. Ross, C. Schlosser, BfS, Germany
Update in Australia

• A Mirion built system was installed in ANSTO in October 2018

• System operating well

• 15 min data automatically transmitted to www.staxdata.net via encryption

• Working to edit data sharing agreement to allow access by NDCs
Update in Argentina

• In September 2018, INVAP initiated the designing and building of the detector system

• In August 2021, the system was installed in CNEA facility for testing

• This year the details of a formal collaboration with CNEA are being developed
Update in the U.S.

- Mirion built system installed at Niowave in March 2021

- VF Nuclear built system installed in SHINE in June 2022

- Data being automatically transmitted to database

- Data sharing agreements will be established when activities ramp up at the facilities
Data from Nuclear Power Plants

• STAX system temporarily installed at Hartlepool NPP in the UK in September 2021 as part of XENAH
  • Data is manually transmitted to www.staxdata.net via encryption

• Forsmark NPP started sharing data with STAX in March 2021

• Data comparison of MIP and NPP
  • NPPs are not constant on a large time scale
  • NPPs release much less than 1E9 Bq/day but can release more when doing something other than power production

VF Nuclear High-purity germanium (HPGe) detector installed at Hartlepool
• NPP releases not constant 1E9 Bq/d
  • Nothing released (<2E8 Bq) under typical operations
  • Periodic (few times a year) releases will be roughly 10% of MIPF
Contrast to MIP

- MIPF range from $5 \times 10^{11}$ to $7 \times 10^{12}$ Bq/h peak releases daily
- For ATM...
  - For NPP, wind direction AND release amount matter
  - For MIPF, only wind direction matters as release are enough to be detected every day.
Next Steps

• Remaining STAX Phase 1 activities (ending September 2023)
  • Additional installs
    • System being purchased for CCHEN in Chile
    • Ongoing discussions with additional facilities
  • Continued data review and system maintenance
  • Continued data sharing
  • Development of tools to help streamline data use

• Planning is underway for STAX Phase 2
  • Focused on continued system maintenance and data sharing
Thank you