Goals and Objectives

Scientific Credibility
One of the most important aspects of IFE14 was to establish a scenario that was scientifically credible. For the radionuclide portion, we calculated:

- Noble gas and volatile iodine fission products and activation products (37Ar) consistent with a 0.5-kiloton detonation
- Emitted and atmospherically transported levels based on previous observations
- Realistic ground depositions consistent with a small release
- Subsurface noble gas concentrations consistent with the best calculations
- Simulated backgrounds at the IMS stations affected

Challenge
The IFE14 scenario needed to be a challenge to the participants.

- Large, remotely observable radionuclide plumes were ruled out for this test
- Ambiguous signal at IMS stations
- Concentrations only observable near ground zero and near equipment detection levels

Exercise of Key On Site Inspection (OSI) Components
A challenge was to ensure that the IFE14 scenario gave an opportunity to demonstrate integration among measurement technologies.

- An ideal exercise would require that many pieces came together to make a strong case

Cost Effectiveness
To ensure maximum use of resources, a scenario was designed that did not stretch the finances of the Provisional Technical Secretariat and that would:

- Minimize the production of radioactive waste
- Minimize the use of special processes and procedures

Flexibility
Due to the expected fluidity of the exercise and the unknown paths that the inspection team could take, we analyzed numerous possibilities and used a “what-if” approach.

- Sub-scenarios and stories were developed that could be injected to speed up or slow down the inspection team as needed

Simulations

Triggering Event
The event that triggered the OSI for IFE14 was a combination of a seismic signal and detection of noble gases (133Xe, 123Xe, and 37Ar) at two IMS stations.

- The radioxenon concentrations at the IMS stations were simulated
  - Concentrations determined via atmospheric forecasting using actual weather data and calculated release sizes from ground zero
  - Backgrounds simulated from a surrogate IMS station influenced by medical isotope production

On-site Measurements
The concentrations of ground contamination of 131I

Types of Measurements

- Type 1: Background (no injection)
- Type 2: >10 x detection limits with soil collection
- Type 3: 10 x detection limits with BCO measurements
- Type 4: Hot spots. Detectable using ground-based survey or in-situ gamma arrays, if used

Implementation

Due to health & safety issues and costs, the control team decided to:

- Use sealed sources
  - For environmental samples, a surrogate (110mAg was used)
  - Buried sources to simulate hot spots used 60Co as a surrogate for 110mAg

- Inject radioactive gases 133Xe, 135Xe, and 37Ar
  - Created at the University of Texas research reactor in the calculated ratios

Conclusion
The Control Team was able to produce a viable scenario that was internally consistent and met the needs of the exercise. Key aspects of the radionuclide part of the scenario included the use of safe but effective surrogate isotopes, noble gases created in physically realistic ratios, and realistic distribution of radionuclides near ground zero as may occur in an on-site inspection.