National Data Centre Preparedness Exercise (NPE) 2019
Scenario Design and Expert Technical Analysis

J. Ole Ross¹, Giuseppe Ottaviano², Antonietta Rizzo², Peter Gaebler¹, Nicolai Gestermann¹, Lars Ceranna¹

¹BGR/B4.3 - Federal Institute for Geosciences and Natural Resources, Germany
²ENEA - Agency for New Technologies, Energy and Sustainable Economic Development, Italy

O4.1-636
NPE are partially simulated scenarios of potentially CTBT relevant events and cases

(often real waveform events combined with simulated RN evidence)

NPE shall test and improve

► Analysis procedures
► Data products
► Communication routines between experts
► Bringing together different types of information ...
► ... and scientists from various disciplines
Scenario NPE 2019 – An Italian-German collaboration

**Colleagues from ENEA, Bologna:**
- Scenario Storyline
- Radionuclide source terms
- RRR design

**BGR, Hannover, German NDC:**
- Seismic event selection
- Forward ATM for RN concentrations
- ETA request and additional seismic data
- Organizational issues and website

**Initial announcement by fictitious alpine state Raetia:**
- Accident at TRIGA reactor, Pavia, morning of 30th July 2019
- Small release of radioactive isotopes expected
- Local monitoring in place, no hazardous level
- No radiological protection measures required

**NPE 2019 timeline**
- November 2019: Announcement, RN concentrations
- December 2019: ETA, with additional NTM
- January 2020: Distribution of SRMR
- February 2020: Additional seismic data
- April 2020: Disclosure and discussion at NDC Workshop in Toledo
- June 2021: Disclosure at S&T
- ? NDC discussion about results and future
Particulate RN detections

After the announced reactor accident there were widespread particulate radionuclide detections reported of Ba-140, La-140, Cs-134, Cs-137

At stations RN 41, 40, 48, 36, 55, 21

Noble Gas RN detections

At DEX33 Xe-133, Xe-135, Xe-133m, Xe-131m

Concentrations were delivered in a RRR like format

NPE 2019 timeline

November 2019 Announcement, RN concentrations
December 2019 ETA, with additional NTM Exercise SRMR released
January 2020 Distribution of SRMR
February 2020 Additional seismic data
April 2020 Disclosure and discussion at NDC Workshop in Toledo
June 2021 Disclosure at S&T

1. NDC discussion about results and future
Need for Expert Technical Analysis (ETA)

Neighbour state EASTRIA’s situation

- Mistrust against neighbour state
- National measurements of untypical particulates and xenon activity concentrations
- Particulates somehow consistent with IMS measurements and maybe with a release from TRIGA reactor
- Xenon origin questionable, not totally consistent with DEX33 measurements
- No suspicious SHI event in REB
- Need for assistance and help → ETA

Protocol to the CTBT Part I section E 20.

IDC ... shall include the following services: ...
(c) Assisting individual States Parties, at their request and at no cost for reasonable efforts, with expert technical analysis of International Monitoring System data and other relevant data provided by the requesting State Party, in order to help the State Party concerned to identify the source of specific events. The output of any such technical analysis shall be considered a product of the requesting State Party, but shall be available to all States Parties.

Inspired by series of Expert Meetings on Special Studies and Expert Technical Analysis 2018 / 2019
Expert Technical Analysis (ETA) request

ETA request by EASTRIA

Eastria has provided national NPE2019 radionuclide measurements to the IDC and requests assistance with an Expert Technical Analysis to identify potential sources. Within the request it was asked for:

1. Backward Atmospheric transport modelling for the given samples
2. Search for (real) waveform events in the region of potential origin including events not yet included in IDC SEL/REB products.
3. Characterization of the isotopic composition and assessment of possible connection to other scenario samples

NPE control team notified IDC Director informally by e-mail in Nov 2019 about idea and plan to request ETA within NPE 2019 and received a positive response.
Exercise-SRMR (State Requested Methods Report) for the NPE2019-Exercise

1. Backward Atmospheric transport modelling for the given samples.
2. Search for [rad wave events in the region of potential origin including events not yet included in IDC SELTEN products.
3. Analysis of the isotopic ratios and assessment of consistency to other event scenarios samples of NPS2019.

Contents:
- Backward Atmospheric transport modelling for the given samples.
- Search for rad wave events in the region of potential origin including events not yet included in IDC SELTEN products.
- Analysis of the isotopic ratios and assessment of consistency to other event scenarios samples of NPS2019.

IDC results on ETA request

- Quick response (within 14 days) with an „Exercise State Requested Methods Report“
- Sticked closely to the specific questions given in the request
- Performed suitable ATM for the additional radionuclide data from Vienna
- Radionuclide analysis difficult, potential connection of Xe at DEX33 and Vienna recognized
- Considered waveform events listed in IDC products
- Identified small earthquake at Lake Constance 30 July, 5:32 UTC

NPE 2019 timeline

- November 2019 Announcement, RN concentrations
- December 2019 ETA, with additional NTM-RN SSRM
- January 2020 Distribution of SRMR
- February 2020 Additional seismic data
- April 2020 Disclosure and discussion at NDC Workshop in Toledo
- June 2021 Disclosure at S&T
- ? NDC discussion about results and future
### NPE 2019 Seismic event

#### Parameter of scenario event
- **Origin time**: 29 June 2019 23:17:47.9 UTC
- **Epicentre**: 47.739N 9.108E
- **Source depth**: 3 km
- **Magnitude**: 3.7 ML
- **Region**: Lake Constance

Seismic data of regional station for two days (29/30 July 2019) were provided. Within the data the signature of the NPE 2019 event was manipulated to show somehow explosive characteristics.
Scenario with two radionuclide sources, non-compliance!

1. Intentional fire in spent fuel storage at TRIGA reactor, Pavia, with release of particulates:
   - Ba-140, La-140, Cs-134, Cs-137, I-131

   Consistent with official announcement of Raetia

2. Delayed xenon release from nuclear explosion in the ground of Lake Constance (Bodensee)
   - Xe-133, Xe-135, Xe-133m, Xe-131m

   Special at DEX33: admixture of real xenon background

Unfortunately some RN scenario flaws:
- inconclusive $^{140}$Ba/$^{140}$La (ment to be “somehow equilibrium“)
- switched $^{137}$Cs/$^{134}$Cs
- difficult ATM situation at the alps
Summary NPE 2019

► Tricky non-compliance scenario with distraction release from intentional burning of spent reactor fuel (some shortcomings in isotopic composition)

► Some shortcomings in RN concentrations

► Fictitious nuclear explosion based on shallow ML 3.7 earthquake undetected in IDC pipeline

► First ETA request to IDC ever

► First time synthetically altered waveforms

► Delayed discussion and disclosure

Venue for sharing of NPE2019 results among NDC yet to come...

Short Discussion about NPE process and needs during S&T NDC session Friday 16-18

Outlook to NPE future

NPE 2019 timeline

November 2019
Announcement, RN concentrations

December 2019
ETA, with additional NTM Exercise SRMR released

January 2020
Distribution of SSRM

February 2020
Additional seismic data

April 2020
Disclosure and discussion at NDC Workshop in Toledo

June 2021
Disclosure at S&T

? NDC discussion about results and future