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Nu-PathNET®: Emergency Response and Exercise Software

International Atomic Energy Agency Good Practice

Bruce Power received International Atomic Energy Agency Good Practice recognition for use of Nu-PathNET.

Nu-PathNET®
a service of RTI International

RTI International collaborated with a major industrial firm to develop a comprehensive assessment of radiological conditions during the 2011 Fukushima Daiichi event. Building on this work and years of experience supporting nuclear facilities in the United States, Canada, and Europe, RTI developed Nu-PathNET®, a web-based application that provides advanced analytics to assess off-site radiological conditions, support collaborative decision-making, and enhance readiness through drills and exercises.

Nu-PathNET provides a powerful capability for understanding and analyzing the nature and extent of off-site radiological conditions in real time. All collected data are accessible within seconds, enabling quick, efficient data review and decision-making and offering substantial benefits for nuclear power plant operators and public response agencies. These benefits include lower total costs for maintaining manual field survey response capabilities; a common understanding of facts among key decision-makers; and improved collaboration with provincial, state, and federal response organizations.

In addition, automated monitoring reduces emergency response survey teams' radiation exposure, and automated reporting minimizes the potential for error during actual events or exercises. When used in exercise mode, Nu-PathNET generates simulated data for use in drills and exercises, providing a realistic train-as-you-respond experience to maintain and enhance readiness.

More Information

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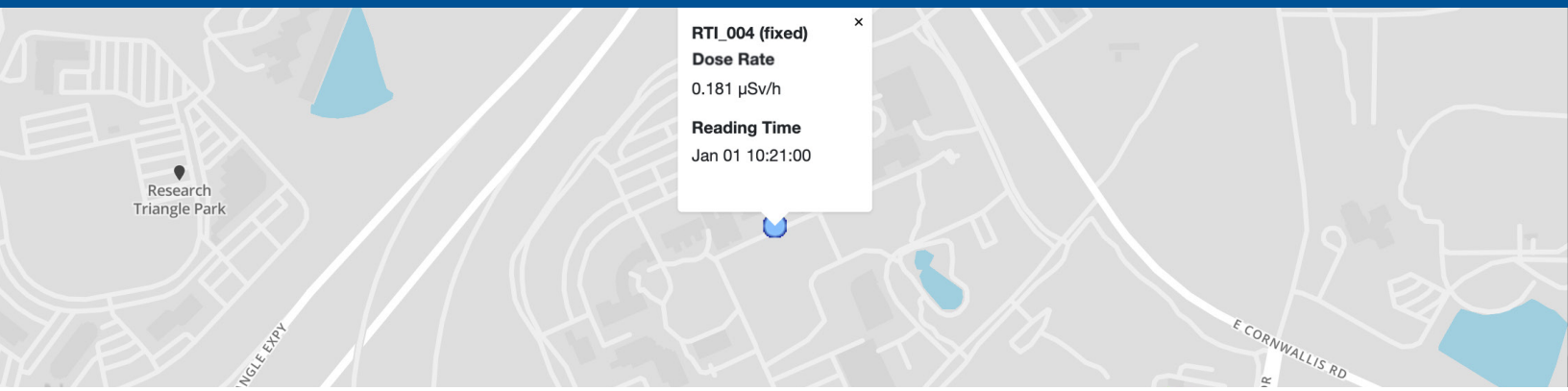


Features

- Real-time data collection and display, including dose rate, deposition, air concentration, spectral analysis, and supporting meteorological data
- Integration between Nu-PathNET and radiological monitoring equipment, regardless of manufacturer
- Fully customizable, real-time geospatial view of key data alongside base map layers, location identifiers, response zones and status, customizable legends, and spatial analysis to quickly understand the nature and extent of radiological and meteorological conditions
- Graphical data display featuring easy-to-read time-series visualization of collected data with associated geospatial location
- Tabular data display that allows sorting and searching by user-defined parameters (e.g., date, location, dose rate) and exporting to common output formats (e.g., CSV, Excel)
- Customizable alarms for radiological dose rate and isotope activity
- Technical alerts that relay current equipment status, in-service and out-of-service notifications, and malfunctions to quickly identify and fix maintenance problems
- Customizable notifications for radiological alarms and technical alerts via telephone, SMS, or email
- Multilevel, user-based access control and permissions, with optional two-factor authentication and integration with major single-sign-on providers
- Integration of manually collected field data and laboratory analysis
- Customized integration with emergency response procedures (e.g., reporting, field surveys, dose models, meteorological data, response zones)
- Simulation of field data for drills and exercises, providing a realistic train-as-you-respond experience
- Compliance with rigorous industry and government cybersecurity requirements, including industry-standard data encryption in flight and at rest, and secure data management in redundant data centers for highly available access

Nu-PathNET Software Suite

Nu-PathNET is a modern, web-based software application available as either a software-as-a-service or an on-premises solution. It consolidates all relevant data in real time and provides a central location for users to analyze information and assess current conditions.

Nu-PathDOSE, available on Android and Windows-based platforms, connects to radiological monitoring equipment via USB or Bluetooth, pairing radiological data with time and GPS location information for transmission to Nu-PathNET over the internet.

Nu-PathEXERCISE, available on Windows-based platforms, enables the creation of realistic drills and exercises for use with Nu-PathNET and Nu-PathDOSE in exercise mode, supporting training activities from tabletop exercises to full-scale scenarios.

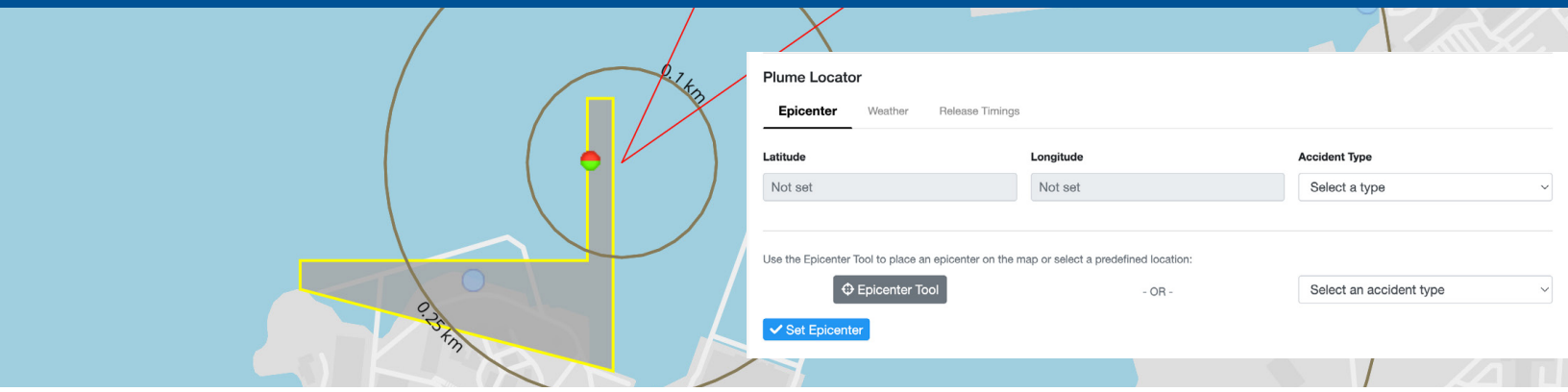
Nu-PathNET Capabilities

Nu-PathNET provides capabilities in three distinct areas: normal operations; emergency response; and exercises, training, and drills.

Normal Operations

Nu-PathNET continuously presents all relevant information for ongoing radiological assessments in the vicinity of the monitored facility. Nu-PathNET offers users the following components and features:

- The **map module** provides a spatial display to immediately orient users to the location and current status of network assets, sensitive receptors, and geographical features. Additionally, users can customize their map module display using the following features and tools:
  - Showing or hiding specific monitoring asset groups and/or emergency preparedness (EP) response sectors. Each monitoring asset will be displayed according to the map legend, indicating current radiation levels and device status. These levels and color codes can be configured to thresholds established by user-specific emergency procedures.



  - Using map annotation features to show, highlight, or hide information on the map display to focus on information that is most relevant. Users can export annotated maps for sharing with other agencies.
- The **network module** provides real-time information about the status of network assets (e.g., fixed and mobile monitoring assets, meteorological stations, air samplers) and a history of radiation alarms and asset equipment status alerts.
  - Tools within the network module are used during all modes of operation to understand the current status of network assets and support network maintenance.
  - These tools convey current and recent instrument readings and current and historical radiation alarms and technical alerts in an easily accessible form that network administrators, emergency responders, and maintenance personnel can search, sort, and filter for analysis. Technical alerts provide equipment status alerts for any instruments in an off-normal status.
- The **data module** provides graphical and tabular data displays for subject matter experts to evaluate the nature and extent of radiological conditions.
- The **event module** allows system administrators to place the system into event mode, thereby activating features designed specifically for emergency response.
- The **administration module** provides system administrators with tools to authorize users, assign user-specific permissions, enter notification preferences, set alarm thresholds, and configure new devices. Users can subscribe to notifications for radiation alarms or technical alerts with a variety of delivery methods.

Emergency Operations

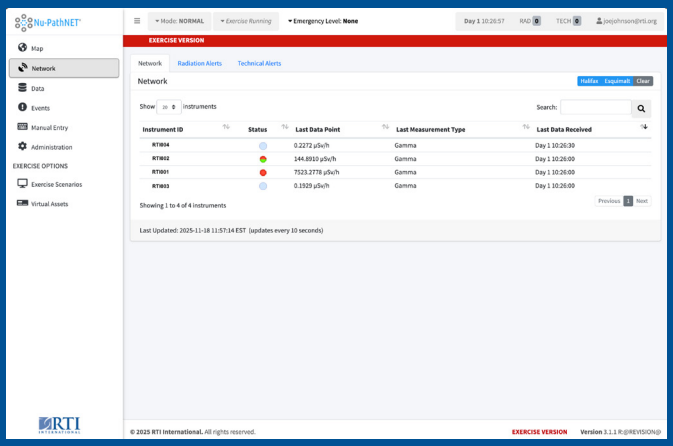
Nu-PathNET provides tools and features to aid emergency responders in directing field monitoring, engaging in protective action decision-making, and protecting emergency workers. Response organizations and personnel can effectively manage emergencies using the following tools and features:

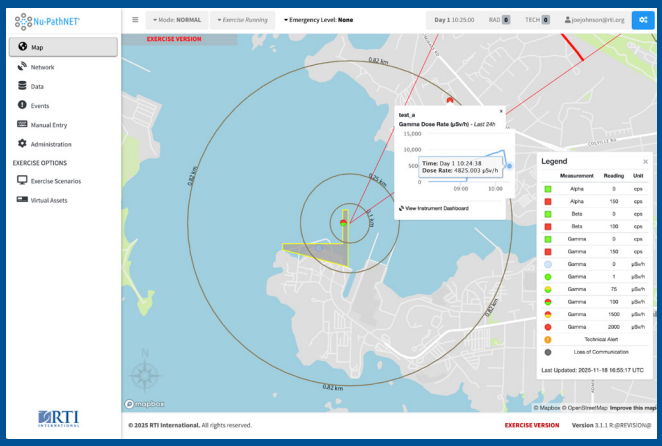
- **Plume Locator.** Locate plume leading and trailing edges and the direction for positioning field monitoring teams.
- **Data Visualization.** Visualize real-time data from various monitoring assets (e.g., fixed and mobile monitors, drop boxes, dosimeters) via graphs and tables that can be customized by user and exported for use outside the systems for reports, presentations, or meetings.
- **Analysis Tools.** Make field monitoring and emergency response decisions quickly and easily. User-selected dose model results can be imported through automated or manual methods for viewing in map space.
- **Dose Model Outputs.** Display dose model predictions overlaid on current or previously recorded radiation levels.
- **Response Zone Status.** Set and display protective action status for each response zone so all responders can maintain situational awareness.
- **Reporting.** Automate reports in accordance with established emergency response procedures.
- **Historical Data View.** View a user-customizable window of previously recorded monitoring data for a selected time period.

Exercises, Training, and Drills

Full-scale exercises can be executed with participants engaging scenario data via their normally used monitoring assets, and tabletop drills use virtual assets. Both methods save valuable man and equipment hours.

- **Exercise Setup and Controls.** An exercise leader can design an exercise scenario for off-site conditions that is internally consistent with other aspects of the exercise scenario (e.g., simulator for nuclear reactor) and exercise objectives. Users can then select the scenario to run. During the tabletop or full-scale exercise, users can control the scenario (e.g., start, stop, pause, skip to time) as needed to adjust to exercise activities as they unfold.
- **Tabletop Exercises.** For tabletop exercises, virtual monitoring assets (e.g., drop boxes, vehicles) can be created and used in lieu of field-deployed assets. For example, adding a virtual driver is easy to do by defining parameters in the virtual driver tool. Users can set a route (shown as a blue line on a map) for the virtual vehicle to drive during a tabletop exercise.





Monitoring Data → Consolidate → Evaluate → Collaborate

Realistic Scenario-Based Drills and Exercises

- **Full-Scale Exercise.** During full-scale exercises, Nu-PathNET can send simulated readings to actual assets that are deployed in the field (e.g., drop boxes, hand-held devices, vehicles). Exercise participants will have a realistic training experience as they work through a virtual data field, thus enhancing the entire team's readiness.

Designed for Effective Emergency Response Programs

Our design philosophy recognizes that emergency response programs need to do more than simply view monitoring data. We have designed Nu-PathNET for the multifaceted and fast-paced emergency response environment. Nu-PathNET offers state-of-the-art systems and tools that enhance operational capabilities, improve emergency operations center functionality, and facilitate effective collaboration among emergency responders in a variety of radiological events.

Consolidate. We compile all relevant data regarding off-site radiological conditions—including radiological measurements, meteorological data, dose model output, and field team survey measurements—to ensure optimal facility management and real-time access to critical data.

Evaluate. Analysts quickly understand the nature and extent of radiological conditions before, during, and after an event. Nu-PathNET maintains all relevant event data in a single analytical framework, allowing analysts to immediately apply data visualization and analysis tools.

Collaborate. Health physics experts from the utility industry, federal and local governments, and other agencies interact with data directly from any location using secure log-in credentials; these experts work together to determine the most-effective protective actions to take.

Recent Developments

RTI assisted Bruce Power in improving its emergency response processes for a Beyond Design Basis event at its nuclear power plant in Ontario, Canada. This plant is located on a 2,300-acre site on the shore of Lake Huron in Ontario and has the capability to power one in four hospitals, homes, and schools in Ontario. Real-time remote monitoring stations integrate with Nu-PathNET, thus providing a vast amount of readily available information and advanced analytical capability to Bruce Power's Emergency Management Center.

Nu-PathNET has been integrated as a key component of the Royal Canadian Navy's Nuclear Vessel Visit Safety Program and by Health Canada's Radiation Protection Bureau to provide real-time data collection and visualization capabilities to their mobile response teams.

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