

Exercise

# UNIFIED RESPONSE

## After Action Report



## Executive Summary

The events in Fukushima, Japan, have changed the nuclear industry forever. Countries around the world (including Canada) are reassessing the planning basis for nuclear emergency preparedness and response capabilities to better anticipate severe accidents. As part of the validation process of recent improvements and to confirm Canada's ability to respond to a nuclear emergency, Ontario Power Generation, supported by the Government of Ontario, the Regional Municipality of Durham, the Canadian Nuclear Safety Commission, Public Safety Canada, and Health Canada organized a full scale nuclear exercise entitled Exercise Unified Response.

Exercise Unified Response was a three day exercise held in May 2014 and involved an incident at Darlington Nuclear Generating Station. The exercise was designed to challenge all organizations with a role in responding to a nuclear emergency. Exercise Unified Response spanned a wide spectrum of the response functions that would normally take place during such an emergency. The exercise evolved from the initial indications of a problem at the plant to the subsequent notification of response organizations. Emergency operations centres were then activated and actions to protect the public were implemented, which included public messaging. The exercise concluded with the first steps of the recovery phase.

Exercise Unified Response involved 54 organizations, requiring the Joint Exercise Planning Team to include each organization's objectives and constraints in the 18 month design process. The Joint Exercise Planning Team also ensured that Exercise Unified Response provided an environment that was realistic and challenging enough to ensure the requisite engagement at all levels of each participating organization.

Following Exercise Unified Response, a two day evaluation process was conducted, which specifically targeted the interoperability of the various response organizations (e.g., between the province and the Regional Municipality of Durham, Darlington Nuclear Generating Station and federal departments, etc.). This process not only identified areas requiring improvement but also identified best practices. Best practices serve as a model of response capability that could be adopted by other agencies to strengthen their own response capabilities.

Best practices identified during the evaluation process include:

- Confirmation calls by sender following transmission of key information is a practice that could be adopted by all organizations;
- Command documents issued by the Provincial Emergency Operations Centre are an effective method of communicating key decisions on protective actions and maintaining situation awareness across organizations;
- The joint operations at the field component of the Environmental Radiation and Assurance Monitoring Group demonstrated the benefits of coordinated and unified operations between response organizations;
- The deployment of the Emergency Medical Assistance Team demonstrated that a strategy to add capacity to a local hospital and reassure worried members of the public can be implemented effectively using special medical teams;
- The use of Health Canada's EMAP platform for sharing and displaying radiation survey information with the Provincial Emergency Operations Centre

- demonstrated the usefulness of web-based Geographic Information System functionality for situational awareness and decision-making; and
- Coordination calls between organizations engaged in public communication and pre-scripted emergency bulletins are a best practice that should be formalized by all organizations.

Along with best practices there were several key findings and opportunities for improvement including:

- Existing protocols for notification between organizations are not sufficiently developed and harmonized to meet the needs of all responding organizations;
- The availability of trained and effective Liaison Officers in external Emergency Operations Centres is essential to effective communication and coordinating activities;
- Critical decision making processes must be optimized between all response agencies to ensure effectiveness during emergency response;
- Further guidance, as it relates to severe accidents, is required to clarify the roles of utility, municipal, provincial, and federal response organizations with shared responsibilities for protecting the public, the environment, food, and water;
- All organizations should review and update dose assessment and control procedures to clearly define roles and responsibilities for the management of dose assessment results;
- Emergency plans would benefit from additional clarity and alignment on dose limits and responsibilities for the radiation protection of workers responding in a nuclear emergency;
- There is a need for a clear process for providing timely information to the public, municipalities, and private agencies regarding their rights and claims to financial compensation for losses incurred during and after a nuclear emergency (e.g., relocation expenses, loss of business revenue, etc.);
- The integration of emergency plans would benefit from improved alignment on the use of dose modeling tools;
- There is currently a gap in definition of the roles and responsibilities, survey and assessment strategies, analysis capabilities, etc., for surveys during each phase of the emergency (pre-release, ongoing release, post-release, and remediation);
- Emergency plans could benefit from additional clarity on the role of the Nuclear Power Plant in public messaging issued by the Province; and
- Messaging to the public needs to be simplified and should not increase public fear and anxiety.

In general, Exercise Unified Response allowed emergency response organizations at every level to test their exercise objectives as identified during the planning process. Although issues were identified, organizations demonstrated that they can respond effectively to a severe accident in order to protect the public, infrastructure, and the environment.

Ontario Power Generation and all supporting partners took a bold step in conducting this full scale, severe accident exercise. All lessons learned should be incorporated in current plans, procedures, and training. This type of exercise should be conducted on a regular basis and be coordinated by a designated responsible authority (i.e., committee).

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## Acknowledgments

The Steering Committee of Exercise Unified Response would like to pass on a special thanks to Ontario Power Generation personnel who were essential in the successful planning and execution of the exercise. As well, much appreciation is expressed to members of the Joint Exercise Planning Team and the Evaluation Team for providing valuable support and input into the development and execution of Exercise Unified Response. Thanks also goes to every individual who had a hand in developing, supporting, or participating in Exercise Unified Response; your professionalism and dedication to making Canada a safer place to live are greatly appreciated.

## **1. INTRODUCTION**

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### **1.1 Background**

On 11 March 2011, a magnitude 9.0 earthquake, followed by a catastrophic tsunami, struck the coast of Japan. The events that soon followed led to the complete devastation of the Fukushima Daiichi nuclear generating station. In response to these events, countries around the world have reassessed their nuclear emergency response and preparedness capabilities. In Canada, government and industry are committed to further developing their nuclear response plans to ensure preparedness for a Fukushima-type emergency, as unlikely as such an event may be. As part of this reassessment, an action plan to address preparedness and response was created by the Canadian Nuclear Safety Commission. Independently, Health Canada updated its Federal Nuclear Emergency Plan and increased focus on its national nuclear emergency preparedness committees. This update was carried out to address lessons learned from the Fukushima accident, with the intent to align with the all-hazards Federal Emergency Response Plan and to strengthen inter-jurisdictional emergency response arrangements. These were by no means the only post Fukushima actions taken, but serve to illustrate that organizations sought to address the lessons learned from that event.

The recent action plan issued by the Canadian Nuclear Safety Commission led to an initiative by Ontario Power Generation to conduct a full scale nuclear emergency response exercise. From the outset, this exercise was designed to include regional, provincial, and federal bodies, as well as the utility itself.

Shortly thereafter, an agreement was made between Ontario Power Generation, Canadian Nuclear Safety Commission, Health Canada, Public Safety Canada, the Regional Municipality of Durham, and the Ontario Ministry of Community Safety and Correctional Services to plan and conduct a full scale exercise at Darlington Nuclear Generating Station in May 2014. In December 2012, planning commenced and in May 2013, International Safety Research Inc. was contracted by Ontario Power Generation to assist with the development, conduct, and evaluation of the exercise.

From 26 to 28 May 2014, Exercise Unified Response was conducted with a strategic goal to assess the preparedness of Ontario Power Generation, government and non-government agencies, and local communities to respond to a nuclear accident, as well as test the interoperability of these organizations and communication with the public. Exercise Unified Response was the most important national, full scale, multi-jurisdictional exercise based on a nuclear power plant emergency conducted since 1999. It involved 54 agencies and over 2000 participants across the utility and all levels of government.

### **1.2 Objective of the Report**

This After Action Report describes the key aspects of the exercise planning and development stage, conduct, and the evaluation process. Key Findings and Best Practices (as they relate to strategic exercise objectives) are detailed with recommendations for their implementation and improvement.

## 1.3 AAR Structure

This After Action Report consists of the following sections:

- Introduction: This section includes background material and describes the purpose of the report;
- Exercise Overview: This section discusses the objectives of the exercise, lists the participating organizations, outlines the general details regarding exercise planning and conduct, and provides an overview of the scenario description;
- Exercise Evaluation: This section describes the evaluation process, including the data collection methods used following conduct;
- Evaluation Results: This section addresses all lessons learned captured as they pertain to the Tier One objectives and recommendations to improve identified gaps;
- Summary;
- Annex A – Exercise Design: This section includes lessons-learned gathered with respect to exercise design, and provides recommendations for improvements on future exercise planning and development.
- Annex B – Evaluation Criteria: This section details the criteria that were used to conduct the evaluation of the exercise; and
- Annex C – Detailed Exercise Actions: This section provides a more detailed explanation of the scenario and the actions taken by the players during the exercise.



## **2. EXERCISE OVERVIEW**

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### **2.1 Exercise Objectives**

The overall purpose of Exercise Unified Response was to test the preparedness of Ontario Power Generation, government and non-government agencies, and communities to respond to a severe nuclear event at Darlington Nuclear Generating Station. There were multiple levels of objectives that were identified as part of the planning and development of this exercise; namely Tiers One, Two, and Three. Tier One objectives were determined by senior members of the key stakeholder organizations and are the focus of this After Action Report.

#### **2.1.1 Tier One Objectives**

Tier One objectives were the overarching goals of the exercise that were agreed upon by the Exercise Unified Response Steering Committee and all participating organizations. The Tier One objectives for Exercise Unified Response were identified as:

1. Conduct an exercise on 26 to 28 May 2014;
2. Focus on the response to a nuclear emergency at Darlington Nuclear Generating Station;
3. Demonstrate that the emergency response of the participating organizations can ensure the safety of the public and the environment;
4. Test the interoperability of the participating organizations, and integration of emergency response;
5. Coordinate communications with real media and the public before and during the exercise; and
6. Prepare a joint evaluation of the interoperability of the participating organizations.

#### **2.1.2 Tier Two and Tier Three Objectives**

Tier Two objectives were unique to each organization or response community within a jurisdiction. For example, one of the Canadian Nuclear Safety Commission's Tier Two objectives was to validate their Nuclear Emergency Response Plan, procedures, and tools/models.

Tier Three objectives were the specific objectives that were used to effectively test an organization's Tier Two objectives (e.g., test notification and activation within the plan). Tier Three objectives were intended to refine and define the specific parameters to be achieved within the Tier Two objectives.

The Tier Two and Tier Three objectives of participating organizations were considered during the planning and development of the exercise injects.

### **2.2 Participants**

The organizations listed in Table 1 participated in Exercise Unified Response.

**Table 1: Participating Organizations**

<b>Federal</b>	
Agriculture and Agri-food Canada	Health Canada
Atomic Energy of Canada Ltd	Natural Resources Canada
Canada Border Services Agency	Industry Canada
Canadian Food Inspection Agency	Government Operations Centre
Canadian Nuclear Safety Commission	Public Health Agency Canada
Department of Justice	Privy Council Office
Department of National Defence	Environment Canada
Department of Fisheries and Oceans	Public Safety Canada
Department of Foreign Affairs, Trade & Development	Employment and Social Development Canada
Transport Canada	
<b>Provincial</b>	
Ministry of Agriculture and Food / Ministry of Rural Affairs	Ministry of Government Services
Ministry of Community Safety and Correctional Services <ul style="list-style-type: none"> <li>- Provincial Emergency Operations Centre</li> <li>- Office of the Fire Marshall and Emergency Management</li> <li>- Ontario Provincial Police</li> <li>- Communications Branch</li> </ul>	Ministry of Community and Social Services /Ministry of Children and Youth Services
Ministry of Labour	Ministry of Municipal Affairs and Housing
Ministry of Health and Long Term Care	Ministry of Natural Resources
Ministry of Energy	Ministry of Transportation
Ministry of the Environment	
<b>Regional Municipality of Durham</b>	
Durham Chief Administrative Officer	Durham Regional Police Service
Durham Emergency Management Office	Durham Transit
Durham Corporate Communications	Durham Health Department
Durham Emergency Medical Services	Durham Corporate Services
Durham Works Department	Durham Social Services
Durham Planning & Economic Development	Regional Fire Coordinator
<b>Municipalities</b>	<b>Local Partners</b>
Municipality of Clarington (includes Fire)	Lakeridge Health
City of Pickering (includes Fire)	Durham District School Board
City of Oshawa (includes Fire)	Durham District Separate School Board
City of Peterborough	Kawartha Pine Ridge District School Board
City of Toronto	Conseil Scolaire Viamonde
<b>Utility</b>	
Ontario Power Generation	

## 2.3 Exercise Planning

### 2.3.1 Planning Groups

Throughout the exercise planning process, there were several key working groups that provided guidance and necessary logistical support for the development and preparation

for Exercise Unified Response conduct and evaluation. Each group was comprised of representatives from participating agencies or functional areas to ensure that the proper input and direction was provided from each of the disciplines.

#### **2.3.1.1 Joint Exercise Planning Team**

The Joint Exercise Planning Team was the working group that served as the main planning body for the sharing of information, resolution of planning issues, decision making, and coordination of actions. This group consisted of representatives from Ontario Power Generation, Regional Municipality of Durham, Office of the Fire Marshal and Emergency Management, Canadian Nuclear Safety Commission, Health Canada, Public Health Agency of Canada, Public Safety Canada, and International Safety Research.

The Joint Exercise Planning Team was responsible for the day-to-day planning, preparations, development, and conduct of the exercise. Further to this, this working group oversaw the joint evaluation of the interoperability and communication between organizations following the completion of exercise conduct. Members were tasked with engaging personnel from participating organizations to attend planning conferences and workshops to ensure their intent was captured and that the requisite senior backing was in place to support the exercise.

A total of 15 Joint Exercise Planning Team meetings were conducted prior to exercise conduct, with the location alternating between Ottawa and Toronto.

#### **2.3.1.2 Steering Committee**

The Steering Committee was established to review decisions made by the Joint Exercise Planning Team and provide guidance for the planning of the exercise. The Steering Committee was chaired by the Ontario Power Generation Vice President Security and Emergency Services, and its membership was comprised of senior level representatives from key stakeholder organizations including: the Vice Presidents from both Canadian Nuclear Safety Commission and Ontario Power Generation; a Deputy Chief from the Office of the Fire Marshal and Emergency Management; Assistant Deputy Ministers from Health Canada, Public Health Agency of Canada, Public Safety Canada; and the Chief Administrative Officer delegate for the Regional Municipality of Durham.

The Steering Committee met bi-monthly to set priorities, ensure alignment between participating organizations, and to provide guidance to Joint Exercise Planning Team members when approval was required on issues and decisions that could not be resolved at the level of the Joint Exercise Planning Team.

#### **2.3.1.3 Communications Working Group**

As Exercise Unified Response was the largest national full scale, multi-jurisdictional, nuclear emergency response exercise conducted at a nuclear power plant since 1999, careful consideration was given to the development of a strategic communications plan that could provide accurate and consistent messaging to the media and public.

Led by Ontario Power Generation, a communications working group was established that was comprised of communications representatives from key organizations to coordinate media and public awareness activities through each stage of planning for Exercise Unified Response. Members of this working group shared approved messages, including internal employee messaging for the awareness of other participants, and identified appropriate spokespeople who were able to speak to their respective roles and mandates.

#### **2.3.1.4 Evaluation Working Group**

An evaluation working group was established to develop an effective and objective process for the evaluation of interoperability between response organizations and to provide feedback for the improvement of identified response gaps. This working group was comprised of select members of the Joint Exercise Planning Team that could provide input at the utility, regional, provincial, and federal levels.

The evaluation working group met multiple times throughout the planning process to discuss details on the evaluation process, and to develop evaluation criteria used in this After Action Report (Annex B: Evaluation Criteria).

#### **2.3.1.5 Regional, Provincial and Federal Planning Groups**

Exercise planners within various organizations (or within certain levels of government), held their own planning conferences, workshops, and other preparatory activities in order to provide input to the overall exercise planning process and ensure that the exercise was designed in such a way that it would address their objectives. Between the scheduled Exercise Unified Response planning conferences, Joint Exercise Planning Team members served as coordinators and liaisons for these planning groups.

### **2.3.2 Planning Sessions**

The planning and development of Exercise Unified Response required significant input from planners and trusted agents across all participating organizations. As such, several planning sessions comprised of conferences and workshops were conducted in an effort to better understand the exercise requirements and expectations.

#### **2.3.2.1 Planning Conferences**

A total of three inter-jurisdictional planning conferences were conducted in Toronto over a period of eight months. The Initial Planning Conference was held in September 2013 and was designed to generate participation interest and to provide organizations with sufficient information to determine their level of effort and intended scope of play. Specific information for the overall plan for the exercise was provided, including exercise logistics, scope, constraints, communication strategies, and the exercise process. Planners and players alike were invited to attend as no sensitive information was communicated to the plenary.

The Mid Planning Conference was conducted in December 2013 and was specifically intended for planners and trusted agents from confirmed participating organizations. The goal of this conference was to acquire a complete understanding of the scope and

constraints of each of the organizations and to determine how this would affect level of play from other agencies. Participating organizations were also able to provide updates or clarifications on their objectives and expectations. Exercise planners were provided with additional exercise information, including scenario details, key event timings that would drive player action, real media management strategies, and information pertaining to the Tier One Evaluation process.

The Final Planning Conference was conducted in April 2014 and was developed specifically as a final forum for reviewing the exercise processes and procedures, logistical requirements, and exercise products. Exercise planners were involved in a high level review of the exercise scenario and required to identify and resolve any last-minute issues that may arise prior to or during exercise conduct. This conference was not intended to further develop the exercise; rather, it was an opportunity to validate, confirm, and approve the design of the exercise, processes, and procedures that had been implemented.

#### **2.3.2.2 Workshops**

As part of the exercise planning and preparation, a series of one-day workshops were conducted in Toronto in an effort to acquire information related to communication and interoperability between response organizations to aid in exercise design, development, and conduct.

**Workshop #1 (Technical Data Sharing)** was conducted in September 2013 and was designed to foster a better understanding of technical information collection, analysis and data sharing. This forum involved organizations that have a role in collecting, transmitting, or interpreting data that is ultimately used to make recommendations for the protection and continued safety of the public. As nearly all of the data for Exercise Unified Response was simulated, it was critical that exercise planners ensured the data generated was correct and was sent to the correct organization at the right time in order to drive the scenario forward. Some objectives of the workshop included the identification of roles that organizations have in the transmission of technical data, methods used for data sharing, and the appropriate format used to communicate the data.

**Workshop #2 (Command and Control)** was conducted in December 2013 and was designed to help exercise planners obtain a clear understanding of how operations centres interoperate and exchange critical information that is used for decision making. This discussion involved participants from various response organizations that had a clear understanding of their organizations' command and control structure, the internal decision making process that is followed, and how internal and external operations are coordinated. Some objectives of the workshop included examining how decisions are made within the operations centres, how command and control structures interoperate (e.g., coordination of response and planning), and how decision parameters are confirmed.

**Workshop #3 (Public Communications)** was conducted in February 2014 and was intended to obtain a clear understanding of how organizations collect and validate information that is used to generate key messages. Information gathered from the workshop was essential for the development of accurate and realistic media injects that

would challenge response agencies and allow them to achieve their communications objectives. Some objectives of the workshop included discussions around communication procedures, managing social media, validation and verification procedures on information from media and public, and coordination of messaging across stakeholder organizations.

An additional workshop on dose projections was conducted in March 2014 to clarify key technical data flows and modelling requirements, as well as to finalize the technical details of the release source term. This workshop was attended by key organizations with a role in predicting and assessing the manner, extent, and impacts of contamination released into the environment.

### **2.3.3 Joint Exercise Planning Team Information Website**

To assist members of the Joint Exercise Planning Team in maintaining situational awareness throughout the planning processing, an information website (Joint Exercise Planning Team Planning Forum) was established and served as a portal for all relevant documentation that was generated or required for additional planning purposes. The website had restricted access to ensure the integrity of sensitive information, and was an efficient and effective way of securely disseminating information to organizations. The website remained active throughout the entire planning, conduct, and evaluation processes.

## **2.4 Exercise Conduct**

Exercise Unified Response was conducted over three days, from 26 to 28 May 2014, with a daily exercise window from 0800 to 2000h. There were a number of measures put in place before and during the exercise that allowed the exercise controllers to effectively manage the exercise process with minimal issues and interruptions.

### **2.4.1 Exercise Control**

Exercise control was effectively maintained through the use of a large team of controllers situated in key locations across Ontario (i.e., Toronto, Durham Region, and Ottawa). Controllers were selected by their own organization based on their level of knowledge and expertise in their respective area of operations. Controllers were trained on their responsibilities prior to the exercise and received a comprehensive controller manual containing instructions and all exercise details.

There were two exercise control cells established during Exercise Unified Response to ensure that the exercise stayed on course across all of the operations centres that were in play. Exercise control cells were situated in both Durham Region (Lead) and in Ottawa (Federal) and were well equipped with computers, phones, radios, and internet to provide an optimal environment for maintaining communication and situational awareness. The Lead Controller, overseeing all controller activity, was in direct communication with Federal Exercise Control and all site controllers via push-to-talk radios, phone, and chat function on the exercise website. Exercise control was responsible for tracking injects, simulating non-participating organizations, managing site controllers, resolving issues, and controlling exercise forums (e.g., exercise web site).

## **2.4.2 Exercise Briefings**

Controllers and evaluators received a comprehensive one-day briefing several days before the start of Exercise Unified Response. The purpose of the briefing was to situate the team and provide them with all of the requisite information to properly prepare for their function during exercise conduct. The briefing outlined conduct rules and protocols, a detailed scenario and inject review, scheduling, and role playing, all of which were designed to ensure that controllers and evaluators fully understood their responsibilities.

Controller and evaluator briefings were conducted in Ottawa on 20 May 2014 and in Durham Region on 22 May 2014.

Further to pre-exercise briefings, the exercise control team participated in daily briefings during exercise conduct to review the day's events, identify lessons learned, and discuss shadow shift briefs. These shadow shift briefs encompassed overnight events that were to be briefed to players the following morning.

## **2.4.3 Assumptions, Constraints, and Simulation**

### **2.4.3.1 Exercise Planning Assumptions**

It was intended that exercise events progress in a logical and realistic manner and that all exercise objectives were achieved during exercise play. The following assumptions were made:

- Exercise participants were well versed in their own department and agency response plans and procedures;
- Players and controllers would use simulated data and information support sources in accordance with their procedures;
- Players would respond in accordance with existing plans, policies, and procedures;
- Implementation of nuclear response plans, policies, and procedures during the exercise would depict actions expected to occur under actual response conditions and, therefore, would provide a sound basis for evaluation; and
- Real-world emergency response actions would take priority over exercise actions.

### **2.4.3.2 Exercise Planning Constraints**

It was recognized that the following constraints could detract from realism; however, exercise planners accepted these as a means of accomplishing the exercise objectives.

- The exercise was played in a compressed time window (3 days) with play ending at 2000h each night. The reality is that a nuclear power plant emergency in Ontario would likely have evolved over a much longer period of time;
- Some organizations had limited scope of play, which may have impacted some levels of response;



- Responses obtained by players from simulations may not have been of the quality or detail available from the real organization or individual;
- Some personnel and equipment were pre-positioned at exercise locations rather than moved in real-time during the exercise, and they entered play at predetermined times from their pre-positioned locations; and
- The weather was scripted for the entire exercise window and was provided on the exercise website.

**Note:** The level of play at the Provincial Emergency Operations Centre was reduced shortly before the start of the exercise due to real-life flooding issues which required personnel and resources. A simulation cell representing the Command, Planning and Operations sections of the Provincial Emergency Operations Centre was established to provide as much realism as possible.

#### **2.4.3.3 Exercise Scenario Constraints**

Early in the exercise design process there were several constraints placed on the scenario. These included:

- Involvement of international players would be limited to the Canadian Nuclear Safety Commission and Ontario Power Generation;
- Exercise would focus on the developing nuclear emergency and exclude impacts of non-radiological hazards (e.g., the storm);
- Scenario would be developed to warrant deploying Ontario's Emergency Medical Assistance Team and the Environmental Radiation and Assurance Monitoring Group ;
- A pre-scripted unfiltered release of radiation was necessary for field teams to exercise effectively;
- The town of Orono would be the site for the Emergency Worker Centre; and
- Darlington Nuclear Generating Station would categorize an On-Site Emergency (based on their internal scenario) before the tornado struck.

#### **2.4.3.4 Exercise Simulations**

Simulation during exercises is required to compensate for non-participating individuals or organizations. Although simulations necessarily detract from realism, they provide the means to facilitate exercise play. Considerations for simulation included the following:

- During the planning process, organizations that identified working constraints during the exercise were required to simulate portions of their play by providing a response cell during non-working hours. Furthermore, some organizations that would normally be engaged during a nuclear emergency (e.g., international, inter-provincial, etc.) were out of scope for this exercise and required simulation;
- The exercise data was simulated prior to the exercise and provided to players at the requisite time in the scenario; and
- Simulated media outlets covering the situation at Darlington Nuclear Generating Station (including TV, radio, and web) were situated in the Exercise Control Simulation Cell.



## **2.4.4 Exercise Scenario Overview**

The following exercise scenario overview provides a short summary of key exercise events. For a more detailed description, including player actions, please refer to Annex C: Exercise Actions.

### **Day 1 – 26 May 2014**

Day 1 focused primarily on the events unfolding at the Darlington site and the efforts of on-site personnel to mitigate the developing emergency. The exercise started with a problem at one of the reactor units that was further complicated when a tornado struck the nuclear generating station, causing a loss of off-site power. The situation appeared to be stabilized after emergency response teams deployed emergency mitigation equipment, which provided cooling and power to critical systems. By 2000h on Day 1, all systems appeared to be under control, with all of the reactors shut down. Meanwhile, off-site response organizations were actively monitoring the situation.

On the evening of Day 1 the situation on Unit 4 deteriorated to the point where, by the morning of Day 2, a release was anticipated within 12 hours.

### **Day 2 – 27 May 2014**

The events of Day 2 shifted the focus from the on-site response at Darlington to the off-site response in the surrounding communities. The situation at the plant caused the municipal, provincial, and federal organizations to assume full activation. After the notification category of the nuclear event was declared as a General Emergency at the plant, the Province of Ontario was focused on planning and implementing protective actions for the public. After assessing the situation, the province ordered the Regional Municipality of Durham to evacuate the contiguous zone immediately surrounding the nuclear power plant.

By mid-day, several actors simulating worried-well (e.g., residents who are worried about being contaminated, even though no release to the environment has occurred) showed up at the Lakeridge Health Bowmanville Hospital, looking to be checked for contamination. Although no release had yet taken place, their concern was further heightened when a contaminated casualty was transported from the nuclear power plant to the hospital.

Federal support to the province included the provision of liaison officers to key operation centres and the pre-deployment of field teams in Durham Region.

During the evening of Day 2, a two hour unfiltered release occurred, causing low levels of contamination in a large downwind sector to the east of the Darlington Nuclear Generating Station.

### **Day 3 – 28 May 2014**

Day 3 focused primarily on the determination of the extent and magnitude of the post-release contamination, and decisions regarding a wide variety of recovery issues including the return of evacuees to their home.

Field operations were centered on the Emergency Worker Centre; a location where emergency workers assemble before deployment and return after deployment. Emergency workers were assigned tasks within contaminated areas and received radiation detection instruments and nuclear safety information. Upon their return, they were monitored for contamination and decontaminated, if necessary. The Environmental Radiation and Assurance Monitoring Group (consisting of Federal and Provincial response experts) was located near the Emergency Worker Centre and conducted operations to determine the extent of the post-release contamination.

## 2.5 Exercise Locations

While field play in Exercise Unified Response took place primarily in Durham Region, the majority of organizations participated from their Emergency Operations Centres. Maps are provided on the subsequent pages to illustrate the wide scale involvement of organizations (see Figure 1 and Figure 2).

### 2.5.1 Toronto and Durham Region

#### Ontario Power Generation Locations

**Darlington Nuclear Generating Station**, owned and operated by Ontario Power Generation, is the origin of the simulated nuclear emergency. The Darlington Station is located some 50 km east of Toronto, in the Regional Municipality of Durham.

**The Site Management Centre** is an on-site facility that hosts Ontario Power Generation Emergency Response Organization and is responsible for on-site emergency operations. It primarily interacts with the Corporate Emergency Operation Facility and the Canadian Nuclear Safety Commission.

**The Local Media Centre** is located at the Darlington Energy Complex and is dedicated to media relations.

**The Corporate Emergency Operation Facility** is an Ontario Power Generation site located in Whitby that interacts with the Province and the Canadian Nuclear Safety Commission.

**The Darlington Energy Complex** is an Ontario Power Generation facility near Darlington Nuclear Generating Station that serves as a meeting and training facility, and is the fixed location for the Local Media Centre.

#### Regional Locations

**The Regional Municipality of Durham's Regional Emergency Operations Centre** is located in Whitby and manages the off-site response activities in the local area.

**Host Cities** are the designated locations that receive evacuees and displaced residents affected by an emergency (i.e., Peterborough and Toronto).

**The Emergency Worker Centre** is a municipal facility used for staging and monitoring

emergency response personnel and vehicles before and after deployment into the Primary Zone. For this exercise, the Emergency Worker Centre was located in the town of Orono, ON.

**Lakeridge Health Bowmanville** is a local the hospital where off-site medical play took place.

### **Provincial Locations**

**The Provincial Emergency Operations Centre** is located in Toronto and is the hub for managing the off-site consequences of the nuclear emergency. The Provincial Emergency Operations Centre is the responsibility of the Office of the Fire Marshal and Emergency Management, under the Ministry of Community Safety and Correctional Services, and is supported by provincial ministries.

**Other Provincial Ministries** each have their own Ministry Emergency Operations Centre in the Toronto Region and a few have regional offices in the area of Regional Municipality of Durham. Some ministries sent representatives to the Emergency Worker Centre in Orono during the exercise.

### **Federal Locations**

**Federal Regional Offices** exist within the Toronto area and have key responsibilities in any emergency that involves the Federal Government. Key departments participated in this exercise from their own offices or sent liaison officers to the Provincial Emergency Operations Centre.

## **2.5.2 National Capital Region and Beyond**

**Canadian Nuclear Safety Commission** is the national regulator for nuclear energy and radiation protection and operates an Emergency Operations Centre at its headquarters in Ottawa. The Federal Nuclear Emergency Plan Technical Assessment Group's subgroup, the On-Site Conditions and Release Characteristics Functional Group, is located here.

**Government Operation Centre** is housed by Public Safety Canada and leads and supports response coordination for events affecting the national interest.

**Health Portfolio Operations Centre** is operated by the Public Health Agency of Canada and is the location where response under the Federal Nuclear Emergency Plan/Technical Assessment Group is managed. It is also the departmental Emergency Operations Centre for Health Canada and the Public Health Agency of Canada.

**Health Canada - Radiation Protection Bureau** is the operating location for the Federal Nuclear Emergency Plan Technical Assessment Group's Plan Risk Assessment, Human Monitoring Groups, and components of the Environmental Monitoring Group.

**Other federal departments and agencies**, each have their own departmental Emergency Operations Centres in the National Capital Region. In addition, some agencies deployed field teams in the Durham Region.



**Figure 1: Exercise Locations in the Region of Durham**



**Figure 2: Other Exercise Participant Locations**



## 2.6 Exercise Website

An exercise website was developed to serve as a tool for players and controllers to access relevant information throughout exercise conduct. The website was an excellent venue that provided situational awareness to players and controllers as well as real-time feedback on all media releases and emergency news bulletins.

During Exercise Unified Response players and controllers were able to use the website to access the following information:

- Players website which included mock media stories (TV, radio, and web), real media releases and emergency bulletins, and weather;
- A link to useful Player information including:
  - Phone directory for all participating organizations; and
  - Player guide books for exercise conduct; and
- Links to simulated social media sites ChatBook and Chatter (i.e., Facebook and Twitter simulated sites).

Controllers had exclusive links to access the narrator function, which allowed the input of scenario injects to maintain an exercise timeline, as well as a chat function for instant communication with all other controllers.

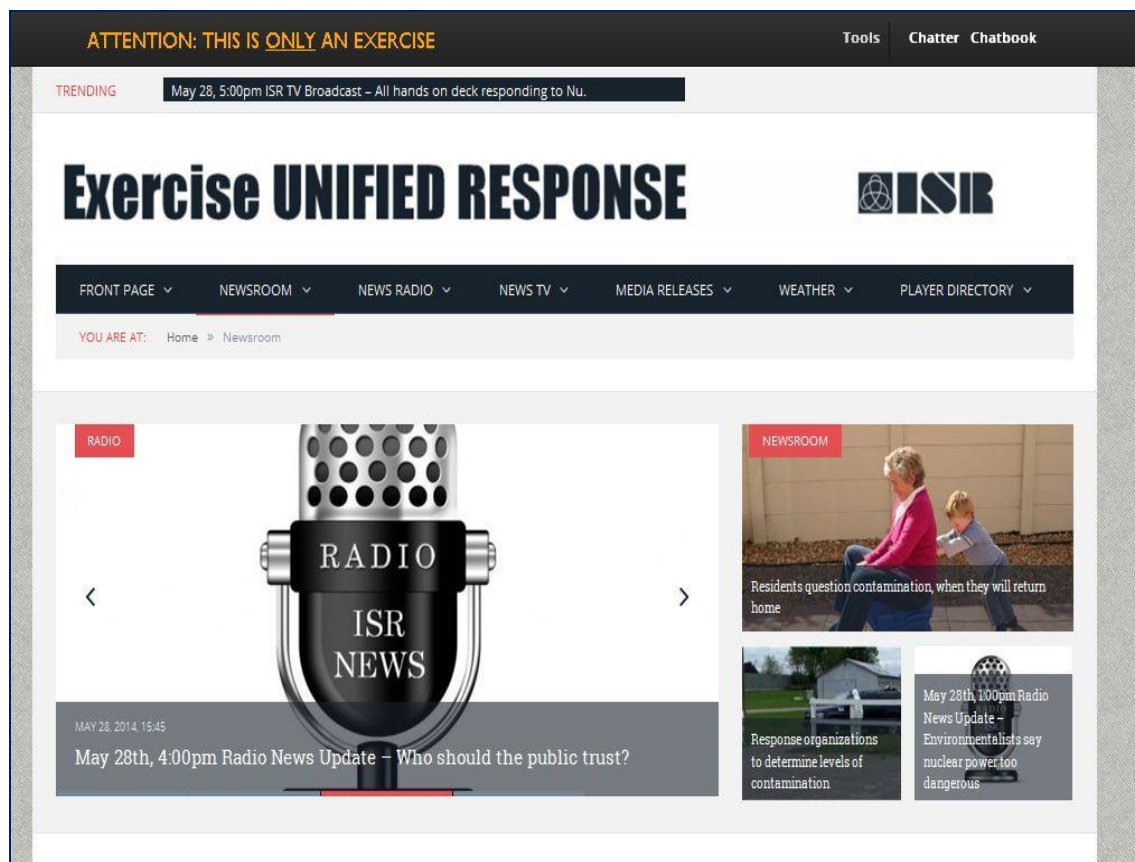


Figure 3: Exercise Website



**Figure 4: Social Media Sites**

Following Exercise Unified Response, controllers and evaluators were able to use the website for the evaluation process including access to:

- The evaluation tool which allowed users to input their timelines and comments relevant to the evaluation criteria. Inputs were subsequently used to help guide the evaluation process discussion; and
- Participant survey which allowed all users, including players, to answer questions on Exercise quality, exercise products, and provide additional requirements, as required.

## 2.7 VIP Observer Program

Given the size and scope of the exercise, the level of observer interest was high. To address this, a comprehensive 3-day guided tour was offered to senior level domestic representatives and international organizations. Observers had the opportunity to observe multiple exercise locations during optimal viewing times, including Ontario Power Generation emergency response facilities, the Regional Municipality of Durham's Emergency Operations Centre and the Provincial Emergency Operations Centre, municipal operations, as well as field operations conducted by provincial and federal

response teams. Participants were briefed each morning and throughout the day on the events that were unfolding. Members were also provided with a tablet to follow the exercise website in real-time, as it posted the latest media updates, emergency news bulletins, weather, and other exercise related information. At each location, a subject matter expert was available to provide specific details on the organizations activities.

In addition to the VIP tour, Health Canada's Radiation Protection Bureau and the Canadian Nuclear Safety Commission also hosted international observers at their operating locations.

### 3. EXERCISE EVALUATION

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#### 3.1 Evaluation Criteria

The evaluation focused on the interoperability and coordination of key response organizations and associated plans, leading to the identification of best practices and recommendations for improvement. The evaluation criteria that were assessed during the exercise are detailed in Annex B: Evaluation Criteria.

The three main interoperability areas that were evaluated during Exercise Unified Response were:

- **Operational Coordination** with specific reference to interagency interoperability and communication, which ensured that all response agencies were well informed and working with the most current information;
- **Scientific and Technical Data Integration and Systems Compatibility** which enabled effective situational awareness, scientific analysis and technical decision making; and
- **Public Communications Coordination**, which examined the consistency of the information provided to the public and the ability of all levels of government and Ontario Power Generation to coordinate their public affairs messages.

#### 3.2 Evaluation Tool

To assist with the evaluation process, a web-based data collection system was developed to capture observations from Evaluators across all locations. This website also allowed for the collection of data from a player's online post exercise survey, critical timeline from evaluators, and data on interoperability, scientific data exchange, and public communications. For areas where there were interoperability linkages, evaluators were able to provide a rating on the basis of response objectives and criteria. The ratings and comments provided by all evaluators were used in the evaluation meeting to determine and agree upon the identified critical gaps and items that needed to be included in the After Action Report.

#### 3.3 Evaluation Process

The Tier One evaluation for Exercise Unified Response followed a multi-stage process that consisted of training, data collection, data input and analysis, evaluation meeting, and, subsequently, production of an evaluation report. The evaluation process was based on the evaluation criteria that were developed and approved by the evaluation working group.

Prior to the exercise conduct, a team of evaluators with knowledge on the roles and responsibilities of response organizations and their respective plans were carefully selected to observe Exercise Unified Response participants. Evaluators were selected on their ability to recognize best practices and deficiencies, and to make recommendations for improvement, if required.



**ISIR** Evaluation

Main Admin Logout

### Unified Response

43% Complete

Take urgent protective actions to protect the public

Protect the public and emergency workers by taking urgent protective actions to protect the public

Time	Date	Evaluated Organization	Rating	Category
		Please Choose :	Please Choose :	Please Choose :
		Please Choose an Option	Please choose an option	Please Choose an Option
		This will list every organization playing in the exercise.	Excellent	Training
			Average	Process
			Needs Improvement	Technology
			Not achieved	Unknown

+ Add Additional Row

Next Page

**Figure 5: Evaluation Tool**

Before the exercise, the evaluators were required to review scenario timelines and objectives, have a good understanding of their organization's response plans, review the evaluation criteria that were developed by the evaluation working group, and anticipate player action throughout the exercise play.

During the exercise, evaluators were strategically placed at specific locations and required to observe and record the timeline and note events and actions, identify strengths and weaknesses, and listen to all communication that affected their area of evaluation.

Following the exercise, evaluators were asked to compile the data collected during the exercise on three specific areas: interoperability, scientific data exchange, and public communications. An evaluation tool (see Figure 5) was made available to evaluators to input their data, focusing their effort on critical timelines in their area of responsibility and highlighting possible areas that require further investigation during the evaluation process.

A two-day evaluation meeting was conducted from 10 to 11 June 2014 to enable evaluators to discuss their observations, noting response gaps and elements of best practice as applicable. Information from the evaluation tool had been organized and summarized in advance allowing the facilitator to quickly identify areas requiring further

discussion, resulting in a very efficient evaluation process. Supporting observations were captured during the discussions, along with recommendations for improvement. These observations are the basis for the evaluation section of this report.

## **3.4 Other Sources of Information**

### **3.4.1 Debrief and Hot Wash**

Following the end of play each day, many organizations conducted their own hot wash meetings in their respective locations. These hot washes provided an opportunity for the players to review exercise play and conduct, and discuss any internal issues or gaps that were identified during the exercise.

Further to individual hot washes, a conference call for all lead controllers was conducted at the end of each day to review the day's events and discuss preparation for the following day. Controllers were given an opportunity to discuss any issues that were encountered and resolve any potential problems that may have impacted play on the following day.

### **3.4.2 Communications Focus Group**

In order to objectively review the quality of communication products that were generated and released during the exercise, the Canadian Nuclear Safety Commission organized a small focus group to review various media products (i.e., press releases from participating organizations, information sheets, and websites) and provide feedback on behalf of the general public regarding their impressions on accuracy, consistency, and clarity of the messages. The focus group was convened over the course of two days and was comprised of three members of the general public – each a member of their local nuclear health and advisory group.

Participants were asked to rate available press releases and other materials on clarity, ease of understanding the content, usefulness, and trustworthiness of the material. Participants were also encouraged to discuss their opinions with focus group facilitators. When engaged in dialogue, facilitators noted comments that were pertinent to the discussion and to the overall evaluation of media products.

It should be noted that the Communications Focus Group was a late addition to the exercise and not all participating organizations had planned to release media products for evaluation. As a result, the focus group findings may not fully reflect arrangements during an actual emergency. At the direction of the Steering Committee, and in consideration of the limited participation of some organizations, relevant findings of the Communications Focus Group were used to inform this After Action Report in a limited manner.

## **4. EVALUATION RESULTS**

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### **4.1 Introduction**

This section outlines the Best Practices and Key Findings identified as part of the Exercise Unified Response evaluation process. It also provides recommended actions for implementation or improvement.

It is important to note that the issues identified relate to the interoperability component of the Tier One objectives. Issues that were identified through the evaluation process but that are internal to an organization or jurisdiction are not included in this report.

### **4.2 Benefits of Exercise Unified Response**

Exercise Unified Response had many benefits identified by players, controllers, and evaluators. These benefits should be considered in future exercises and should also be used to enhance real-world operations. These benefits were realized not only during the conduct phase of the exercise, but also during the planning and evaluation processes:

- This exercise provided a unique opportunity for participating organizations at all levels to confirm response protocols and strategic preparedness to a severe accident at Darlington Nuclear Generating Station;
- Organizations were afforded an exceptional opportunity to test interoperability between participating agencies, enabling the identification of areas of best practice and those requiring improvement;
- The use of multi-organizational working groups (e.g., Joint Exercise Planning Team, Evaluation Working Group) and a senior level steering committee to plan, develop, and oversee the exercise was seen as extremely valuable. The planning process proved to be highly effective in generating an exercise scenario that allowed organizations to achieve very diverse objectives and effectively resolve issues;
- The planning and development stage of the exercise fostered excellent inter-agency relationships across all levels of response. The exercise also served to confirm and strengthen the pre-existing relationships between responding agencies. Organizational cohesion, both new and legacy, should be sustained and further cultivated for optimal effectiveness in all phases of emergency response. These working relationships will be sustained through continued information exchange, collaborative doctrine, and protocol development;
- The planning events (i.e., conferences and workshops) also provided an excellent opportunity for exercise staff, subject matter experts, and participants to meet, network, and collaborate with multiple organizations that they may not otherwise have had an opportunity to work with;
- Exercise resources that were available on-line were considered very useful and effective (e.g., player guide, phone directory, scoping document, exercise web site, evaluation tool and controller site, etc.);
- Participating organizations were able to gain an enhanced understanding of their own capabilities related to a severe accident (e.g., integration, transfer of

- scientific data, and communications), which for some are not often exercised and tested to this extent;
- The exercise allowed some organizations to showcase their capabilities (e.g., Emergency Mitigation Equipment deployment, Emergency Medical Assistance Team, Emergency Workers Centre, and Environmental Radiation and Assurance Monitoring Group), effectively narrowing the gap with respect to shared knowledge of resource inventory, location, and availability. Building from this initial knowledge can only help to improve awareness and expedite the decision making process in the future;
  - Organizations were offered the exceptional opportunity to thoroughly test and confirm their standard operating procedures, their concept of operation, policy development, communication plans and procedures, and mobilization through all levels of response. As an example, Health Canada noted improved communications with other Technical Assessment Group players as compared to previous exercises, particularly with the use of Federal Nuclear Emergency Plan Technical Assessment Group SharePoint. Organizations were also able to exercise their Emergency Operation Centres as well as practice internal protocols, departmental procedures, and interoperability between emergency operations centres;
  - The scenario demonstrated how quickly resources can become depleted, which resulted in organizations developing a better understanding of the needs for robust mutual aid support and interoperability;
  - The use of web based inject and social media tools greatly increased the ability of all players to follow the exercise progression; and
  - The observer and VIP tours were well organized and managed. The tours were a mechanism to effectively promote the wide variety of emergency response organizations, expertise, and capabilities available in Canada.

### 4.3 Supporting Observations and Recommendations

This section outlines best practices, lessons learned, and recommendations to be considered for the key evaluation criteria that were observed throughout the exercise. Exercise Design observations can be found in Annex A: Exercise Design.

Supporting Observations (SO) will be identified for each evaluation component and integrated into a higher level element of either a Best Practice (BP) or a Key Finding (KF). A Best Practice is an example of exceptional performance or planning, which could be used as an example by other response organizations. A Key Finding is an adverse condition that had, or could have had, a significant impact on the response and typically identifies a gap in response capability.

In addition to Best Practices and Key Findings, Opportunities for Improvement also exist. An Opportunity for Improvement (OI) is a deficiency of a minor nature or an area identified for a potential enhancement during the Exercise Unified Response. In general, an Opportunity for Improvement relates to existing plans and procedures, which, while undergoing the 'stress test' of the exercise, exposed a potential weakness that should be addressed.

### 4.3.1 Operational Interoperability, Coordination, and Integration

The evaluation of operational interoperability focused on two main response objectives that included the establishment of emergency response organizations, and the protection of the public and emergency workers. To assess the former, the evaluation process concentrated on the effectiveness of the notification process and subsequent activation levels that were determined. The degree to which emergency response operations were coordinated is also noted.

#### Notification and Activation

Effective notification procedures are essential to the successful establishment of emergency response organizations. Agencies that have a responsibility to notify organizations outside of their jurisdiction were evaluated on their ability to do so in accordance with their plans and procedures. Communication methods used for notification were also examined for redundancy, robustness, and an organization's ability to communicate changes in readiness or activation to external organizations.

#### *General Observations*

In general, emergency notification and alerting procedures to external response agencies were timely and effective. The notification of re-categorization to On-Site Emergency between Ontario Power Generation and the Province, and onward to federal authorities and the international community (through International Atomic Energy Agency) was very efficient. Although there were some exceptions that require improvement (as noted below), the current notification system within the response plans worked and proved to be a reliable method to exchange information.

#### *Best Practice*

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***BP1 – Confirmation calls by sender after transmission of key information is a best practice that could be adopted by all organizations.***

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- SO1:** Confirmation calls to the Provincial Emergency Operations Centre were placed by Ontario Power Generation personnel as a follow-up to each faxed notification. This practice was extremely valuable, particularly when confusion arose in confirming if a fax was initially received.

#### *Key Finding*

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***KF1 – Existing protocols for notification between organizations are not sufficiently developed and harmonized to meet the needs of all responding organizations.***

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- SO2:** Although provincial emergency level notifications were always effectively verbally communicated on coordinated conference calls, some organizations (e.g., Regional Emergency Operations Centre) require a formal notification

before any action can be implemented. For example, the Regional Municipality of Durham cannot activate the public alerting sirens until the Provincial Emergency Operations Centre has issued written bulletins. Written confirmation of critical decisions is also required, especially when they include accompanying orders or directives.

Note: Some of the emergency bulletins could not be sent in a timely manner due to low staffing level caused by the real-life flooding emergency in Northern Ontario.

- SO3:** There was some confusion between various organizations regarding the terms Emergency categorization, Emergency Declaration, and Activation Level. In accordance with the Provincial Nuclear Emergency Response Plan, Ontario Power Generation is only required to send formal notifications of any change in emergency categorization at the plant to the province within the first 4 hours after initial notification. Once the science section is operational within the Provincial Emergency Operations Centre, the province can increase or decrease the Provincial Emergency Operations Centre activation level, independent of the utility, based on the technical information that is readily available. Although Ontario Power Generation was not required to formally notify the province of a general emergency categorization, the provincial science section recognized the progression of the event as a general emergency and took appropriate measures. As a note, initial declaration of a general emergency by the province was misinterpreted by at least one responder as a provincial 'state of emergency'; the Provincial Emergency Operations Centre never declared a Provincial Emergency. However, the Regional Municipality of Durham can, and did, declare a regional emergency independent of the province.
- SO4:** Notification regarding the authorization of potassium iodide (KI) pills by the Provincial Emergency Operations Centre Commander was not received by several key organizations (e.g., Regional Emergency Operations Centre, City of Peterborough). While the command section within the Provincial Emergency Operations Centre received notice from the Ministry of Health and Long Term Care on this matter, it is understood that Health Units will not act on this order until a written directive has been issued and received from the Chief Medical Officer of Health. Notification of potassium iodide pill authorization was issued by the Provincial Emergency Operations Centre Commander to outside response organizations; however, several organizations require formal notification from the Chief Medical Officer of Health, particularly if it involves a host city preparing to receive evacuees at reception centres. The Regional Municipality of Durham was significantly delayed in addressing the distribution of potassium iodide pills to the public as potassium iodide pills was only 'recommended' to be taken, whereas a clear official 'order' was expected by the Regional Municipality of Durham, in accordance with Provincial Nuclear Emergency Response Plan and the Radiation Response Health Plan.

**KF1 Recommendation:** There is a need to improve protocols for emergency categorization and declaration between all applicable organizations. Protocol and terminology improvements would ensure that the required notifications are



sent, received, understood, and acted upon in an effective and timely manner. Protocol development should include a review of all required notification recipients, message content, validation, and confirmation processes. This development should be a joint process with all relevant organizations involved.

### **Coordination of Emergency Response Operations**

Organizations were evaluated on their ability to coordinate response operations between jurisdictions throughout the simulated nuclear emergency. This involved examining an organization's ability to align all off-site response organizations with the on-site response and to maintain that coordination effectively. The use of liaison officers in accordance with plans and procedures was also observed. Evaluators assessed how disparate organizations with similar capabilities could maximize interoperability effectiveness when working within a common area or response sector.

### **General Observations**

Throughout the exercise, there appeared to be good coordination and alignment between the key response organizations from different jurisdictions. Some of the provincial requests for federal assistance were well orchestrated and generated the required discussions within the federal family. Coordination between Ontario Power Generation and province was considered excellent. Further, a field component of the Environmental Radiation and Assurance Monitoring Group, comprised of Health Canada Radiation Protection Bureau, Canadian Food Inspection Agency, Health Canada, Natural Resources Canada, Atomic Energy of Canada Ltd, Ministry of Labour, Ministry of Environment, Ministry of Agriculture and Food/Ministry of Rural Affairs, was established to monitor risks of ingestion related to radiological contamination.

Arrangements for escalating the Technical Assessment Group response level, sharing information between Technical Assessment Group and the Provincial Emergency Operation Centre's Science Section to inform situational awareness, exchanging technical information through the technical liaison officers, and the Health Canada-Ontario Ministry of Labour co-lead of the Environmental Radiation and Assurance Monitoring Group proved to be highly effective in responding to the event and rapidly addressing any confusion in the scenario..

The use of prearranged support protocols between various levels of response organization (e.g., the Ontario Annex of Federal Nuclear Emergency Plan, Memorandum of Understanding between utilities for personnel and equipment, etc.) is a good practice and facilitates response actions when they are in place and well understood.

### **Best Practices**

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***BP2 – Command documents issued by the Provincial Emergency Operations Centre are an effective method of communicating key decisions on protective actions and maintaining situation awareness across organizations.***

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**SO5:** Senior level representatives from the Government Operations Centre were able to liaise directly with their provincial counterparts within the Provincial

Emergency Operations Centre. This direct communication served both organizations extremely well and made for efficient and effective decision making and situational awareness.

- SO6:** The Provincial Emergency Operations Centre issued and distributed a number of command documents that provided clear and concise direction on protective actions. Command documents typically contain a summary of command decisions with respect to the response and are issued by the Provincial Emergency Operations Centre Commander. Organizations that received these documents found them to be extremely beneficial and perceived them as authoritative in nature as they included the Commanders signature. Other organizations could benefit from adopting this practice into their own protocols.
- SO7:** Direct liaison between the Provincial Science Section and Federal Nuclear Emergency Plan Technical Assessment Group aided in providing overall situational awareness and facilitated requests for technical support, allowing the Provincial Emergency Operations Centre to determine and communicate protective actions effectively. Effective coordination between these technical groups was enabled through the Federal Nuclear Emergency Plan Ontario Annex, which documents standing arrangements for federal support to the Provincial Emergency Operations Centre through Federal Nuclear Emergency Plan. Interoperability was further facilitated by a common understanding of roles/responsibilities, use of Technical Assessment Group technical liaison officers in the Provincial Emergency Operations Centre Science Section, and specialized web tools.

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***BP3 - The joint operations at the field component of the Environmental Radiation and Assurance Monitoring Group demonstrated the benefits of coordinated and unified operations between response organizations.***

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- SO8:** A field component of the Environmental Radiation and Assurance Monitoring Group was established and comprised of provincial and federal organizations staged in a single location within close proximity to the Emergency Worker Centre. The setup and coordination of the survey team was effective, due in large part to the sharing of information and equipment. The field team operated within a unified command structure and were able to effectively determine which sectors would be surveyed and by which organization.

### ***Key Findings***

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***KF2 - The availability of trained and effective Liaison Officers in external Emergency Operation Centres is essential to effective communication and coordinating activities.***

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- SO9:** The role of an effective liaison officer in supporting emergency Operations Centres may not be fully understood by some organizations or some individuals. Although expectations were largely based on experience and



background, some liaison officers were not familiar with operations and did not appear to understand the processes within the emergency operations centre where they were positioned (i.e., where to get answers to questions asked by command). At times there did not appear to be effective coordination between the Provincial Emergency Operations Centre staff and some of the federal liaison officers when dealing with a request for federal assistance. The function of liaison officers was not optimized as some did not view their role as trying to collect information and pass it on to the commander. This comment does not apply to all liaison officers as some were recognized as being very effective (e.g., Technical Assessment Group Technical Liaison Officers located at the Provincial Emergency Operations Centre and the Government Operations Centre, and Regional Emergency Operations Centres Liaison Officers).

**SO10:** Coordination of operational cycles between responses organizations were not optimized during Exercise Unified Response, making it more difficult to arrange teleconferences and share information. The synchronization of operational cycles can be eased and facilitated by effective Liaison Officers.

**KF2 Recommendation:** There is a requirement to enhance the process that ensures organizations providing Liaison Officers inter-jurisdictionally receive a clear indication of their roles and responsibilities, thus ensuring that effective Liaison Officers support is subsequently provided (i.e., well trained Liaison Officers in appropriate numbers). This enhanced process would optimize the function of Liaison Officers by enhancing their level of knowledge regarding the structure and functions of other key organizations. Components of this new process could include training on plans and procedures, equipment and communication (e.g., business cycles).

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***KF3 - Critical decision making processes must be optimized between all response agencies to ensure effectiveness during emergency response.***

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**SO11:** There was some confusion over the consultative process regarding venting outside the pre-approved procedure. While it is clear that Ontario Power Generation has the authority to vent without consultation with any external organization if the requirement is within procedure (i.e., a nominal situation) or when venting is required to protect containment, the protocol for external consultation when venting for reasons outside of normal procedures were not clear. Individuals who participated in the consultation had varying levels of technical expertise and the complexities of venting in a severe accident were not understood by all involved.

**SO12:** The formal regulatory request sent by the Canadian Nuclear Safety Commission relating to Ontario Power Generation's plans to vent (i.e., use 12(2) clause) distracted Ontario Power Generation responders at the Corporate Emergency Operations Facility, where the request was received. The regulatory requirement process during an on-going response effort must be clarified (i.e., who at the utility should receive and action the regulatory request, the required timeline and process for response, etc.) and formally documented.

**KF3 Recommendation:** There is a requirement to review the process for consultation for venting in a situation that does not fall within the nominal procedures. A review of the consultative requirements to vent outlined within Provincial Nuclear Emergency Response Plan should be examined and modified as required. Under abnormal circumstances, there is a need to define an ultimate authority on venting. The recipient and response timeline for regulatory requests during an emergency should be formalized.

### **Urgent Protective Actions to Protect the Public**

Response organizations were evaluated on their ability to coordinate their efforts and take all appropriate measure to save lives and reduce health effects. This included the efficiency of authorities to make protective action decisions and recommendations to the public following notification of an emergency level. The evaluation also examined the use of all potential sources of radiological information in the decision making process, as well as the measures taken to notify the public of any protective actions to be taken (e.g., KI pills, evacuation order, etc.).

### **General Observations**

Response organizations demonstrated an excellent ability to coordinate their efforts for decision making on protective actions for the public. Decisions within the Provincial Emergency Operations Centre were made promptly upon notification of a nuclear emergency and communicated quickly. Although the region noted that an evacuation notification was not initially received from the Provincial Emergency Operations Centre, the Regional Municipality of Durham's Emergency Operations Centre effectively used existing public infrastructure by sounding their siren alert system to notify area residents of an emergency. Evacuation and sheltering orders were issued and communicated to the public in accordance with the automatic actions given in the Provincial Nuclear Emergency Response Plan. Orders were issued to close down roads, rail, and airspace, and to control access to areas where protective actions were being implemented.

### ***Opportunity for Improvement***

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***OI1 – Further guidance, as it relates to severe accidents, is required to clarify the roles of utility, municipal, provincial, and federal response organizations with shared responsibilities for protecting the public, the environment, food, and water.***

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**SO13:** There was confusion between the province and federal organizations as to the authority over the safety of farmland and the implementation of restrictions on immediate consumption of food and water. While emergency action levels for food and water ingestion control exist (Canadian Guidelines for the Restriction of Radioactively Contaminated Food and Water Following a Nuclear Emergency), there is a lack of guidance on roles, responsibilities, and criteria for long-term agricultural measures following a nuclear emergency.

**SO14:** There was a communication gap between the Province and Ontario Power Generation surrounding details on the evacuation order, protective actions, emergency bulletins, and associated direction and expectations. The Corporate

Emergency Operations Facility is not on the distribution list for Provincial Emergency Operations Centre command documents which typically provide more clarity and details on evacuation orders that are issued by the Province. Ontario Power Generation requires this information for operational planning (e.g., deployment of equipment, movement of staff, etc). During this exercise, Ontario Power Generation only learned of the highway closure through social media rather than formal notification processes.

**SO15:** Normally during an emergency, the Provincial Emergency Operations Centre informs their partners of areas and the number of people evacuated. In this exercise, information on evacuated areas was provided to the Government Operations Centre in terms of 'sectors', but did not include specifics on numbers of people affected (this may have been the result of limited play at the province due to real world events).

**OL1 Recommendation:** The Provincial Nuclear Emergency Response Plan defines protective action levels for the public. There is a requirement to clarify roles and responsibilities for organizations involved with the assessment or implementation of those protective actions, including a Concept of Operations with criteria and triggers for automatic protective actions, and default actions for long-term agricultural measures. In addition, the plan should describe the required response capabilities across various organizations and the protocols for submitting information, assessments, and recommendations associated with protective actions. The improvements to the plan should be joint and validated.

**KF4 - All organizations should review and update dose assessment and control procedures to clearly define roles and responsibilities for the management of dose assessment results.**

**SO16:** Multiple dose assessments created some confusion within the Provincial and Federal Emergency Operations Centres. The Canadian Nuclear Safety Commission provided an assessment indicating that the potassium iodide Protective Action Level could be exceeded up to 50 km away from Darlington Nuclear Generating Station. This assessment was outside of the normal procedures of the Provincial Scientific Section and the Federal Nuclear Emergency Plan Technical Assessment Group. Both the Scientific Section and the Technical Assessment Group successfully tasked their liaison officers and relevant group leads to seek additional context for the Canadian Nuclear Safety Commission assessment, resulting in the subsequent resolution of the situation.

### **Ensure Safety of Emergency Workers**

Response organizations demonstrated that appropriate measures were taken to ensure worker safety by establishing an Emergency Worker Centre for command and control of operations within restricted access zones. This included the ability to designate

emergency workers, save lives, and take actions to avert a large collective dose or prevent the deterioration of the emergency.

### General Observations

Response organizations demonstrated that appropriate measures were taken to ensure worker safety by establishing an Emergency Worker Centre for the command and control operations within the restricted access zones. Communication between the Emergency Worker Centre and other response agencies (e.g., the Environmental Radiation and Assurance Monitoring Group) was excellent and the coordination of survey and sampling within the restricted zone was unprecedented. Federal and Provincial partners (e.g., Industry Canada and others) requested advice and support from the Provincial Emergency Operations Centre for the protection of Emergency Workers, which worked well. Federal Nuclear Emergency Plan Technical Assessment Group contributed field protection guidance for federal workers. Ministry of Labour provided on-site guidance for provincial responders. Specifics regarding required Personal Protective Equipment were clarified and dosimeters were distributed to all field staff.

### Key Finding

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***KF5 – Emergency plans would benefit from additional clarity and alignment on dose limits and responsibilities for the radiation protection of workers responding in a nuclear emergency.***

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**SO17:** The criteria used for establishing turn back (back-out) dose limits for the protection of off-site emergency workers were established from multiple sources that were inconsistent with those provided in the Provincial Nuclear Emergency Response Plan (50 mSv), and were at times confusing. Although the Ministry of Labour external dose rate limit became the default limit used by every organization, there was also an effective dose limit and colour code categories that were implemented concurrently. The same colour codes were used to refer to different dose limits, dose rate limits, and protective posture for workers and the public (for whom these limits have different connotations). As the Ministry of Health and Long Term Care is responsible for tracking dose and due diligence for employee safety, these inconsistencies between the Provincial Nuclear Emergency Response Plan and Ministry of Labour guidance generated unnecessary difficulties.

**SO 18:** The use of different dose limits and turn-back criteria by different groups of responders created confusion at the Emergency Worker Centre. Response personnel had questions about how their exposures were being monitored and reported.

**SO19:** Although Ontario Power Generation is responsible for managing and reporting dose for the protection of anyone arriving on-site at Darlington Nuclear Generating Station, and for Ontario Power Generation and Regional Municipality of Durham field staff at the Emergency Worker Centre, there was some confusion as to which organization was responsible for dose control and

dose reporting for non-Ontario Power Generation and Regional Municipality of Durham personnel who are processed through the Emergency Worker Centre. This confusion also led to questions regarding the definition of an emergency worker and the dose limits that apply to a civilian responder. At the Emergency Worker Centre, there was no formal process in place or definitive responsibility to transport thermoluminescent dosimeters and bioassay samples, analyse results, and report the dose of non-Ontario Power Generation personnel.

**SO20:** The Incident Commander at the Emergency Worker Centre did not have good situational awareness of the number and location of Ontario Power Generation personnel in the field. While other emergency workers are required to register upon arrival, Ontario Power Generation has not adopted this process due in part to the fact that their personnel are considered Nuclear Energy Workers, rather than emergency workers. Regardless of how workers are designated, Durham Police are responsible for everyone that transitions through the Emergency Worker Centre, and for maintaining security for all safety sectors, even in non-contaminated or 'safe' sectors. Without a complete list of all survey assets that are in the field, the Incident Commander's situational awareness will be compromised. Further to this, the Incident Commander provides situational awareness to personnel entering and exiting the controlled access (e.g., the possibility of further releases, high dose rate areas, road closures, hazards, etc). Without formally integrating into the Emergency Worker Centre, Ontario Power Generation personnel may miss an opportunity to receive safety-related situational updates when required.

**SO21:** There is some uncertainty about the ability of some response organizations that may be reliant on Ontario Power Generation for access to some of the equipment and reporting measures (normally issued at the Emergency Worker Centre) to be self-sufficient during the transition period between the need for dose control and the time that the Emergency Worker Centre becomes operational. Questions arose as to whether some of these organizations could be self-sufficient given their current access to electronic personal dosimeters for the number of responders in play. For example, the Ontario Provincial Police have 12 electronic personal dosimeters for 32 officers from the local dispatch which could only be augmented by electronic personal dosimeters issued by Ontario Power Generation at the Emergency Worker Centre. At present, organizations must rely on their own Concept of Operations to sustain their response capability during this transition period (i.e., they are responsible for their own dose control and equipment management until additional equipment can be supplied). In addition, there is no defined procedure to ensure that aerial survey workers are registered, since they enter the controlled sectors by air and they do not land or take off at the Emergency Worker Centre. For this reason there was no mechanism in place to track their movements and perform dose control.

**SO22:** The Natural Resources Canada aerial survey aircrafts are not processed through the Emergency Worker Centre. Aerial survey operations were conducted from local airfields outside of the controlled sectors. This means that there was no mechanism in place for managing potential aircraft contamination after a survey over the contaminated area.

**SO23:** There appears to be some confusion regarding the type and scale of military assets that are available during a domestic emergency involving a civilian nuclear establishment. It would be useful to ensure that all parties involved have a general understanding of the types of military capabilities that could be available to provide support during domestic emergencies, especially as they have an impact on the potential to enhance off-site emergency worker safety.

**KF5 Recommendation:** There is a need to develop a standardized, scientifically-based Concept of Operations with respect to dose management for all organizations that may respond during a nuclear emergency in Ontario. The Concept of Operation should cover the off-site emergency workers who are not deployed from the Emergency Worker Centre and are not required to return to it after deployment. As an example, aerial survey personnel need to be registered before they enter the controlled sectors, and checked for contamination when they return. The Concept of Operations should be jointly developed for all teams and supporting procedures must be prepared and validated.

A procedure should be established for managing aircraft contamination including checking for contamination, limits, cleaning, and quarantine.

### **Minimize psycho-social impacts**

Organizations with a responsibility for public health response and messaging were evaluated on their ability to minimize the psycho-social impacts of the event on the general population and emergency workers. This included how health risks and appropriate actions to be taken were explained in accordance with provincial and federal guidance. Further to this, the evaluation considered an organization's ability to address the concerns of workers and the public, to dispel any myths or rumours, and to provide accurate and timely information to minimize psycho-social impacts.

### **General Observations**

Those organizations for whom public messaging was within their scope of exercise play were exceptional at responding to public concern and distress that was generated through the simulation cell, social media, and simulated media articles. Health Portfolio used social media effectively to quell rumours about potential health effects that were circulated in the media. The early identification of a federal spokesperson from the Health Portfolio, the proactive posting of monitoring information to the Health Canada website, and the information that Health Portfolio was providing for federal workers and First Nations also aided in minimizing the psychosocial impacts of the event. The Province was outstanding in their approach to deal with public anxiety and provided the appropriate information to correct misinformation. There were also numerous coordination calls hosted by Public Safety Canada to ensure that messaging was consistent across the federal government, province, and region with respect to health related issues. To ensure public messaging consistency, accuracy and to avoid duplication, the Regional Municipality of Durham deferred to Provincial Emergency Operations Centre on messaging. This approach is consistent with the Provincial Nuclear Emergency Response Plan.



Currently, there is no coordinated process for posting real-time radiological monitoring data (i.e., routine daily data and data related to an emergency) and related public communications to government websites that could be used to familiarize the public with radiological measurements and minimize psychosocial impacts during an emergency.

### Best Practice

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***BP4 – The deployment of the Emergency Medical Assistance Team demonstrated that a strategy to add capacity to a local hospital and reassure worried members of the public can be implemented using special medical teams.***

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**SO24:** The Emergency Medical Assistance Team was deployed to assist Lakeridge Health in dealing with the worried well and any additional influx of patients as a result of the emergency. The response was quick and the capabilities were extensive. As part of their essential services, psycho-social counselling was made available to the masses that arrived at the hospital for screening. Emergency Medical Assistance Team was a demonstration of best practice and was an impressive display of the additional resources that are available to first receivers during a large scale nuclear emergency. This team is considered an international best practice.

### Key Finding

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***KF6 – There is a need for a clear process for providing timely information to the public, municipalities, and private agencies regarding their rights and claims to financial compensation for losses incurred during and after a nuclear emergency (e.g., relocation expenses, loss of business revenue, etc.).***

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**SO25:** Some stakeholders were unclear about the operator's role and responsibilities under the Nuclear Liability Act, including the operator's responsibility for providing financial compensation following a nuclear emergency. Costs to displaced residents could be a burden and create another concern that adds to the psycho-social impacts from the nuclear emergency. Displaced residents, and the municipalities who are responsible for them, need to better understand how they will be compensated by the operator and its insurers. An evacuation and subsequent shutdown of critical infrastructure could effectively put many businesses into financial difficulty. Questions were raised as to whether a declaration of provincial emergency would expedite the process of reimbursing displaced residents, lost business revenue, regional expenditures, and costs associated with the return to normal operations after the emergency has ended. Discussion regarding the federal Nuclear Liability Act took place between the Province and the Federal government, during which the process for compensation and the eligible categories of damage for compensation were discussed. It was explained that persons who suffer eligible damages would receive compensation (e.g., residents, businesses, etc.) but not the costs of municipal emergency services (i.e., police, health services, etc.), as these costs

are not defined as nuclear injury or damage.

Note: At the time this report was written, proposed legislation to replace the Nuclear Liability Act was before Parliament; one of its key revisions is to increase the operator liability limit to \$1 billion from the current \$75 million.

**KF6 Recommendation:** While the Nuclear Liability Act sets a clear framework for financial compensation, the observed lack of clarity may have been a function of the limits of the exercise. Nevertheless, it is recommended that the roles and responsibilities of operators and insurers with respect to financial compensation under the Nuclear Liability Act be clearly communicated by operators and insurers to all stakeholders. This information should be readily available to residents and businesses during the early stages of an emergency to minimize the psycho-social impacts on the public. It is also recommended that ongoing federal-provincial information briefings continue to take place within the context of Ontario's Nuclear Compensation Working Group, which includes members from federal, provincial and municipal organizations, nuclear operators, and insurers.

#### **4.3.2 Technical/Scientific Data Sharing**

Evaluation of the ability to share scientific and technical data between jurisdictions focused on three response objectives; the transfer and receipt of data used to inform decision making, keeping off-site emergency worker dose as low as reasonably achievable, and the use of data to make recommendations for the restriction of food stuff and water consumption.

##### **Technical information is transmitted and received between response organizations to inform decision making**

Organizations were required to transmit data, technical forms, and reports used in accordance with internal plans and procedures to the appropriate authorities (e.g., meteorological data, station parameters, off-site survey, etc.). These organizations were evaluated on their ability to share this information between all response agencies with a role in data analysis, modeling, or analyzing the impacts of release in a timely manner.

##### **General Observations**

The transfer of technical data between response organizations was excellent and highly useful for making recommendations on protective actions within Provincial Emergency Operations Centre science. The coordination and management of this information by the Federal Nuclear Emergency Plan Technical Assessment Group, the Province, and the Federal Partners in the Provincial Emergency Operations Centre worked very well in both directions. Dose models for projected releases and post release were prepared in a timely fashion by Technical Assessment Group and shared with the Province. Data from Health Canada's Fixed Point Systems proved to be invaluable, and the frequency of monitoring this data was increased to provide more timely information to the Province. Although there were areas that can be improved, the Province had numerous sources for technical data and assessments (e.g. Ontario Power Generation, Canadian Nuclear Safety Commission, and Health Canada). Emergency workers registered at the



Emergency Worker Centre were informed, protected, and their doses were kept as low as reasonably achievable. Data was also available to Canadian Food Inspection Agency and Ministry of Agriculture and Food / Ministry of Rural Affairs to make recommendations for the restriction of food stuff and water consumption.

The coordination and exchange of information between Technical Assessment Group, Provincial Emergency Operations Centre science section, and the field component of the Environmental Radiation and Assurance Monitoring Group was highly effective. Command and control at the Emergency Worker Centre was very good as organizations were kept informed of any change in status board for the affected sectors.

The efforts made in advance of Exercise Unified Response to coordinate Federal and Provincial technical functions, including the field operations within the Environmental Radiation and Assurance Monitoring Group must continue and should be expanded to include field assets from all jurisdictions, including the utility. Federal and provincial organizations and Ontario Power Generation clearly understood that they were to report measurements to the Provincial Emergency Operations Centre Science Section; however, there was no mechanism for consolidating or sharing the information that was being reported, or for identifying priorities and directing teams to action them. The model for provincial coordination of all assets deployed under the Provincial Nuclear Emergency Response Plan requires significant improvement.

### Best Practice

***BP5 - The use of Health Canada's EMAP platform for sharing and displaying radiation survey information with the Provincial Emergency Operations Centre demonstrated the usefulness of web-based Geographic Information System for situational awareness and decision-making.***

**SO26:** Federal and Provincial organizations used EMAP during the exercise, which provided excellent results (federal pre-release plume/dose projections, simulated radiation surveys from air borne and vehicle borne detection) and assisted Provincial Emergency Operations Centre Command in making decisions on protective actions. While some key organizations did not have access to EMAP (e.g., Regional Emergency Operations Centre, Ontario Power Generation, etc), the Technical Assessment Group, Canadian Nuclear Safety Commission and Provincial Emergency Operations Centre Science Section were receiving measurements from the joint federal-provincial field teams in real-time. Although there are some limitations with EMAP (e.g., number of simultaneously connected users), there is evidence that this tool, or any comparable data collection and mapping software, is a valuable asset to command and control decision making.

## Key Finding

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**KF7 – *The integration of emergency plans would benefit from improved alignment on the use of dose modeling tools.***

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**SO27:** Hypothetical assessments for an anticipated release provided by the Canadian Nuclear Safety Commission caused some confusion within the Provincial Emergency Operations Centre. Although these predictions provide the Provincial Emergency Operations Centre Commander with a full spectrum of potential outcomes (most likely and earliest release scenario) and can be beneficial for decision making for protective actions, these products need to be clearly understood by all recipients. The players in the Provincial Emergency Operations Centre Science Section, which includes Canadian Nuclear Safety Commission and Technical Assessment Group representatives, were unaware of how these alternative assessments were generated (i.e., the data and assumptions used to generate alternative release scenarios) and thus could not give context to the Provincial Emergency Operations Centre Command Section. In particular, the Provincial Emergency Operations Centre Science Section wrongly presumed that the earliest release scenario had been generated from data and information that was not available to Ontario Power Generation and the Provincial Emergency Operations Centre Science Section.

Further to this, the use of different assessment tools between various organizations can generate different results and may lead to confusion if not well understood. Each assessment tool in its own right has capabilities and limitations. The procedures currently in place to incorporate and validate data from all available sources were not followed during the exercise and caused confusion among the players.

**SO28:** There is currently no guidance and governance within the Provincial Nuclear Emergency Response Plan on developing a source term estimate for a severe accident. The existing Emergency Response Projection software is only reliable for use in calculations within the boundaries of design basis accidents. Although the responsibility falls on the Province to determine protective actions, neither Ontario Power Generation nor the Province currently have the tools to make source term estimates for a severe accident. The Canadian Nuclear Safety Commission is now able to generate source terms for severe accidents; however, there is no provincial standard operating procedure in place on how to use it. There is joint provincial-federal-utility guidance available that discusses which source term should be used for the estimates. It was understood that the Emergency Response Projection software would be used in calculations of design basis accidents and Canadian Nuclear Safety Commission software would be used for a severe accident. This policy may change when provincial tools are updated to handle severe accidents. Nevertheless, Exercise Unified Response was designed to use the Emergency Response Projection software, therefore the sharing of source term estimates by the Canadian Nuclear Safety Commission to the Provincial Emergency Operations Centre was unexpected by the technical scenario designers.

**SO29:** It was not fully understood who has the responsibility to provide Ontario Power Generation with accurate meteorological forecast data once the Provincial Emergency Operations Centre science section is operational. Ontario Power Generation understood that the Provincial Emergency Operations Centre was to provide this data. The Province was unaware of the requirement to provide this data to Ontario Power Generation.

**KF7 Recommendation:** There is a requirement to formalize the protocol for the inter-organizational exchange and use of projected data such as weather and source term. This could include the joint development of a common tool or decision support system that can combine information from multiple modelling sources to provide the highest level of situational awareness possible for decision making. The protocol should be validated once developed. In the interim, it must be recognized by all stakeholders that Emergency Response Projection software is limited to a design basis accident and that there is a requirement to develop severe accident modelling software.

### *Opportunity for Improvement*

**OI2 - *There is currently a gap in definition of the roles and responsibilities, survey and assessment strategies, analysis capabilities, etc., for surveys during each phase of the emergency (pre-release, ongoing release, post-release, and remediation).***

**SO30:** Although the field component of the Environmental Radiation and Assurance Monitoring Group was considered a best practice, there is no formal process in place that delineates how the federal organizations integrate with the Emergency Worker Centre to conduct their post-release surveys. The process for federal deployment was not tested during the exercise (i.e., provincial request for deployment was not formally issued as a result of exercise artificialities, specifically the pre-deployment of federal assets to meet the exercise timelines). While triggers for deployment are understood by the Province, there appears to be a need for further documentation, formal integration into the Concept of Operations, and training. Directions from the Provincial representative to the federal field teams seemed to be limited and most task assignments were provided by the Health Canada field team leader instead. This can lead to confusion and a delay in organizing the response effort. As this was the first opportunity to practice this setup, there was no apparent integration between the Federal-Provincial organizations with Ontario Power Generation field staff and the Region. The model of command and control of joint federal-provincial field teams requires significant improvement.

It was unclear which organization was responsible to conduct field surveys during an ongoing release from a severe accident (which could be ongoing for an extended period of time) and after a release from the severe accident had stopped, (i.e., at various levels of radiological contamination). It was also unclear what would be the readiness posture of these response organizations (i.e., response times, resources, and capabilities).

The 'As Low as Reasonably Achievable' principle must be included in field surveying strategies and process development (i.e., use of automated worker dose tracking tools). It was noted during the exercise that there was no consistent format for data presentation to all required response organizations, causing confusion and delays in decision making process.

**SO31:** Provincial requirements for dose and radionuclide data for initial conditions, holdup period, during and after release, need to be better understood. For example, existing procedures do not adequately address deployment of emergency workers into a plume for the purpose of collecting data during a severe accident. For a design basis accident, Ontario Power Generation procedures assume that it is acceptable to send workers into the plume for taking measurements, since the release would be filtered. During Exercise Unified Response, which involved a severe accident, this assumption was questioned and a decision was made by the Corporate Emergency Off-site Facility Commander not to send workers out into the plume unless specifically directed by the Province. Since the release during the exercise happened overnight, this procedure was only discussed and not tested during the exercise. Further to this, the Environmental Radiation and Assurance Monitoring Group (Provincial and Federal) survey team's current policy is that they will not deploy any assets into a plume from an ongoing unfiltered release. While the Ontario Power Generation Concept of Operations for field survey and data collection are strong and widely accepted for a design basis accident, questions remain regarding the benefit versus risk to emergency workers for collecting data during a severe accident release or within a hazard area post-release.

**SO32:** The use of different Geographic Information Systems across various organizations has the potential to hinder the sharing of technical information and place limits on situational awareness. Not all organizations have access to EMAP, despite this tool proving itself as an effective means to share data and aid with command decisions. Even when they are equipped with their own Geographic Information System software, they were not able to integrate layers or products from EMAP into their Geographic Information System maps. As a result, maps could be shared but not necessarily used dynamically; meaning that organizations were not able to superimpose a layer of information into their own picture (e.g., the Joint Traffic Control Centre could not see closed roads or evacuation routes). Sharing map layers between disparate systems should not be difficult, but the procedures for sharing this information have not yet been established between organizations relying on Geographic Information System systems.

Further to this, various maps of the contamination deposition pattern not only used different units of measure (e.g., mSv/wk versus  $\mu\text{Sv/hr}$ ) but also used the same colour for different information, which led to considerable confusion as users tried to compare the maps. In the Regional Municipality of Durham, the Regional Emergency Operations Centre uses the color codes established under the Provincial Nuclear Emergency Response Plan.

**SO33:** Fax transmittals of fixed monitoring readings from Ontario Power Generation to the Province are an ineffective and inefficient way of transmitting useful technical data. Although Ontario Power Generation has a network of online readings, they are not currently shared with Health Canada for use within the EMAP system. Data provided by Ontario Power Generation must be manually entered by the Science Section for Provincial Emergency Operations Centre command to consider measurements from the field. This is a time-consuming procedure that could lead to errors or omissions of data once entered. At present Ontario Power Generation does not transfer data directly, which could result in response delays. The Ontario Power Generation process for validating data was also slow during the exercise.

**OI2 Recommendation:** There is a need to develop a joint Concept of Operations for all applicable organizations that delineates survey and assessment roles and responsibilities during each phase of the emergency (pre-release, ongoing release, and post release). This Concept of Operations must include the definition of joint and interoperable data collection, methods of display, reporting, units, formats, and analysis methodology. The strategy must also define the command and control structure for survey effectiveness and safety (e.g., 'As Low as Reasonably Achievable' principle) of all personnel deployed in a potentially contaminated area. The Concept of Operations must also delineate which organizations will respond during each phase (i.e., pre-release, ongoing release, post release, etc.) of the emergency, their readiness posture, available resources, capabilities, data collection procedures and interoperability plan. Guidance on how to deal with the discrepancies between different measurement systems when making protective action decisions is also required.

### 4.3.3 Public Communications

The evaluation of public communication coordination focused on three response objectives that included the consistency of messaging, addressing the media, and managing concerns from the public.

#### Media products are consistent across all organizations

Organizations that have a role in public communications were evaluated on their ability to coordinate useful, timely, accurate, and consistent information to the public. The evaluation examined the ability of an organization to prepare material used to provide advice in advance with the ability to revise the information before release. Further to this, the content of the messages was examined for the quality of instruction provided to the public and the provision of additional sources of information identified within the messages.

#### **General Observations**

Overall, public communication was excellent across most organizations. Media products were remarkably consistent, due in large part to the coordination effort of the communications representatives that were tasked with public messaging. Many organizations handled media and public queries with brevity, accuracy, and

professionalism in an impressive manner. Some organizations practiced new procedures and determined that embedding communicators with technical personnel proved to be beneficial for producing their own communications products (e.g., Ontario Power Generation had communication advisors within the Site Management Centre, Technical Assessment Group provided support to communications, etc.). It must also be noted that not all response organizations provided communications products during the exercise.

Social media was also introduced on a scale that has never been used before during a nuclear exercise in Canada. Organizations were able to monitor simulated social media sites in an interactive manner and many incorporated trending information into their own public messaging.

### Best Practice

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***BP6 – Coordination calls between organizations engaged in public communication and pre-scripted emergency bulletins are a best practice that should be formalized by all organizations.***

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**SO34:** The Public Safety Canada Communications Directorate conducted a total of seven Public Communication coordination calls with the Province, Ontario Power Generation, Regional Municipality of Durham, and other federal organizations. These calls were an excellent way to align messaging and ensure consistency in media releases across all organizations.

**SO35:** The Provincial Emergency Operations Centre used pre-scripted automated messaging for emergency bulletins that are issued to the public. These messages were pre-approved and served as an effective measure to alert the public in a timely manner.

### Opportunity for Improvement

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***OI3 – Emergency plans could benefit from additional clarity on the role of the Nuclear Power Plant in public messaging issued by the Province.***

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**SO36:** Participation in the public communication coordination calls could have been further improved if conflicts in scheduled operational cycles (across the participating organizations and jurisdictions) had been better coordinated.

**SO37:** Coordination of messaging between Ontario Power Generation and the Province was not always optimal. While there were discussions about the practicality of notifying the public of the potential for venting in the future, there was no official consensus reached. The Province subsequently issued a public message confirming that venting would occur however Ontario Power Generation was not notified in advance. Although there were no issues with the content, Ontario Power Generation would have benefited from advanced knowledge of the emergency bulletin.



**OI3 Recommendation:** Update or create processes for coordinating public communications between the Province and Ontario Power Generation when it relates to operational issues at the Nuclear Power Plant.

### **Media concerns are addressed and misinformation is corrected**

Organizations were evaluated on their ability to respond to requests from the media, which included protocols in place to monitor media outlets, correct any misinformation, and validate information that may affect public concern.

#### **General Observations**

In general, responses to media requests for information were managed well by most organizations. Misinformation presented in simulated news articles was often addressed and corrected promptly. Although not formally conducted, the Province did oblige a request to hold a press conference when pressed by the simulated media. Ontario Power Generation conducted one technical briefing for the benefit of local media at the Darlington Energy Complex and notionally conducted a second briefing at Ontario Power Generation's Corporate Media Desk.

A notional technical briefing was organized on Day 2 in Ottawa with participation from the Province of Ontario, Ontario Power Generation, the Health Canada/Public Health Agency Canada, the Canadian Nuclear Safety Commission, Natural Resources Canada, and Transport Canada. Another notional technical briefing took place on Day 3 at the Durham Region Media Conference Centre with participation from Durham Region, the Province of Ontario, Ontario Power Generation, the Health Canada/Public Health Agency Canada, and the Canadian Nuclear Safety Commission.

### **Response to concerns of the public are addressed**

Organizations were evaluated on their ability to monitor and address requests from the public in a timely, accurate, and coordinated manner.

#### **General Observations**

In general, public communications coordination between the participating organizations was well coordinated and resulted in consistent messages and media products. Concerns raised on social media were closely monitored and those organizations that manage their own social media accounts used social media effectively to respond directly to public concerns.

#### **Comments from Communications Focus Group**

While the Communications Focus Group agreed that the media products were generally very clear and concise, there appeared to be two primary themes that warrant mention. First, it was suggested that a central joint communications effort was needed to ensure that information being released was relevant, easy to read (i.e., some of the language used in public messaging was highly technical), and contained the requisite information.

Second, there were questions about why certain information was not included or consistent with other messages that were released. For example, maps that were included in media products were valuable sources of information; however, they were not of equal quality and usefulness. Additionally, there appeared to be an overall lack of information regarding Potassium Iodide pills; specifically, details were delayed and instructions were 'out of context' by the time they were received by the public.

It should be noted that Health Canada simulated posting information to its website before the planned release and this information may not have been accessible to the focus group for review.

### **Key Finding**

**KF8 - Messaging to the public needs to be simplified and should not increase public fear and anxiety.**

**SO38:** There was no reference directory or common package of terminology issued with press releases made available to the public to help clarify certain 'nuclear specific' references. Failure to understand even a small part of the message can often lead to confusion and a misunderstanding of the intended purpose of the information. Further to this, some communicators who are responsible for generating and delivering the messages to the public noted that at times, they did not fully understand the terminology themselves (e.g., controlled release, filtered versus unfiltered release, etc.).

**SO39:** Briefs provided to the public and media by Ontario Power Generation were considered too technical in nature and were missing the 'human' factor. These briefings are designed to provide situational awareness to the public in simple terms, and to instill confidence that the situation is under control.

Note: During the exercise, there were no briefings delivered by the more senior representatives (in particular public health spokespersons), as this was out of scope for those organizations during this exercise.

**SO40:** When the 'simulated' public called some organizations to request information about the accident, they were informed that messaging was not within their organization's mandate. Even if an organization does not have a primary responsibility to inform the public, they should have been able to direct the caller to the responsible agencies.

**KF8 Recommendation:** The joint communications coordination process tested during the exercise should be continued and enhanced to ensure messaging consistency and effectiveness. Once the process is finalized, material should be developed and training for communication staff responsible for messaging. Messaging should contain very simple descriptions of all terminology used in the media products in order to minimize confusion and anxiety to both the public and communicators alike. Developed material should focus primarily on what the potential impact is to the community rather than addressing the technical aspects of the emergency (e.g., reactor status, etc.). The process

should also delineate that for large scale events, senior level representatives (particularly senior health officials) should be more involved in the facilitation of the briefings to illustrate to the public that the authorities are compassionate and empathetic to the impact on society.

If an agency has the potential to receive phone calls during an emergency, an adequate response to members of the public should be scripted. For example, Employment and Social Development Canada is responsible for servicing a 24 hour information line (1-800-0-Canada) to Canadians during an emergency. When contacted during Exercise Unified Response, operators were prepared to provide instruction on protective measures and where individuals could go to obtain more information.

## 5. SUMMARY

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Exercise Unified Response was a full scale nuclear emergency at Darlington Nuclear Generating Station designed to assess the preparedness of the utility, Ontario Power Generation, government agencies, non-government agencies, and local communities to respond to a severe accident. The exercise consisted of a carefully constructed scenario involving a release that resulted in off-site consequences. Following an extensive planning and development process, the exercise was effectively executed and considered a success on many fronts.

Exercise Unified Response involved more than 2000 participants at every level of response from more than 50 organizations. The high level focus of Exercise Unified Response was to assess operational interoperability and coordination, transfer of scientific data, and public communications. All Tier One exercise objectives were effectively achieved while each organization was provided with the opportunity to meet their internal goals. Participating organizations were able to test response plans and strategic preparedness in response to a nuclear emergency as well as assess the communication and overall interoperability.

Exercise Unified Response had many benefits and best practices that should be discussed and included in future exercises and operations. It is recommended that a briefing package on Exercise Unified Response, as well as management action plans relevant to each organization's mandate, be developed to ensure key findings are not repeated and the benefits realized are not lost.

The findings in this report will require a collaborative approach to revise existing processes and plans or implement new solutions to further enhance interoperability. It will be the joint development of these improvements that will be the critical factor in their operational success.

In general, Exercise Unified Response was successful in providing maximum value to emergency response organizations at every level. Although issues were identified, organizations successfully demonstrated that their plans are sufficiently integrated to support an effective response to a severe accident.

During the conduct of Exercise Unified Response multiple response plans across a wide variety of organizations were tested. The following nuclear-related plans were tested and validated:

- the Provincial Nuclear Emergency Response Plan;
- the Provincial Implementing Plan for the Darlington Nuclear Generating Station;
- the Durham Region Nuclear Emergency Response Plan;
- the Durham Region Evacuation and Sheltering Plan;
- Ontario Power Generation's Consolidated Nuclear Emergency Plan; and
- the Federal Nuclear Emergency Plan.

The successful validation of the Federal Nuclear Emergency Plan was a key goal of Health Canada and the other Federal departments who have responsibilities under the Federal Nuclear Emergency Plan. Validation of the Federal Nuclear Emergency Plan

also included validation of the Ontario Annex, which details many of the cross jurisdictional functions addressed in this after action report.

Ontario Power Generation and all supporting partners took a bold step in conducting this severe accident exercise. In a building block approach to training and exercising, all lessons should be incorporated as applicable and this type of exercise should be conducted on a regular basis.

## ANNEX A: EXERCISE DESIGN

In addition to the lessons learned relevant to the evaluation criteria, the exercise also revealed best practices and deficiencies regarding the exercise design. Overall, the exercise design was effective and allowed organizations to achieve their objectives. Several aspects of design were highlighted as positive practices that enhanced player experience and optimized control functionality. The use of push-to-talk radios by controllers situated at key locations optimized situational awareness from a control perspective. It was also noted that the instant feedback of player action reflected in news articles and simulated TV news videos increased the realism and introduced a new element of player action consequence not normally experienced in an exercise. Overall, the use of the exercise website was considered a step in the right direction for future exercise design.

It should be noted that exercise design was not evaluated against any criteria; rather, observations have been made and annotated as either a 'BP' to highlight effective design methods to be carried forward, or 'SO' to identify some areas for improvement.

### Best Practice

- BP7:** The use of the exercise website, [www.responseready.ca](http://www.responseready.ca), to provide players with situational awareness displayed elements of best practice by allowing players to experience the media and social media components in a very realistic manner. The simulated social media sites 'Chatter' and 'Chatbook' were well received and used by some organizations to help manage their public communications during the exercise. While there were some limitations with the site, the introduction of social media on such an interactive level for emergency management was unique and allowed organizations to better understand the impact of social media during an emergency.
- BP8:** The use of defined governance, project charters, and intra-jurisdictional planning teams and conferences was effective in coordinating and planning across multiple organizations.

### Supporting Observation

- SO41:** While the website showed elements of best practice, there were some limitations that negatively impacted the exercise. Exercise planners did not anticipate the extremely high usage that occurred during the exercise window (i.e., from exercise players and non-exercise observers viewing website) which ultimately led to surge capacity and bandwidth issues. Although effective, the narrator component used by controllers as a tool to build a scenario timeline could be improved. The chat function for controllers to communicate in real-time was an excellent idea but requires improvement to allow greater traffic and improve usability. Although the simulated media sites were very realistic, the functionality was slightly different than real sites. Some topics on Chatter did not 'trend' as they would have in the real world of social media. Users had to 'like' everyone on Chatbook in order to see the communication that was posted.



**Recommendation:** Further development is required to refine the functionality of the website to ensure that the chat function and narrator tool serve their intended purpose. Further to this, the social media websites should be more aligned with the functionality of existing real world media sites to ensure consistency and minimize user issues during the exercise. Although it is hard to predict user activity, future planning should ensure that the exercise web site can handle very high volumes of traffic.

**SO42:** Media injects were regularly scheduled throughout the exercise (i.e. web news was hourly, radio was every two hours). It was noted that this set schedule led to some players delaying their actions and responses as there was more time than normal to react. Further to this, some organizations delayed their communications responses as they were waiting to see postings on the website before acting. The predictability of simulated media was an exercise artificiality that influenced player action and delayed actual response.

**Recommendation:** Planners are advised to mix up the schedule of simulated media injects that include both regularly scheduled and random timings to ensure that players do not become complacent in their approach to public communications.

**SO43:** The technical scenario had been designed to work around known limitations of the Emergency Response Projection software in regards to modelling of Beyond Design Basis Events while at the same time meet the specific goals of the Scientific Section at the Provincial Emergency Operations Centre. However, during the second day of the exercise, it became apparent that the technical scenario did not meet the goals of the Technical Support Group at the Corporate Emergency Operations Facility, and the technical analysts at the Canadian Nuclear Safety Commission. For example, based on the data provided, the players at Ontario Power Generation's Technical Support Group came up with three potential scenario evolutions, none of which corresponded to the technical scenario given to the Scientific Section. As a result, the controllers at the Corporate Emergency Operations Facility had to intervene to keep the scenario on track.

**Recommendation:** The needs of each of the groups involved in technical assessment should be considered in the development of technical scenario data.

**SO44:** As with many exercises under such time constraints, staging was required to ensure a timely response. The pre-deployment of certain organizations resulted in an unrealistic arrival time at certain exercise locations (e.g. AMEC arrived at the Provincial Emergency Operations Centre too soon). It appeared that some organizations did not wait to receive the proper notification before deploying resources which creates confusion and exercise artificiality. Some organizations that were pre-deployed responded in a phase of the emergency that may not normally be possible. While pre-deployment may be unavoidable during an exercise, it must be done as realistically as possible and in accordance with plans and procedures.

**Recommendation:** Exercise artificiality can be better managed by ensuring that organizations understand the impacts of real deployment versus pre-deployment on exercise participants. Planners must make certain that different organizations are playing with the same expectations and are not to show up at an exercise site until proper notification has been received and the arrival is conducive to a more realistic response time. A more measured and controlled approach involving a staggered arrival of organizations may be a more efficient way of managing exercise play. Should similar circumstances present themselves during future exercises, ground rules must be relayed to all participants with respect to staging and communications.

**SO45:** Attempts to engage senior level participation within some organizations during the exercise was excellent, while for others it could have been improved. The importance of senior level involvement during this type of full-scale exercise is critical to ensuring its success. Further to this, the creation of a steering committee was a practical method of ensuring senior level engagement but could have been done earlier in the planning process.

**Recommendation:** Engage senior officials early and often to ensure awareness and commitment of their department to the exercise.

**SO46:** Several of the provincial requests for federal assistance did not result in the desired level of senior level discussion and action that was anticipated. Further to this, attempts to drive the decision to conduct a press conference were only partially successful. Despite the discussions and coordination that took place to prepare for a press conference, it was never implemented. Had the requirement to conduct a press conference with briefings from senior officials been agreed upon beforehand, this would have increased the likelihood of realization.

**Recommendation:** Exercise planners must ensure that there is a thorough understanding of the criteria that is required to engage senior level participation in an exercise. All triggers must be identified in advance and built into the scenario to ensure that player action is optimized.

**SO47:** While the workshops were considered highly beneficial for planners throughout the development process of the exercise, it was noted that the participation and preparation of relevant organizations need greater attention to address both exercise artificialities and expected information flow and decision making needs. Shortcomings from the Command and Control Workshop (#1), as well as the technical data sharing workshop (#2), led to the need for the additional dose assessment workshop, as well as the issues that arose between Canadian Nuclear Safety Commission and Ontario Power Generation during the exercise itself (i.e., regarding the need for the release).

**Recommendation:** Planning workshops must thoroughly consider the needs of each of the groups involved in technical assessment throughout the development of technical scenario data. Limitations of tools that model Beyond

Design Basis Accidents (e.g., Emergency Response Projection code) should not impair the ability of each group to achieve its objectives.

## ANNEX B: EVALUATION CRITERIA

This annex provides specific descriptions that support the criteria used by the evaluators while evaluating the exercise.

### A. Operational Interoperability, Coordination, and Integration

This interoperability area is divided into two response objectives (A1 and A2) and associated evaluation criteria as follows:

- Establish emergency response organizations; and
- Protect the public and emergency workers.

#### A1. ESTABLISH EMERGENCY RESPONSE ORGANIZATIONS TO:

- Ensure that response agencies are notified of an event and are activated to the appropriate level; and
- Ensure that emergency response operations are coordinated.

##### A1.1 Ensure that response agencies are notified and are activated to the appropriate level for all stages of the event.

- *Organizations with the responsibility to notify external response agencies do so in accordance with their plans and procedures.*
- *Communication methods should be redundant and not susceptible to a single point of failure.*
- *Changes in the event that may require a change in readiness or activation are communicated to external organizations.*

##### A1.2 Ensure emergency response operations are coordinated.

- a. Emergency response is managed in co-ordination with all applicable response organizations.
  - *(e.g., co-ordination of the emergency responses of all off-site response organizations aligns with the on-site response).*
  - *Once initiated, the coordination between response organizations is maintained such that response efforts are efficient and effective, with a minimum of wasted resources.*
  - *Inter-organizational liaison officers are dispatched and available (as applicable) in accordance with plans and procedures.*
- b. Response efforts from all organizations responding within a controlled area are coordinated between all responding agencies.
  - *Response efforts between disparate organizations are coordinated to maximize response effectiveness. Multiple response organizations may have similar capabilities and capacities. Their response efforts should be complimentary and maximize the resources and personnel available during the response.*

#### A2. PROTECT THE PUBLIC AND EMERGENCY WORKERS BY:

- Taking urgent protective actions to protect the public;
- Providing emergency workers with the appropriate means and methods to ensure their safety;
- Maintaining situational awareness during the event and modifying protective actions as required; and
- Minimizing the psycho-social impacts of the event on the general population and emergency workers.

## **A2.1 Take urgent protective actions to protect the public.**

- a. Response Organizations coordinate their efforts and take all appropriate measures to save lives and reduce health effects.
  - *Officials, who are responsible for making decisions on protective actions for the population, make such decisions promptly upon the notification of a radiation emergency. Protective actions should be recommended immediately upon declaration that a specific classification of emergency has been made and revised on the basis of later monitoring.*
- b. The off-site hazard is continuously assessed and communicated to inform decision makers.
  - *Reports between response organizations are transmitted and received in accordance with emergency plans.*
- c. Take urgent protective actions to avoid deterministic health effects and avert doses.
  - *Make use of the existing public infrastructure to limit deterministic health effects and avert doses.*
  - *Protective actions are initiated using existing public infrastructure (e.g. public loudspeakers), buildings, etc., are utilized to best avert dose (e.g. shelter in schools).*
  - *All potential sources of radiological information are assessed (e.g. fixed detector networks in the vicinity of the power plant).*
  - *Relevant jurisdictions take appropriate urgent protective actions and communicate them promptly upon the categorization of a nuclear emergency. This might include:*
    - *Communicating appropriate actions for protecting emergency workers;*
    - *Alerting permanent, transient and special population groups or those responsible for them;*
    - *Taking urgent protective actions;*
    - *protecting sources of food and water;*
    - *Imposing restrictions on immediate consumption of produce from farms or gardens and of locally produced milk;*
    - *Monitoring and decontaminating evacuees;*
    - *Caring for evacuees;*
    - *Arranging for special facilities; and*
    - *Controlling access to and restricting traffic by road, air, water, and rail.*
- d. Make and effectively implement decisions on urgent off-site protective actions.

- *Radiological surveys conducted off-site are factored into the decisions for urgent protective actions. Survey results are communicated in a timely and effective manner.*
- *Based on gamma survey results or other information available, affected zones outside the contiguous zone are evacuated in a timely manner (as required) and as required by the province's Protective Action Levels for evacuation.*
- *The authorization to take stable iodine is communicated to all responders, at all levels, in a timely manner.*

**A2.2 Provide emergency workers with the appropriate means and methods to ensure their safety.**

- a. An emergency centre is established for the command and control of operations within the identified restricted access zones.
  - *All response organizations responding within the emergency zones are represented in the emergency centre or provided with the means for ongoing co-ordination with that centre.*
- b. Designate as emergency workers those who may undertake an intervention in order to:
  - Save lives or prevent serious injury to include doses that could cause severe deterministic health effects;
  - Take action to avert a large collective dose; or
  - Take action to prevent the development of catastrophic conditions.

**A2.3 Maintain situational awareness during the event and modify protective actions as required.**

- a. All applicable organizations understand the radiological threat and have up-to-date situational awareness on the overall event. Radiation monitoring and environmental sampling data are effectively used in the organization's decision making process and is communicated as applicable to other organizations.
- b. All response organizations have a clear understanding of the situation at the affected NPP.
- c. All response organizations have a clear understanding of the response actions recommended, taken, by relevant response organizations.
- d. Take agricultural countermeasures and longer-term protective actions.



#### **A2.4 Minimize the psycho-social impacts of the event on the general population and emergency workers.**

- a. All levels of government, with a responsibility for public health messaging, respond to public concern, anxiety and distress to an actual or perceived radiation emergency.
  - *Explain any health risks and appropriate and inappropriate personal actions for reducing risks, in accordance with provincial and federal guidance (where applicable):*
    - *To monitor for and respond to any related health effects;*
    - *To counter inappropriate or unwarranted reactions on the part of workers and the public;*
    - *To designate organization(s) with the responsibility for identifying the reasons for such actions (such as misinformation obtained from the media); and*
    - *To make recommendations on countering them.*
  - *Identify the organization(s) with the responsibility for identifying causes of these reactions (e.g. misinformation or unrealistic fears) and for making recommendations on their mitigation and detail how these recommendations will be incorporated into the response. Unwarranted reactions include shunning of potentially exposed people, spontaneous evacuations, hoarding, or unwarranted terminations of pregnancy.*

## **B. SCIENTIFIC/TECHNICAL DATA SHARING**

This interoperability area is divided into three response objectives (B1 to B3) and associated evaluation criteria as follows:

- Scientific/technical information is transmitted and received between response organizations to inform decision making throughout the response;
- Emergency workers are protected from all hazards and their doses are kept as low as reasonably achievable (ALARA); and
- Data is available to make recommendations for the restriction of food stuff and water consumption as appropriate.

### **B1. Scientific/technical information is transmitted and received between response organizations to inform decision making throughout the response.**

- a. In accordance with internal plans and procedures, required reports are transmitted to applicable response organizations. The following reports are periodically transmitted to the appropriate authorities:
  - *Current Meteorological Data;*
  - *Meteorological Forecast;*
  - *Station Parameters;*
  - *Repressurization Time Information;*
  - *Source Term; and*

- *Off-Site Survey.*
- b. Technical information is shared between all response agencies with a role in modeling the release and/or analyzing the potential impacts of the release in accordance with national guidance.
- c. Transmission of technical information is not unduly delayed by communications failures.

**B2. Emergency workers are protected from all hazards and their doses are kept as low as reasonably achievable (ALARA).**

- a. The on-site and off-site hazards are monitored, assessed, and communicated to appropriate emergency workers.
  - *Information that may be critical to emergency workers' safety is passed through the chain of command in a timely manner and communicated to the emergency workers as appropriate.*
- b. The dose to emergency workers is kept as low as reasonably achievable.
  - *Emergency worker doses are monitored and stay times for specific tasks are considered.*

**B3. Data is available to make recommendations for the restriction of food stuff and water consumption as appropriate.**

- a. Radiological data collected by all field operatives, regardless of the employer, is communicated to all applicable response organizations.
  - *Radiological data will be used to determine a variety of protective actions. This information must reach the responsible authorities in order implement agricultural and longer-term protective actions and to keep the doses to the public as low as reasonable achievable.*

## **C. PUBLIC AFFAIRS COORDINATION**

This interoperability area is divided into three response objectives (C1 to C3) and associated evaluation criteria as follows:

- Media products are consistent across all response organizations;
- Media concerns and queries are addressed and misinformation in the media is corrected; and
- Response to concerns of the public are addressed quickly and accurately.

**C1. Media products are consistent across all response organizations.**

- a. All responsible organizations with a role in public affairs during a nuclear emergency response situation provide coordinated, useful, timely, truthful, consistent and appropriate information to the public.
  - *Upon declaration of an emergency or receipt of significant inquiries from the media concerning a possible emergency, arrange to immediately co-ordinate all information from sources viewed by the*

*public as official (governmental agencies and the facility). This should include arrangements:*

- To issue a press release identifying the agency that will be the official source of information;*
- To establish as soon as possible, a single official source; and*
- To remind other agencies to refer requests by the media for information to the designated agency.*
- The material used to provide advice to the public and address likely questions and concerns during an emergency is prepared in advance. During an emergency, arrangements should be made to revise this material before release.*
- The public is promptly provided with information on the risks and protective actions following warning of an emergency and again following issuance of protective action recommendations. Sources of additional information are identified in the instructions provided to the public. Information is provided to the public outside the emergency zones (outside the area where protective actions are being recommended) regarding what actions they should or should not take and the reasons why.*

**C2. Media concerns and queries are addressed and misinformation in the media is corrected.**

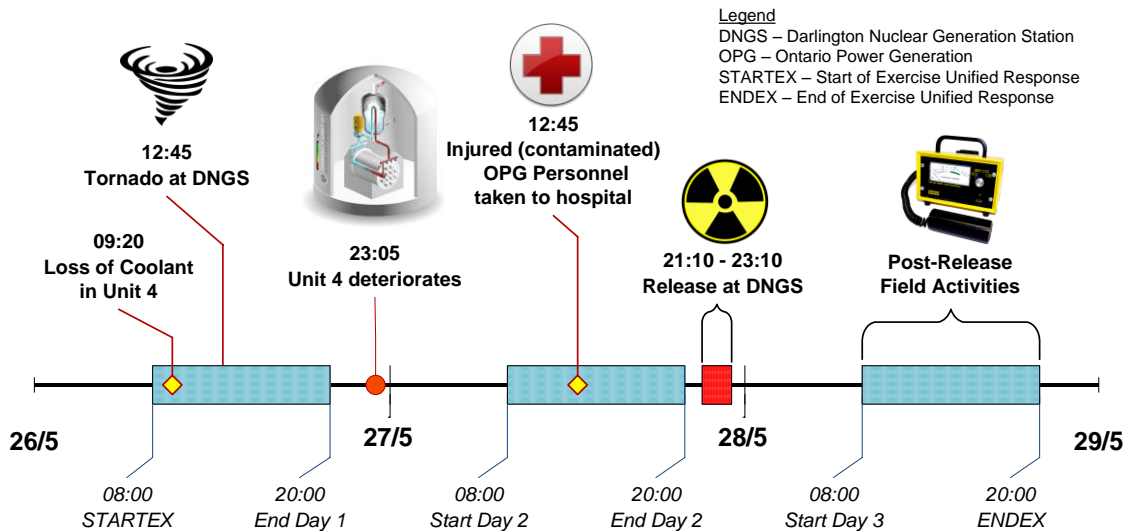
- a. Response to requests for information from news media is coordinated.
  - Media requests should be monitored and logged. Media should be directed to the appropriate organization if a subject falls outside of the mandate of the contacted organization.*
  - Media should be monitored for misinformation, and such information should be corrected at the earliest opportunity, by the organization that is responsible for the area in question.*
- b. Response organizations demonstrate that they have a means of validating information from the public and media.
  - Information that may affect public concern or response is validated prior to inclusion in press releases or emergency bulletins.*

**C3. Response to concerns of the public are addressed quickly and accurately.**

- a. Response to requests for information from the public is coordinated.
  - Requests from members of the public should be monitored and logged. Topics that appear to be of general concern should be identified and addressed in media releases, public announcements, etc.*
- b. Media and social media are monitored to determine areas of public concern.
  - Media information and social media that expresses public concern are monitored in order to promptly respond to misleading, inaccurate or confusing information.*
  - Inappropriate reactions by the public during an emergency are identified, a responsible agency (region, province, etc.) is identified to address the situation, and information is provided to the media to help address the area of concern.*

## ANNEX C: EXERCISE ACTIONS

The following section provides a more detailed summary of events and player actions for Exercise Unified Response. As shown in the main timeline of key events on Figure 6, the exercise was carried out over three days.



**Figure 6: Key Initiating Event Timings**

### Day 1 – General Summary

The initiating event was a simulated Loss of Coolant Accident on Unit 4. The event was initially categorized as an Abnormal Incident, and subsequently upgraded to an On-site Emergency once the Unit 4 source term data (the dose rates measured inside the plant) suggested fuel damage. Later in the morning, Darlington Nuclear Generating Station received a Severe Thunderstorm Watch, followed shortly thereafter by a Severe Thunderstorm Warning issued by Environment Canada for Durham Region. These weather bulletins identified the potential for severe thunderstorms, strong winds, and the possibility of isolated tornados.

At around noon, the exercise scenario introduced an isolated tornado that swept through the Darlington site. As a result, the Bowmanville Switchyard, Standby Generators, and Emergency Power Generators were all rendered unavailable, creating a total station-wide loss of power with no restoration in the foreseeable future. This scenario element was required to test the response of Ontario Power Generation to a multi-unit, severe accident.

The deployment of Emergency Mitigation Equipment on-site was initiated as a means of maintaining a suitable heat sink and enabling critical safety parameter monitoring. A total of four emergency pumps and one emergency generator were successfully deployed by the Emergency Response Team. By the end of exercise play on Day 1, a heat sink was re-established on all units and critical safety parameter monitoring was possible.

Within the Regional Municipality of Durham, the Regional Emergency Operations Centre was partially activated, enabling the enhanced monitoring of the tornado. This was followed by internal and external notifications. Communications were established and maintained both internally and externally. The public alerting auto-dialler was activated.

At the Provincial Emergency Operations Centre, internal and external notifications were conducted and the Centre went to partial activation. Efforts of the province focused on data collection, situational awareness and advanced planning to prepare for potential off-site impacts on the public and on organizations' operations. Limited international notification was also conducted (e.g., province to state level).

Within the Federal Government, personnel were notified of the situation through regular channels and some Operations Centres were activated. The Federal Nuclear Emergency Plan was raised to Level 2, and as a result, Federal liaison officers were deployed to the Provincial Emergency Operations Centre and to the Government Operations Centre. Operational links were established between the Federal Nuclear Emergency Plan Technical Assessment Group and the Provincial Emergency Operations Centre Science Section to facilitate overall situational awareness and to support decision-making. Efforts at the federal level, coordinated through the Government Operations Centre, focused on gathering information and producing a consolidated picture of events for partners and senior officials. Subject matter experts from a number of federal departments and agencies were called to the Government Operations Centre to provide specialized knowledge related to their respective mandates under a nuclear emergency. International notifications were sent to the International Atomic Energy Agency and simulated notifications were sent to the United States. Efforts of all off-site authorities focused on data collection, situational awareness and advanced planning to prepare for potential off-site impacts on the public and on organizations' operations.

### **Simulated Scenario Events Overnight (Day 1)**

There was no actual exercise play during the #1 shift between Day 1 and Day 2. The plant conditions postulated in the exercise scenario were that Units 1, 2, and 3 remained stable. However, the situation on Unit 4 degraded overnight, with severe accident management guideline entry conditions being met as a result of a drop in moderator level and a degraded sub cooling margin. A strategy to connect emergency mitigation equipment to the Unit 4 moderator system was developed and successfully implemented.

The exercise scenario also postulated a Vacuum Building airlock seal failure which was identified and repaired by OPG Operators. This temporary seal failure resulted in a significant increase in Vacuum Building pressure resulting in containment being predicted to go positive at 2100h on Tuesday, May 27<sup>th</sup>, 2014.

As a result of the deteriorating conditions at the plant, the decision to deploy Federal field teams was injected by the controllers into the exercise events before the start of play on Day 2.

## Day 2 – General Summary

Based on the degrading situation at the nuclear power plant, both the Provincial Emergency Operations Centre and the Federal Nuclear Emergency Plan were raised to full activation on the morning of Day 2. After the declaration of a General Emergency by the Provincial Emergency Operations Centre Commander, the Province of Ontario focused on planning and implementing protective actions for the public. According to the provincial plan, upon declaration of a General Emergency, the contiguous zone (within 3 km of the plant) was to be automatically evacuated. Further evacuation or sheltering in adjacent sectors was recommended since the calculated projected dose exceeded pre-determined Protective Action Levels. Also within the provincial government, the Ministry of Health and Long Term Care considered and ordered stable iodine distribution to the population (in the form of potassium iodide pills).

The Provincial Emergency Operations Centre Scientific Section was routinely in contact with Ontario Power Generation's Corporate Emergency Off-site Facility to collect data on the state of the reactors. It also collected information from the Canadian Meteorological Centre and held discussions with the Regional Municipality of Durham for the implementation of evacuation orders within specific sectors.

On Day 2 the Regional Municipality of Durham activated the full public alerting system, sirens and telephone mass notifications, staff notification and activated the Regional Emergency Operations Centre. It also declared a regional emergency; monitored media and social media; issued media releases and tweets; implemented the Traffic Plan; activated the Regional Municipality of Durham Traffic Control Centre; simulated the evacuation of designated sectors; simulated the setup of reception and evacuee centres; and established communication and liaison with local municipalities. Within Durham Region, the Emergency Operations Centres for Clarington, Oshawa and Pickering were also established.

Ontario's Emergency Medical Assistance Team set up a mobile hospital at Lakeridge Health Hospital Bowmanville to assist with the worried well, who were actors portraying local residents concerned about being contaminated but who were otherwise not at risk. Simulated media coverage at the hospital, calls, and emails from concerned citizens were received throughout the day.

The Federal Nuclear Emergency Plan Technical Assessment Group provided updated assessments to the Science Section and the Government Operations Centre. Following a formal request from the Science Section to the Federal Nuclear Emergency Plan Technical Assessment Group, the field component of the Environment Radiation Assurance Monitoring Group was activated and mobilised at the Emergency Workers Centre in the municipality of Orono. The field team focused their efforts on set-up and preparing for post-release data collection from within potentially contaminated zones, and the provision of situational awareness to the Province. As part of that team, and at the request of the Provincial Emergency Operations Centre, National Resources Canada conducted pre-release aerial surveillance of the potentially impacted areas (based on modelling outputs) and this information was provided to the Province.

At the federal level, strategic level planning for the anticipated release was ongoing at the Government Operations Centre, in consideration of the scientific information being



provided through the Federal Nuclear Emergency Plan Technical Assessment Group. There were several senior official calls at the Director General and Assistant Deputy Minister levels to share information and coordinate ongoing response activities. Potential and actual requests for assistance from the Province were being planned for and coordinated at the federal level.

All levels of government and Ontario Power Generation were involved in coordinating, producing, and distributing public messaging, which was reflected on the exercise website.

### **Simulated Scenario Events Overnight (Day 2)**

There was no exercise play during the #1 shift between Day 2 and Day 3. However the exercise scenario postulated that another Vacuum Building seal failure occurred, resulting in a simulated release to the environment once containment pressure went positive at around 2100h.

Two hours after the release started the return of emergency power allowed the Vacuum Building pressure to return to sub-atmospheric and this, along with the repair of the airlock seal, resulted in the end of the release.

### **Day 3 – General Summary**

On Day 3, the Regional Municipality of Durham established and opened the Emergency Workers Centre to process emergency workers entering and exiting the controlled zones. The Emergency Worker Centre was managed by the Durham Regional Police Service, with the support of personnel from Ontario Power Generation. All emergency workers who needed to enter a controlled sector had to report to the Emergency Worker Centre, where they were provided with radiation detection instruments (for Yellow and Red zones) and were briefed on the precautions they had to observe and the time limit for their stay in the sector. At the end of their work in the controlled sectors, the emergency workers returned to the Emergency Worker Centre for contamination control and dosimetry.

The Provincial and Federal governments coordinated the deployment of their survey teams, through the Environmental Radiation and Assurance Monitoring Group, to conduct assurance monitoring in areas where the public would be allowed to return after the evacuation. The Environmental Radiation and Assurance Monitoring Group (co-led by Ministry of Labour and Health Canada) field teams conducted ground surveys to establish safe areas where Ministry of Environment and Ontario Ministry of Agriculture and Food took water samples. They also conducted airborne and ground sampling. Vehicles with gamma survey equipment were directed in sectors that were potentially affected by the release. The Environmental Radiation and Assurance Monitoring Group field teams, including Health Canada's mobile laboratories, were deployed to take in-situ measurements of ground contamination.

Federal Operations during Day 3 focused on post-release data collection, maintaining situational awareness in coordination with the province, and responding to requests for information and assistance (e.g., provision of dosimeters). Response actions on Day 3 also turned towards early recovery efforts and anticipating, at the strategic level, the

federal activities that could be involved in the post-release phase of the emergency. The Canadian Nuclear Safety Commission maintained communications with international partners, in accordance to their internal plans.