

# CHAPTER 13

## EMERGENCY PLANNING

### INTRODUCTION

Every large industrial installation requires contingency plans and procedures to protect its people and equipment from the effects of any emergency that may arise. Point Lepreau is no different. There is a lot of expensive equipment around and there are a lot of different ways that people could be injured while working around this machinery.

In addition to the normal industrial hazards, a nuclear generating station also has the presence of radiation as a complicating factor. Fighting a fire can be unpleasant enough. But what if the smoke is radioactive? A broken leg can be traumatic if it happens to be yours. However, you want to be sure that the hospital will still accept you as a patient when they find out that your leg is also contaminated.

Because of the special nature of nuclear generating stations, our operating licence requires that our emergency plans ensure the safety of the general public in addition to protecting the station and its staff. This implies that, should releases of radioactive material to the environment occur, we must be able to identify quickly any off-site areas that have become contaminated, so that we can promptly notify the relevant public authorities.

The only nuclear power accident that has caused direct fatalities due to radiation is the Chernobyl accident. It occurred in the Soviet Union on April 26, 1986. In this catastrophic accident, 31 fire-fighters or plant workers were killed: 29 of them died from radiation injuries they received while fire-fighting amidst fuel fragments ejected from the reactor core. Contamination was widespread in a 30 km radius around the station, and contingency plans were required to cover everything from evacuation to restricting food consumption.

### TIMING

Experience indicates that emergencies often occur at inconvenient times. The five serious reactor accidents listed in Table 13.1 bear this out

TABLE 13.1. TIMES OF REACTOR ACCIDENTS

Windscale, UK	19:25	Monday	October 7, 1957
SL-1, Idaho, USA	21:01	Monday	January 3, 1961
Browns Ferry, Alabama, USA	00:20	Saturday	March 22, 1975
Three Mile Island, PA, USA	04:00	Wednesday	March 28, 1979
Chernobyl, Soviet Union	01:26	Saturday	April 26, 1986

This means that those people most expert at dealing with the emergency may well be absent. For us, it means that our emergency plans have to be workable even during off-shifts when we have relatively few people on site. During an emergency, a lot of things need to be done at the same time and there will be little time for sitting down and thinking about what to do. Without advance emergency plans, it is certain that important details will be overlooked.

## POINT LEPREAU EMERGENCY PLANS

The emergency plan for Point Lepreau G.S. is called the **Point Lepreau G.S. On-Site Contingency Plan**. It consists of a "mother document" outlining the Station responses common to any emergency and appendices that contain the specific plans for particular types of contingency. These specific plans are:

<b>Radiation Plan</b>	<b>Chemical Plan</b>
<b>Medical Plan</b>	<b>Security Plan</b>
<b>Fire Plan</b>	

We'll go into a little detail about these plans in a while, after we've explained some basics.

## EMERGENCY PLANNING GROUP

The Emergency Planning (EP) group in the Health Physics Department administers the emergency plans. The EP group has no direct role in any emergency response; all its responsibilities are confined to administration, support, and co-ordination. The EP group oversees all aspects of the plan, including both the on-site and off-site aspects.

The EP group has four primary roles:

- produce and maintain EP procedures,
- liaise with outside emergency response agencies, such as The New Brunswick Emergency Measures Organisation (NBEMO), Saint John Regional Hospital, Saint John and Musquash Fire Departments, etc.,
- train emergency responders\*),
- develop EP exercises and conduct practice drills.

Legal obligation aside, the first three items are primarily intended to support the fourth.



*Fig. 13.1. Provincial Emergency Operations Centre in Fredericton (PEOC)*

\*) and not just them. I would like to add here that Rick Butland, a member of the EP group, put most of this chapter together for you. His other claim to fame is that he has a very impressive selection of CDs that not even your dog would want to listen to.

Only by putting our emergency responders through exercises and drills can we test them under realistic conditions. Exercises are also an invaluable way to reveal procedural and training deficiencies. If you are asked to take part in a drill, please take it seriously.

**Emergency Exercises don't delay work, they *are* work.**

## THE RESPONSE TEAM

The Duty Shift Supervisor has the ultimate authority and responsibility for the response to any emergency that arises. Because this response has to be forthcoming at any time of the day or night, the initial organised reaction to an emergency has to come from the Duty Shift.

To make this happen, we have organised part of each shift crew into a group known as the **Response Team**, which is made up of a minimum of seven people. There is the Response Team Leader (RTL), usually the Field Senior Operator, and six members drawn from shift Operations, EI&C, Mechanical Maintenance, and Chemistry. Those six must include the following qualifications:

- five fire fighting qualified,
- four advanced chemical qualified,
- two First-Aid qualified to the First Responder level.

In addition, virtually all shift staff receive training above the normal Radiation Protection Courses so that they can respond to any Radiation contingency.

The training regimen for a Response Team member is quite intense. It includes annual live fire training using the props on the PLGS firegrounds, and quarterly classroom sessions on fire fighting topics. The fitness requirements decreed by NFPA 600 (the document dealing with industrial fire brigades that is cited in the Occupational Health And Safety Act) are unquestionably rigorous, dealing with both type and amount of training and fitness for duty.



*Fig. 13.2. Fire-Fighting Training*

Response Team members must re-qualify every two years to be authorised for Chemical duties and First Aid training is done on a quarterly refresher basis after initial qualification. The Response Team, with the aid of the individual plan-holders, also exercises one of the contingency plans a minimum of once per six-week shift cycle. This means that they have at least two exercises of each type per year. Normally, exercises are run more often than that to allow us to train with outside agencies such as the local fire departments.

The EP group also runs exercises and conducts independent training with the Saint John Regional Hospital ER staff and local ambulance staff.

When an incident is called in to **222**, the Work Control Area Operator records the information, gives immediate instructions to the caller as necessary, and relays the information to the Shift Supervisor. He, usually in consultation with the Control Room Operator, (CRO),

decides whether to call an **Alert** or an **Emergency**. The CRO will then make an announcement stating the type of incident and directing the Response Team to the appropriate area. The CRO will also inform plant staff of areas and actions to avoid.

**If you come across any type of emergency situation, immediately call 222 on any plant phone.**

## ALERT AND EMERGENCY ALARMS

There are two different alarms that can be sounded at Point Lepreau G.S., and be heard throughout the Station. Either alarm will be followed by a P.A. announcement telling you what to do.

- 1) The **ALERT** alarm is usually called when the danger is confined to a small area or only one or two people are hurt. There is no threat to the public or the station.
- 2) If there is a hazard over a large area, or if it has the potential to spread throughout the station or off-site (i.e., affect the public), or several people are hurt, then the Shift Supervisor will likely call an **EMERGENCY**.

Table 13.2 summarises the types of Alerts that have occurred at PLGS in the past. We've never declared an Emergency. Roughly 75 % of Alerts occurred on the #2 shift. (Individual entries total more than 75 due to multiple response alerts such as Medical/Chemical and Fire/Medical.) Medical Alerts have ranged from cut thumbs to a fatal heart attack.

TABLE 13.2. SUMMARY OF  
ALERTS FROM 1985 - 2000

<i>Type</i>	<i>Number</i>
Medical	46
Fire	15
Chemical	13
Security	4
Radiation	1

## Employee Actions during Alerts and Emergencies

### Alerts

The Alert signal is a continuous-tone siren. After sounding the Alert signal, the CRO will make an announcement declaring the type of Alert and give the Response Team directions on how and where to respond. He will also instruct station staff to avoid the incident area, stay out of elevators (in case they are needed by the Response Team), and not use the PA system. There are several reasons for not using the PA system during an incident:

- the Response Team may need it at a moment's notice to communicate,
- it distracts the Response Team,
- It may actually hinder them in responding. In past Medical Alerts, excessive PA use has made it difficult to obtain vital signs like pulse and blood pressure.

It is also important to keep in mind that areas other than the immediate incident area should be avoided. In a Fire Alert, the muster area (S/B, elevation 45', between Stores and the Crane Hall, see Fig. 13.3) will be busy, and the Chemical Contingency Area (S/B el. 45', between Stores and the ECC heat exchangers) will be hectic during a Chemical Alert.

If, for whatever reason, you come across the Response Team during an actual event or even an exercise, **leave the area immediately**, unless instructed otherwise by a Response Team member. If one of them tells you to do something, you should do it. You may be asked to carry equipment (extra hose or air bottles, for example) or direct traffic. You should comply even if it's an exercise and it interferes with your regular work. The EP group will handle any flack that's fired at you.



*Fig. 13.3. Fire Response Muster Area*

### Emergencies

The Emergency signal is a series of tone bursts (~ 3/second). When you hear the signal, you should at once put your work site into a safe condition and then report immediately to the nearest emergency station. Once there, you should card in at the EPAS\*) reader using your employee ID card and then report to your supervisor if he's at that station.



*Fig. 13.4. EPAS Reader*

The EPAS sends the data to the Security computer, which prints it out for Work Control. (There is also an EPAS card reader outside the R/T Muster Area on el. 45'. It accounts for R/T members while not delaying their response to any incident.)

**TABLE 13.3. EMERGENCY STATIONS**

<i>Location</i>	<i>Normal workgroups</i>
EI&C/HP Lab Hallway	FH, HP, EI&C, Chemistry
WCA Corridor	Shift
MM Shop	Mech. Maintenance
SM Shop	Service Maintenance
A/B Basement outside	A/B Basement and Annex
A/B Ground floor	A/B Ground floor
A/B Top floor	A/B Top floor

\*) EPAS = Electronic Personnel Accounting System

If it doesn't delay reporting to your emergency station, pick up any radiation meters that you may see along the way in case they are needed. **Keep quiet** at the Emergency Station and await instructions from the Emergency Station Leader (ESL). He\*) will canvas the crowd for car keys and assign people to vehicles in case evacuation is ordered. He will also delegate people to perform surveys and ensure that areas have been evacuated.

If no ESL shows up at the Emergency Station, then take the initiative and retrieve the procedure from the Emergency Station cabinet and fill the ESL role yourself.

It is important to also card in and out at the R/B airlocks. This allows the shift to determine immediately if any missing people are in the R/B once an emergency is declared. If anybody is missing the Shift Supervisor will then make a decision, based upon current conditions, about what type, if any, of search and rescue to perform. The only access to the R/B is via the airlocks. The ability to eliminate a difficult-to-access area makes his job a little bit easier — infinitely more so in an emergency if there is a major LOCA or if dousing has fired.



*Fig. 13.5. Emergency Station*

## THE PLANS

Now that you have a few clues about the alarm signals, and who is supposed to do what, we can discuss our five emergency plans mentioned on page 412. We'll leave the Radiation Plan till last.

### Security Plan

The Security Supervisor holds the security plan. It does not come under the direct control of the EP group, but both groups work closely together. The CNSC has some specific Security standards and conditions that we must meet. These requirements are confidential for the most part, so we couldn't provide you with details even if they were absolutely riveting.

### Fire Plan

The Fire Plan is fairly standard, and not that different from what any large industrial site such as Irving or McCain would have. We have to maintain certain standards as part of our license conditions, but generally those standards are determined by codes from organisations such as NFPA.

\*) I know and you know that "he" could be "she". I don't want to start writing "he/she", "his/hers" or even worse "their" when it's singular. Political correctness can be carried too far. As my old boss (the Oatmeal Savage) used to say, "man embraces woman".

We also have a contract with the Saint John Fire Department that ensures that they will respond to any fire that we have on-site. There is also an agreement in place with the Musquash Volunteer Fire Department. As soon as a fire alarm comes in, a call is made to the Saint John Fire Department. It is much easier to have them turn back than try to make up time lost while we're confirming whether an alarm was real or not. They train regularly with our Response Team members at the fire grounds and also take part in regular exercises on-site.

### Chemical Plan

We have some nasty chemicals on site, particularly chlorine. Inhalation of chlorine gas (50 ppm) can cause painful eye and throat irritation, a choking sensation, nausea, vomiting, shortness of breath, chest pain, and fluid in the lungs. Just a brief exposure to very high concentrations (1000 ppm) can kill you by suffocation within a few minutes. Nasty.

We need to be prepared to deal with hazards like this. Shown at right is one of the two types of fully encapsulating suits that we have for just such a purpose. The suits are worn with self-contained breathing apparatus as shown here. Supplies for dealing with chemical incidents are kept in cabinets at the Chemical Contingency Area.



*Fig. 13.6. Fully Encapsulating Suit*

### Medical Plans

Although we have very good First Aid people on the Response Teams, most of us unlucky enough to be injured at work would prefer a second opinion from a medical doctor. We have agreements in place with the local ambulance services and the Saint John Regional Hospital to make sure that they won't turn anyone away from our nasty nuclear station. (If you are going to be taken to the hospital in Browns, you will be escorted by a green-qualified person who will advise on any decontamination efforts.)

The EP staff holds regular training sessions with the ambulance and medical staff, and they also take part in some of our exercises. In fact, Rick tells me that the precautions they take for infectious diseases makes them better at contamination control than we are. And they are happy to be able to measure the contamination for a change.



*Fig. 13.7. Medical Drill*

## The Radiation Plan

The plan that comes most directly under CNSC control is, not surprisingly, the Radiation Plan. It is the most complex and the most stringently monitored and tested. In fact, it is the only one of the plans to have three levels instead of two. These levels are:

**Alert:** events involving an unknown or significant decrease in the level of protection of onsite personnel that may require an increase in the state of readiness or additional assessments. This includes:

1. Abnormal radiation conditions in the plant warranting immediate additional assistance. A large heavy water spill would be an example of this.
2. A potential or actual release resulting in dose rates exceeding  $1 \mu\text{Sv/h}$  within 1 km of the station.
3. Airborne releases exceeding 350% of the daily DEL or liquid releases exceeding 50% of the monthly DEL.

**Site Area Emergency:** events requiring actions to control the dose to onsite personnel and preparations to take protective actions offsite. This includes:

1. Conditions where any additional equipment failures could result in a major increase in the threat to the core or large amounts spent fuel. An example of this would be fuel stuck in the FM, unable to be discharged.
2. High doses on-site and releases off-site resulting in gamma dose rates (from the plume or deposition on the ground) exceeding  $10 \mu\text{Sv/h}$  at 1 km from the station.
3. Airborne releases exceeding 3500% daily DEL.

**General Emergency:** events resulting in actual or substantial risk of a release requiring implementation of urgent protection actions for the public (such as sheltering, evacuation, KI use), and dose control for onsite personnel. This includes:

1. Actual or projected damage to the core or large amounts of spent fuel.
2. Releases offsite resulting in dose rates from the plume or deposition exceeding  $1 \text{ mSv/h}$ .

Once something serious enough to prompt an emergency response happens, several things follow. The shift will initially follow their Emergency Operating Procedures (EOPs) or Abnormal Plant Operating Procedures (APOPs) to first handle the plant situation. Early on in those procedures, there are branch points that will force the Shift Supervisor to decide if any sort of emergency declaration should or must be made. The S/S may call an Alert or Emergency at any time, at his discretion, based upon plant conditions, the potential for them to change, and his thorough knowledge of the plant — the levels stated above are only when he *must* declare one.

Once he declares an Alert or Emergency, the Work Control Area Operator will man (person?) the Contingency Desk, becoming the Contingency Desk Operator (CDO). He will make notification calls as directed by the S/S, mobilising both PLGS and offsite emergency responders. He will also communicate with the two surveyors performing outside surveys in the



Emergency Vehicle (normally those two people will be assigned by the Response Team Leader, if the S/S decides he needs outside survey data). At the same time, a two-person team will perform a series of in-plant surveys as predetermined locations to give the SS a good idea of general plant radiation conditions and the condition of major systems. If an Emergency is declared, personnel accounting will take place automatically, via the EPAS system.



*Fig. 13.8. PLGS Emergency Vehicle*

Once the CDO makes the notification calls, several things start happening. NBEMO will start its fan-out calls and activate its Provincial Emergency Operations Centre (PEOC) in Fredericton. (We saw this in Fig. 13.1.)

*Some of things in the Emergency Vehicle:*  
 environmental gamma meter, air sampler and filters, bubbler, frisker, TLDs & DRDs, handheld radio, KI Pills, SCBAs, respirators, sample collection containers, maps, floodlights, shovels, blankets, Dispos, spare batteries, First Aid kits, oxygen bottle, stretcher, tools, slings, snatch block, wire cutters.

The Technical Advisory Group (TAG) will form. The TAG is made up of senior PLGS station staff. They provide the S/S with support, and the majority of concerns that don't relate directly to the reactor core are offloaded to them, allowing the S/S and his duty shift to concentrate on the most urgent matters at hand. The TAG will deal with items like relief staff, procuring equipment and external expertise as required, staff safety, etc. (The TAG can be activated for any emergency support function, radiation or otherwise.)

As well, the Offsite Emergency Centre is activated. This magnificent building is shown at right. Trained PLGS employees will report there and will begin environmental surveys to provide the EOC staff in Fredericton with survey data, so that they can make informed decisions on evacuation, sheltering, etc.



*Fig. 13.9. The OEC (May 2001)*

The Lepreau Wardens and RCMP will also operate out of the OEC, assisting with notifications and providing security such as roadblocks. PLGS staff will also assist at roadblocks, dispensing and collecting dosimetry and monitoring people and vehicles. The OEC is located approximately 1.5 km south of Highway #1.

NB Power head office staff (the Executive Advisory Group) will convene in order to provide assistance to both NBEMO and PLGS. Other NB Power staff will prepare and issue press releases in conjunction with Communication New Brunswick. Other government agencies such as the Department of the Environment, Department of Health, etc., also have roles.

The TAG and OEC areas also have administrative support staff assigned to them to provide support functions such as information flow, minute recording, and log keeping.

## EXERCISES

There are several reasons to exercise our plans. Our responders need to practice their duties so that they are familiar with them should they ever have to respond for real. This is the reason that we attempt to exercise as close to reality as we can. There's little value in responding one way in an exercise and another in a real event. Unfortunately, we must sometimes make allowances in our exercises due to safety and monetary matters. We are not going to send someone into a high radiation field in an exercise because it wouldn't be ALARA. We must also make compromises due to production concerns – we don't want to shut down the plant because of an exercise.

We also must exercise to demonstrate to outside agencies such as the CNSC, WANO, INPO, etc., that we can respond properly to events. This is the other side of the coin – if we don't exercise our plans properly we will be shut down.

Finally, we exercise our plans to expose flaws in our procedures and plans in order to improve them. Obviously, it's much better to fail in an exercise than a real event.

Each six-week shift cycle has a series of emergency exercises associated with it. Each plan (excluding Security) gets exercised twice per year, for a total of eight exercises per crew per year. Additionally, we intend to exercise the TAG team quarterly, and our OEC surveyors annually. We also schedule regular EPAS accounting exercises for all plant staff.

Testing the individual components of our plan is very useful and important, but doesn't give us the whole picture. All the components can work in isolation, but the overall plan can be ineffective because of the way in which they interact. We must test our entire plan to ensure that all aspects of it mesh in the way they were intended. Think of it as taking that car down off the rack and out onto the track after you've bench tested the motor, fixed the brakes, aligned the wheels, etc. So, every three years we have a large-scale exercise that includes NB Power staff, NBEMO, the RCMP, Saint John Regional Hospital, Saint John and Musquash Fire Departments, and local EMO Wardens, among others, and even some members of the public.



*Fig. 13.10. One of our Shifties in a Control Room Drill*

## SUMMARY

All nuclear generating stations have emergency plans. The emergency plans for Point Lepreau are described in a document called "Point Lepreau G.S. On-Site Contingency Plan". It contains five specific plans for dealing with radiation, fire, medical, chemical, and security contingencies.

Part of the duty shift forms a Response Team to provide the first organised reaction to any contingency.

During an ALERT (continuous-tone signal) only the Response Team responds. Stay out of the area.

During an EMERGENCY (tone-burst signal), go to your Emergency Station, check in at the EPAS Reader, and wait for instructions from the Emergency Station Leader.

Once the OEC is manned, the OEC Co-ordinator directs all off-site emergency responses carried out by station staff. He deals with the duty Shift Supervisor and all external agencies.

Exercises and drills are a major part of our emergency planning. If you are asked to participate in them, take them seriously.



