CANADIAN ENVIRONMENTAL LAW ASSOCIATION
L'ASSOCIATION CANADIENNE DU DROIT DE L'ENVIRONNEMENT

Mr. Andrew McAllister
Environmental Assessment Specialist
Environmental Assessment Division Directorate of
Environmental and Radiation Protection and Assessment
Canadian Nuclear Safety Commission
P.O. Box 1046, Station B Ottawa, ON
K1P 5S9

(Phone: 1-800-668-5284 Fax: 613-995-5086)

Email: EA@cnsc-ccsn.gc.ca

Sent By Email

July 18, 2012

Re: Request for Public Comment: Draft Environmental Assessment Screening Report – Refurbishment and Continued Operation of the Darlington Nuclear Generating Station

Comments Due July 18, 2012

Dear Mr. McAllister:

Please find attached the submission of the Canadian Environmental Law Association in respect of comments on the Draft Environmental Assessment Screening Report – Refurbishment and Continued Operation of the Darlington Nuclear Generating Station.

These comments deal expressly with emergency planning issues arising in relation to the refurbishment and continued operation project. They are a duplicate of comments we prepared to assist Durham Nuclear Awareness with responding to the Request for Public Comment on the Draft Screening Report on this project and are being submitted separately by DNA as the DNA comments. They are also submitted as the comments of the Canadian Environmental Law Association by way of this letter.

CELA has also had a chance to review the submissions of Greenpeace and endorses their comments to be submitted by them today in response to the Draft Screening Report.

CELA plans to continue to participate in the EA of the Refurbishment and Continued Operation of the Darlington Nuclear Generating Station and reserves the right to make further comments on emergency planning or on any other issues after the Final Screening Report including but not limited to issues we raised in previous comments on the Draft Scoping Document.

CELA submits that the Draft Screening report is incomplete and inadequate and has failed to assess a large list of issues relevant to the EA and the requirements of the *Canadian Environmental Assessment Act* and in respect of the decisions that the Responsible Authorities will have to make. These issues are described in terms of emergency planning in the attached document. Other significant issues are described in the submission of Greenpeace and others will be enumerated in the submissions of other participants in this process. CELA submits that the Responsible Authorities are not in a position to conclude that the effects of the project are not significant; nor that they can be appropriately mitigated; nor that there will not be significant residual effects and cumulative effects from the project. CELA asks that the CNSC recommend to the Minister of Environment that this EA be elevated to a full panel review.

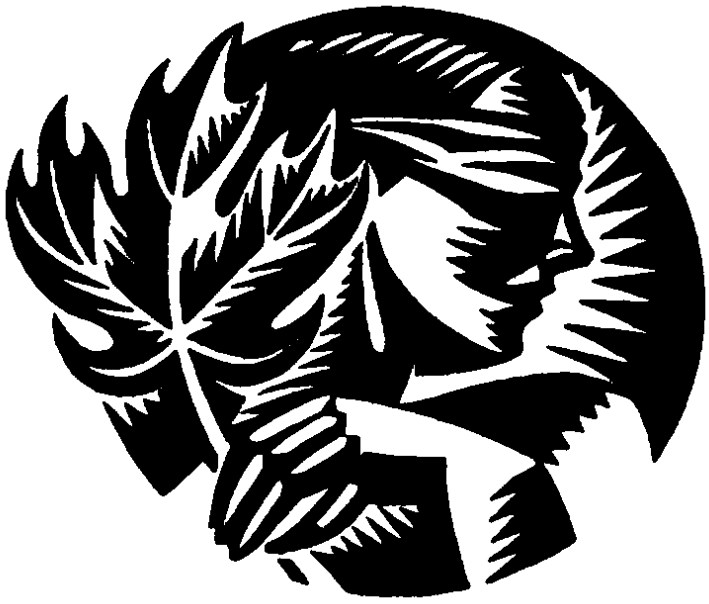
Yours very truly,

CANADIAN ENVIRONMENTAL LAW ASSOCIATION

Per
Theresa McClenaghan
Executive Director and Counsel

Emergency Planning at the Darlington Refurbishment

Comments of the Canadian Environmental Law Association to the Canadian Nuclear Safety Commission with respect to the Draft Screening Report: Consideration of Emergency Planning in the Darlington Refurbishment and Continued Operation Project



CANADIAN ENVIRONMENTAL LAW ASSOCIATION
Author: **Theresa McClenaghan**
Date: **July 18, 2012**

Table of Contents

This page intentionally left blank – Main Document numbering begins at following page

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
A	**EMERGENCY PLANNING, EMERGENCY RESPONSE AND EVACUATION**		
A.1	**COMMUNITY NOTIFICATION**		
A.1.a	**Questions and Concerns Relating to Notification of Vulnerable Communities in case of accidents**		
	In the case of the accident at Fukushima, there were significant difficulties in evacuation and communication with residences housing vulnerable communities within various distances of the plants.	There is no consideration in the draft screening report of the plans for communications to vulnerable communities such as seniors, schools, day-cares, hospitals, long term care homes, prisons and other vulnerable communities within any distance of the refurbished Darlington nuclear plant in the Draft Screening report. The specific provisions and capacity to care for vulnerable patients and others remaining behind who are not able to be evacuated due to their conditions	In the case of the accident at Fukushima, there were significant difficulties in evacuation and communication with residences housing vulnerable communities within various distances of the plants. Evacuation of these residents was difficult and in many cases there was no adequate medical or other care left with the residents who were not evacuated, or at emergency shelters. (GPI at 18) The Durham Region Nuclear Emergency Plan indicates that Durham Region must have arrangements for pickup of people without vehicles. (at 29) The draft screening report should review what these plans are, and whether they are

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
		should be explicitly reviewed in the Screening Report. Issues of training of care providers and assessment of consent and commitment of caregivers to remain behind to care for such patients should be explored given the experience at Fukushima where there was inadequate care for many such patients in the face of the hazard to caregivers who did not remain. (GPI at 18)	sufficient including consideration of availability of drivers and vehicles for the numbers of people who would need this assistance, including from schools, daycares hospitals, long term care facilities and other institutions. In particular, identification and training of those who would be expected to provide this transportation must be specified, and evaluated in the screening report as a critical aspect of the adequacy of the emergency planning. The Durham Region Nuclear Emergency Plan discusses generalized notification in a 3 to 10 km zone (beyond auditory notification within a 3 km zone) through media emergency bulletins. (at 28) As evidenced by the experience in other emergencies, specific consideration as to reaching seniors, disabled, rural, and vulnerable communities must be planned within the 10 km zone, as well as beyond this zone in the case of a broader evacuation. The Darlington Implementation Plan 2009 directs that "As it may not be possible or desirable to evacuate some of these persons, special arrangements shall be made for the care of staff/residents/patients remaining behind, as identified in the Municipal Plans." (at p. 48) However this direction is not reflected in the Durham Nuclear Emergency Response Plan 2011.
A.1.b	**Questions and Concerns Relating to general community notification as to accidents**		

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
A.1.b.i	In the case of the Walkerton drinking water tragedy, communication with residents in a timely way was a significant issue. In the case of the Fukushima tragedy, communication with affected community residents was lacking and confusing, and further hampered by simultaneous catastrophic events such as the earthquakes and following tsunamis. Will the community be notified door to door in case of a serious nuclear accident at Darlington?	There is no mention in the draft screening report of anything related to communication with surrounding residents in case of an accident. This is a critical issue as to which the RAs must be satisfied prior to proceeding to consider approval of the proposed Darlington refurbishment and continued operation.	Walkerton Inquiry chapter 8 at 261 ff The CNSC public meeting of March 2012 stated that at present not all notification requirements are met: `` The representative from EMO explained that, following the Fukushima nuclear accident, EMO undertook a review of municipal nuclear emergency response plans in Ontario. The EMO representative stated that EMO communicated the results of this review to the applicable municipalities in February 2012, and noted that while none of the municipalities are fully compliant with all of the requirements of the Provincial Nuclear Emergency Response Plan (PNERP), there is an effort underway to be compliant by the end of 2012.`` (at 43)  The Minutes further noted that the municipalities Durham Region are not even in compliance with the requirements for community alerting and notification required by the current provincial Nuclear Emergency Response Plans within 10 km of the plant: ``The Commission sought further information regarding the expected date for compliance with the requirements for public alerting in the ten kilometre zones in the Durham Region. The EMO representative responded that EMO is working with the municipalities in the ten kilometre zones to develop a plan to meet all requirements, and noted that the plan is expected to be completed by the end of 2012. The EMO representative noted that many public alerting measures are already in place in the ten-kilometre zones.

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
			CNSC staff stated that the focus in the short-term would be on meeting requirements for the three-kilometre zones, and noted that the municipalities would be developing a strategy for the ten-kilometre zones. CNSC staff stated that the measures currently in place for the ten-kilometre zones are acceptable until the more robust strategy is implemented.`` (at 43) http://www.cnsc-ccsn.gc.ca/eng/commission/pdf/2012-03-28-29-Minutes-e-Final-Edocs3932793.pdf http://nuclearsafety.gc.ca/eng/mediacentre/updates/2012/March-20-2012-spotlight-ontario.cfm Kurokawa, Fukushima Commission, at 19[1] The Fukushima Independent Commission stated, "Evacuation orders were repeatedly revised as the evacuation zones expanded from the original 3-kilometer

[1] The Fukushima Independent Commission stated in its Executive Summary that "The central government was not only slow in informing municipal governments about the nuclear power plant accident, but also failed to convey the severity of the accident. Similarly, the speed of information in the evacuation areas varied significantly depending on the distance from the plant. Specifically, only 20 percent of the residents of the town hosting the plant knew about the accident when evacuation from the 3km zone was ordered at 21:23 on the evening of March 11. Most residents within 10km of the plant learned about the accident when the evacuation order was issued at 5:44 on March 12, more than 12 hours after the Article 15 notification—but received no further explanation of the accident or evacuation directions. Many residents had to flee with only the barest necessities and were forced to move multiple times or to areas with high radiation levels. There was great confusion over the evacuation, caused by prolonged shelter-in-place orders and voluntary evacuation orders. Some residents were evacuated to high dosage areas because radiation monitoring information was not provided. Some people evacuated to areas with high levels of radiation and were then neglected, receiving no further evacuation orders until April. The Commission has verified that there was a lag in upgrading nuclear emergency preparedness and complex disaster countermeasures, and attributes this to regulators' negative attitudes toward revising and improving existing emergency plans." At 19

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
			radius to 10 kilometers and later, 20 kilometers, all in one day. Each time the evacuation zone expanded, the residents were required to relocate. Some evacuees were unaware that they had been relocated to sites with high levels of radiation. Hospitals and nursing homes in the 20-kilometer zone struggled to secure evacuation transportation and find accommodations; 60 patients died in March from complications related to the evacuation." (at 38) The Durham Region Nuclear Emergency Plan has an outline and charts as to notification protocols (at 37) but it is not possible to determine how quickly and how individually residents would be notified if they did not happen to be listening to broadcast media. As noted above, the sufficiency of broadcast media alerts cannot be presumed as was experienced during the events of the Walkerton drinking water tragedy in May 2000.
A.1.b.ii	How far from the Darlington station, if at all, will receive direct notification of an accident?	There is no evaluation in the screening report of anything related to community notification in case of a significant accident.	
A.1.b.iii	The Municipality of Clarington in its comments on the Scoping Document stated that "The Draft Scoping Document should be revised to require OPG to describe its communications and	Does the communications and consultation program deal adequately with emergency planning and emergency scenarios and notification? Does the communications and consultation program deal with prior notification to communities,	The CNSC staff stated in its disposition report, App D. that "Change made to the Scoping Information Document. Text added to Section 2.4 of the Scoping Information Document to describe requirements for OPG to report on their communication and consultation activities." The Fukushima Independent Commission found that there

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
	consultations program and to provide a summary of any issues or concerns identified by the public."	vulnerable community member residences, and advance preparation as to emergency planning scenarios? The screening report did not evaluate these issues and should do so. Are there measures in place in order to promptly communicate differences in risk to various members of the community in the event of a large scale offsite nuclear accident at the refurbished Darlington plant? The draft screening report did not review or evaluate these issues and should do so as well.	had and has been a failure following the accident to communicate differences in risk and vulnerability to radiation of different segments of the population such as infants and youth, expecting mothers, and others particularly susceptible to the effects of radiation. (At 20)
A.2	**SHELTER IN PLACE DIRECTIONS**		
A.2.a	**Questions and Concerns Relating to "Shelter in Place" directions**	What "sheltering in place" protocols are there in case of a serious accident specifically at a refurbished Darlington plant? The draft screening report does not consider any sheltering instructions that would pertain to the vicinity of Darlington in the case of severe offsite accidents. It references sheltering in respect of a representative accident sequence in the "RC7" Category; the representative accident is stated to	The Durham Region Nuclear Emergency Plan contains brief provision for directions to be issued for sheltering based on triggers known as "Protection Action Levels" (at 29). The expected details of these plans should be clearly communicated to the entire community, frequently, together with clear science based advice as to any benefits and information as to implementation of suggested procedures.

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
		have "no substantive releases early in the accident progression"; and in any event sheltering is not credited in the dose calculation. CELA submits that it is appropriate not to credit sheltering in the dose calculation unless there is evidence that sheltering would provide benefit in protecting the local population from exposures to radioactive materials. CELA submits that the topic of sheltering should be communicated and discussed with the local community as to if and when it would ever be recommended[2], why, what the benefits would be, how it would be communicated, and what steps would have to be taken to "seal" the area from outside contamination. CELA also submits that a consideration of the potential for accidents beyond those in which the safety systems all work as hoped must be conducted and implications for all types of protection of the local population must be considered in light	

[2] Although the EIS cites the Provincial Action Levels for sheltering (when a whole body effective dose in the range of 1-10 mSV and/ or a thyroid dose of 10-100 mSV would be expected), in the 1996 Royal Society Report on Ontario's Nuclear Emergency Plans, the authors stated that "since neither KI prophylaxis nor sheltering offer very much protection in a nuclear emergency, that sheltering be considered only as an automatic and immediate first step while arranging evacuation." (at 2)

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
		of such an accident. The draft screening report does not consider or evaluate any accidents beyond those in which the safety systems are anticipated to operate as designed (for example assuming no early release in the RC7 accident scenario examined.)	
A.2.a.i		When would such directions for sheltering be issued	
A.2.a.ii		To whom specifically would such directions for sheltering be issued	
A.2.a.iii		Do staff at facilities with vulnerable communities have specific training as to these directions and protocols regarding sheltering	
A.2.a.iv		How are the directions for sheltering communicated?	
A.2.a.v		What evidence is there that "shelter in place" protocols work?[3]	
A.2.a.vi		What specific directions are given as to sealing of air / ventilation pathways into buildings in such cases?	
A.2.a.vii		How long are such directions intended	The IAEA Guidelines referenced in EIS are noted in that

[3] The Royal Society Report, 1996, in discussing its views of the limited value of sheltering (it was of the view that sheltering should be in interim step while preparing for evacuation), noted without references that radiation fields inside houses would be reduced only 10 to 50%. (at 30)

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
		to remain in force?	directions for sheltering should not be given for more than two days[4]. The GPI report noted the practical difficulties of sheltering for longer times especially in terms of provision of food and water but the fact that large releases continued for more than ten days at both Fukushima and Chernobyl. (GPI at 19)
A.2.a.viii	What provisions are in place to ensure that vulnerable communities sheltering in place have appropriate caretakers?	The draft screening report did not address this issue.	The GPI report included evidence that in the Fukushima Prefecture hospitals, "hundreds of doctors and nurses have resigned from nearby facilities since the accident." (GPI at 19)
A.2.a.ix	Has there been any advance preparation, notification, assurance of preparedness with the potentially affected community as to sheltering in place?	The draft screening report did not address this issue.	
A.3	**POTASSIUM IODIDE DISTRIBUTION**		
A.3.a	**Questions and Concerns Relating to Distribution of Potassium Iodide Pills**		

[4] The EIS states, "The IAEA GS-R-2 (2002b) suggests a "generic optimized interaction level for sheltering of 10 mSv of avertable dose in a period of no more than 2 days" (EIS at 7-57)

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
A.3.a.i		There is no evaluation of plans for distribution or pre-distribution of KI pills in the community contained in the draft screening report on the Darlington refurbishment. There is no evaluation of the appropriateness of potential distribution, the mechanisms for doing so, nor the communications that would accompany same. There is no information as to who would make the decision for distribution, nor how such decisions would be communicated and to who. These issues should be specifically evaluated in the draft screening report as a key emergency response measure in relation to the proposed refurbished Darlington plant, and specifically in relation to these questions. Furthermore, the adequacy of the supply of potassium iodide must be explicitly considered since the Durham Region Nuclear Emergency Plan requires only that there be sufficient supply within the 10 km primary zone. (at 30)	It is expected that there would be distribution of KI pills in the case of certain severe accidents in which radioactive materials escape, or are threatening to escape containment from the plant. Health Canada advises that "KI works best when it is taken immediately before (about one-half hour) or as soon as possible after exposure. KI should only be taken when directed by public health officials. Not all radiological emergencies involve radioactive iodine and it is only required when there are significant amount of radioactive iodine present."[5] Distribution of potassium iodide was problematic in the Fukushima case. Different municipalities had different quantities of potassium iodide. There were issues with decision making as to distribution and issues with timeliness of distribution in terms of effectiveness. (GPI at 20.) The CNSC's External Advisory Committee noted in its 2012 report that this is a specific example of the kind of information Canadians would look for in an emergency and that it should be prepared and available in advance of emergencies: "Notwithstanding the prompt communications actions and daily web updates by the CNSC in the early stages of the Fukushima crisis, the EAC notes that in the time that has passed since the crisis subsided there has been little visible communications/ education progress to prepare for a future incident. During the crisis, it was observed that Canadians were looking for readily-available answers

[5] http://www.hc-sc.gc.ca/hc-ps/ed-ud/respond/nuclea/potassium-eng.php

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
			regarding a variety of issues such as the impact of radiation on humans and on food, what measures were in place if radiation was to reach Canada (e.g. potassium-iodide, or KI, pills), and how Canadian nuclear reactors protect against a similar accident." (at 20)
A.4	**EVACUATION**		
A.4.a	**Questions and Concerns Relating to Length of potential Evacuation**		
A.4.a.i	What specific planning has been done in relation to the proposed refurbished Darlington plant in terms of how long evacuations might be? What are the implications of lengthy evacuations in terms of relocation of evacuees, compensation for lost property, and consequences of displaced communities?		The Royal Society 1996 Report noted the IAEA guidance of the day to the effect that evacuations should not be ordered for longer than a week. (at 19) In the Fukushima accident, evacuation of many communities has become permanent. This was also true at Chernobyl. GPI at 21-22
A.4.b	**Questions and Concerns Relating to Size of Evacuation Areas**		
A.4.b.i	In comments on the Draft EIS CELA submitted that the	The Draft Screening Report does not note any evaluation by OPG of any	The CNSC response in the dispositioning report (App D) to the Final Scoping decision was as follows:

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
	Screening EA should consider the suitability of the Darlington location for operation of nuclear power plants into the future. The location is not suitable for continued nuclear power plant operation at Darlington. The populations in the immediate vicinity and in the near-to-medium distance are too great to continue beyond the current plants and lifetimes of existing operations. Development pressures are increasing and the community is growing quickly. The safety and security of the site in light of the surrounding population has been decreasing, because of the increasing population. A review of evacuation planning was conducted in the New Build EA for only a 10 km zone around the plant. Evacuation of even a 20 or 30 kilometre zone around the Darlington site would be unimaginably difficult with a	scenarios in which anything beyond a temporary 3 km evacuation would be expected. No evaluation of evacuation beyond 10 km, 20 km, 30 km, 50 km, or 80 km is contained in the draft Screening report. CELA submits that emergency planning for the Darlington refurbishment project is inadequate. There is no basis to conclude that evacuation as a result of severe offsite emergencies such as that necessitated at Fukushima or Chernobyl could be managed adequately so as to safeguard the health and safety of the residents in the vicinity of the refurbished Darlington plant in those potential evacuation zones. CELA submits that the CNSC must conclude that the adverse effects to be expected in the case of such a severe accident are, significant, that no adequate mitigation is presently in place nor planned in that there are no specific plans for evacuation for any distances beyond 10 km around the plant. (Durham	"Change made to the Scoping Information Document. Emergency response planning is within the mandate of provincial and municipal jurisdictions. Section 3.4.4[7] of the Scoping Information Document directs OPG to examine postulated accident sequences leading to radiological release that could occur with a frequency greater than 10^{-6} per year. This will, in-turn, determine the need for sheltering, evacuation, relocation, etc. in accordance with the Ontario's Provincial Nuclear Emergency Response Plan. Additional wording has been added to section 3.4.4 regarding expectations related to accident management such as emergency response." The Greenpeace International Report, *Lessons from Fukushima*, noted that evacuation zones were increased following the accident, for example to areas up to 50 km to the northwest. The Durham Region Nuclear Emergency Plan 2009 does not reflect the statement contained in the Darlington Implementation Plan approved by the provincial cabinet, which does contemplate a very severe accident with loss of containment. The Darlington Implementation Plan states that in the case of "Intermediate to severe core damage with an accompanying loss of the containment function", the baseline

[7] See Section 3.4.4 of Scoping Document contained in Appendix A

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
	very large population potentially impacted. OPG has not demonstrated that emergency planning measures for very serious accidents that might require evacuation ranges of 20 to 80 km are in place or could be carried out with adequate protection of the population. This must be tested in the Refurbishment EA.	Region Nuclear Emergency Plan 2011 at 7 to 11). The 2006 population within this 10 km zone was 122,410 people including the slightly over 1000 workers at the Darlington facility. The 50 km Secondary zone around Darlington does not have population estimates in the Durham Region Nuclear Emergency Plan (it is specified to be for "ingestion control measures based on the monitoring of the food chain for contamination.")[6] This 50 km Secondary zone includes "parts of Durham Region, the City of Toronto, York Region, the City of Kawartha Lakes, Northumberland County and Peterborough County within a 50 kilometre radius of the Darlington NGS." (Durham Region Nuclear Emergency Plan 2011 at 8) It is essential that the Screening Report evaluate the compliance of the specific emergency planning for the Darlington nuclear generating stations and	protective measures should include: "1.**Evacuation** of the Contiguous Zone, all other Primary Zone sectors likely to be affected by the emission, and the area beyond the Primary Zone likely to be affected by the emission up to a distance of 20 km from the reactor. 2. **Thyroid Blocking**: All evacuees from the Primary Zone to ingest a KI dose. 3. **Personal Monitoring**: All evacuees from the Primary Zone to proceed to a facility for personal monitoring or to self-decontaminate at destination 4.**Sheltering**: All sectors likely to be affected by the emission, which are not immediately evacuating, to shelter. Also, all sectors/areas adjacent (in the same ring) to sectors/areas being evacuated should shelter." (at 43) This is the only example in all of the emergency planning documents that CELA has been able to find an acknowledgement that an evacuation of greater than 10 km may be required. However, the Durham Region Nuclear Emergency Plan 2011 contains no provisions for evacuation beyond the 10 km primary zone. The IAEA Safety Guide 3-2.2 (2002) notes that if a nuclear generating plant is located near a city or large population, then this may diminish the feasibility of an emergency plan. (at p. 27)

[6] This rationale is also the rationale stated in the Darlington Emergency Response Implementation Plan under the Provincial Nuclear Emergency Response Plan – (at 8 and 111). Compare to the IAEA Technical Document 955 which recommends an initial protective action of ingestion control of 300 km around a plant boundary in the case of a "General" nuclear emergency. IAEA August 1997, IAEA TecDoc-955 Generic Assessment Procedures for Determining Protective Actions During A Reactor Accident, IAEA Vienna, 1997 at 72.

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
		whether emergency planning for a severe offsite accident with emissions that escape containment and necessitate evacuation beyond the 10 km primary zone is in place.	
A.4.b.ii	In its submissions on the Draft Scoping Document, CELA submitted that it questioned whether continuing operation of refurbished reactors at Darlington justifiable, in light of the potential adverse effects of a very serious accident? Would other unfortunate lessons from Japan then apply? Would the fact that emergency and evacuation planning has been limited to 10 kilometres (despite a vast nearby population extending into the GTA) result in an inability to ensure that radiation limits for the public could be met? Would there be an ability to provide full, timely and accurate information to the public? Would the scale and difficulty of the task of protecting the	The Draft Screening Report did not evaluate any changes to emergency plans or processes that have arisen as a result of lessons learned from Fukushima. One significant lesson from Fukushima is that evacuation may have to occur at distances greater than "expected", and in varying locations depending on factors such as the sequence of the accident, the release of hazardous radioactive materials at different times during the accident sequence, and differing weather patterns over that time frame. There is no evidence that there are plans in place to handle these evacuation contingencies in the event of a severe offsite accident release from the proposed refurbished Darlington nuclear power plant.	The CNSC Staff stated in its dispositioning report in response that "Change made to the Scoping Information Document. Emergency response planning is within the mandate of provincial and municipal jurisdictions. Section 3.4.4 of the Scoping Information Document directs OPG to examine postulated accident sequences leading to radiological release that could occur with a frequency greater than 10^{-6} per year. This will, in-turn, determine the need for sheltering, evacuation, relocation, etc. in accordance with the Ontario's Provincial Nuclear Emergency Response Plan. Additional wording has been added to section 3.4.4 regarding expectations related to accident management such as emergency response. Finally, emergency response is one of the criteria that the CNSC Fukushima Task Force is examining. The subsequent Integrated Implementation Plan that will describe the program for corrective actions and safety improvement at Darlington, that will be brought forth when OPG seeks a renewal/amendment to their Power Reactor Operating Licence in 2014, is expected to address lessons learned from the events at Fukushima in a fulsome manner."

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
	sizeable nearby population even be possible? This EA for Darlington refurbishment must examine whether these critically important matters would be appropriately addressed, particularly since the analysis and planning presented to date by OPG has been limited to smaller accidents (i.e. those which do not exceed regulatory limits at the plant boundaries) and smaller evacuation zone (i.e. 10 km).		
A.4.c	**Questions and Concerns Relating to Evacuation Routes**		
A.4.c.i	Have evacuation routes been thoroughly explored? Are there alternatives to the primary evacuation routes? Have impacts on expected times for evacuation been examined in case of the necessity to follow alternative routes? Have evacuation routes been explored in the event that	The draft screening report does not evaluate evacuation routes at all. There is no basis for a decision by the CNSC as an RA that there will not be residual adverse effects in the event of an accident and insufficient routes available for evacuation. Given the proposed duration of operation of the proposed refurbishment project, the draft	The Durham Region Nuclear Emergency Plan 2011 estimates evacuation times from the 10 km Primary zone at between 4 and 6 hours (best case to worst case) for the last vehicle to leave this zone. No estimates of evacuation time for an evacuation of a larger perimeter area was included other than allowing for the impact on the 10 km zone of "shadow" evacuations of people who leave a larger area voluntarily. (at 19) The question of evacuation time given future population growth was not evaluated in the Refurbishment EA and

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
	evacuation from a zone greater than 10 km is required? Would all of the planned evacuation routes be available in such a case?	Screening report should analyze evacuation time estimates for the projected population in Durham Region for the time frame during which the project would be operating.	screening report. However, an estimate was provided in the evidence to the Darlington New Build panel of 9 hours evacuation time given the projected population in 2025. (JRP at 126)
A.4.d	**Questions and Concerns Relating to Evacuation Centres**		
A.4.d.i	In its submissions regarding the draft scope of the EIS requirements, CELA submitted that in the Refurbishment EA there must be: (i) analysis of where residents from a broader vicinity [than 10 km] would go for evacuation shelters; (ii) evaluation of transportation mechanism/routes beyond 10 kilometres (beyond the limited evaluation of a fifteen km shadow zone in case people opt voluntarily to leave); and (iii) planning, rehearsal, or provision of emergency supplies for such scenarios. The sufficiency and provision of any facilities or locations that could absorb and shelter	The Screening Report did not include any evaluation of information regarding evacuation centres. Suitability of the site in terms of the ability to properly evacuate residents is critical. A prior license is irrelevant to the requirement for the RAs to make the determinations required under CEAA for this project. In particular, CELA submits that the evacuation centres at Sir Sanford Fleming College in Peterborough and York University and Seneca College in Toronto would be incapable of taking the numbers of evacuees in a broader evacuation zone of beyond 10 km. Given that such events occurred at Fukushima and emergency preparedness and evacuation were critical issues which did not function	In its response, CNSC stated in the dispositioning report, App D, that "Change made to the Scoping Information Document. Emergency response planning is within the mandate of provincial and municipal jurisdictions. Section 3.4.4 of the Scoping Information Document directs OPG to examine postulated accident sequences leading to radiological release that could occur with a frequency greater than 10^{-6} per year. This will, in-turn, determine the need for sheltering, evacuation, relocation, etc. in accordance with the Ontario's Provincial Nuclear Emergency Response Plan. Additional wording has been added to section 3.4.4 regarding expectations related to accident management such as emergency response. Section 3.4.4 also indicates that lessons learned from the events at Fukushima that are relevant to the EA are to be identified and discussed. Finally, emergency response is one of the criteria that the CNSC Fukushima Task Force is examining. With respect to reference to IAEA Document NS-R-3 *Site*

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
	the numbers of people who would be affected by 20, 30 or 80 km evacuation zones surrounding the Darlington facility must be tested in the Refurbishment EA. In addition, consideration must be given as to how food and safe water would be provided to sizeable populations fleeing from these larger evacuation zones. The significance of these potential effects must be tested in this EA. In addition, these issues must be tested against IAEA Site Evaluation Guidance.	well in that tragedy, these questions must be considered and planned for in the instant case before the RAs give any approvals to proceed and therefore should be explicitly evaluated in the screening report (or Panel Review if so referred).	*Evaluation for Nuclear Installations,* clause 2.13 states that "If it is proposed that the installed nuclear capacity be significantly increased to a level greater than that previously determined to be acceptable, the suitability of the site shall be re-evaluated, as appropriate." Given that a license has been granted to OPG for Darlington NGS, the CNSC previously determined that the site was acceptable. Increased capacity is not being considered as part of the refurbishment EA. This is part of the Darlington New Build Joint Review Panel process. Potential cumulative effects will be considered as per section 5 of the Scoping Information Document."
A.4.d.ii	It is expected in the Durham Regional Nuclear Emergency Plan that evacuees will make their own arrangements as to lodging and food. (at 30) It is not clear that this is well known in the community, nor that community members have been encouraged to have such arrangements in place. Nor has any attention	The draft screening report does not consider the issues of the adequacy of the availability of food and lodging for an evacuated population, whether within the 10 km primary zone or beyond. This must be explicitly considered as an essential aspect of emergency planning before the RAs make their decisions on this project.	

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
	been given to the prospect that larger evacuation zones may mean that the family and friends who would normally be available to take in evacuees might themselves be located in such broader evacuation zones making them unavailable. Furthermore, no consideration is included as to issues of financing food and accommodation during evacuation especially in case of lengthy evacuations.		
A.4.e	**Questions and Concerns relating to communications as to welfare of and reunification of families and friends**	Additional specifics as to how families would be reunited either before evacuation, in order to evacuate together, or after evacuation, must be reviewed in the screening report as an essential aspect of emergency preparedness. The draft screening report does not evaluate this question. Nor does the Durham Region Nuclear Emergency Plan provide mechanisms for expediting reunification or communications before or after evacuation.	The Durham Regional Nuclear Emergency Plan indicates merely that "families will want to reunite and evacuate together" but that "The ability for families to unite will depend on the entry control measures put in place due to the severity of the accident and the timing of an emission." (at 29) The reunification of families was a significant issue during the Fukushima accident and must therefore be explicitly and well planned ahead of time before decisions to allow the refurbishment and continued operation of the Darlington nuclear generating station.

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
A.5	**TRANSPORTATION FOLLOWING AN ACCIDENT**		
A.5.a	**Questions and Concerns Relating to Transportation of Vulnerable Communities in case of evacuation**		
A.5.a.i	In the case of the Fukushima accident, there were significant concerns as to the capability to transport vulnerable communities to safe locations following the accident. Arrangements pertaining to seniors, residents in long term care homes, residents in group homes, students in school, young infants and children in daycares, inmates incarcerated in prison facilities, community residents without cars or other forms of transportation, and anyone else who cannot take care of relocating themselves in the case of a	The draft screening report does not consider at all any arrangements relating to transportation of vulnerable communities.	The independent Fukushima Commission found that there were deaths among seriously ill patients as a result of the conduct of the evacuation during the disaster. (at p. 19)

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
	severe accident must be made.		
A.5.b	**Questions and Concerns Relating to regionally important transportation corridors in event of a serious accident at Darlington**	What would be the impact on regional and provincial transportation options in the event of a serious accident at Darlington involving the restriction or closure of Highway 401 in the vicinity, or restriction or closure of the rail lines in the vicinity of the plant? The draft screening report does not evaluate OPG's EIS in this respect.	The Durham Nuclear Emergency Plan notes the possibility of the closure of Highway 401 in case of an evacuation, and a rerouting of traffic around the 10 km primary zone. (at 34) There is no indication as to the effect of these steps on the evacuation time frames estimated for evacuating the 10 km primary zone, nor any consideration as to the implications for traffic options in the event that a larger evacuation zone is necessary. Specific information should be provided to the community as to their evacuation routes from homes and work, and alternatives in the event that Highway 401 or other highways are closed.
A.5.b.i		What re-routing options exist for Highway 401? The draft screening report does not report on adequacy of transportation planning from or to the Darlington nuclear plant post refurbishment in the event of accident.	
A.5.b.ii		What re-routing options exist for the CN Rail line that runs adjacent to the plant to handle VIA Rail and rail freight transportation? The draft screening report does not evaluate or comment on the impact on passenger and freight rail in the event of a severe offsite accident and does not evaluate preparedness or alternative	

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
		arrangements in such a situation.	
A.5.c	**Questions and Concerns Relating to Transportation of "voluntary" evacuees**	What evaluation of transportation routes, numbers of people who could be accommodated, and time frames for evacuation have been conducted in the event of large numbers of "voluntary" evacuees leaving the Darlington area?	In the Fukushima tragedy there were massive "voluntary" evacuations, especially of mothers and children. (GPI 22)
A.5.c.i		What evaluations have been done in respect of the impacts and availability of transportation routes in all directions from the Darlington plant in the event of "voluntary" evacuations of large numbers of members of the Durham communities? The draft screening report should review these issues.	
A.5.c.ii		Are there any additional evacuation centres as back-up to the Trent and York University centres?	
A.6	**PATHWAYS AND EXPOSURE MITIGATION IN EMERGENCIES**		
A.6.a	**Questions and Concerns Relating to potential and expected pathways of**		

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
	radioactive emissions in the event of a severe accident		
A.6.a.i		The Draft Screening report should evaluate measures to reduce impacts and exposures that would be implemented in the event of a severe accident. Although some precautionary measures and exposure reduction measures are provided in the Durham Nuclear Emergency Plan 2011 for example, there is no review or evaluation of the sufficiency of these measures in the draft screening report. These issues should be canvassed in the screening report before the RAs proceed to consider the decisions for approval that would allow the Darlington refurbishment and continued operation project to proceed.	CELA notes that some appropriate Precautionary Measures are provided in the Durham Nuclear Emergency Plan 2011: "Precautionary Measures. The PEOC will consider, and discuss with the REOC, the implementation of precautionary measures. The application of precautionary measures will be conveyed to the public by Emergency Bulletins issued by the PEOC. The REOC and MEOCs must be prepared to assist with the implementation of these measures including: □ closing beaches and recreation areas, □ closing workplaces and schools, □ entry control, □ suspension of admissions of non-critical patients to hospitals, and □ banning consumption of local water, milk, meat and produce"
A.6.a.ii	Has there been an adequate plan for monitoring extensive areas at varying distances from the refurbished Darlington nuclear plant in the case of a severe offsite accident at the plant? Is the monitoring planned in advance? Is there sufficient	The draft screening report briefly mentions post-accident monitoring, with no assessment as to its adequacy or as to the difficulties and barriers that might be faced or recommendations to deal with them. It merely states that "A variety of measures could be implemented after the accident to assist in mitigating some of these	The Fukushima Independent Commission found that monitoring even on-site could not occur due to the prolonged station blackout. (at 33) Monitoring at locations around the Fukushima plant also could not function due to disrupted monitoring stations, lack of power, lack of fuel and other issues. (Independent Commission at 36) Monitoring elsewhere at Fukushima was delayed and information was not communicated to the public in a timely

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
	equipment available? Is it clear who would do the monitoring at various locations? Would this be able to happen quickly so as to provide timely information to help with evacuation advice, transportation routes, destination, and consumption of food, milk and water?[8] Is there sufficient capacity to conduct widespread monitoring of food and water such as would be expected by the public following a severe nuclear accident? Has there been any evaluation of likely "hotspots" following a severe offsite accident that released radioactive materials to the environment from a refurbished Darlington plant	anticipated effects, and to maintain OPG's credibility with the public. Such measures could include regular publication of radiation monitoring results, an information centre where both the media and the public could obtain credible information regarding issues such as decontamination activities, repairs to the reactor or any anticipated changes to emergency response and alerting procedures. These measures would likely enable the community to return to normalcy and lessen the likelihood of long-lasting effects." CELA submits that this review of a serious post accident monitoring program is inadequate. It is lacking in sufficient review of the details of the monitoring programs, capacity, equipment, assignment of responsibility, locations and many other matters that would be required in	way; communication was inconsistent and incomplete and others had to provide monitoring in surrounding areas. Evacuation to certain communities was found to be unsafe once it was realized they had higher than expected levels of radiation themselves. (GPI at 18) The necessity to conduct thorough post accident monitoring and to disseminate its results is demonstrated in the map of Cesium-137 deposition contained in the Fukushima Commission report showing elevated levels of Cesium-137 deposition in some directions extending well beyond the 80 km zone under monitoring; this is not in the same direction as the most elevated areas of Cesium-137 deposition closer to the plant. (at 40) Furthermore, the Fukushima Commission found that hotspots have arisen and are continuing to accumulate radioactivity due to precipitation, elevation, and ongoing weather conditions, such that lakes for example are becoming such hotspots because of surface water trajectories. (at 40) The range of protective actions available after a severe nuclear accident in which radioactive materials escape the

[8] The Federal Nuclear Emergency Plan merely notes that "Monitoring and sampling of agricultural products, food, soil, water, etc., will normally be coordinated by the province, with federal involvement and support as appropriate. Aerial monitoring to determine the extent and magnitude of ground contamination or to track a plume may be conducted in response to a provincial request or to a request by the Technical Advisory Group." at 26 For details of ingestion control measures see Annex E to the Provincial Nuclear Emergency Response Plan (excerpted to this submission as Appendix D below) in which various levels of radionuclides are set out with related directions as to consumption or banning of the foods.

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
	with assessment of implications for subsequent land use, food and crop use?	the event of emergency response to a severe offsite accident. It also inappropriately emphasizes the values of operator credibility and "return to normalcy" rather than avoidance and reduction of harm. The EIS and the Draft Screening Report did not examine the issue of ht epotential necessity of relocation following a large scale accident from the refurbishment and continued operation of the Darlington nuclear generating station. This issue should be included in the potential impacts, mitigating actions, and residual effects	plant demonstrates the critical nature of the monitoring programs in order to make decisions as to distribution of potassium iodide, issuance of instructions on sheltering, giving of directions for evacuation.[9] The Joint Review Panel for the proposed New Build project at Darlington stated that emergency planning included not only sheltering and evacuation but also relocation: "OPG indicated that relocation may be required for residents who are expected to receive a dose of 20 millisieverts or greater during the first year following an accident." (JRP at 126)

[9] "Application of these principles entails the development and use of protective measures for averting radiation exposures arising through various pathways. The major protective measures are sheltering, evacuation and relocation, administration of stable iodine and control of the source of foodstuffs." Royal Society report 1996 at 18; Durham Nuclear Emergency Response Plan 2011 at 28 (sheltering, evacuation and thyroid blocking; that plan also mentions ingestion control). A more complete list of protective measures is contained in the Darlington Implementation Plan 2009 (but not all of these measures are reflected in the Durham 2011 plan) including "precautionary measures" such as

(i) Closing of beaches, recreation areas, etc.
(ii) Closing of workplaces and schools
(iii) Suspension of admissions of non-critical patients in hospitals
(iv) Entry control (**section 4.6**)
(v) Clearing the milk storage of dairy farms
(vi) Banning consumption of any item of food or water that may have been exposed outdoors
(vii) Banning consumption and export of locally produced milk, meat, produce, milk-and meat producing animals
(viii) Removing milk- and meat-producing animals from outside pasture and exposed water sources."

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
		analysis of the Draft Screening Report and the underlying EIS.	
A.6.b	**Questions and Concerns relating to provision of safe drinking water in event of a severe offsite nuclear accident**		
A.6.b.i	In its submissions on the draft Scoping Document, CELA submitted that The Darlington location is unsuitable for the refurbishment and continued operation of nuclear power plants because of the risk of accidents arising from the site's proximity to the drinking water supply for millions of Ontarians. Water treatment plants do not typically treat for removal of radioactive materials. A serious accident with major off-site releases of radioactive materials such as those listed in examples of previous Dose Consequence Analysis in other Darlington proceedings may see much of that material	The Draft Screening Report should consider: has the emergency planning for a serious offsite accident at the Darlington nuclear plant considered the potential necessity to replace the drinking water sources that utilize Lake Ontario and if so what are the contingency measures that would be utilized to ensure safe drinking water for the populations who utilize that source (Canadian and American).	No change to the Scoping Information Document. Section 3.4.4 of the Scoping Information Document requires OPG to, amongst other things; assess the potential health and environmental effects resulting from the release of contamination during any postulated malfunction or accident. Such an assessment would include potential effects to the aquatic environment and the consideration of mitigation measures as necessary." The CNSC also stated in its Dispositioning report that " No change to the Scoping Information Document. Section 3.4.4 of the Scoping Information Document requires OPG to, amongst other things: 1. Provide a description of postulated accident sequences leading to radiological release that could occur with a frequency greater than 10^{-6} per year considering as appropriate internal events, internal hazards, external hazards, external events and human-induced events, including an explanation of how these events were identified, and any modeling that was performed, for the purpose of this environmental assessment 2. Assess the potential health and environmental effects

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
	deposited in Lake Ontario on whose shoreline the reactors would be sited. There is no reasonable alternative to this drinking water source if it is rendered unusable due to a nuclear mishap. Accident/malfunction risks must be examined in this Refurbishment EA in terms of releases to drinking water. The Refurbishment EA must consider whether the impacts would be fully mitigated or are otherwise justified. CELA also submitted that Very severe accidents which release large portions of the "source term" of radioactive materials contained in reactor cores must be modelled and examined in this Refurbishment EA. Similarly, very severe accidents dealing with the used high level fuel on-site (and their potential impact on drinking water supplies in Lake Ontario) must be adequately modelled and examined. In addition,		resulting from the release of contamination during any postulated malfunction or accident. Such an assessment would include potential effects to the aquatic environment and the consideration of mitigation measures as necessary.

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
	potential impacts on inland water supplies (both groundwater and surface water), and downstream surface water along the St. Lawrence River, from a potential serious accident must be considered in terms of impairment of the safety of the drinking water supplies of millions of people in the central heartland of Canada and neighbouring jurisdictions (i.e. Quebec and New York State).		
A.6.b.ii	In its comments on the draft dispositioning report, CELA submitted that in this EA, a review of impacts on drinking water supplies from very severe accidents, taking account of all users of Lake Ontario for drinking water as well as other drinking water sources potentially impacted, must be compared to the provisions of the IAEA guidance document *Dispersion of Radioactive Materials in Air and Water*	The Draft Scoping Document did not examine the contingency plans and other measures for protection or replacement of drinking water supplies since large scale nuclear accidents were excluded from examination.	In its response, App D, Dispositioning report to the Scoping Document, CNSC staff stated that “ No change to the Scoping Information Document. Section 3.4.4 of the Scoping Information Document directs OPG to assess the potential health and environmental effects resulting from the release of contamination during any postulated malfunction or accident. Such an assessment could include potential effects to drinking water supplies and the consideration of mitigation measures as necessary.”

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
	and Consideration of Population Distribution in Site Evaluation for Nuclear Power Plants, Safety Guide NS – G – 3.2. In addition, these potential long-term impacts must be considered in light of the temporal "benefits" of using the Darlington site to provide a relatively small portion of Ontario's power requirements, particularly when there are viable non-nuclear alternatives.		
A.6.b.iii	In its submissions on the draft scoping document, CELA submitted that OPG must demonstrate in this EA for Refurbishment that refurbished operation, would ensure protection of all surface and groundwater supplies, and in particular, drinking water supplies.	The Draft Scoping document did not examine the contingency plans and other measures for protection or replacement of drinking water supplies since large scale nuclear accidents were excluded from examination.	In its response, in the Dispositioning Report, App D, the CNSC staff stated that " No change to the Scoping Information Document. Section 3.5 of the Scoping Information Document directs OPG to describe the existing and planned use of water resources (e.g., drinking or recreation). Section 4 directs OPG to assess and mitigate environmental effects from the project, such as those on drinking water."
A.6.c	**Questions and Concerns relating to safety of food following a severe nuclear accident**		

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
A.6.c.i	In its submissions to the CNSC on the draft scoping document, the Canadian Coalition for Nuclear Responsibility queried "What procedures are in place to ensure that there will be rapid and comprehensive monitoring of food following a potential disaster at Darlington? Shouldn't the elaboration of such procedures be a licence requirement before any "continued operation" of the Darlington reactors is authorized by the CNSC?"	The Draft Screening Report did not address the issue of plans to monitor for impacts on food following a severe nuclear accident. What are the plans to monitor for impacts on food following a severe nuclear accident? Which foods will be tested? How soon? How often? In what distances from the Darlington plant? What contingency plans are in place for replacement of food for populations remaining in the vicinity of the Darlington plant following a severe accident in the event that food is impacted? What assessments have been done of the lengths of time that foods and food producing lands would be impacted following a severe accident?	In its response in the dispositioning report, the CNSC staff stated that "Change made to the Scoping Information Document to section 3.4.4 to include any monitoring work that would be required during, or immediately following, the postulated malfunction and accident scenarios." In the Fukushima tragedy, there were issues with monitoring of food for radioactive contamination, as well as with ensuring distribution of non-contaminated to evacuees and other communities. There were also surprises in terms of which areas' crops were radioactively contaminated upon testing in areas that had been expected to be unaffected. (GPI at 23)
A.6.d	**Questions and Concerns Relating to mechanisms to slow or mitigate adverse effects from serious accidents**		
A.6.d.i	In its submission regarding the draft scoping document, the Canadian Coalition for	The draft screening report did not consider lessons from Fukushima including alternatives to reliance on	The CNSC staff response in the dispositioning report stated that "No change to the Scoping Information Document. The CNSC Fukushima Task Force will be releasing a report on

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
	Nuclear Responsibility submitted that “ In light of the Fukushima disaster, which took place in one of the most industrially advanced nations in the world, a nation which is world famous for its superiority in advanced technology, surely the CNSC should examine the wisdom of CANDU reactors continuing to rely on the intervention of fast shutdown systems rather than on the redesign of the fuel or the core of the reactors so as to drastically reduce or maybe even eliminate the positive void coefficient altogether. Shouldn’t this be a high-priority requirement for the approval of any refurbishment plans?”	fast shutdown systems as a method of accident mitigation and reduction of severity of resulting emergencies. While relevant to the Integrated Safety Review, the issue of mitigation of severe accidents is also relevant to this EA and should be reviewed in the Draft Screening report for the proposed refurbishment and continued operation of the Darlington Nuclear Generating Station.	the impacts of Fukushima for Canadian Nuclear Power Plants. Consideration of lessons learned from the events at Fukushima will be incorporated as appropriate in the screening level EA and ongoing Integrated Safety Review of the Darlington Nuclear Generating Station.”
B	**LAND USE CONSIDERATIONS**		
B.1	**LAND USE AND POPULATION SIZE**		

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
	& SITING GUIDELINES		
B.1.a	**Questions and Concerns relating to size of population in vicinity of Darlington nuclear power plant and implications for emergency planning in the event of significant population growth over the time frame of the refurbishment and subsequent operations**		
B.1.a.i	In comments on the Draft scoping / EIS, CELA submitted that even just within the Region of Durham, the population at present is 620,000 people and is expected to grow to 900,000 by 2031. Much of this population will be within 20 to 80 km from the site, which is a relevant distance, given the lessons of the current experience in Japan (see below). This population figure is not inclusive of the	The Draft Screening Report did not assess whether OPG considered land use and population growth and did not reach appropriate conclusions as to the impact of the growing population on the suitability of the Darlington site for continued operation of nuclear power plants by way of the refurbishment, particularly in light of severe accident risks.	In its dispositioning report in response, App D, CNSC staff stated that "Change made to the Scoping Information Document. Emergency response planning is within the mandate of provincial and municipal jurisdictions. Section 3.4.4 of the Scoping Information Document directs OPG to examine postulated accident sequences leading to radiological release that could occur with a frequency greater than 10^{-6} per year. This will, in-turn, determine the need for sheltering, evacuation, relocation, etc. in accordance with the Ontario's Provincial Nuclear Emergency Response Plan. Additional wording has been added to section 3.4.4 regarding expectations related to accident management such as emergency response.

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
	municipalities to the west, east, and north of the Darlington site. The existing plan of providing merely for a 10 kilometre evacuation range is not prudent and is highly inadequate. The adequacy of emergency planning must be considered in the Darlington Refurbishment EA. While no one wants a serious accident at a nuclear facility, this eventuality must be considered, and properly planned for, and if it is not possible to effectively respond to it, then the existing reactors must not be refurbished in this location.		Section 3.4.4 also indicates that lessons learned from the events at Fukushima that are relevant to the EA are to be identified and discussed. Finally, emergency response is one of the criteria that the CNSC Fukushima Task Force is examining." In a later comment in the dispositioning report, (in response to GP-26), CNSC staff stated that "As well, the Scoping Information Document (i.e., Section 4) directs OPG to look at land use."
B.1.a.ii	In its submissions on the draft Scoping Document, CELA also submitted that the EA should consider whether there are appropriate measures which can mitigate the potential adverse impacts on populations from a worst case severe accident (or even any less severe accident that	The Draft Screening Report considered only a smaller scale accident (RC7).	In its dispositioning report, CNSC Staff stated that "Change made to the Scoping Information Document. Emergency response planning is within the mandate of provincial and municipal jurisdictions. Section 3.4.4 of the Scoping Information Document directs OPG to examine postulated accident sequences leading to radiological release that could occur with a frequency greater than 10^{-6} per year. This will, in-turn, determine the need for sheltering, evacuation, relocation, etc. in accordance with the Ontario's

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
	nevertheless escapes containment) at the Darlington site that causes a 30 to 80 km evacuation zone to be implemented. The EA should consider whether there is evidence to substantiate that such an evacuation could be managed, mitigated and the population adequately protected. This type of scenario must be explicitly evaluated in this EA. Consideration should include the provision of IAEA *Safety Standard for Site Evaluation for Nuclear Installations*, NS-R_3. The EA should consider whether the radiological risk to the population is acceptably low in the case of very severe accidents with large releases of radioactive materials from containment and beyond the plant boundaries.		Provincial Nuclear Emergency Response Plan. Additional wording has been added to section 3.4.4 regarding expectations related to accident management such as emergency response. Section 3.4.4 also directs OPG to do an assessment of potential health and environmental effects resulting from the release of contamination during any postulated malfunction or accident."
B.1.a.iii	In its submissions regarding the draft Scoping Document,	The Draft Screening Report considered only a smaller scale accident (RC7)	In response in its Dispositioning Report, the CNSC staff stated

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
	CELA submitted that it is far too early to learn any complete lessons from the tragic events in Japan earlier this year. However, the first and most obvious lesson is that there must be acceptance of the reality of the potential for very catastrophic accidents that exceed the design basis for a nuclear plant. Thus, the key question for the refurbishment EA is whether the consequences of such catastrophic accidents would be acceptable at this location – is this a suitable site at which to allow for the potential of such an accident? In answering this question, it is insufficient for the proponent to simply assert that such accidents will not or cannot happen at the Darlington site, or that such accidents have been considered and found to be not "credible". Such accidents must be explicitly considered in this EA.		that " No change to the Scoping Information Document. Section 3.4.4 of the Scoping Information Document directs OPG to examine postulated accident sequences leading to radiological release that could occur with a frequency greater than10^{-6} per year. This frequency value includes both Design Basis Accidents and Beyond Design Basis Accidents (i.e., exceeds the design basis for a nuclear plant). Section 3.4.4 also indicates that lessons learned from the events at Fukushima that are relevant to the EA are to be identified and discussed. It is recognized that complete lessons learned may not be realized at this time. However, the subsequent Integrated Implementation Plan that will describe the program for corrective actions and safety improvement at Darlington, that will be brought forth when OPG seeks a renewal/amendment to their Power Reactor Operating Licence in 2014, is expected to address lessons learned from the events at Fukushima in a fulsome manner."

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
C	**SIZE AND TYPE OF ACCIDENT CONSIDERED FOR EMERGENCY PLANNING**		
C.1	**Questions and Concerns Concerning Size and Type of Accident for Emergency Planning**		
C.1.a.i	In its submissions on the draft Scoping document, CELA submitted that consideration of an application for Refurbishment and later continued operation of the nuclear power plants at Darlington is not a pro forma decision. Fundamental questions about the suitability of the site and the adequacy of the information about consequences and ability to respond and mitigate very serious events as well as to	The draft Screening report did not evaluate emergency response to very large accidents where large amounts of radioactive materials are released to the surrounding environment. Rather the screening report reviewed smaller scale accidents in which many assumptions are made as to accident sequences, safety systems, containment and other matter such that the resulting assumption is that there would not be large scale releases of radioactive materials to the environment. This is not adequate. A decision regarding the refurbishment	In response in its dispositioning report, the CNSC staff stated that "No change to the Scoping Information Document. The screening-level EA will be a thorough assessment of the potential effects from the Darlington Refurbishment and Continued Operation project. Severe accidents, known as Beyond Design Basis Accidents will be considered in the EA as well as the means (e.g., emergency response) to mitigate them. Adverse effects from routine operations will also be assessed thoroughly, and documented in the EA Screening Report." In the wake of the accident at Japan, it has been found that the continued belief in the fallacy of nuclear safety and the continued denial of the potential for large scale catastrophic

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
	prevent adverse effects from routine operations must be fully evaluated. A massive investment, which amounts to irrevocable decision making, is under consideration, and its appropriateness must be thoroughly tested in this EA under the provisions of the CEAA as well as the CNSC, and the relevant international guidance.	of the Darlington Plant cannot be made in the face of continued denial of the possibility of large scale accidents such as occurred at Chernobyl and Fukushima, and particular in respect of emergency planning and preparedness. The screening report is fundamentally deficient as a decision making tool for the RAs without facing this possibility.	accidents, together with the lack of preparedness for such accidents, were contributing factors to the tragedy. This for example specifically precluded serious disaster preparedness. It was found that this attitude and lack of preparedness was encapsulated in the use of the term "unanticipated" in relation to such severe disasters. The use of this terminology in itself was found to be untenable and unsubstantiated. (Funabashi and Kitazawa at 14). Similarly use of terminology such as "credible" and "not credible", and "beyond design basis"; and other similar terminology is employed in the Darlington refurbishment draft screening report and in the EIS such that the terminology obscures the fact that catastrophic accidents with offsite releases to the environment and general public are not examined in the EA.[10] As was pointed out in the 1996 Royal Society Report on the basis for emergency planning in respect of Ontario's nuclear plants, there are three basic categories of events that are not quantifiable in probabilistic safety assessments: extreme natural seismic events; hostile action and gross human error. (at 6) Given that these issues cannot be quantified, and given that we have had examples of all three of these in the past 25 years in the cases of Fukushima, Chernobyl and 9/11, emergency planning should be considered in terms of accidents or releases that are far beyond "engineering design", i.e. in

[10] This was well stated in the Funabashi and Kitazawa paper in their conclusion that "When it comes to nuclear disasters, no two are exactly the same. So legislation and manuals do little to add clarity or direction to the situation. At Fukushima Daiichi, the problems were not with the law or the manual, but with the humans who formulated the 'anticipated' risks that fell in line with corporate and political will – but did not represent the actual risks the nuclear plant faced and posed." (at 19)

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
			terms of scenarios involving catastrophic releases, before approving refurbishment and continued operation of the Darlington plants and in that location. The importance of this issue was explored after the Chernobyl accident (in the Ontario Nuclear Safety Review and in the Ontario Provincial Working Group 8 Report on the "Upper Limit for Detailed Nuclear Emergency Planning"[11]) but has become obscured in the regulatory process in recent years. However, the importance of addressing this issue head on has been put back into stark relief by the events at Fukushima and the findings there that much of the chain of causation for the events at Fukushima was over reliance on probabilistic safety assessments, dismissal of the need for planning for events of remote likelihood, and reliance on performance of engineered systems. These causal factors are evident in the current EA and the proposal for refurbishment and continued operation of the Darlington plant. This proposal should not proceed until emergency planning is considered in the context of the maximum releases that could physically occur from the plant even in unexpected and rare sequences of events, including those which cannot be quantified.[12] The Royal Society's subsequent crediting of

[11] Working Group 8 was established by the Ontario Ministry of the Solicitor General on June 22, 1987 to examine the appropriate level of emergency planning for Ontario (Working Group 8 report at 11).

[12] See page 7 of Royal Society report " The final recommendation of WG-8 was a two tier approach with a maximum planning accident (MPA) based on a predetermined probability of occurrence and a worst credible radiation emission with no limit to its probability and defined as the maximum consequences possible within physical and chemical realities." The WCRE as a higher level accident was the maximum imaginable, but possible, release of radioactivity. In the words of that Report, it was to be a "bounding case which subsumes all events, however low their probability" and included hostile action and gross human error." (at 8) Compare to the Working Group 8 recommendation that for the second tier, Worst Credible Radiation Emission, planning should be done for accidents "which are lower in frequency or whose frequency cannot be quantified (gross human error or hostile action). For this tier the Working Group recommends planning to protect against the onset of early morbidity (sickness) and the onset of early mortality (death) in a member of the public. (Working Group report at ii)

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
			safety systems[13] has proven to be a non-protective approach given the events at Fukushima and elsewhere. While safety systems must be constantly improved, nevertheless emergency planning must plan for the worst case. Furthermore, CELA submits that planning for these accidents must ensure better protection and provide for more certainty as to the health and welfare of the surrounding community and beyond than just plan for "early morbidity (sickness) and the onset of early mortality (death) in a member of the public which was the Working Group 8 recommendation in Ontario in the 1980's.
C.1.a.ii	In its submissions to the CNSC in respect of the scoping / draft EIS guidelines, CELA submitted that the consequences of a severe accident at a refurbished reactor at Darlington must be adequately considered. CELA also submitted that accident/malfunction risk must be central to the EA for Refurbishment. Accident risk is also central to the NSCA decision on whether to allow the refurbishment of existing nuclear reactors at this	The Screening Report did not evaluate maximum possible releases for emergency planning nor as to their potential consequences, adverse effects, cumulative effects, residual effects or significance.	In its response in the dispositioning report, App D, the CNSC staff stated that "No change to the Scoping Information Document. Section 3.4.4 of the Scoping Information Document directs OPG to examine postulated accident sequences leading to radiological release that could occur with a frequency greater than10^{-6} per year. This frequency value includes both Design Basis Accidents and Beyond Design Basis Accidents (i.e., severe accidents). Probabilistic Safety Assessment considers all accident sequences and then calculates the release magnitude and frequency as appropriate. Section 3.4.4 also indicates that lessons learned from the events at Fukushima that are relevant to the EA are to be identified and

[13] See Royal Society report at p. 9

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
	location. Worst case scenarios and maximum *possible* releases (emphasis added) must be required to be evaluated, particularly for emergency planning purposes and consideration of local populations.		discussed. Finally, under the NSCA, no licensing actions would be undertaken by the CNSC unless the applicant provided adequate provision for the protection of the environment and the health and safety of persons. The Integrated Implementation Plan that will describe the program for any corrective actions and safety improvements at Darlington will be part of OPG's licence application when it seeks a renewal/amendment to their Power Reactor Operating Licence in 2014 for permission to proceed with refurbishment."
C.1.a.iii	In its submission on the scope of the EIS, CELA submitted that in the past such as during the Darlington New Build EA, OPG consistently downplayed and denied risks (or consequences) of very serious accidents, malfunctions, or malfeasance. However, OPG has only provided generic reassurances based on its probabilistic analysis and a general understanding of the type of modelling used for such analysis. CELA submits that the adequacy of analysis of accident and malfunction risk must be thoroughly tested	The draft Screening Report examines a relatively lower consequence accident based in part on the low probablitiy of a severe large consequence nuclear emergency. The draft Screening Report should consider the emergency preparedness of the proposed Darlington refurbishment and continued operation for a large release accident such as occurred at Fukushima or Chernobyl.	In its response in the Dispositioning report to the Final EIS scoping document, CNSC staff stated that "No change to the Scoping Information Document. A thorough analysis of malfunctions and accidents is expected in this EA. Section 3.4.4 of the Scoping Information Document outlines the expectations for the consideration of malfunctions and accidents, including the consideration of Beyond Design Basis Accidents, and any associated modeling that was performed." This issue was discussed by the Fukushima Commission which found that the regulator and the operator downplayed the prospects of a complex severe accident and continued to assume low probabilities of a complex disaster. (at 39). This is a fair description of the approach to accident analysis and analysis of accident preparedness in the current Darlington refurbishment EA, and the Fukushima disaster tragically demonstrates that this type of approach leads to worse

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
	in the Darlington Refurbishment EA.		consequences in the event of such a disaster when there is inadequate preparedness.
C.1.a.iv	In its submission on the scoping document, CELA submitted that the indisputable fact that catastrophic accidents can happen at nuclear power plants must be admitted, accepted, and the potential consequences evaluated in this Refurbishment EA. Past practice of refusal to clearly acknowledge that catastrophic accidents, with extensive off-site release of radioactive materials, are possible at the Darlington site must not be permitted in the Darlington Refurbishment EA. Rather an approach must be taken as indicated in the IAEA Guide *Site Evaluation for Nuclear Installations*, which states that site evaluation is primarily concerned with "severe events of low probability." Catastrophic accidents must be	The Draft Screening report did not consider a high consequence accident.	In its response in the Dispositioning report, CNSC staff stated that " No change to the Scoping Information Document. Section 3.4.4 of the Scoping Information Document directs OPG to examine postulated accident sequences leading to radiological release that could occur with a frequency greater than10^{-6} per year. This frequency value includes both Design Basis Accidents and Beyond Design Basis Accidents (i.e., severe accidents). Probabilistic Safety Assessment considers all accident sequences and then calculates the release magnitude and frequency as appropriate. With respect to reference to IAEA Document NS-R-3 *Site Evaluation for Nuclear Installations,* clause 2.13 states that "If it is proposed that the installed nuclear capacity be significantly increased to a level greater than that previously determined to be acceptable, the suitability of the site shall be re-evaluated, as appropriate." Given that a license has been granted to OPG for Darlington NGS, the CNSC previously determined that the site was acceptable. Increased capacity is not being considered as part of the refurbishment EA. This is part of the Darlington New Build Joint Review Panel process."

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
	considered possible in the event that: (i) OPG's probabilistic calculations err; (ii) there is missing information; (iii) OPG's defence in depth and redundancies fail; or (iv) a combination of unanticipated events lead to large releases. The refurbishment EA must require a comprehensive evaluation of the consequences at this location if things go terribly wrong at a Refurbished nuclear reactor – that is, beyond the probabilistic analysis.		
C.1.a.v	In its submission to the Scoping consultation, CELA submitted that for example, in the New Build EA, OPG advised the JRP that its backup power systems can provide up to three days of power. However, there may be multiple events which challenge the sufficiency of such technical contingency	The Draft Screening Report did not consider emergency planning capability in response to such severe accidents in which safety systems are overwhelmed.	No change to the Scoping Information Document. Section 3.4.4 of the Scoping Information Document directs OPG to examine postulated accident sequences leading to radiological release that could occur with a frequency greater than10^{-6} per year. This frequency value includes both Design Basis Accidents and Beyond Design Basis Accidents (i.e., severe accidents). Section 3.4.4 also indicates that lessons learned from the events at Fukushima that are relevant to the EA are to be identified and discussed.

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
	measures. The point here is not to recite plausible scenarios (i.e. severe natural event combined with cascading infrastructure failures), but to stress that despite best efforts in planning, prediction and engineering, unexpected sequences that overwhelm these complex systems, or that exceed even conservative engineering, can and do occur. As a result, a proposal in which the consequences of such failures are unacceptable (as in this case) must be considered as to its license ability in this Refurbishment EA before a licence for continued operation is granted.		Probabilistic Safety Assessment, which will inform the postulated accident sequences in the EA, does consider the failure of systems and multiple events as appropriate. In addition, multiple events and loss of power are being examined as part of the CNSC Fukushima Task Force. Finally, under the NSCA, no licensing actions would be undertaken by the CNSC unless the applicant provided adequate provision for the protection of the environment, the health and safety of persons. The Integrated Implementation Plan that will describe the program for any corrective actions and safety improvements at Darlington will be part of OPG's licence application when it seeks a renewal/amendment to their Power Reactor Operating Licence in 2014 for permission to proceed with refurbishment.
C.1.a.vi	Can the public rely on this EA screening to understand the potential consequences and preparedness of a very severe nuclear accident at the refurbished Darlington nuclear plant where radioactive materials escape containment?	The draft screening report conclusion as to whether there would be a residual effect from severe accidents in erroneous. Because the draft screening report has considered only a "bounded" accident with limited releases and assumed limited consequences as a result, there is no review in the screening report as to residual effects	CEAA section 16

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
		from very severe accidents with extensive offsite consequences. Because of the limited accident review, and because of assumptions build in to the review, the draft screening report states that residual effects would be "minor in nature and not significant". (Draft Screening report at p. 135 - 136) This evaluation in the Draft Screening Report should be re-considered.	
C.1.b	**Questions and Concerns relating to type of source term considered for emergency planning**		
C.1.b.i	In its submissions on the scoping document, CELA submitted that the Darlington Refurbishment must include consideration of the range of radionuclides which would potentially be released (source term) in case of a catastrophic accident at the Darlington site. For example, these substances could include Iodine 131 and Cesium 137. Other radioactive isotopes which could be released in an accident were listed in the OPG New Build	The draft screening report should evaluate the emergency planning implications of greater source term (radioactive emissions) as a result of a severe accident and breach of containment.	In its response, the CNSC staff stated, App D, dispositioning report, that "No change to the Scoping Information Document. Section 3.4.4 of the Scoping Information Document indicates that OPG is to provide the source, quantity, mechanism, pathway, rate, form and characteristics of contaminants and other materials (physical, chemical and radiological) likely to be released to the surrounding environment during the postulated malfunctions and accidents. This is expected to include the range of radionuclides in the source term(s) used. Section 3.4.4 of the Scoping Information Document directs OPG to examine postulated accident sequences leading to radiological release that could occur with a frequency greater than10^{-6} per year. This frequency value includes both Design Basis Accidents and Beyond Design Basis Accidents (i.e.,

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
	EA dose consequence analysis, such as Cobalt 60, Strontium 90, and numerous other radionuclides. However, the Refurbishment EA the analysis and licensing application must not be limited to "bounded" scenarios and must also consider catastrophic scenarios. CELA submits that Refurbishment EA must consider the possibility of even more serious accidents, as provided in IAEA Standard NG-G-3.2 dealing with consideration of		severe accidents). This will, in-turn, determine the need for sheltering, evacuation, relocation, etc. in accordance with the Ontario's Provincial Nuclear Emergency Response Plan, and in consideration of the surrounding population." The continued practice of the regulator and the industry to exclude the high consequence accidents from review in approvals processes such as this EA is unacceptable and must not be allowed to continue in the wake of the Fukushima accident. An untoward reliance on safety systems functioning as designed, and exclusion of the most severe accidents because of "low probability" is systemic in the regulatory process, resulting in lack of preparedness for such large accidents.[14] The ability of the emergency plans as they presently exist to respond to a very severe accident has not been tested in this EA

[14] For example, the Royal Society 1996 report examined the 7 categories of accidents in which radioactive materials could be released into the environment from accidents at CANDU plants. These 7 categories are divided according to whether the release is "early" in the accident, such as from a hydrogen explosion causing a breach of containment, or whether the release is over a longer time, such as from intentional venting of the radioactive gases from containment following an accident to release pressure from inside containment. These are titled "ExPlantReleaseCategories" (EPRC) and the lower number means an earlier release. Thus EPRC1 is the earliest containment such as would occur in a catastrophic accident breaching containment, and EPRC7 is the longer time frame such as a month of intentional venting following an accident. The Royal Society arbitrarily removed the two first categories, EPRC 1 and 2 from further consideration in their report on emergency planning because of their presumed "low probability of occurrence." (at p. 10) It also discarded the Working Group 8 Recommendation for a Worst Credible Release Event because it had been "assumed" rather than "being deduced from a credible accident scenario". (at p. 25) Given the real life experience of catastrophic nuclear accidents with large amounts of hazardous radioactive materials escaping containment, it is not longer accurate or tenable to presume these accidents to be "low probability". In empirical terms, we have experienced these accidents once every decade (GPI at 6). This is wildly inconsistent with the "presumed low probability" of this category of accident which is alleged to occur less than once in one million operating reactor years. Deducing a possible very large release from unexpected or infrequent events is now a very rational approach to emergency planning for the proposed Darlington refurbishment and should be the approach taken in the EA.

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
	population distribution in site evaluation. The presence of these radionuclides in the reactor core constitute a high hazard for the surrounding population, thereby indicating that this is not a suitable location for reactor operation, and thus for a major Refurbishment and life extension of the any of the existing reactors.		since such accidents have been considered "improbable" and excluded from consideration.[15]
C.1.b.ii	In its submission to the CNSC on the draft scoping document, Greenpeace requested that "the CNSC direct the proponent to proactively release information related to risk to the public from its Probabilistic Risk Assessments	The screening report inadequately assessed the adequacy of information as to how costs of accidents will be handled – it merely included a sentence stating that "The Nuclear Liability and Compensation Act[16] (*sic*) specifies that compensation to third parties for injury or damage caused by a nuclear incident would be assessed and paid under the provisions of this	In response the CNSC staff stated in its disposition report that "For the purposes of malfunctions and accidents in this EA, Section 3.4.4 of the Scoping Information Document outlines the information that is to be provided and would include elements of Probabilistic Safety Assessments that are relevant to the EA, including consequences on the environment and human health. Modification made to section 3.4.4 of the Scoping Information Document to more clearly articulate the need for information on the manner in which the costs of accidents will be handled."

[15] Senes Technical Support Document, Emergency Planning and Malfunctions, at 1-4 – only accidents considered "credible" have been evaluated; and this has been defined to be accidents with a calculated frequency of less than once in 1 million operating reactor years (10-6). For example, an aircraft crash at the site is calculated to occur with a frequency of 10-7 and is thus deemed not to be "credible" in the terminology of the EIS, and is thus not examined any further. Not other potential large release, large consequence accidents are noted nor examined in the EIS and its technical documents. (Senes, ibid at 4-6)

[16] The title of this legislation is incorrectly stated in the CNSC Draft Screening Report – this is the proposed title of legislation which has been introduced in part Parliamentary sessions, but not passed. The correct title of the current legislation is the *Nuclear Liability Act*. This begs the question as to whether the CNSC screening report intended to reference the current or proposed legislation in its comments.

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
	While it is may be reasonable to withhold information from these risks studies that may reveal vulnerabilities of the station, information related to the risk imposed on the public and Canadian society by the continued operation of the Darlington nuclear station should be proactively released. Such information should include: accident probability estimates, source term and public dose estimates for accident scenarios (known as Ex-Plant Release Categories), and any economic consequence estimates.	act." This is the entire treatment of this topic in the draft Screening report and this is not sufficient answer to the community about how they would bear consequences of a severe accident at the proposed refurbishment and continued operations of Darlington nuclear generating stations.	(A portion of this answer was also provided in response to GP-14)
C.1.c	**Questions and Concerns relating to timing of release of source term considered for emergency planning**		
C.1.c.i	Has the potential for short term release (under 6 hours after an accident is initiated and under 24 hours after an accident is initiated) been considered in relation to	The draft screening report did not evaluate any category of accidents with short term release ("early" is stated to be within 24 hours of the accident) because it limited the analysis to the RC7 accident which	The Working Group 8 report in 1988 considered the worst case in terms of the CANDUs then in operation in Ontario and calculated a possible dose of up to 9000 msv whole body at 1 km and 200000 msv at 1km thyroid. However this type of analysis has not been done for this Darlington refurbishment EA and in fact the types of accidents that

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
	implications for emergency planning for an accident from the refurbished Darlington nuclear plant?	does not incur and early release. The accidents in which early release are possible are categorized as RC2 and RC4, and possibly RC1 and these accidents were not evaluated in the Draft Screening report (at 129; see table 7.5-2). The Draft Screening report should evaluate the adequacy for emergency planning for early release (less than 24 hours)of radioactive emissions (source term) from a refurbished and continued operation Darlington project before the RAs make decisions on this project.	could conceivably result in large doses have been excluded from the EA and have not been considered at all.[17]
C.1.d	**Questions and Concerns relating to the likelihood of severe accidents and implications for emergency planning.**		
C.1.d.i	In its submissions to the	The draft screening report should be	In its response in the dispositioning report, App. D, the In its

[17] For the reasoning which began to lead to the exclusion of consideration of large releases and the resulting doses, see the Royal Society report, 1996, at page 11. The main reason for their exclusion is their presumed low likelihood. Other "adjustments" made by the Royal Society contractors included reduced conservatism for weather scenarios, and increased credit for safety systems. Similarly in the Darlington New Build project, the Joint Review Panel noted that OPG had "stated that for the analysis of the effects of the accident, the release characteristics were based on an assumed containment hold-up time of 24 hours. OpG noted that after that period releases were modelled as continuous plumes spread over the course of 72 hours. OPG explained that the assumed release duration was representative of a wide range of possible accident scenarios. OPG expressed the view that this was a reasonable assumption for the purpose of estimating the effects of releases for the environmental assessment." (JRP at 126)

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
	CNSC in respect of the Draft Scoping Document, the Canadian Coalition for Nuclear Responsibility submitted that "Probabilistic assessments do have a useful role to play – in comparing competing engineering designs, for example – but probabilistic assessments cannot and should not be used to deny the possibility of a disaster, or to ignore the consequences of such a disaster. The misuse of probability in this way is scientifically and morally wrong."	amended to make a recommendation that the OPG include those accident sequences with frequencies of 10-7 and consider the implications of these sequences for emergency planning and emergency response.	response, CNSC stated in its dispositioning report that "Change made to the Scoping Information Document. The public comment period on the EA Screening Report and subsequent public hearing will be opportunities for interested parties to provide their views on accident scenarios and related information. Additional text has been added to Section 3.4 of the Scoping Information Document directing OPG, for those accident sequences having frequencies less than 10^{-6} per year but sufficiently close to this frequency, to provide the rationale for screening them out from further analysis."
C.1.d.ii	In its submissions in respect of the draft Scoping document, Greenpeace submitted that "Greenpeace requests a public hearing of the CNSC take place at which OPG's risk studies can be presented and scrutinized before accident scenarios are excluded from the proposed environmental review."		

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
C.1.d.iii		The draft screening report only considers some representative accidents of low consequence. The draft screening report should be amended to include consideration of very high consequence accidents in terms of emergency planning.	In light of yet another catastrophic nuclear power accident, 24 years after Chernobyl, at Fukushima, it is not acceptable nor credible to screen out high consequence accidents on the basis that they are of "low probability." The Ontario Nuclear Safety Review and the Working Group 8 Report of 1988 more accurately stated the need to plan for high consequence accidents in which large amounts of radioactive material escape containment. The history of the change in Canadian regulation of the nuclear industry in terms of which frequency of accidents must be considered in emergency planning is illustrated in the report of the Royal Society 1996. After considering the Ontario Nuclear Safety Report (1988) and the Ontario Working Group #8 Report on Emergency Planning (1988), this Royal society report, contracted in 1996, disagreed with some of the conclusions and recommendations regarding the frequency of accidents to be taken into account in emergency planning. The Royal Society panel argued that calculated less frequent accidents should be excluded from planning. It stated, " As discussed in Section 2, the ONSR recommended "comprehensive planning" for the "maximum credible releases of radioactive materials". The phrase "maximum credible" was indicated as probably in the higher of a two tier classification of accident severity. The two tier picture was developed by Working Group No. 8, the lower one being the "maximum planning accident" – MPA – and the upper one the "worst credible radiation emission – WCRE. Considerable progress has been made since that time in describing accidents and their consequences. WE FIND THAT IN

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
			THE CONTEXT OF PRESENT DAY EMERGENCY PLANNING THAT IT IS NO LONGER REASONABLE TO DEFINE THE "MAXIMUM CREDIBLE RELEASE" FOR "COMPREHENSIVE PLANNING" AS THE WCRE OF WG-8. WE RECOMMEND THAT DETAILED EMERGENCY PLANNING SHOULD BE DONE FOR ACCIDENTS RESULTING FROM A CREDIBLE SERIES OF EVENTS WHICH COULD OCCUR WITH A PROBABILITY OF APPROXIMATELY 10 -7/ REACTOR YEAR (ONE IN TEN MILLION YEARS PER REACTOR[18]). At 22 (Emphasis in the original). A further rationale of the Royal Society in recommending against emergency planning for "improbable" accidents was that there are a wide range of severity of accidents and a wide range of accident consequences. It opined that planning for such an accident is very difficult, and that " It seems wasteful to spend much public money on detailed planning for very improbable accidents. Thus an informed and pragmatic judgment must be used in making the rules and plans for any response to an emergency." (at 31) This opinion has become embedded in the regulatory framework in Canada and accordingly there is a lack of emergency preparedness for such severe accidents which

[18] A further issue arises in terms of the frequency used in this Darlington refurbishment EA, in that only accident frequencies calculated at 10 -6 / reactor year or more were examined. Thus not only did the Royal Society Report in 1996 recommend radically narrowing the number and severity of accidents to be used in emergency planning compared to the Working Group 8 Report, but since then the regulator by way of the scoping document in this EA and other regulatory instruments has reduced even this recommendation only to accidents an order of magnitude more "frequent" than the higher consequence 10-7 accidents, i.e. 10-6 or more. (Draft Screening Report at 129).

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
			must be addressed before the RAs exercise their decision making responsibilities in respect of this EA[19].
C.1.e	**Questions and Concerns Relating to Exacerbation of Accidents and increased response needs for emergency planning**	What capabilities are there for cooling/moderating if on site systems (power, water) and their back-ups fail? The Severe Accident Management Guidelines should be reviewed in the Draft Screening Report in relation to the Darlington refurbishmnet and continued operation project before the Ras make decisions in relation to the project.	The EIS states that "OPG has already undertaken several actions which will address conditions such as those which occurred at Fukushima (OPG 2011e)" and among other things, "Severe Accident Management Guidelines (SAMG) are being implemented at DNGS and will be functional by the end of 2011." However, these Severe Accident Management Guidelines were not apparently provided in the EIS or technical supporting documents and not reviewed in the Draft Screening report.
D	**EMERGENCY RESPONSE CAPACITY**		
D.1	**SPECIFIC CAPACITY FOR IMPLEMENTATION OF EMERGENCY PLAN AT DARLINGTON**		

[19] It would appear from the correspondence included in the Royal Society report that the Royal Society was engaged by the Ontario Ministry of Energy and the Environment in 1995 to provide a review of some of the Working Group 8's 1988 Recommendations, at least in part because of the dissenting views of Ontario Hydro as it then was with respect to the issue of the type of accidents which should form the basis for emergency planning in the province.

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
D.1.a	**Questions and Concerns relating to adequacy of local emergency response plans**		
D.1.a.i	Is the Darlington – specific on-site and off-site nuclear emergency plan adequate to respond to the issues raised in this submission. The adequacy of the nuclear emergency plans cannot be presumed and must be specifically examined in this Screening Report in order to provide a basis for decision making by the RAs.	The Draft Screening report does not assess the adequacy of local emergency response plans (municipal and provincial) in respect of the proposed refurbishment and operation of the Darlington plant. Given the importance of this issue and the deficiencies identified in the Fukushima events as well as the recommendations of the CNSC External Advisory Committee, this should be done as part of this EA.	The Federal Nuclear Emergency Response Plan requires that "For each nuclear generating station in Canada, in addition to the on-site emergency plan which is under the responsibility of the owner/operator, an off-site nuclear emergency plan involving both municipal and provincial levels must be in place. The latter should detail how to implement urgent protective actions in the emergency planning zones near a licensed nuclear facility (e.g., access control, sheltering, evacuation, administering thyroid blocking agent[20]), and ingestion control measures for a larger ingestion exposure emergency planning zone (e.g., food controls on locally produced food, closing local drinking water supplies, quarantine of farm animals)." (at 7)
D.1.b	**Questions and Concerns Relating to Emergency Operations**	The actions in relation to emergency planning following the Fukushima accident should be reviewed in the draft screening report specifically in relation to the proposed Darlington refurbishment and continued operations project before the Ras make their decisions in respect of this	OPG stated in its EIS that it is taking certain actions in relation to emergency planning following the Fukushima accident. These included "As a result of the events at Fukushima, OPG has conducted a review of its EP program with a view to identifying areas for enhancement and addressing lessons learned from this event. The

[20] The reason to be concerned about thyroid blocking agents was explained in the 1996 Royal Society report, in that the thyroid concentrates iodine and accordingly the dose of radioactivity to the thyroid can be up to an order of magnitude greater than the whole body dose. (Royal Society report at 12).

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
		project.	review considered challenges to the EP program that might arise from a total and sustained loss of AC power. Based on the assessment to date, OPG has committed to the following actions: Work with industry partners to incorporate a Fukushima-type BDBE scenario into emergency plans; Work with industry partners to evaluate and implement initiatives such as a Regional Emergency Response Support Centre (RERSC) and mutual assistance agreements; Assess the Emergency Response Projection (ERP) computer program to determine if further enhancements to explicitly address multi-unit BDBE scenarios are required (the ERP program is used to estimate source term and public dose for protective measure decisionmaking; it was not designed for BDBE or multi-unit events); and Review telecommunications with key external stakeholders to see if existing back-up systems are sufficient." (EIS at 7-84) These actions should be thoroughly reviewed in the screening report (and furthermore in a Panel Review which we submit should be recommended for this project), and tested against the specific emergency preparedness of the proposed Darlington refurbishment project against a Fukushima scale set of events.
D.1.b.i		From where are operations directed?	

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
D.1.b.ii		Who has authority to issue new directions if there are further unexpected events during the course of a severe nuclear emergency?	
D.1.b.iii		Who has authority to deviate from emergency plans and in what conditions?	
D.1.c	**Questions and concerns relating to ability of hospitals, labs, emergency responders to handle radioactively contaminated accident victims**		
D.1.c.i		There is no evaluation in the screening report of the capability of hospitals, labs and emergency responders to handle radioactively contaminated accident victims in their vehicles or in their facilities	The Working Group 8 Report recommended as one of four key preparedness measures, "the need for adequate medical facilities to deal with possible acute radiation exposure" (at iv)[21]
D.1.d	**Questions and concerns relating to radioactive hazards to other patients at health facilities and evacuation centres**	The draft screening report contains no evaluation of monitoring and controls of people and patients in the vicinity of the proposed refurbished Darlington nuclear plant who may have been exposed to radioactive materials after a	The Durham Region Nuclear Emergency Plan contains a brief reference to monitoring at decontamination centres and issuance of instructions to the public; and a generalized direction if unable to attend at decontamination centres, to "go to a destination of their choice, shower and bag their clothes" and "Details of personal decontamination

[21] The other three were: "the availability and distribution of potassium iodide pills; the need for early warning systems for the public; the advisability of restricting new housing construction near nuclear facilities." (at iv)

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
		severe accident. The adequacy of such provisions should be considered in the screening report before the RAs exercise decision making responsibilities in respect of this project.	procedures will be provided through Emergency Bulletins from the PEOC as will the locations of MDUs when they are operational." (at page 31) It is further stated in that Emergency Plan that if there is a "a reasonable possibility of significant radiation exposure, the Ministry of Health and Long-Term Care (MOHLTC) will implement the Provincial Radiation Health Response Plan. This includes monitoring for internal contamination, maintaining a database of potentially affected people, counselling and public health information program".
D.1.e	**Questions and concerns relating to need for specialized emergency, rescue and other equipment at the Darlington site in case of a serious accident**	What specialized equipment may be needed to respond to a serious emergency onsite if buildings are damaged	Elliot Lake Inquiry
D.1.e.i		Where would such equipment be brought from and how would it be transported?	
D.1.e.ii		How long would such transport take in the event of an evacuation simultaneously occurring away from the Darlington site?	
D.1.e.iii		What type of training and specialized expertise may be required to operate	

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
		such equipment in the context of a radioactively contaminated accident site at the Darlington plant?	
D.1.e.iv		Where are such trained personnel/operators/holders of this expertise located?	In the Enbridge report of the US National Transportation Safety Board on the Enbridge oil pipeline spill to the Kalamazoo River in 2010 it was noted that specialized expertise was not located in close vicinity to the spill and took a considerable time to get to that emergency. There were issues with training the emergency response teams and issues with adequate outreach and training to local responders. See the summary at the NTSB website (full report to be posted in several weeks as of the date of writing this submission) http://www.ntsb.gov/news/events/2012/marshall_mi/index.html In the case of a refurbished Darlington nuclear generating station, the need for specialized emergency expertise is even greater due to radioactive hazards.
E	**OCCUPATIONAL HEALTH**		
E.1	**OCCUPATIONAL HEALTH AND SAFETY OF WORKERS IN**		

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
	EMERGENCY		
E.1.a	**Questions and Concerns Relating to occupational health and safety of emergency responders – OPG personnel**		
E.1.a.i	Are there adequate protocols as to the radiation exposures to which OPG workers may be exposed in responding to an emergency situation at the refurbished Darlington plant? Are there protocols as to allowing workers to be exposed to dosages in excess of Canadian health guidelines for workers? Is there any guidance as to if, how and when such a decision would be made? Has there been any planning as to obtaining consent for workers in such	The draft screening report does not address this issue[22]. It should evaluate the sufficiency of protocols under which workers may be exposed to radiation in emergency situations and how; what protocols and systems are in place in the event that workers will exceed occupational guidelines and when the regulations may be applicable or varied.	The Fukushima Commission found that between 28% and 35% of the workers, contractors and subcontractors working at the plant after the accident were never notified about their cumulative radiation exposures. (at 67) Another finding showed that between 28 and 44% of workers did not give consent to be assigned response tasks in the event of an accident (but did so as they felt they had no choice). (at 67) Before the accident, 90% of contractor and subcontractor workers, and 33% of plant operator workers had never been notified that they could be tasked with response tasks in the event of an accident. The 2002 IAEA Guidance Document Preparedness and Response for a Nuclear Emergency states that " Those persons who may be called upon as first responders shall be informed of the risks of radiation exposure and the

[22] The CNSC Nuclear Emergency Response Plan states that "CNSC employees at a nuclear generating station should consider adopting the same protective measures as station personnel (i.e., re-location, sheltering, stable iodine tablets). CNSC employees who have to work in a contaminated environment should take appropriate protective measures to reduce their dose as much as possible." (at page 37)

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
	cases?		meanings of radiation signs and placards." (at section 4.59); and see Annex 1 which states that "Workers who undertake actions in which the dose may exceed the maximum single year dose limit shall be volunteers and shall be clearly and comprehensively informed in advance of the associated health risk, and shall, to the extent feasible, be trained in the actions that may be required." (at Annex 1, p. 47) The OPG Technical Support Document references the applicable standard: "the CNSC 2000 *Radiation Protection Regulations, Nuclear Safety and Control Act*, Section 15 specifies that the effective dose to workers shall not exceed 500 mSv and the equivalent dose received by the skin shall not exceed 5000 mSv." (Senes TSD Malfunctions and Accidents at 4-13) The Senes report also states that "All emergency staff receive a Pre-Job Briefing prior to dispatch in the field, including personal protective equipment to be worn based on the event. On-site shift staff are assigned to Radiation Exposure Permit (REP) set-up for emergency use only. This REP invokes dose and dose rate alarm settings on the Electronic Personal Dosimeter (EPD)." The Durham Region Nuclear Emergency Plan reviews plans for dosimeters and allowed exposure limits. (at 32-33) However the possibility of exposures beyond those limits, or the basis on which decisions to alter those limits is not outlined or discussed.

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
			Given the experience of the workers at the Fukushima plant, a thorough evaluation of worker exposures in severe emergencies must be undertaken and evaluated in the Screening Report (or Panel Review) before the RAs proceed to decision making.
E.1.b	**Questions and Concerns Relating to occupational health and safety of emergency responders – non-OPG personnel**		
E.1.b.i		The draft screening report should explicitly consider the adequacy of protection for emergency responders in the face of radioactive hazards following a severe accident. In particular, issues of informed consent and adequacy of protection measures should be evaluated in the screening report.	In the case of the Elliot Lake events of July 2012, emergency response was curtailed or delayed due to occupational health and safety issues in respect of the emergency responders. This can be anticipated as a major concern in respect of a severe accident at the proposed refurbished Darlington nuclear generating station. http://news.ontario.ca/mag/en/2012/07/statement-from-attorney-general-on-elliot-lake-inquiry.html
E.1.b.ii			The Senes TSD states that "In the event of an emergency situation, the Shift Manager (in the role of the Emergency Response Manager) would implement on-site protective measures. This includes dismissing non-essential staff (in a controlled manner), to avoid radiation exposure and authorizing emergency exposures (for site staff)." (at 4-13)
E.1.c	**Questions and Concerns**		

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
	Relating to occupational health and safety of emergency responders – volunteers		
E.1.c.i		Are there any circumstances where volunteers, such as retired OPG or retired emergency responders would be permitted to assist in a serious emergency at a refurbished Darlington Nuclear generating station.	In the Elliot Lake mall collapse, retired mine workers and retired emergency workers were volunteering to conduct searches. Elliot Lake Inquiry http://news.ontario.ca/mag/en/2012/07/statement-from-attorney-general-on-elliot-lake-inquiry.html
E.1.d	**Questions and Concerns Relating to emergency workers (staff or volunteers) who would be exposed to radionuclides above Canada's guidelines during a serious accident at the Darlington site**	What rules or protocols are in place for response if emergency workers (staff or volunteers) will be exposed to radionuclides above Canada's guidelines during a serious accident at the Darlington site	
E.1.d.i		What provisions are in place to ensure replacement workers in the event that staff would be exposed to radionuclides above Canada's guidelines during a serious accident at the Darlington site. How many workers are available; with what skill sets; where would they be travelling from; how long would it take them to	A causal factor as found in the Enbridge report of the US National Safety Transportation Board was the fact that necessary skilled personnel and equipment were located a long distance from the site of the accident.

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
		get there; would there be potential gaps in their expertise?	
E.1.e	**Questions and Concerns Relating to ability of emergency responders to respond in case of multi-site or multi-community natural hazards**		
E.1.e.i	In its submission regarding the scoping document, CELA submitted that the Darlington Refurbishment EA must examine the possibility for catastrophic events to occur and whether the consequences of those events would be consistent with the provisions of CEAA and the CNSC. Unfortunately, despite computer modelling, engineering design, and probabilistic analysis, the potential for catastrophic events is reasonably foreseeable upon existing information. A current example is the calamity in Japan and the combination of events which led to the crisis,	The draft screening report did not adequately assess any large scale accidents, high consequence, large release accidents, regardless of the sequence. The screening report should address large release high consequence accidents in relation to emergency planning.	In its response, CNSC stated in the dispositioning report to the Final scoping document, App D that "No change to the Scoping Information Document. Section 3.4.4 of the Scoping Information Document directs OPG to examine postulated accident sequences leading to radiological release that could occur with a frequency greater than10^{-6} per year. This frequency value includes both Design Basis Accidents and Beyond Design Basis Accidents (i.e., severe accidents). Section 3.4.4 also indicates that lessons learned from the events at Fukushima that are relevant to the EA are to be identified and discussed. Probabilistic Safety Assessment, which will inform the postulated accident sequences in the EA, does consider the failure of systems and multiple events as appropriate. In addition, multiple events and loss of power are being examined as part of the CNSC Fukushima Task Force. Finally, under the NSCA, no licensing actions would be undertaken by the CNSC unless the applicant provided adequate provision for the protection of the environment, the

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
	including the location of high level fuel storage as a source of criticality. The engineers in Japan had designed to a very high magnitude earthquake, (i.e. M8.2), but a M9 earthquake struck in the nearby seabed. Furthermore, recent nuclear accidents suggest that it is the unanticipated combinations of events (rather than single isolated events) which result in the most major calamities. Ontario may not encounter an earthquake of the magnitude that occurred in Japan, but it is not inconceivable that Ontario may experience a combination of events that leaves centralized power systems out of service for unknown lengths of time, rendering the backup power plans helpless to maintain critical safety systems. Severe natural catastrophes causing major power failures have occurred in the past decade (i.e. the major ice storm in Ontario		health and safety of persons. The Integrated Implementation Plan that will describe the program for any corrective actions and safety improvements at Darlington will be part of OPG's licence application when it seeks a renewal/amendment to their Power Reactor Operating Licence in 2014 for permission to proceed with refurbishment."

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
	and Quebec in 1998; the massive grid failure across eastern North America in 2003, etc.). This is not hypothetical speculation; in the latter example in 2003, one of OPG's operating nuclear reactors was left without backup power for about five hours.		
E.1.f	**Questions and Concerns Relating to non-emergency workers on site**		
E.1.f.i	Is there advance preparation as to evacuation of non-emergency workers, whether OPG or contracts, from the refurbished Darlington plant in the event of a serious accident with offsite releases? Is there clear planning for lines of communication and dissemination of information to these workers?	The draft screening report does not deal with non-emergency workers safety in the event of a severe offsite accident – it merely contains a bullet which reads "well-trained competent operating and maintenance staff" in a list relating to CANDU station designs and operational provisions. (at 125 of the draft screening report)	The Fukushima Commission found that 63% of Primary Contractors working on site received no instructions at all regarding evacuation on March 11, 2011.
F	**COMMUNICATIONS,**		

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
	OVERSIGHT, DECISION MAKING, DIRECTION OF OPERATIONS		
F.1	**COMMUNICATIONS**		
F.1.a	**Questions and Concerns Relating to maintenance of Communications in case of a serious accident**		
F.1.a.i	Are the specifics as to the centre of communications and decision making in case of a serious offsite accident at the refurbished Darlington plant adequate and are there adequate alternatives to these locations and alternatives to communications channels and alternatives to decision making structures in place in advance?	The adequacy of emergency response plans and contingencies in respect of a refurbished Darlington nuclear plant is not examined in the draft screening report. The specific questions as to communications and dissemination of information and the findings from the official Fukushima commission as well as the CNSC's EAC recommendations should be specifically considered in relation to the Darlington refurbishment proposal and the adequacy of all elements of emergency planning and preparedness including communications should be evaluated in the screening report prior to decisions by the RAs.	The Fukushima Commission found that the emergency response plan did not function in part because communications and governance could not occur at the off-site Emergency Response Centre due to disrupted power. (at 33) The External Advisory Committee to the CNSC in its 2012 report found that there was "no evidence of a coordinated government-wide communication strategy" and that while the CNSC had a technical role to play, "it is the federal government who should take the lead in the communications role during a nuclear emergency, able to provide regular and consolidated updates for the public and media." (at 20) Communications was also an issue during the Elliott Lake tragedy and will no doubt be an issue explored during the

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
			Public Inquiry into that tragedy.
F.2	**OVERSIGHT, DECISION MAKING, DIRECTION OF OPERATIONS**		
F.2.a	**Questions and Concerns Relating to Oversight, decision making, direction of operations in case of a serious accident**		
F.2.a.i	Is there sufficient capability to provide oversight, decision making and direction of operations regarding all of the issues that would arise in the event of a very severe nuclear offsite accident in at a refurbished Darlington nuclear plant? Is the Premier of Ontario and Emergency Measures Ontario capable of providing this capacity particularly in respect of an accident entailing radioactively contaminated materials, victims and territories? Has the federal	The draft screening report merely contains a bullet point stating, "in the event of a nuclear accident, well developed emergency preparedness plans and procedures". There is no detailed assessment of any of the questions posed in this submission in the draft screening report whatsoever. Therefore the ability of the RAs or the public to judge the preparedness situation in Ontario compared to Fukushima is absent, but this is essential before decisions to proceed with refurbishment and continued operation of the Darlington plant are made.	In the Fukushima accident, despite being a country generally well prepared for natural disasters, the government was specifically unprepared for a nuclear disaster and this was found to have exacerbated the disaster and its consequences. (Funabashi and Kitazawa at 13) The Japanese Diet's Official Independent Investigation similarly found that the government, regulators and industry lacked the preparedness and mindset to properly oversee emergency response and none of them were therefore effective in limiting or preventing consequential damage from the disaster. (Kurokawa et al at Executive Summary 18) In the Canadian context, the External Advisory Committee established by the CNSC President following the Fukushima accident found that "There is a lack of coordination of emergency planning roles in Canada with regard to

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
	government put in place sufficient decision making structures to carry out this role in the event of a very severe accident? What specific coordination for a severe accident at Darlington is in place with the United States?		nuclear events" (at ii) It also reported that "Broadly-based emergency planning exercises have been carried out infrequently;" (at ii), and that There is a lack of coordination of emergency planning exercises with other countries, particularly the United States. (at iii) These findings reinforce the necessity for the draft screening report in this EA to address the adequacy of emergency preparedness for the refurbished Darlington nuclear plant[23]. Further findings included that it has been a decade and a half since a nuclear emergency planning exercise has been carried out for the Darlington nuclear plant.[24] In addition the EAC found that

[23] The External Advisory Committee's full finding is as follows: "These concerns spread the emergency response across several federal government departments and exposed the lack of clearly-defined responsibilities and leadership as it pertains to a nuclear emergency in Canada or a global event such as the Fukushima crisis. Examples include responsibility for public release of radiation level measurements in British Columbia and the confusion over the lead role being either with Public Safety Canada, the department with the authority to manage the Federal Emergency Response Plan (FERP) or with Health Canada, the responsible organization for the Federal Nuclear Emergency Plan (FNEP). In reviewing the implications for a domestic nuclear emergency, the potential for confusion over roles and responsibilities is even greater- involving federal, provincial and municipal governments, with each containing its own responsible organizations. The CNSC is not alone in identifying a need for greater coordination- for example, Health Canada released a 'lessons-learned' assessment which cites many of the same issues. While the CNSC is generally of the view that the FNEP should have been activated Health Canada decided not to. For a brief period Health Canada's website indicated that the FNEP had been implemented, and
was subsequently corrected. This concern over a lack of coordination in federal plans is also shared by the nuclear power plant operators with whom the EAC met.
RECOMMENDATION 3 - The EAC recommends that the CNSC work with other government departments to ensure better coordination and redefinition of departmental roles and responsibilities should a nuclear accident occur in Canada, the United States or overseas."

[24] "Finding 1-4 – Broadly-based emergency planning exercises have been carried out infrequently. Related to, but distinct from, the roles and responsibilities during an emergency is the ongoing practice of procedures laid out in emergency plans. Exercises are not only necessary for the respondent organizations to simulate the actions during a real emergency, but also for identifying potential gaps in planning and conflicting roles- the very issue identified above. CNSC staff reported that the last broadly-based federal exercise took place in the 1997-1999

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
			"Finding 4-2 - There is a lack of coordination of emergency planning exercises with other countries, particularly the United States. As noted earlier, emergency planning and management are a key element in dealing with a nuclear crisis, and the EAC believes that coordination and practice are essential to being prepared. The Fukushima crisis illustrated how a foreign nuclear emergency can quickly become a local one. This is certainly true for Canada and the United States, where an incident in a nuclear plant in one country could quickly impact communities in the other country." (at 21) The recent 2012 tragedy at Elliot Lake, Ontario, as to which there will now be a public inquiry, raises major questions of the capacity of Emergency Measures Ontario to handle any large scale or complex disaster, and especially raises questions as to decision making and communications which would be absolutely essential components of early response in a large scale nuclear disaster at the refurbished Darlington plant. Given that the Durham Region Nuclear Emergency Plan places responsibility for overall direction with the

timeframe, predating the creation of Public Safety Canada and its central role in emergency planning/response. The EAC also heard that the last exercise at Darlington which involved multiple groups was the CANATEX-3 simulation in 1998-1999. The EAC has learned that a major exercise took place in late March 2012 at Point Lepreau in New Brunswick and that Bruce Power is planning a similar event at its NPP in Ontario in October 2012. While there have been a number of exercises of limited scope simulating nuclear emergencies the EAC's fact-finding process revealed that there appears to be general agreement that these are not sufficient for testing the full range of response actions called for in the emergency plans. (CNSC External Advisory Panel at 15-16)

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
			Premier of Ontario, and overall coordination with the Provincial Emergency Operations Centre (PEOC), these are essential questions to address in the Screening Report before decisions are made to allow the Darlington refurbishment and continued operation project to proceed.[25]
F.2.a.ii	Have the roles and governance been properly articulated in advance as between provincial government, federal government, nuclear regulator, Ontario's Ministry of Energy, and the plant operator in case of severe offsite emergency? Are there back up plans for decision making and communications in the event of unavailability of someone in the expected "chain of command".	The draft screening report has not outlined or reviewed that adequacy of governance, oversight and communications of emergency response plans. As noted in the rationale column, even in a context where there were specific offices assigned responsibility, the organizations did not function as planned in the case of Fukushima. The draft screening report should consider and address the adequacy of emergency response oversight, inter-agency and inter-office communication and governance in relation to a severe offsite accident at a refurbished Darlington nuclear plant as part of this EA.	The Fukushima Commission found that "The main organizations of the government's accident response system were the Prime Minister's Nuclear Emergency Response Headquarters, the Secretariat of the Nuclear Emergency Response Headquarters of NISA and the Regional Nuclear Emergency Response team. Overall, none of these organizations functioned as planned." (at 33) The Commission also found that the failure to share information in real time among the agencies and offices was a contributor to the failure of the emergency response plans to operate.
F.2.b	**Questions and Concerns Relating to differences in**		

[25] The Durham Nuclear Emergency Plan states, "Overall Direction. Response organizations for a nuclear emergency are the same as for any emergency. However, in a nuclear emergency, the Premier of Ontario will provide overall direction to the management of the response. Overall coordination will beprovided through the Provincial Emergency Operations Centre (PEOC)." (at 21)

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
	emergency response for a serious accident at the Darlington Plant that unfolds very quickly (in hours to offsite release) versus over a longer time frame (days to an offsite release)		
F.2.b.i	What are the differences in emergency response for a serious accident at the Darlington Plant that unfolds very quickly (in hours to offsite release) versus over a longer time frame (days to an offsite release)	The screening report should evaluate the ability of the emergency plans for the Darlington plant, (provincial, Durham Region and Darlington) to handle the diverse aspects of an accident that unfolds quickly with large releases, versus slowly with lower releases in order to provide the RAs with assurance that such an accident would receive proper attention and best protect the potentially impacted populations around the proposed refurbishment and operation of the Darlington nuclear generating stations. This capability is not evident given that a relatively low release, slow accident is the basis for planning at present.	The Durham Region Nuclear Emergency Plan is based on a relatively low emission, low consequence accident: "The Provincial plan has selected a "basic offsite effect" to serve as the basis for nuclear emergency management. The basic offsite effect is characterized by one or more of the following: □ a warning period would usually exist before the offsite effects occur, □ the main hazard would be from external exposure to and inhalation of radionuclides, □ radiation doses would be low (it is assumed that the individual dose to the most exposed person at the station boundary will not exceed 250 mSv (25 rem), □ environmental contamination would be limited to very low levels, □ low level radioactive emissions could continue for some time (days or weeks), and □ the impact would mainly be confined to the 10 km Primary Zone around the nuclear station." (Durham Nuclear

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
			Emergency Plan 2011 at 2.3.3) The Durham Nuclear Emergency Plan mentions the possibility of a more severe accident, such as that described in the Darlington Emergency Response Implementation Plan, 2011, which describes another scale of the hazard, in that: "2.2.3 <u>More Severe Accident</u> (a) An even less probable accident is one which could cause more severe offsite effects. Such an accident would likely result in a Full Activation response by the PEOC. (b) A more sev A severe accident would be defined by one or more of the following: (i) The time between the accident and any release of radioactivity may be generally limited. (ii) Radiation doses could be high – greater than 250 mSv (25 rem) for the most exposed person at the station boundary. (iii) Radioiodines and particulates could form a component of the radioactive emission. (iv) Environmental contamination could be quantitatively significant in both extent and duration.

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
			(v) The area affected could be larger than that for the basic offsite effect. (c) Accidents which could result in some or all of the above offsite effects would generally involve some form of failure of the containment system (either an impairment or a bypassing) and/or reduced filter efficiency as part of an accident which releases significant amounts of radioactive material from damaged reactor fuel." (at 7) Details for planning for a more severe accident are absent in the Durham Nuclear Emergency Response Plan 2009. The time frame for planning is further noted in respect of this third category of severe hazard in the Darlington Emergency Response Implementation Plan 2009: "2.6.1 Planning Times for Radioactive Emissions The time interval between the occurrence of an accident at DNGS and the commencement of an emission depends on the condition and functioning of the station containment system and on the effectiveness of the actions taken by station operators to delay re-pressurization of the vacuum structure thus prolonging the holdup of radioactive material within containment: (a) For a normally functioning containment system, a minimum interval of 7 days (between the occurrence of the accident and the commencement of an emission) may be used for planning purposes.

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
			(b) When venting does commence, it could be intermittent, with the emission lasting for many weeks. (c) If however, the containment system is either impaired, breached or bypassed, an emission could commence much earlier; in some cases, very soon after the accident. With an impaired containment, the emission may be continuous." The third category time frame does not appear to be included in the Durham Nuclear Emergency Management Plan – that is, this category of emissions "very soon" after an accident, from a severe accident.
G	**CONDUCT OF THE ENVIRONMENTAL ASSESSMENT**		
G.1	**PANEL REVIEW**		
G.1.a	**Panel Review**		
G.1.b	**Questions and Concerns relating to conduct of the EA**	The Minister of the Environment should remit this EA to a review Panel under the CEAA. The Commission should now	The Disposition report (App D) to the EIS Final Scoping Decision contained the following statement by CNSC regarding earlier requests such as by International Institute of Concern for Public Health, the Canadian Coalition for Nuclear

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
		recommend that the Minister refer the matter to a review Panel. The Screening Report should be amended to make this recommendation.	Responsibility, Northwatch, Greenpeace and Lake Ontario Water Keeper for referral of this EA to a review panel: "Pursuant to the *Canadian Environmental Assessment Act*, the proposed project does not require a Comprehensive Study and hence the CNSC is required to ensure the conduct of a screening level EA of the project. That not-withstanding, it is recognized that under the *Canadian Environmental Assessment Act*, an EA can be elevated to a review panel at any time by the Minister of the Environment should it be warranted." In the disposition report, the CNSC further stated that " It is recognized that under the *Canadian Environmental Assessment Act*, an EA can be elevated to a review panel at any time by the Minister of the Environment should it be warranted. It is the Commission who will make a decision on the Scoping Information Document, including whether to accept the scope of the Project, the factors to be considered in the assessment and the scope of those factors. The Commission will also consider whether the Project should continue as a screening-level EA or whether to recommend to the federal Minister of the Environment to refer the Project to a mediator or review panel. Note that the Commission may make such a referral at any time during the course of the EA process, if warranted." The CNSC staff also stated on this point in the dispositioning report that " It is recognized that under the *Canadian Environmental Assessment Act*, an EA can be elevated to a review panel at any time by the Minister of the Environment should it be

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
			warranted. It is the Commission who will make a decision on the Scoping Information Document, including whether to accept the scope of the Project, the factors to be considered in the assessment and the scope of those factors. The Commission will also consider whether the Project should continue as a screening-level EA or whether to recommend to the federal Minister of the Environment to refer the Project to a mediator or review panel. Note that the Commission may make such a referral at any time during the course of the EA process, if warranted. Currently, in the Scoping Information Document, CNSC staff are recommending that the EA proceed as a screening with a public hearing on the EA Screening Report." In yet a later part of the dispositioning report, CNSC staff added that "Wording has been adjusted in section 2.4 of the Scoping Information Document to reflect that a public hearing associated with the EA Screening Report would be conducted in accordance with CNSC's Rules of Procedure and its length, would in part, be dictated by the number of interveners."
G.1.c	**Questions and Concerns Relating to CNSC's opinions on its exercise of Jurisdiction over emergency planning for the Darlington refurbishment EA**	Emergency planning in relation to a nuclear accident is not merely nor primarily provincial under Canada's division of powers. Canada has federal jurisdiction in all matters integrally related to the undertaking, operation, and regulation of nuclear power. Emergency planning is an essential core function of this	Ontario Hydro *v.* Ontario (Labour Relations Board), [1993] 3 S.C.R. 327

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
		responsibility. Emergency planning for potential accidents which include radioactivity is completely different than the type of emergency planning that the provincial emergency planning organization normally undertakes or prepares for. The CNSC must exercise its jurisdiction to ensure that emergency planning will meet all foreseeable and many unforeseeable contingencies in the event of a serious nuclear accident following Darlington refurbishment and restart of operation. The draft screening report should examine the state of federal emergency preparedness and oversight specifically in regard to the proposed Darlington refurbishment and continued operation project.	
G.2	**CONCLUSIONS ON ADVERSE EFFECTS...**		
G.2.a	**Questions and Concerns Regarding Draft Screening Report Proposed Conclusions on Adverse Effects**	The Draft Screening Report concludes that adverse effects are not likely in relation to emergency planning issues related to the Darlington nuclear refurbishment project.	In the dispositioning report, App D, the CNSC staff stated in response to a comment from Lake Ontario Water Keeper (LOW-1) and Greenpeace (GP-4) or that "The purpose of undertaking the screening level EA is to allow a decision under section 20 of the CEAA by the RAs. To do so before the screening is completed, as LOW seems to suggest, would be to

Request #	DESCRIPTION OF ISSUE OR CONCERN	Request	Rationale
		The Draft Screening report did not indicate what other mitigation measures in relation to emergency planning were considered by the proponent, or explain if rejected why and what the trade-offs between cost savings and effectiveness were and how they were justified. Now that the CNSC staff have reviewed the EIS and technical support documents, the draft screening report should be amended so as to find that in the current state of emergency preparedness, adverse effects are highly likely in the event of a severe offsite nuclear accident. The draft screening report should be amended so as to recommend that Responsible Authorities not proceed with approvals that would allow the Darlington refurbishment to proceed at this time. Furthermore, the draft screening report should be amended to include recommendations that would address the extensive list of emergency planning issues which have been identified in this submission.	prejudge the outcome. Additional wording has been added to Section 6 of the Scoping Information Document to describe what should happen under the CEAA should the RAs conclude that significant adverse environmental effects are likely." Later in the dispositioning report, (in response to LOW-4), the CNSC staff added that "Additional text has been added to Section 4.4 that directs OPG to indicate what other mitigation measures were considered, including the various components of mitigation and explain why they were rejected. Trade-offs between cost savings and effectiveness of the various forms of mitigation must be justified."

References to this Submission (Chronological):

June 30, 1988, Ontario, Report of the Provincial Working Group #8, "The Upper Limit for Detailed Nuclear Emergency Planning"

November, 1996, Report to the Ministry of Energy and Environment (Ontario) Concerning Two Technical Matters in the Province of Ontario's Nuclear Emergency Plan, Royal Society of Canada and Canadian Academy of Engineering (Bruce, Shemilt and Stewart)

July 1997, IAEA TecDoc-953 Method for the Development of Emergency Response Preparedness for Nuclear or Radiological Accidents, IAEA Vienna, 1997

August 1997, IAEA TecDoc-955 Generic Assessment Procedures for Determining Protective Actions During A Reactor Accident, IAEA Vienna, 1997

Federal Nuclear Emergency Plan, Master Plan, (4th ed) 2002, Health Canada

2002 IAEA Guidance document Dispersion of Radioactive Materials in Air and Water and Consideration of Population Distribution in Site Evaluation for Nuclear Power Plants, Safety Guide NS-G-3.2, IAEA Vienna

2002 IAEA GS-R-2 Preparedness and Response for a Nuclear or Radiological Emergency, IAEA, Vienna

2003 Health Canada, *Canadian Guidelines for Intervention during a Nuclear Emergency*, Document H46-2/03-32E, Ottawa, Ontario, November 2003.

2003 Periodic Safety Review of Nuclear Power Plants—Safety Guide, Safety Standards Series No. NS-G-2.10, IAEA, Vienna, 2003.

February 2008, CNSC Regulatory Document 360 – *Life Extension of Nuclear Power Plants*.

2009, Provincial Nuclear Emergency Response Plan (PNERP) from the Province of Ontario (Emergency Management Ontario, Ministry of Community Safety and Correctional Services issued by an Order of Council on February 11th, 2009.

August 2009, Technical Support Document, Emergency Planning and Preparedness, Senes Consultants Ltd. And KLD Associates Inc., NK054-REP-07730-00021 Rev 000

November 2009, Provincial Nuclear Emergency Response Plan – Implementing Plan for the Darlington Nuclear Generating Station, Emergency Management Ontario, Approved by Cabinet December 9, 2009

December 2010, CNSC Emergency Response Plan CAN2-1, Revision 6

April 2011, Durham Region Nuclear Emergency Response Plan, Part II to the Durham Region Emergency Master Plan (Durham Region) Plan with Support Annexes: Annexes provide details on procedures in support of the DRNERP and are issued separately:

- Annex A – Nuclear Notification Procedure
- Annex B – Nuclear Emergency Evacuation Information
- Annex C – Emergency Worker Protection Plan and Procedure
- Annex D – Potassium Iodide (KI) Distribution Procedure
- Annex E – Public Alerting Procedure
- Annex F – Child Care Nuclear Emergency Response Guidelines

August 2011, Joint Review Panel Environmental Assessment Report, Darlington New Nuclear Power Plant Project

October 2011, CNSC Reasons for Decision and Final Scoping Document, Darlington Refurbishment and Continued Operation Project

October 2011, CNSC Record of Proceedings Environmental Scoping Information Document, Darlington Refurbishment and Continued Operation Project

October 2011, CNSC Addendum D Addendum D Public, First Nations And Métis Groups Disposition Table, Comments And Responses – Darlington Refurbishment And Continued Operation Project

December 2011, *Malfunctions and Accidents – Technical Support Document*, Senes Consultants Limited, NK38-REP-07730-10017 prepared for OPG Darlington Nuclear Generating Station Refurbishment and Continued Operation Project

December 2011, OPG, Environmental Impact Statement, Darlington Nuclear Generating Station Refurbishment and Continued Operation Project; Chapter 7 Malfunctions and Accidents

February 2012, *Lessons from Fukushima*, Greenpeace International

March, 2012, *Fukushima in review: A complex disaster, a disastrous response*, Yoichi Funabashi and Kay Kitazawa, (an independent investigation panel established by the Rebuild Japan Initiative Foundation.) Bulletin of the Atomic Scientists

April 12, 2012, *Report of the External Advisory Committee Examining the Response of the Canadian Nuclear Safety Commission to the Japanese 2011 Nuclear Event*, (available on CNSC website)

June 2012, Draft Screening Report On: Environmental Assessment of the Refurbishment and Continued Operation of the Darlington Nuclear Generating Station, Municipality of Clarington, Ontario, Canadian Nuclear Safety Commission and Fisheries and Oceans Canada, CEAR #11-01-62516, e-Doc:3917932

July 2012, *National Diet of Japan Official Report of the Fukushima Nuclear Accident Independent Investigation Commission*, Executive Summary (English), Kiyoshi Kurokawa, Chairman, et al. The National Diet of Japan

July 2012, Enbridge report of the US National Transportation Safety Board on the Enbridge oil pipeline spill to the Kalamazoo River, http://www.ntsb.gov/news/events/2012/marshall_mi/index.html (Summary report)

Appendix A – Excerpt of Section 3.4.4, Darlington Refurbishment and Continued Operation Scoping Document

(October 2011 Scoping Information Document - Proposal by OPG - Refurbishment and Continued Operation - Darlington Nuclear Generating Station, Clarington, Ontario e-DOC 3734740 CEAR 11-01-62516)

3.4.4 Potential Malfunctions and Accidents

The discussion and evaluation of potential malfunctions and accidents should include the following:

- an identification and discussion of any past abnormal operations, accidents and spills to the extent that they are relevant to the current assessment for the purpose of identifying accident and malfunction scenarios during the refurbishment and continued operations phases;
- a description of postulated accident sequences leading to radiological release that could occur with a frequency greater than 10-6 per year considering as appropriate internal events, external events and human-induced events, including an explanation of how these events were identified, and any modeling that was performed, for the purpose of this environmental assessment;
- for those sequences having frequencies less than 10-6 per year but sufficiently close to this frequency, the proponent should provide the rationale for screening them out from further analysis;
- a description of specific out-of-core criticality events and a demonstration that consequences of the events do not violate criteria established by international standards [4] and national guidance [5] as a trigger for a temporary public evacuation;
- a description of the safeguards that have been established by the proponent to protect against such malfunctions and accidents and the contingency procedures in place. Accident management typically relies heavily on the evacuation of personnel and of the population, as required. The proponent must demonstrate that the requirements for adequate infrastructure to support evacuation of personnel and the population can be met. The need for any necessary administrative measures must also be identified together with the responsibilities of organizations other than the proponent.
- a description of specific conventional malfunction and accident events that have a reasonable probability of occurring during the life of the project, including their frequency and an explanation of how these events were identified for the purpose of this environmental assessment. This explanation should include historical accidents/malfunctions to allow an understanding of the types of accidents that are plausible.
- the source, quantity, mechanism, pathway, rate, form and characteristics of contaminants and other materials (physical, chemical and radiological) likely to be released to the surrounding environment during the postulated malfunctions and accidents;

- an assessment of potential health and environmental effects resulting from the release of contaminants during any postulated malfunction or accident;
- any monitoring, contingency, clean-up or restoration work in the surrounding environment that would be required during, or immediately following, the postulated malfunction and accident scenarios, including the manner in which related costs would be covered; and
- an identification and discussion of any lessons learned from the events at Fukushima to the extent that they are relevant to the assessment of malfunctions and accidents for this project, in alignment with OPG's response pursuant to CNSC's 12(2) request under the *General Nuclear Safety and Control Regulations* on lessons learned from the events at Fukushima and the CNSC Fukushima Task Force Review Criteria [6].

Appendix B – Excerpt of Departmental Functions in Federal Nuclear Emergency Plan, 2002 (Health Canada)

TABLE A5.1: Nuclear Emergency Functions - Departmental Roles and Responsibilities

ID#	Nuclear Emergency Function	Responsibilities of primary departments and agencies	Responsibilities of supporting departments and agencies
1	Provide staff, resources and support for activation and operation of the NSS in support of the FNEP and its Provincial Annexes.	**Departments** to notify their own staff, headquarters and regional offices, to establish and maintain a departmental EOC, to provide required staff to support the NSC, the provincial emergency management organization and a federal regional EOC, when required. **HC** (for an emergency in Canada or the U.S.A. near the Can-U.S.A. border) to staff the NSC Management Team and provide staff for the FRO. **DND** (for an emergency involving an NPV) to assist the National Coordinator in implementing the FNEP, to chair the OPS, to provide a Federal Spokesperson (for technical aspects of the accident) and the Federal Operations Liaison Officer. **DFAIT** (for an emergency involving a nuclear facility in a foreign country) to chair the OPS. **OCIPEP** to provide the interim Federal Coordination Officer. **LFD** to arrange for the provision of the NSC and identify communications requirements.	**AAFC**, **CFIA** to provide staff for an ingestion impact assessment Task Team, if required. **EC** to chair the Task Team on plume dispersion and dose projections, if required. **HC** to chair the Task Team on radiation protection for emergency workers, and to chair the Task Team on ingestion impact assessment, if required. **HRDC** to provide support for the provision of NSC. **OCIPEP** to designate the Federal Operations Liaison Officer and assist the National Coordinator in implementing the FNEP. **PCO** to approve designation of the Lead Federal Department for Response, to chair a Task Team on Government/Cabinet briefings, if required. **TC** to chair a Task Team on transportation and logistics, if required. **LFD** to chair the Task Team on public inquiries and rumour control, if required.

TABLE A5.1: Nuclear Emergency Functions - Departmental Roles and Responsibilities			
ID#	**Nuclear Emergency Function**	**Responsibilities of primary departments and agencies**	**Responsibilities of supporting departments and agencies**
2	Participate in maintaining a good flow of information and a coordinated response.	**Departments** to implement their plans and procedures in accordance with the terms contained in the FNEP and Provincial Annexes, to respond to the emergency in consultation with the NSC, to report their activities to the appropriate Federal Liaison Officer and to the NSC, and to coordinate their activities with their provincial counterpart, as necessary.	**PCO** to provide standard Government/Cabinet briefing documents.
3	Establish and maintain liaison with federal institutions, NGOs, foreign governments, international organizations, the private sector (e.g., industry, universities), etc.	**CNSC** for liaison with the Canadian nuclear facility or with foreign regulators (such as U.S. NRC). **DND** for liaison with DND military bases and U.S. DOD. **DFAIT** for liaison with foreign governments, international organizations, Canadian embassies and Ottawa based foreign embassies.	**CNSC**, **DND**, **HC**, **OCIPEP**to provide support, as required, for liaison with international agencies, including advice on existing plans and arrangements. **HC** for liaison with U.S. EPA, U.S. FRMAC, IAEA, and WHO. **OCIPEP** for liaison with U.S. FEMA.
4	Gather technical information on the accident facility or source.	**AECL** (for emergency at Chalk River Laboratories) to gather on-site data. **CNSC** (for emergency involving a nuclear facility in Canada or in U.S.) to gather on-site data from the Canadian nuclear facility or foreign regulators (such as U.S. NRC). **DND** (for emergency involving an NPV) to gather on-site data. **DFO** (for emergency involving a vessel at sea)	**AECL** to gather information on the CANDU system and specialized knowledge arising from AECL research activities (e.g., plutonium handling). **EC** to gather weather data, forecasts and atmospheric dispersion factors. **NRCan** to assist as required.
5	Run plume dispersion	**AECL**, **CNSC**, **EC**, **HC** to run	**EC** to provide weather data, forecasts,

TABLE A5.1: Nuclear Emergency Functions - Departmental Roles and Responsibilities			
ID#	**Nuclear Emergency Function**	**Responsibilities of primary departments and agencies**	**Responsibilities of supporting departments and agencies**
	and dose projection models.	atmospheric trajectory, dispersion and/or dose projection models if requested by a province or required for federal purposes, and to provide outputs to TAG. **DND** (for emergency involving an NPV) to run their marine dispersion model.	atmospheric dispersion factors and scientific advice on meteorology. **DFO** to provide oceanographic or hydrographic information related to marine dispersion plumes.
6	Conduct and coordinate departmental activities for monitoring and sampling.	**Departments** to identify departmental resources available for operations in affected areas, to contact and deploy their national and regional personnel and equipment, and to provide monitoring and sampling data to TAG. **AAFC** for agricultural food stuff, dairy products and animal feed. **CFIA** for consumers food and food fish. **EC** for water, soil and vegetation. **HC** for environmental radioactivity measurements **NRCan** to provide remote sensing or other surveying services.	**EC** to assist in locating the plume trajectory. **AECL** to provide stand-by personnel and resources for field monitoring. **AECL**, **CNSC** to provide emergency personnel and resources for survey and control of contamination and exposure. **CNSC** to provide field monitoring units. **DND** (for an emergency involving an NPV) to provide field monitoring units for monitoring outside the emergency planning zone in support of provinces. **DND** to provide a support capacity for air-lifting all necessary monitoring equipment. **LFD** to provide an inventory of potential national and international resources for operations. **NRCan** to provide an inventory of potential aerial monitoring capabilities and resources.
7	Perform laboratory analysis of food, soil, air filters, dosimeters, etc.	**HC** to provide existing resources and facilities for laboratory analysis.	**AECL**, **CNSC** to provide stand-by resources and facilities for laboratory analysis. **HC** to provide an inventory of laboratories which can perform

TABLE A5.1: Nuclear Emergency Functions - Departmental Roles and Responsibilities			
ID#	**Nuclear Emergency Function**	**Responsibilities of primary departments and agencies**	**Responsibilities of supporting departments and agencies**
			radiological analysis.
8	Provide a capability to TAG for the evaluation of radiological hazards and to OPS for the evaluation of national impacts of interventions.	**AAFC** for agricultural lands, facilities, commodities, agricultural food stuff and livestock. **CFIA** for consumer food products. **EC** for environmental impacts. **DFO** for marine transportation over sea routes except in ports and St. Lawrence Seaway. **HC** for public health and safety issues, including drinking water, consumer food products.	**AECL**, **CNSC**, **EC**, **HC** to provide support in the analysis of technical data and response trends. **NRCan** to provide support in the analysis of technical data and response trends, especially for contamination and remediation of contaminated areas through the LLRWMO.
9	Provide a capability to TAG for the formulation of recommendations for protective measures.	**Departments** for analysis of assessment data and formulation of recommendations for areas within their jurisdiction.	**HC** for urgent protective actions such as evacuation and sheltering, when requested by a province.
10	Implement protective measures under federal jurisdiction or as requested by a province	**Departments** to identify departmental resources available for operations in affected areas, to contact and deploy their national and regional personnel and equipment. **CFIA** food consumer foods. **CH** for national heritage sites, national parks and reserves. **DFO** for marine traffic control over sea routes except in ports and St. Lawrence Seaway. **INAC** for aboriginal and arctic lands. **TC** for air traffic control and airports.	**CCRA** to assist in the control of food and goods importation from affected regions. **DND** to provide support for marine traffic control. **DND** (for an emergency involving an NPV) to provide personnel and resources for operations in the Emergency Planning Zone. **DND** (for emergency involving a vessel) to provide emergency personnel and equipment. **DFO** to provide support for marine traffic control in ports and St. Lawrence Seaway. **LFD** to provide an inventory of potential national and international resources for operations.
11	Provide medical	**HC** to coordinate the identification	**AECL**, **CNSC**, **DND** (for an emergency

TABLE A5.1: Nuclear Emergency Functions - Departmental Roles and Responsibilities			
ID#	**Nuclear Emergency Function**	**Responsibilities of primary departments and agencies**	**Responsibilities of supporting departments and agencies**
	radiation expertise and capabilities for the treatment of contaminated and/or overexposed casualties.	of experts and capabilities in Canada and abroad, to provide medical radiation expertise and to provide bioassay, radiobiology and *in vivo*monitoring services for evaluation of internal doses.	involving an NPV) to provide technical support, equipment and facilities.
12	Provide technical support for the shipment of radioactive material and the disposal of contaminated soil, equipment, etc.	**AECL** for advice and assistance as required. NRCan for remediation of contaminated areas through the LLRWMO.	**CNSC** to provide technical radiation protection support. **DND** to provide logistics support. **TC** to coordinate logistics support for the removal of contaminated soil and for the selection of transportation means and routes.
13	Provide radiation protection advice, assistance and equipment for federal emergency workers.	**CNSC** to provide radiation protection standards for on-site nuclear energy workers, and technical support and advice on radiation protection. **HC** to provide: radiation protection standards for off-site emergency workers; support in radiation protection issues; dosimeters and emergency supplies of iodine tablets; bioassay, radiobiology and in vivo monitoring services for evaluation of internal doses, and to evaluate cumulative external doses.	**AECL** to provide technical support and advice. **TC** to facilitate the delivery of iodine tablets, and to provide airlift information and advice for delivery of dosimetry and personal protection equipment required by federal emergency workers.
14	Facilitate the deployment of personnel and equipment for operations in affected areas.	**TC** to implement emergency transportation arrangements for movement of personnel and equipment within Canada.	**CCRA** to facilitate the movement across the Canadian border of goods to be used temporarily for a nuclear emergency (e.g., radioactive standards). **DND**, **DFO** to provide transportation support, as required. **TC** to make arrangements for

TABLE A5.1: Nuclear Emergency Functions - Departmental Roles and Responsibilities			
ID#	**Nuclear Emergency Function**	**Responsibilities of primary departments and agencies**	**Responsibilities of supporting departments and agencies**
			transportation of radioactive samples across Canada, and to provide information and advice on aviation matters including air transportation resources and operations.
15	Provide emergency telecommunication equipment and services for operations in the affected area.	**IC** for coordination and delivery of emergency telecommunications equipment.	**Departments** to provide advice and assistance to the NSS with respect to their telecommunications requirements. **DND**, **EC**, **DFO**, **OCIPEP**,**TC** to support operations with their existing telecommunications systems and to identify transportation resources required for transport of telecommunications equipment to the site.
16	Assist in the management of requests/offers for assistance.	**Departments** to formulate requests for assistance, to use and manage resources offered for operations within their mandates, and to provide information on their ability to provide assistance. **NRCan** to prepare, in consultation with the Treasury Board Secretariat, submissions concerning provincial requests for disaster financial assistance (under the *Nuclear Liability Act*).	**CNSC**, **DND**, **EC**, **HC**,**OCIPEP** to provide support, as required, for liaison with international agencies. **DFAIT** to provide advice and assistance on the handling of offers and requests for assistance from foreign governments taking into account Canada's international commitments.
17	Assist PAG in disseminating and customizing the information products on protective measures to target and specialized audiences.	**Departments** for audiences within their mandates. **DFAIT** for Canadians abroad, relevant Canadian missions and Ottawa based foreign embassies.	**CNSC**, **EC**, **HC** to provide assistance. **IC** to obtain broadcast approvals, and coordinate and activate communications networks, when required. **NRCan** to provide assistance in ensuring that communications have considered the risks within a larger

TABLE A5.1: Nuclear Emergency Functions - Departmental Roles and Responsibilities			
ID#	**Nuclear Emergency Function**	**Responsibilities of primary departments and agencies**	**Responsibilities of supporting departments and agencies**
			context including societal costs of intervention measures. **OCIPEP** to assist with the development of messages for use on the emergency broadcasting system (if available).
18	Provide support, equipment, technical experts and spokespersons for operation of a media centre.	**Departments** to provide spokespersons and support personnel, as required. **LFD** to identify the media centre. **OCIPEP** to provide staff to set up and operate a national media centre.	**CNSC** (for emergency involving a nuclear facility in Canada) to allow use of the **CNSC** media centre by the PAG until an alternate location is established and operating. **DFAIT** to provide operating staff as required for specialized interpreting or translation skills and for contact and liaison with foreign media both in Ottawa and abroad.
19	Provide available public information packages.	**Departments** to provide available public information material on relevant emergency plans to PAG.	**AECL** to provide available public information material on radiation and reactors. **CNSC** to provide available public information material on nuclear safety, radiation and regulatory matters. **DND** to provide available public information material on NPVs and military nuclear devices. **HC** to provide material on radiation protection issues and the FNEP.
20	Propose emergency classification level (INES).	**CNSC** as required.	
21	Provide resources and infrastructure for operation of public inquiries systems.	**HC** provide existing public inquiries systems.	**Departments** to provide information and personnel to staff public inquiries systems.
22	Provide resources and		**IC** to provide technical advice and

TABLE A5.1: Nuclear Emergency Functions - Departmental Roles and Responsibilities			
ID#	**Nuclear Emergency Function**	**Responsibilities of primary departments and agencies**	**Responsibilities of supporting departments and agencies**
	infrastructure for monitoring of national and regional media.		assistance with respect to the operation of broadcast systems.
23	Assist in termination of the FNEP.	**PCO** to approve designation of the Lead Federal Minister for Recovery and a National Recovery Coordinator, and to assist the Executive Group and the National Coordinator in making the transition to Recovery.	**Departments** to provide technical and operational advice on the appropriateness of terminating the FNEP.

APPENDIX C – EXCERPT FROM ONTARIO PROVINCIAL NUCLEAR EMERGENCY RESPONSE PLAN 2009 CHAPTER 2 – PLANNING BASIS

Chapter 2

Planning Basis and Concepts

2.1 The Potential Hazard

2.1.1 In all of the emergencies covered by this plan, the hazard could arise either from a nuclear reactor accident or from a radioactive source which has undergone an accident or over which control has been lost, resulting in the potential for, or the occurrence of:

a. Radiation exposure
b. Radioactive contamination of people (internal and external) and the environment.

2.1.2 The most likely radiation exposure pathways are:

a. Contamination of skin and clothing (external contamination);
b. Direct radiation from a source (exposure);
c. Inhalation of airborne radioactive material (internal contamination);
d. Ingestion of contaminated foodstuffs or water (internal contamination).

2.1.3 The primary health effect of chronic low doses of radiation could be the induction of various types of cancers, typically with a latency period of 4 to 20 years.

2.1.4 Radiological and nuclear emergencies carry a real or potential health threat and as such, the MOHLTC's (Ministry of Health & Long Term Care) Radiation Health Response Plan will come into effect, together with, and as a complement to this PNERP.

2.2 Protective and Precautionary Measures

2.2.1 The body can be protected from radiation exposure and external contamination by preventing or minimizing its exposure to the radiation source. This can be achieved by creating distance, by limiting the duration of exposure, and/or by shielding.

2.2.2 Internal contamination can be minimized or eliminated by preventing ingestion and inhalation of radioactive material. Once radioactive material enters the body, internal contamination decreases in accordance with the radioactive decay and biological elimination of such material.

2.2.3 A special method of protection is possible for the thyroid gland, which absorbs and stores iodine. If there is a risk of radioiodine entering the body, the thyroid's capacity to absorb it can be reduced or eliminated by taking a compound of stable iodine before, or even shortly after, the radioiodine enters the body. This is known as *thyroid blocking*.

2.2.4 Specific *protective measures* available for minimizing the radiation hazard in a *nuclear or radiological emergency* are:

a. Entry Control
   - To prevent or discourage non-essential persons from entering the affected area.

b. Use of Protective Equipment
   - Protective equipment will usually be available for any *emergency workers* who may need it.

c. Thyroid Blocking
   - Through the use of stable iodine compounds as described in **paragraph 2.2.3** above.

d. Sheltering
   - Remaining indoors with doors and windows closed and external ventilation turned off or reduced.

e. Evacuation
   - Leaving an area or location that is, or may become, affected by radiation.

f. Decontamination
   - Removal of deposited radioactive material.

g. Food Chain Protection
   - Preventing radioactive material from entering the food chain at any stage.

h. Food and Water Control
   - Preventing the consumption of contaminated food and water.

2.2.5 In planning the application of these *protective measures,* it is convenient to group them into two categories (see **Table 2.1**):

a. Exposure Control Measures
   - Measures which protect against external contamination and radiation exposure (as a result of a radioactive cloud or plume or deposited *contamination*).

b. Ingestion Control Measures
   - Measures which protect the food chain from radioactive *contamination*, and prevent the ingestion of contaminated food and water.

2.2.6 When considering the application of the protective measures which fall into the two categories in 2.2.5 above, it should be borne in mind that they are complementary to each other, and should be applied in combinations appropriate to each stage of the developing situation (**Table 2.1**).

2.2.7 Precautionary Measures

Precautionary measures facilitate the application and effectiveness of *protective measures*, and include:

a. Closing of beaches, recreation areas, etc.
b. Closing of workplaces and schools.
c. Suspension of non-critical patient admissions in hospitals.
d. Entry control.
e. Clearing milk storages of dairy farms.
f. Banning consumption of any item of food or water that may have been exposed outdoors.
g. Banning consumption and export of locally produced milk, meat, produce, and milk-and meat-producing animals.
h. Removing milk-and meat-producing animals from outside pasture and exposed water sources.

2.3 Basis of Planning

2.3.1 Nuclear and radiological emergency response plans must be able to deal with a wide range of possible emergencies. However, because resources are not available to make full preparations for dealing with all possible events, a judicious choice must be made to select the optimum basis for emergency management.

2.3.2 Radiological Emergencies

The types of radiological emergencies covered by this plan include:

a. Accidents or occurrences at a nuclear establishment**3**
b. Accidents or occurrences during the transportation of radioactive material
c. Satellite re-entry
d. Radiological Dispersal Devices (RDD)
e. Radiological Devices (RD)
f. Nuclear Weapon detonation

2.3.3 Nuclear Emergencies

a. The main challenge that Ontario faces in this area would arise from an emergency at a nuclear installation**4**. Formal risk analysis of nuclear reactor accidents shows that there is generally an inverse relationship between the probability of occurrence of an accident and the severity of its likely consequences. The planning basis selected must strike an appropriate balance in considering these two factors.

b. Taking the above into consideration, as well as the various types of nuclear accidents that could potentially occur in Ontario, a basic offsite effect has been selected to serve as the main basis for nuclear emergency management. The basic offsite effect could generally be characterized by one or more of the following:

i. A warning period would usually exist before the offsite effects occur.

ii. The main hazard to people would be from external *exposure* to, and inhalation of radionuclides.
iii. *Doses* would be low. (For planning purposes it can be assumed that the individual *dose* to the most exposed person at the facility boundary will not exceed 250 mSv (25 rem).)
iv. Environmental *contamination* would be limited to very low levels.

v. Low-level radioactive emissions to the environment could continue for some time (i.e., days or weeks).

vi. The impact would mainly be confined to a limited area around the *nuclear installation* (i.e., the*Primary Zone;* see **section 2.4** below).

c. Detailed planning and preparedness shall be carried out in Ontario for dealing effectively with the basic offsite effect of a nuclear installation accident. The aim of this is to ensure, to the extent possible, that no person offsite will be exposed to intolerable levels**5** of *radiation* as a result of such an accident.

d. An accident or event could occur which could result in a more severe offsite effect, though the probability of such an occurrence is very low. One or more of the following defines the more severe offsite effect:

i. The time between the accident and any release of radioactivity may be generally limited.

ii. Radiation *doses* could be high (greater than 250 mSv [25 rem] for the most exposed person at the facility boundary).

iii. Radioiodines and particulates could form a component of the radioactive emission.

iv. Environmental *contamination* could be quantitatively significant in both extent and duration.

v. The area affected could be larger than that for the basic offsite effect.

e. Appropriate additional planning and preparedness shall be carried out to deal with the less probable but more severe offsite effects outlined in **paragraph 2.3.3 (d)** above:
i. Timely *public alerting* and direction;

ii. Priorizing evacuations for those closest to the hazard;

iii. Radiation monitoring and, if necessary, *decontamination;*

iv. If needed, medical assessment, treatment and counselling.

f. Detailed planning and preparedness will establish an effective basis to deal with an emergency caused by any type of nuclear installation accident.

2.3.4 *Contamination* of the environment by radioactive material could occur in a *nuclear and/or radiological emergency.* This requires planning and preparedness to enable detection and assessment of environmental contamination, protection of the food chain from *contamination*, and prevention of the ingestion of contaminated food and water.

2.3.5 This PNERP contains and prescribes the detailed planning that shall be carried out to deal effectively with any *nuclear or radiological emergency* that may affect Ontario. The preparedness required to effectively implement this Plan (and associated plans/procedures) is outlined in **Chapter 3**.

2.4 Primary Zones and Sectors – Nuclear Emergencies

2.4.1 The area around the boundary of a *nuclear installation* for which a nuclear emergency response plan is made shall be divided into the following zones:

a. Contiguous Zone

The zone immediately surrounding the *nuclear installation*. Priority evacuations, if necessary, shall be undertaken within this area because of its proximity to the source of the potential hazard.

b. Primary Zone

The zone around the *nuclear installation* within which detailed planning and preparedness shall be carried out for measures against *exposure* to a radioactive plume. (The *Primary Zone* includes the *Contiguous Zone*).

c. Secondary Zone

A larger zone within which it is necessary to plan and prepare measures to prevent ingestion of radioactive material. (The *Secondary Zone* includes both the *Primary* and *Contiguous Zones*).

2.4.2 The approximate or nominal radii of the zones for the designated *nuclear installations* in Ontario (listed in **Annex A**), as measured from the venting or release stacks, shall be:

Zones	Pickering, Darlington, Bruce	Chalk River Laboratories	Fermi 2

Contiguous Zone	3 km	none	none
Primary Zone	10 km	9 km	23 km
Secondary Zone	50 km	50 km	80 km

2.4.3 The *Primary Zone* around a designated *nuclear installation* shall be divided into a number of*Response Sectors*. All emergency response measures, both operational and protective, shall be planned and implemented in terms of these sectors.
2.4.4 The desirable pattern of *Response Sectors* in a *Primary Zone* is illustrated in **Figure 2.2**. Response Sectors will lie within up to three rings around the nuclear installation: an inner ring (which is the*Contiguous Zone*), a middle ring and an outer ring. Within each ring it is desirable to have as few sectors as possible, while maintaining the need for flexibility and practicability in the application of the operational response strategy.
2.4.5 The actual demarcation of *Response Sectors* shall be carried out so that, as far as possible, their boundaries lie along clearly recognizable features, such as roads and railway tracks. Other factors to be taken into account shall be municipal boundaries, population densities, and availability of appropriate evacuation routes.
2.4.6 The *Secondary Zone* shall be divided into four concentric sub-zones – the Primary Zone, and sub-zones A,B and C:

a. Sub-zone A lies between the *Primary Zone* boundary and a 20 km radius circle.
b. Sub-zones B and C lie between the 20 km and 30 km circles, and the 30 km and 50 km circles, respectively.
c. Sub-zones A, B and C will each be sub-divided into eight standard zonal sectors.
d. The portion of each zonal sector lying within a sub-zone shall be a sub-sector.

These divisions are illustrated in **Figure 2.3**.
2.4.7 The actual zones and response sectors for each designated *nuclear installation* are shown in the relevant implementing plan.

2.5 Contamination Zones – Radiological Emergencies

2.5.1 Field monitoring will result in the delineation of zones to be used as the basis for protective measures in a radiological incident (Note: contamination zones for radiological incidents arising onsite at a nuclear installation shall be delineated pursuant to **section 2.4** above):

a. The Restricted Zone is the area within which exposure control measures are likely to be required.

b. The Buffer Zone provides a buffer area beyond the Restricted Zone where limited measures of radioactivity are detected. This is the area within which ingestion control measures may be necessary.

2.5.2 **Table 2.1** lists the exposure and ingestion control measures that could be applied.

2.6 Population Groups

2.6.1 A decision on the need for a *protective measure* shall take into account the *projected dose* to the most exposed individual in the *Critical Group*. This is a group, which, by virtue of age, sex or dietary habits, is expected to receive the highest *projected dose*. For full definition, see **Glossary**, **Annex K**.

2.6.2 When implementing protective *measures,* municipalities should consider that certain groups within the general population might need special consideration:

a. Vulnerable Group

A group which, because it is more vulnerable to *radiation*, may require *protective measures* not considered necessary for the general population; examples are children, and pregnant women.

b. Special Group

A group for which special constraints arise in the application of a *protective measure*, such as intensive care patients in hospitals, bedridden residents in nursing homes, handicapped persons and prison inmates.

2.7 Protective Action Levels

2.7.1 *Protective Action Levels* (PALs) serve as aids in planning and decision-making during an emergency, providing technical guidance on the need to take specific *protective measures*.

2.7.2 PALs are expressed in terms of projected radiation doses for exposure control measures of evacuation, sheltering and KI and are laid down as a lower and upper level:

a. Lower Level

Below this level, the *protective measure* would not normally be justified. At or above this level, the*protective measure* should be applied unless valid reasons exist for deferring action.

b. Upper Level

At or above this level, the *protective measure* shall be implemented, unless implementation clearly entails greater risks for the people involved than those from the projected radiation dose.

2.7.3 PALs for banning the consumption of affected foods and water are expressed as levels of radionuclide concentrations.

2.7.4 When the time available for making decisions is limited, it would be entirely appropriate to use only PALs as the **technical criteria** for indicating the need for the application of any *protective measure*. However, when such urgency does

not exist (i.e., during the later stages of the response phase and during the recovery phase [**paragraph 2.9.2**) and when dealing with low doses over long periods of time, it would be preferable to also consider other technical factors such as *collective dose* and its likely health impact.
2.7.5 The specific *Protective Action Levels* to be used in Ontario are prescribed in **Annex E**.

2.8 Planning Times – Nuclear Emergencies

2.8.1 The timing of any release of radioactivity into the environment following an accident at a nuclear reactor depends both on the characteristics of the accident and the response of the *containment*system. *Containment* systems are specifically designed to prevent releases in the event of an accident, and it is only if the system fails to operate as designed or is bypassed, that the possibility of a significant early (i.e. within a few hours) release arises.
2.8.2 An early release can occur if the accident involves both a rapid release from the fuel together with a failure of *containment* to isolate automatically or, if there is some other form of impairment, creating a pathway for the release of radioactivity to the environment.
2.8.3 *Containment* systems vary in design between different types of reactor and this also affects planning times.
2.8.4 The *containment* design for Ontario's CANDU reactors involves the use of a negative-pressure (vacuum building) concept which can prevent an uncontrolled release even in the presence of an impairment. Over time the vacuum becomes depleted at a rate depending on the rate of air in leakage, requiring a controlled, filtered discharge to the atmosphere resulting in a sustained or intermittent*emission*. For planning purposes, the sequence of events and hold-up times to be used in the case of the CANDU reactors are generally as follows :

a. Typically, there will be a short interval after a loss-of-coolant accident (LOCA) before containment is isolated (i.e., before "box-up"). During this interval, there may be an initial release of radioactivity (known as a "puff" release) of short duration.
b. The interval between any initial puff and the start of a sustained *emission* could be as short as about one hour (impaired *containment*) but can be contained for a minimum of 2 days (Pickering), 2½ days (Bruce), or 7 days (Darlington).
c. The duration of an *emission* (whether sustained or intermittent) could be several weeks. The largest release of radioactivity would most likely occur during the first few days.

2.8.5 In the case of the NRU reactor at **Chalk River Laboratories,** which is a relatively small reactor with only a limited *containment* capability, radioactivity would be emitted to the atmosphere commencing at the time of the accident and would likely cease within one hour, depending on the nature of the accident.
2.8.6 The *containment* system in the **Fermi 2** reactor is of a high-pressure, low-leakage design intended to prevent any release of radioactivity following an accident. A release would only occur if *containment*were impaired or bypassed, and in such cases would likely commence within a few hours of the onset of the accident. The duration of such a release would depend on the nature of the accident, but is unlikely to exceed 24 hours.

2.9 Concept of Operations - Nuclear and Radiological Emergencies

Operations to deal with a *nuclear or radiological emergency* shall be conducted in two successive phases (see **Figure 2.5**).
2.9.1 The Response Phase

The Response Phase requires urgent action to deal with the immediate effects of radiation. Such action may be based on prearranged plans, procedures and preparedness, when there is insufficient time to plan a response.

This phase begins with the first warning that a significant problem exists and should normally be ended when the radiation threat has ended. This phase could last for several weeks.

During this phase the following types of emergency management and response operations would generally be required:

a. Exposure Control
- All necessary measures designed to avoid or limit *exposure* to the source of radiation (and surface deposits from it) would be undertaken.

b. Ingestion Control
- Initially, ingestion control is imposed as a precaution to minimize *contamination* of the food chain and prevent consumption of food and water that may have been contaminated. As *ExposureControl* operations wind down, more effort and attention will be focused on *Ingestion Control*operations as a protective measure.

c. Restoration
- If appropriate, rescinding of some or all of the *protective measures* in force may be considered, including, the return of evacuees to their homes.

2.9.2 The Recovery Phase

The recovery phase is when action is required to restore conditions to normal. During this phase the following types of emergency management and response operations would take place :

a. Ingestion Control
- Assessment of the food chain and water sources for possible *contamination*, and taking measures to deal with it, including banning the consumption of contaminated commodities.

b. Restoration
- Measures to restore conditions to normal, as far as possible.

2.9.3 Distinction Between Phases

Since emergency response operations may occur in both phases, and since planning for the recovery phase should commence as soon as practicable during the response phase, there will not normally be a sharp distinction between phases.

The Response Phase of this PNERP will likely end when attention begins to focus on the hazard from*contamination* of the environment.

2.9.4 Long-Term Rehabilitation

In the unlikely event of large-scale *contamination* of the environment and/or the displacement of a large number of people, it will be necessary to undertake a long-term rehabilitation operation.

2.10 Modifications to Concepts

The basic operational and organizational concepts described in this Plan may need to be modified under special circumstances. These modifications will be made in the specific implementing plan that relates to it.

Exposure Control Measures	Ingestion Control Measures
• Entry Control • Sheltering • Evacuation • Thyroid Blocking • Use of Protective Equipment • Decontamination	• Milk Control • Water Control • Pasture Control • Produce and Crop Control • Livestock Control • Food Control • Land Control* • Environmental Decontamination*

Table 2.1: Protective Measures
Note - These measures are defined in the **Glossary**, **Annex K**.

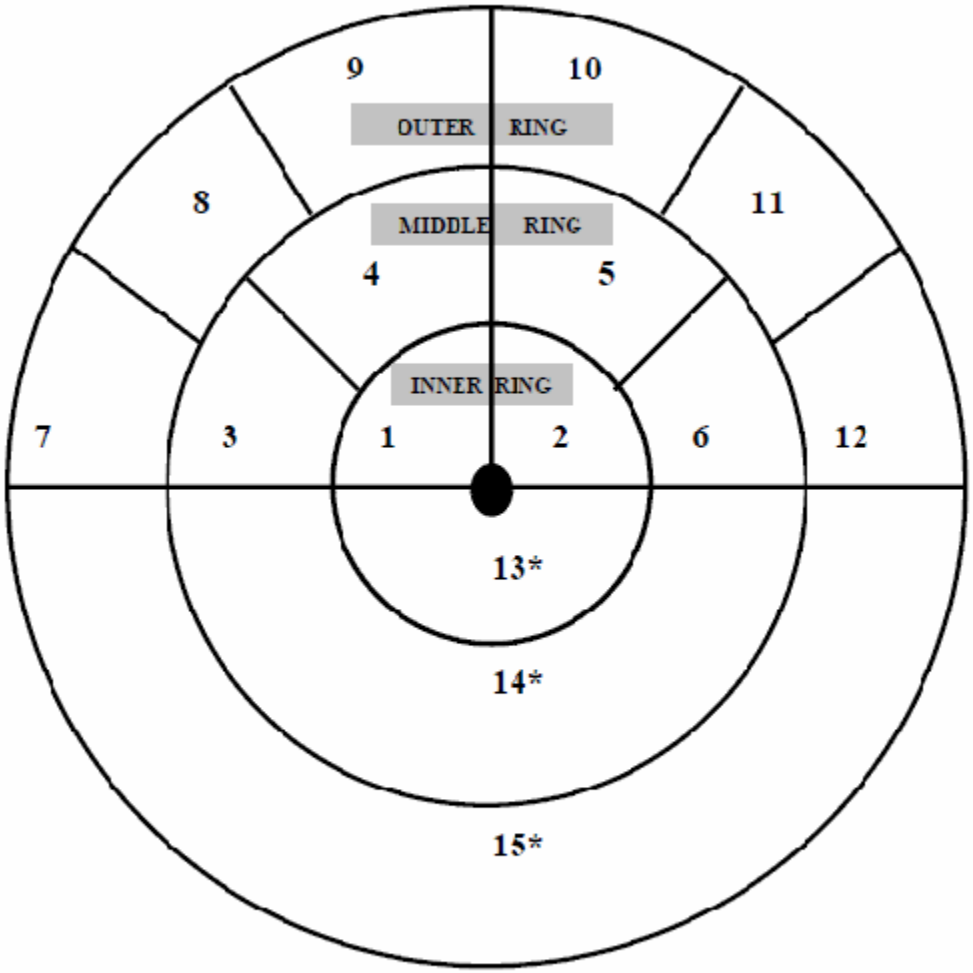

9
10
OUTER RING
8
11
MIDDLE RING
4
5
INNER RING
7
3
1
2
6
12
13*
14*
15*
* Lake/River Sectors

Figure 2.2 : Primary Zone And Response Sectors

(Nuclear Emergency)

(Diagrammatic - Not to Scale)

Comments of CELA with respect to draft screening report consideration of emergency planning in the Darlington Refurbishment and continued operation project
July 18, 2012

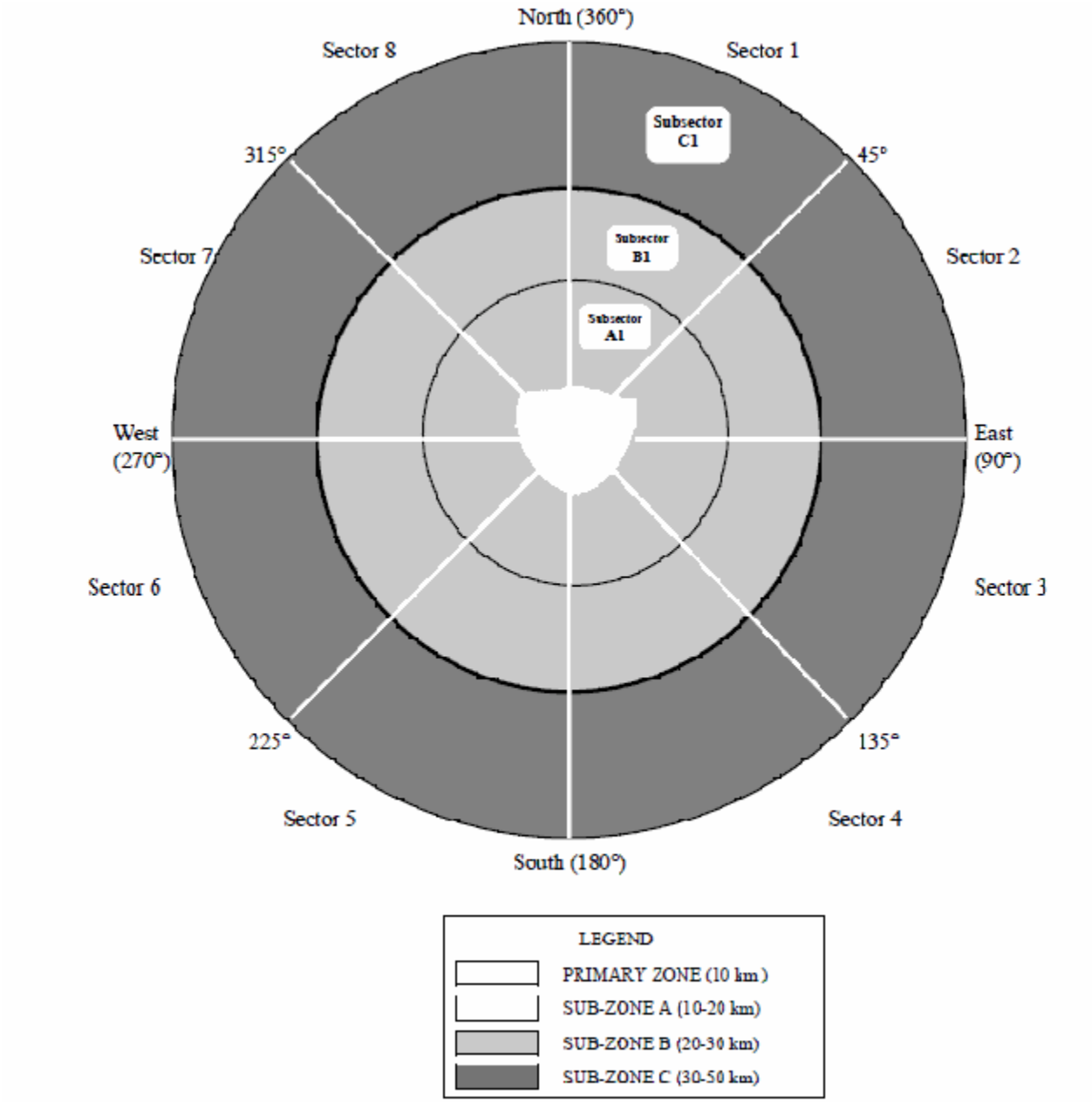


Figure 2.3 Secondary Zone Divisions

(Nuclear Emergency)

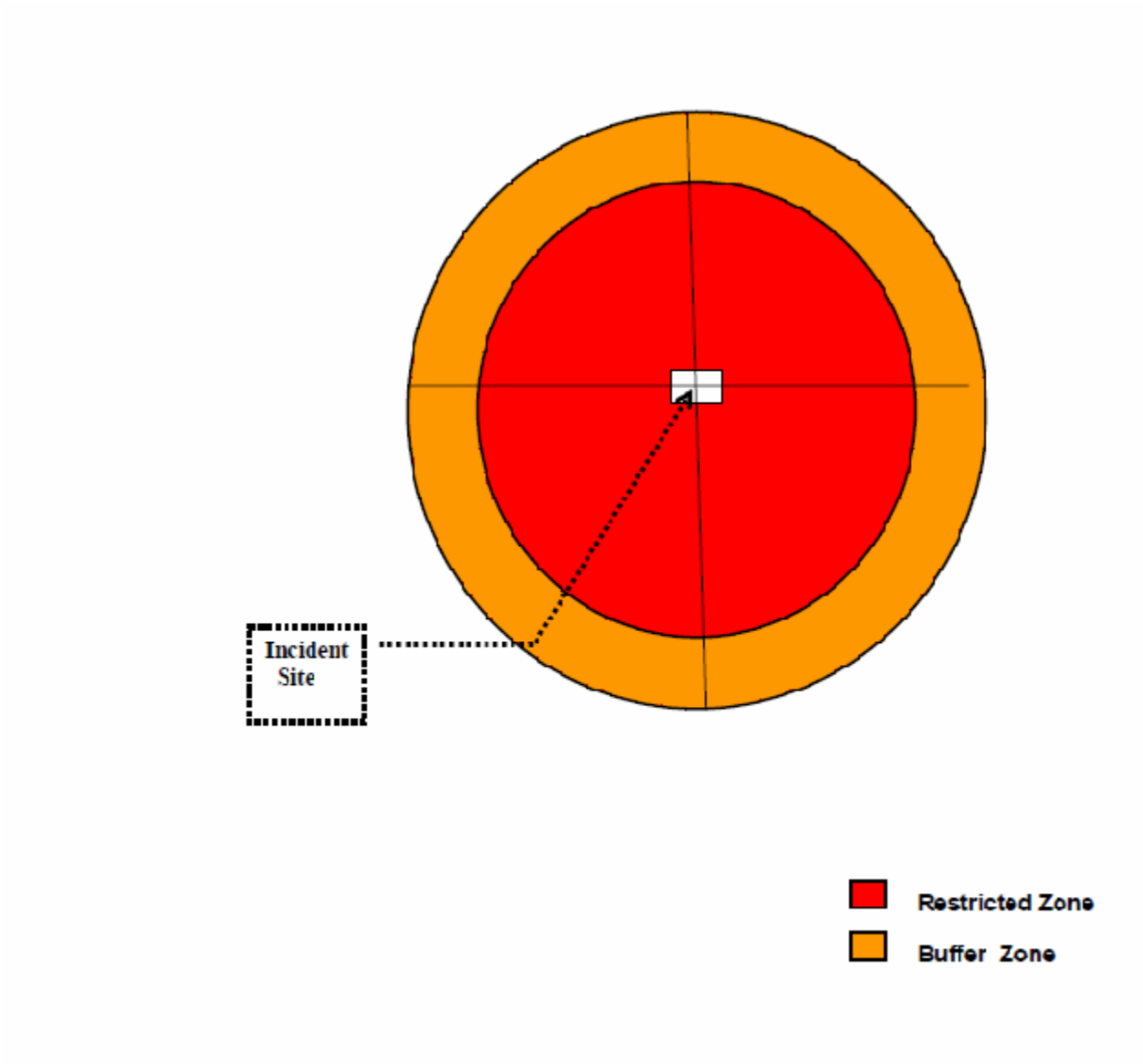

Incident Site
Restricted Zone
Buffer Zone

Figure 2.4: Environmental Radiation Monitoring Zones

(Radiological Emergency)

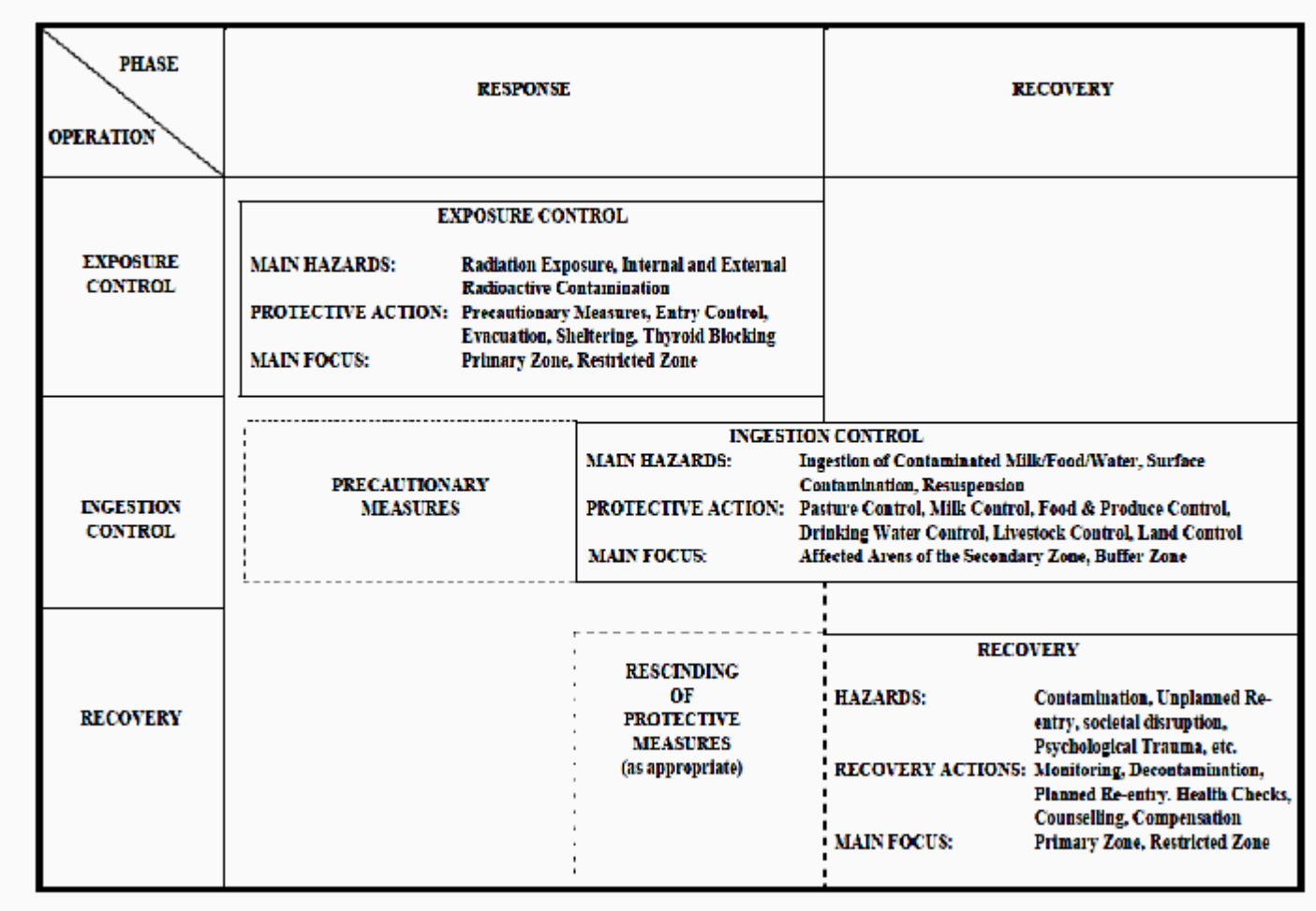


Figure 2.5 : Concept Of Operations - Nuclear And Radiological Emergencies

APPENDIX D – EXCERPT FROM PROVINCIAL NUCLEAR EMERGENCY RESPONSE PLAN 2009, ANNEX E - DETAILS OF PROTECTION ACTION LEVELS AND INGESTION CONTROL MEASURES

Annex E

(Ref : **Section 2.7**)

Protective Action Levels (Pals)

Exposure Control Measures

PROTECTIVE MEASURE	LOWER LEVEL		UPPER LEVEL	
	Effective Dose	**Thyroid Dose**	**Effective Dose**	**Thyroid Dose**
Sheltering	1 mSv (0.1 rem)	10 mSv (1 rem)	10 mSv (1 rem)	100 mSv (10 rem)
Evacuation	10 mSv (1 rem)	100 mSv (10 rem)	100 mSv (10 rem)	1 Sv (100 rem)

Thyroid Blocking	-	100 mSv (10 rem)	-	1 Sv (100 rem)

Ingestion Control Measures

BANNING FOOD/WATER	RADIONUCLIDE CONCENTRATION LEVEL			
CONSUMPTION	Cs-134, Cs-137 Ru-103, Ru-106, Sr-89	I-131	Sr-90	Am-241, Pu-238 Pu-239, Pu-240 Pu-242
Foods for General Consumption	1 kBq (27 nCi) per kg		100 Bq (2.7 nCi) per kg	10 Bq (270 pCi) per kg
Milk, Infant Foods,	1 kBq (27 nCi)	100 Bq (2.7 nCi)		1 Bq (27 pCi)

Drinking Water	per kg	per kg	per kg

For Application and Notes, see next page.

Application

1. The PALs for exposure control measures are expressed in terms of, and shall be related to, the highest projected dose likely to be received by the most exposed individual in the relevant critical group (see Glossary in **Annex K**, for definitions of these terms).
2. PALs are expressed over the duration of significant releases.
3. The PALs for ingestion control measures should be applied to food prepared for consumption. The PALs are to be applied to the **sum** of the activity levels for each radionuclide within a group. However, they are applied independently to each group. For example, if in a foodstuff the radiocesium is 50% of the permitted concentration while the quantity of rubidium (which is in the same group as cesium) is 60% of the permitted concentration, the item should be banned. However, an item containing 50% of the permitted concentration of radiocesium and 60% of the permitted concentration of Sr-90 (which is in a different group) would be acceptable. (**Note**: I-131 is grouped with radiocesium, etc. in the case of foods for general consumption, but is grouped with Sr-90 for infant food and water).

Notes

1. The effective dose PALs above were adopted by the Province in 1984 upon the recommendation of Provincial Working Group # 3 and are generally consistent with Health Canada Intervention levels as published in Canadian Guidelines for Intervention During a Nuclear Emergency (2003). The latest authoritative international guidance on the subject confirms their continuing validity. (Cf*. International Basic Safety Standards for Protection Against Ionizing Radiation and for Safety of Radiation Sources,* International Atomic Energy Agency. Safety Series No.115, 2004).
2. The intervention levels recommended in the International Basic Safety Standards (IBSS) are in terms of *avertable dose*, whereas the Ontario PALs are in the form of *projected dose*. This difference is essentially academic since the PALs are used most often in decisions on protective measures taken**prior to any radiation exposure**, and hence are being compared to avertable dose. In most cases where radiation exposure is already occurring, it would neither be possible nor desirable to base protective action decisions on calculations involving PALs; instead, they would be based on pre-planned responses and conservative estimates. (See Operational Response Strategy, **Chapter 6**).
3. It is necessary to express PALs in terms of projected dose in order to conform to the Plan principle that protective measures should avert (or at least reduce) risk resulting from radiation exposure. Thus, expressed as projected doses, PALs in essence represent levels of risk from potential exposure, which justify the initiation of various protective measures. The risk commences when radiation exposure begins, and not when the emergency management organization starts to use PALs

to assess the need for protective measures. If this assessment occurs in some circumstances after radiation exposure has commenced, the use of PALs in the prescribed manner will fulfil the above principle adopted in this Plan.

4. The PALs for exposure control measures are prescribed as a range for each protective measure because the decision on applying a protective measure is based not only on technical factors but also on operational and public policy considerations. To enable these considerations to be applied, it is appropriate to provide decision-makers with technical advice ranging between when a measure**should** be considered for application (on purely technical grounds) and when it becomes **necessary**on the same grounds. This span also allows for the fact that there are inherent uncertainties in the results of technical assessments.
5. The factor of 10 used to obtain the thyroid dose equivalent to the effective dose is based on the assumption that non-fatal or curable cancers of the thyroid carry the same socio-economic impact as fatal thyroid cancers. This assumption is presumed to be valid in the context of public safety and the low dose (or risk) levels used in the PALs.
6. The PALs for banning food and water consumption are consistent with International Atomic Energy Agency. Safety Series No. GS-R-2 'Preparedness and Response for a Nuclear and Radiological Emergency' (2002), and the Canadian Guidelines for the Restriction of Radioactively Contaminated Food and Water Following a Nuclear Emergency: Guidelines and Rationale, Health Canada (2000).