

**Comments on the Discussion Paper and Proposed Changes to the  
Provincial Nuclear Emergency Response Plan (PNERP)  
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I am a family doctor and professor in the Department of Family Medicine at Queen's University, and a longtime board member of Canadian Association of Physicians for the Environment (CAPE). I am providing these comments on behalf of CAPE in response to the proposed update of the Provincial Nuclear Response Emergency Planning document (PNERP) described in the Discussion Paper (DP).

Though the Discussion Paper claims to respond to lessons learned from the Fukushima nuclear accident in 2011, it is clear that this is not the case. This paper will discuss the health consequences of this omission, and will make recommendations to the Ontario government to improve the proposed updates to the PNERP. My conclusion is that the Ontario government's claim that the updates to the PNERP – for the protection of the health, safety, welfare and property of the people of Ontario and the protection of the environment – are not consistent with the goal of protecting the public's health in the event of a Fukushima level accident.

### **Response to proposed changes to the PNERP**

**1. PNERP should use as a planning basis a Fukushima level (INES level 7) accident based on radioactive releases, not on radiation dose estimates**

I have major concerns that the PNERP is based on a nuclear accident that is several times smaller than Fukushima. Though the estimated radiation doses from Fukushima are similar to the numbers used in the PNERP, the choice of level of accident should be based on radiation releases, because dose estimates can significantly under-estimate real doses and therefore under-estimate disease risk by orders of magnitude. Because doses are estimated based on many assumptions about weather patterns, reference citizens (usually adult males) and other variable factors, they are not necessarily representative of a real case.

In medicine, we know that effective medication doses vary hugely according to patient size, gender, kidney/liver functioning, environment and individual metabolism, and these factors can cause large individual differences in effectiveness of a medication. Similarly, the actual radiation releases from an accident would be a more accurate reflection of risk rather than dose estimates, and should be the planning basis for the PNERP.

**2. Intentional lack of detailed emergency preparation because a severe accident is "unlikely"**

I have concerns about the PNERP's decisions about what level of detail its plan should be based on likelihood of a severe nuclear accident. On page 46 of the DP, the PNERP states:

"...the amount of detailed planning should decrease as the probability of the accidents' occurrence decreases"

and

"...detailed planning and preparedness for events with the levels of probability contemplated under the severe accident assessments examined in this paper is potentially imprudent and detrimental to the goal of public safety".

As a physician, I find these comments peculiar and disturbing. It is true that decisions about resource distribution must be made according to the probability of an event, but the potential severity of consequences should also play a large role in these decisions. It is clear that a Fukushima level accident at Pickering or Darlington would have far more devastating consequences than it did in Fukushima due to the fact that the population numbers and density near these reactors are many times greater than those associated with Fukushima, and also due to the potential radioactive contamination of the Great Lakes. Half of Ontarians live near one of Ontario's nuclear reactors and forty million Canadians and Americans rely on the Great Lakes for drinking water. All these people could be subject to increased levels of radiation in the event of such an accident. The health consequences of this exposure could be staggering.

In medicine, the opposite attitude is prevalent. An event that is unlikely but catastrophic in scope is diligently prepared for. As much care, attention and preparedness is paid to an unlikely, but catastrophic event, as is paid to more common, less serious events. A ruptured abdominal aortic aneurysm (AAA) is not a common medical condition but carries a high fatality rate if not treated immediately. Surgeons are taught in detail how to do the surgery that saves lives and must keep up their skills on the unlikely chance that a patient arrives in the emergency room with this condition. The surgeon does not say to herself: "I do not need to know how to do ruptured AAA surgeries well, as it is unlikely to happen anyway". Many conditions are extremely unlikely to occur, but doctors and nurses are expected to be able to recognize and treat them anyway, and this is the public's very reasonable expectation. Similarly, it is reasonable for the PNERP to have in place, a detailed emergency response plan that addresses an unlikely, but potentially catastrophic, nuclear accident. Anything less is unacceptable and inexcusable, considering the large population surrounding our nuclear reactors and the potential for large radiation release.

### **3. Estimates of the probability of a severe nuclear accident do not align with the actual frequency of severe accidents seen worldwide**

Though the estimates for likelihood of a major nuclear accident are extremely small according to the PNERP, in fact there has been a significant nuclear accident worldwide every ten years since the inception of nuclear energy, putting into question the formula for estimating the probability of such an event. In addition, Canadian reactors are old, and therefore prone to dysfunction. The fact that they are multi-unit plants (up to eight reactors together unlike most other countries which have only a single reactor per site) makes the risk higher. Also Canadian reactors share a single containment structure for several reactors, which is discouraged as a nuclear reactor

design, as it increases the risk of breaching the containment of radioactive substances in the case of an accident. The radiation releases in multi-unit accident scenarios estimate much larger releases than the present PNERP proposes.

#### **4. Population effect of small risk in a large population**

The DP refers frequently to the estimated doses of an accident being very small. However, one must remember the population effect of even a small increase in risk. Even if the radiation dose to a population is small, and would elevate the cancer risk minimally, when applied to a large population of many millions of people, there will be significant numbers of new cancer cases due to the exposure.

There is considerable controversy about the actual health effects of the Fukushima disaster, with much discussion about suppression of data and numbers of actual cancer cases by the Japanese government. It is hard to imagine that there have been no health effects with such a large and ongoing release of radiation, as is claimed.

The UNSCEAR report (p. 41 of DP) concludes that basically there will be no negative health consequences of the Fukushima nuclear accident, other than a “theoretical” increase in childhood thyroid cancer only among the most exposed children. Clearly this is an attempt to minimize the overall harm from the accident, and cannot be accurate, given our knowledge of the deleterious health effects of ionizing radiation. There is no doubt that the exposure experienced by the people of Japan, which continues, and will continue for thousands of years, is causing and will cause an increase in cancer and other radiosensitive diseases for many years.

#### **5. Concerns about primary and secondary zoning**

Another concerning issue is the decision around what should constitute the distance for primary and secondary zones. I do not see any scientific justification in declaring a primary zone of 10 kilometres in the PNERP, nor do I see anything in the DP that supports doubling the primary zone distance from 10 to 20 kilometres, and must conclude that this is an arbitrary change. The decision about distance of primary and secondary zone should be based on rigorous science-based information. It should be noted that the primary zone in many other countries is larger than the 20 kilometres proposed in the PNERP changes.

#### **6. Conflict of interest regarding source of information**

In the PNERP DP, the discussions appear to be based on technical information from the Ontario Power Generation (OPG) and the Canadian Nuclear Safety Commission (CNSC), which are strong supporters of the nuclear industry, which therefore represents a conflict of interest situation. In medicine, there is much criticism of doctors who base medical decisions on information derived from pharmaceutical companies, and who accept gifts, monetary and otherwise, from the drug industry, as this has been shown to increase their prescription rates of the medications produced by those same companies. Similarly, decisions made around the PNERP should be free from industry influence.

#### **7. International best practices**

PNERP authors claim that the plan should meet international best practices. However, I do not see any indication of this, especially since the planning basis for the PNERP is based on an accident magnitudes smaller than Fukushima (see #1 above).

A good example of best international practices would be last month's decision by Switzerland to upgrade its reference accident for emergency planning purposes to a true Fukushima level accident (INES level 7). Prior to this, Switzerland calculated estimates based on different accident scenarios at all nuclear stations and using different weather patterns (the worst being an INES level 6 accident which is 10 times less severe in terms of radioactive releases than Fukushima). It then outlined detailed protective measures that would be required in these various scenarios (such as evacuation, ensuring uncontaminated food supplies, pre-distribution of thyroid protection pills etc). They established an evacuation zone to 50 kilometres from the station (in contrast to PNERP's proposed evacuation zone of 20 kilometres).

Clearly the PNERP does not address emergency planning in nearly as much detail or with worse case scenarios as Switzerland. Considering the health risks in Ontario are far greater than in most of the world due to the large population living near the reactors, the adjacent source of drinking water serving tens of millions of people, and the inherent risks of aging multi-unit reactors with shared containment structures, the PNERP is grossly inadequate. The PNERP should be altered extensively to meet international best practices, using Switzerland as an example.

#### **8. Potassium iodide (KI) pills are not part of the PNERP "because it done not form a component of the planning basis" (p. 9 DP)**

The distribution of KI is extremely important as a preventative health measure in the case of a nuclear accident. In terms of international best practices, Switzerland presently pre-distributes KI to all citizens living within a 50 kilometre radius of nuclear stations. The PNERP proposes 20 kilometres, despite the more serious risks to health of a nuclear accident near the Great Lakes previously described. In Ontario KI pills are available free to everyone within a 50 kilometre radius but there has been little public education about this and little uptake.

It cannot be overstated that the public expects an appropriate PNERP. It is always important for people to feel they have some control in emergency situations and the truth is that in the case of a nuclear accident, people have little control. Taking KI pills is one action they can take and the acquisition of these pills should be encouraged. After a Toronto Star article about the opportunity to order for free KI pills for everyone within 50 kilometres of Pickering station, which most people were not aware of, ([www.thestar.com/news/gta/2016/01/05/is-toronto-ready-for-a-radiation-emergency.html](http://www.thestar.com/news/gta/2016/01/05/is-toronto-ready-for-a-radiation-emergency.html)), nearly 11,000 orders occurred within five days. Clearly the public is concerned about protecting themselves in the event of a nuclear accident, and largely unaware of measures available to them. It is not up to a newspaper to increase awareness of protective measures during a nuclear accident, it is up to the Ontario government and should be a prominent part of the PNERP.

#### **9. Emergency plan appears to based on unrealistic assumptions about nuclear accidents**

There are some significant assumptions made about the events following an accident that may not represent a real scenario – no radioactive release within 24 hours, complete evacuation from the primary zone during this window, predictable weather patterns, 100% ingestion of KI in the primary zone, complete sheltering, extensive communication to the public, no traffic jams etc. This is unrealistic, and alternative plans should be in place in case these scenarios do not unfold as planned, which I believe is highly probable.

#### **10. Drinking water contamination**

As the source of drinking water for 40 million people, it is extremely important to have a plan in place in the event that a nuclear accident contaminates Lake Ontario. The radionuclides emitted from Fukushima were largely deposited in the ocean and therefore drinking water contamination was not as much of an issue. The situation in Ontario is completely different. I do not see any reasonable plan to address this in the PNERP.

#### **11. Plans for vulnerable populations**

In the event of mass evacuation, the PNERP should address particular plans for evacuation and accommodation of hospital and nursing home patients, elderly shut-ins, children in schools and daycare centres and other vulnerable populations. In addition, hospitals outside the primary zone should be prepared to accept evacuated patients. I do not see any discussion of this in the DP or PNERP.

### **Recommendations**

1. The PNERP should be based on a Fukushima level accident (INES level 7), based on radioactive releases, not on dose estimates.
2. The PNERP should not avoid a detailed emergency plan just because it is “improbable”.
3. The PNERP should admit that its estimates of probability of an accident are not in keeping with actual severe accident rates seen worldwide.
4. The PNERP should recognize that even small increases in disease risk due to radiation exposure translate to considerable actual numbers when a large population is exposed.
5. The PNERP should establish primary and secondary zones according to appropriate calculations instead of arbitrary distances, derived from data from a reference accident similar to a Fukushima level accident.
6. The PNERP should use information from independent sources instead of industry in order to access accurate information and make unbiased decisions.
7. The PNERP should meet international best practices, using Switzerland as a prototype.
8. The PNERP should reassess KI pre-distribution availability beyond 20 kilometres in keeping with international best practices and implement appropriate public education

for people within 50 kilometres of a nuclear station, including ready access to free KI pills.

## **Conclusion**

On p. 46 of the DP, it states: “The examination of such severe accidents does not imply that detailed nuclear emergency response planning must be undertaken for these extremely low probability events. Rather, our objective is to ensure that the organization and processes detailed in the plan are capable of meeting international best practice goals for nuclear emergency response – that is, to prevent deterministic effects and minimize the stochastic effects (reference Section 7(i)) which possibly could result from such accidents.”

The PNERP does not meet the above goals, precisely because it does not address detailed nuclear emergency response planning in the case of “extremely low probability events”. As it stands the PNERP does not provide protective measures required in the event of a Fukushima level (INES level 7) accident and is therefore inadequate even without considering the elevated health risk of Ontario’s nuclear stations to Ontario and other citizens, compared to others in the world. Until it addresses such a severe accident it will remain severely lacking as a means of protecting Ontarians.

It is the role of the Ontario government to provide an appropriate nuclear emergency response plan, instead of tweaking an already weak substitute like the PNERP. In the interest of the health of Ontarians and others living downstream and downwind from Ontario’s reactors, the Ontario government should design and implement an appropriate nuclear emergency response plan that meets international best practices and aligns with public expectations.