

IN THE MATTER of a Joint Review Panel established under sections 29 and 40(2) of the *Canadian Environmental Assessment Act* in relation to the New Nuclear Power Plant Project proposed by Ontario Power Generation at the Darlington Nuclear Site, in the Regional Municipality of Durham, Province of Ontario

- and -

IN THE MATTER of an Application for Licence to Prepare a Site filed under section 24(2) of the *Nuclear Safety Control Act* in relation to the New Nuclear Power Plant Project proposed by Ontario Power Generation at the Darlington Nuclear Site, in the Regional Municipality of Durham, Province of Ontario

**FINAL COMMENTS OF THE  
CANADIAN ENVIRONMENTAL LAW ASSOCIATION**

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**FINAL COMMENTS OF THE CANADIAN ENVIRONMENTAL LAW  
ASSOCIATION TO THE JOINT REVIEW PANEL  
RE: DARLINGTON NEW NUCLEAR POWER PLANT PROJECT**

**PART I – INTRODUCTION**

1. These are the final comments of the Canadian Environmental Law Association (“CELA”), which intervened in the Joint Review Panel (“JRP”) hearing under the *Canadian Environmental Assessment Act* (“CEAA”) and the *Nuclear Safety Control Act* (“NSCA”) in relation to the Darlington New Nuclear Power Plant (“NNPP”) Project.<sup>1</sup>

2. With respect to environmental assessment (“EA”) matters, CELA’s overall position is that the JRP cannot recommend approval of the NNPP Project under CEAA on the basis of the record currently before the JRP. CELA’s reasons for its position can be summarized as follows:

- (a) there is insufficient information to adequately establish the alleged “need” for the NNPP Project, contrary to section 16(1)(e) of CEAA, section 7.1 of the Environmental Impact Statement (“EIS”) Guidelines, and the JRP Terms of Reference;
- (b) there is an improper description of the “purpose” of the NNPP Project, contrary to section 16(2)(a) of CEAA, section 7.1 of the EIS Guidelines, and the JRP Terms of Reference;
- (c) there is insufficient information to adequately identify and evaluate a reasonable range of functionally different “alternatives to” the NNPP Project, contrary to section 16(1)(e) of CEAA, section 7.2 of the EIS Guidelines, and the JRP Terms of Reference;
- (d) there is insufficient information to adequately identify and evaluate “alternate means” of carrying out the NNPP Project, contrary to section 16(2)(b) of CEAA, section 7.3 of the EIS Guidelines, and the JRP Terms of Reference;
- (e) there is insufficient information to adequately identify and evaluate the environmental effects (or their significance) of the NNPP Project, contrary to section 16(1)(a) and (b) of CEAA, sections 11.1, 11.3 and 13 of the EIS Guidelines, and the JRP Terms of Reference;
- (f) there is insufficient information to adequately describe, at a sufficient level of detail, technically and economically feasible mitigation measures that will be effective in preventing significant adverse environmental effects, contrary to section 16(1)(d) of CEAA, section 11.2 of the EIS Guidelines, and the JRP Terms of Reference;

- (g) there is insufficient information to adequately describe, at a sufficient level of detail, the content requirements of an appropriate followup program, contrary to section 16(2)(c) of CEAA, section 15 of the EIS Guidelines, and the JRP Terms of Reference; and
- (h) there is insufficient information to adequately demonstrate that the NNPP Project meets the sustainability purposes and precautionary requirements established under CEAA.

3. With respect to the application filed by Ontario Power Generation (“OPG”) under the NSCA, CELA’s overall position is that the Licence to Prepare a Site (“LTPS”) should not be issued to the proponent. CELA’s reasons for its position can be summarized as follows:

- (a) the Darlington location is inherently unsuitable for the NNPP Project because of the sizeable (and ever-increasing) population living beside and near the site;
- (b) the effectiveness of emergency planning and/or mass evacuation measures in the event of a catastrophic nuclear incident at the Darlington site has not been satisfactorily demonstrated;
- (c) it is inappropriate to grant an LTPS for a location at which there are already existing reactors and used nuclear fuel storage in close proximity;
- (d) there has been inadequate consideration of the various risks – and unacceptable consequences – of accidents and malfunctions over the entire lifecycle of the NNPP Project; and
- (e) there has been inadequate consideration of the impacts of routine or accidental emissions of radionuclides from the Darlington site into nearby and downstream sources of drinking water.

## **PART II – CELA’S COMMENTS ON EA MATTERS UNDER CEAA**

### **(a) Inadequate Consideration of Purpose and Need for the Project**

4. With respect to the NNPP Project, OPG was obliged by CEAA and the EIS Guidelines to address the threshold EA planning issues of “need”, “purpose”, “alternatives to”, and “alternative means.”<sup>2</sup> As described below, CELA submits that OPG did not satisfactorily address these matters in the EIS or during the JRP hearing.

5. Accordingly, the JRP has been left with inadequate information to discharge its “high standard of care” when considering these mandatory requirements under section 16 of CEAA.<sup>3</sup> In this regard, CELA notes that the JRP’s Terms of Reference specifically stated that the scope of the Review will include the important considerations set out in

subsections 16(1) and (2) of CEAA, including “need”, “purpose”, “alternatives to”, and “alternative means.”<sup>4</sup>

6. By any objective standard, OPG failed to adequately address “need” and “purpose” in the EIS. Instead, the EIS simply invokes the Energy Minister’s 2006 directive,<sup>5</sup> and implies (without elaboration) that the mere existence of the directive wholly disposes of the statutory obligation to address “need” and “purpose” under CEAA.

7. The substantive deficiencies in the EIS regarding “need” were not satisfactorily remedied by OPG presentations, undertaking answers, or responses to information requests during the JRP hearing. For example, OPG: (i) continued to invoke the Minister’s directive as justification for the Project; (ii) conceded that it had not conducted a cost-benefit analysis of the Project; and (iii) made a belated attempt to read into the record certain excerpts from Ontario’s most recent demand-supply directive. In essence, during three weeks of public hearings, OPG failed to present any detailed information, accurate modeling and credible forecasts which would quantify or otherwise substantiate the need for the NNPP Project. Thus, CELA submits that OPG’s efforts at the hearing do not constitute proper or probative evidence of “need” within the meaning of CEAA.<sup>6</sup>

8. During the JRP hearing, certain representations were made by the Ontario government in relation to the alleged “need” for the NNPP Project.<sup>7</sup> However, like OPG, provincial officials at the JRP hearing presented no actual proof or cogent analysis to objectively justify the “need” for the Project.

9. The answers provided by the Ministry of Energy and OPG to Undertakings 75 and 76 do not remedy the paucity of evidence regarding “need” for NNPP Project. In addition, CELA notes that the answers to Undertakings 75 and 76 were filed after the conclusion of the public hearing. As a matter of procedural fairness, CELA strongly objects to the *ex post facto* filing of these undertaking answers outside of the hearing process, which contravenes the public participation purposes of CEAA, and significantly prejudices the ability of interveners to meaningfully respond to the various claims contained within the undertaking answers.

10. With respect to Undertaking 75, the Ministry’s answer confirms that the latest supply mix directive must still be reflected in the as-yet undrafted Integrated Power System Plan (“IPSP”), and that the IPSP must still be submitted to the Ontario Energy Board (“OEB”). In addition, the Ministry’s answer provides no evidence to verify its assumptions, data analysis or projections regarding peak demand, annual consumption, predicted generation, and anticipated electricity costs. More alarmingly, Tables 3 and 4 suggest that energy from renewable sources (i.e. wind, solar and bioenergy) will flat-line after 2020, when OPG anticipates that new/refurbished nuclear reactors will be put into service. This projection underscores CELA’s concern that pouring untold billions of dollars into new nuclear capacity will effectively constrain or “cap” the development of cleaner, cheaper and safer renewable energy projects.

11. The Ministry's answer to Undertaking 75 corroborates the position taken by CELA and other interveners at the hearing that "renewable is doable."<sup>8</sup> The Ministry's own figures for the 2010-2020 period suggest that: (i) total electricity demand will stay relatively flat; (ii) efficiency/conservation measures will offset the projected population growth; and (iii) the complete phase-out of coal generation and sizeable (i.e. 40%) reduction in nuclear generation will be offset by doubling renewable energy generation (hydro, wind, solar and bioenergy), with the biggest increase coming from wind, and a modest increase in natural gas generation. However, in the 2020-2030 period, the Ministry inexplicably predicts a huge increase in total electricity demand (despite the downward trend in demand since 2006), and the Ministry projects no increase in output from renewable energy sources during that decade. Thus, it appears that the Ministry's illogical basis for the NNPP Project is that Ontario may require new nuclear generation in about 15 years, but only if all of the province's energy conservation and renewable energy programs are capped, scaled back or discontinued about 7 years from now.

12. OPG's answer to Undertaking 76 attaches the 2005 Memorandum of Agreement ("MOA") between OPG and Ontario, but fails to append the relevant excerpts from the *Electricity Act*, which places no legislative limits on OPG's ability to pursue non-nuclear generation options.<sup>9</sup> Assuming (without deciding) that the MOA is a legally binding contract between the signatories, it does not amend or supersede the *Electricity Act*. In addition, the MOA can be changed at any time by the Ontario government and, more importantly, the MOA (page 2) leaves the door open to Ontario to direct OPG to pursue non-nuclear renewable energy projects. Indeed, the OPG undertaking answer confirms that it has already been directed by Ontario in March 2011 to convert some existing stations to biomass or natural gas. Thus, OPG's suggestion that it is legally precluded from pursuing renewables is without merit.

13. OPG's refusal to adequately address "need" and "purpose" within the EIS, or during the JRP hearing, is unreasonable, unacceptable, and unsupportable in law for the following reasons:

- (a) given the peremptory language of subsections 16(1)(e) and (2)(a) of CEEA (i.e. this JRP assessment "must" consider the purpose of, and need for, the project), there is no merit to the OPG's suggestion that it was free to disregard the threshold question of "need" in these proceedings. Once the EIS Guidelines and JRP Terms of Reference specified that "need" must be considered in this EA process, OPG – and, more importantly, the JRP – is legally obliged under CEEA to fully canvass this key issue rather than sidestep it;<sup>10</sup>
- (b) the Minister's directive is, at best, a political statement of governmental intention. However, it does not objectively demonstrate the alleged "need" for the NNPP Project, particularly a project of the size, scale, capacity, and location being proposed by OPG;<sup>11</sup>
- (c) the Minister's directive has not been adopted or incorporated within an approved long-term energy plan for Ontario. To the contrary, it must be noted that: (i) the

first proposed IPSP was discontinued; (ii) public consultation on the second IPSP has not yet occurred; (iii) the second IPSP must still undergo extensive public hearings before the OEB; and (iv) there is considerable uncertainty as to when – or whether – the OEB will approve the IPSP under the *Electricity Act*. In these circumstances, it remains to be seen whether the so-called “need” for 14,000 MW of nuclear baseload (including 2,000 MW from Darlington) will be eventually upheld – or rejected – by the OEB, having regard for the two-branch approval test for the IPSP (compliance with the Minister’s directives and “economically prudent and cost-effective”);<sup>12</sup>

- (d) the mere fact that Ontario has undertaken some limited pre-consultation on its most recent supply-mix directive does not obviate the legal duty to adequately address “need” under CEAA. Similarly, the fact that some people participated in Ontario’s pre-consultation exercise is neither relevant to, nor dispositive of, the question of whether the CEAA requirements regarding “need” have been met in this case;
- (e) OPG has failed to adequately “define the problem or opportunity that the project is intending to solve”, and OPG’s circular description of “purpose” (i.e. to satisfy the Minister’s supply-mix directive) fails to “define what is to be achieved by carrying out the project”. As currently drafted, OPG’s problematic definition of “purpose” simply amounts to a statement that the proponent intends to fulfill the wishes of its shareholder. For EA planning purposes, this statement of purpose is inadequate and unacceptable under CEAA and the JRP Terms of Reference, and should therefore be rejected by the JRP;<sup>13</sup> and
- (f) given that the Ontario government is the sole shareholder of OPG, any protestations by OPG that its mandate is “limited” should not be accepted by the JRP. In effect, OPG is inextricably connected to the Ontario government, and the so-called “limits” on OPG’s mandate are more illusory than real. Moreover, given the legal linkage between OPG and the Ontario government (and their commonality of interest), both parties should be considered to be co-proponents for the purposes of this EA process.

14. “Need” and “purpose” are arguably two of the most important CEAA considerations in this case, particularly in light of the significant costs and environmental risks posed by the NNPP Project. It is a tenet of sound EA planning that where a project poses environmental risks, the proponent must demonstrate that the project is actually needed. Thus, it is not in the public interest to approve a risky (or costly) project for which there is no demonstrable public need.<sup>14</sup> This principle has been accepted under Ontario’s EA legislation,<sup>15</sup> and CELA commends its adoption by the JRP in this case.

**(b) Inadequate Consideration of Alternatives to the Project**

15. CEAA, the EIS Guidelines, and the JRP Terms of Reference made it abundantly clear that this EA process required “an analysis of alternatives to the project”, which was

to include descriptions of “functionally different ways to meet the project’s need and achieve the project’s purpose from the perspective of the proponent.”<sup>16</sup> The EIS Guidelines further specified that OPG must “identify and discuss other technically and economically feasible methods of producing electricity other than the construction and operation of the OPG Darlington NNPP that are within the control and/or interests of OPG (emphasis added).”

16. However, OPG filed an EIS which did not contain any meaningful analysis of functionally different “alternatives to” the NNPP Project. Instead, OPG briefly listed four so-called “alternatives to”: (i) do nothing; (ii) smaller nuclear project at the Darlington site; (iii) same nuclear project at a different location; or (iv) non-nuclear generation option. All four options were summarily rejected by OPG without analysis on the grounds that they were “unacceptable” and “inconsistent” with the Minister’s directive, thereby leaving OPG to claim that there are no reasonable “alternatives to” within the control or interests of OPG.<sup>17</sup> These EIS claims were repeated by OPG at the JRP hearing.<sup>18</sup>

17. OPG’s refusal to properly evaluate “alternatives to” the Project in the EIS, or at the JRP hearing, is unreasonable, unacceptable, and unsupportable in law for the reasons described above regarding “need”, and for the following additional reasons:

- (a) OPG’s one sentence discussion of Option 1 (i.e. “do nothing”) fails to include any analysis or criteria to evaluate the biophysical and socio-economic pros/cons of not building the NNPP Project. Indeed, not building the Project may, in fact, be a realistic (if not preferable) outcome;
- (b) even if OPG does not intend to “do nothing”, proper review of the “do nothing” alternative has long been considered to be an important component of EA planning since such analysis helps provide a comparative benchmark for assessing the environmental impacts and acceptability of the preferred alternative;<sup>19</sup>
- (c) OPG’s Options 2 and 3 (i.e. smaller nuclear project at Darlington, or same nuclear project at a different site) are essentially variations of the same alternative preferred by OPG, and therefore do not represent functionally different “alternatives to”. Indeed, these variations are essentially “alternative means” of carrying out a nuclear generation option, and do not satisfy the requirements of the EIS Guidelines or the JRP Terms of Reference to evaluate functionally different “alternatives to” OPG’s new nuclear proposal;
- (d) OPG’s Option 4 is labeled as “non-nuclear generation” alternatives, but OPG has failed to specifically identify what projects, facilities or activities fall within this category, and has further failed include any analysis or criteria to evaluate the biophysical and socio-economic pros/cons of non-nuclear generation options which are technically and economically feasible;



- (e) when asked by the JRP about the underlying rationale for Ontario's insistence upon 50% baseload from nuclear power, the Ministry of Energy could only advise that this has been the *status quo* to date. Significantly, however, the Ministry acknowledged that the baseload number could be set at less than 50%, and could be derived from other cost-effective non-nuclear generation options.<sup>20</sup> Furthermore, the Ministry's musings about these non-nuclear options (or combinations thereof) do not amount to a stringent evaluation of "need" or "alternatives to" that would justify a new nuclear project of the scale, cost and potential impact being proposed in this case;
- (f) CELA submits that the reasonable range of "alternatives to" which should have been evaluated within this EA process include all forms of non-nuclear electricity generation, demand management, smart grid development, electricity imports from other jurisdictions, and energy conservation/efficiency options. It is only after this comparative exercise has been properly completed (with public/agency input) that any informed conclusions can be drawn about the "alternative to" (or combinations thereof) that can best supply the required electricity with the lowest cost, fewest adverse environmental effects, and most positive contributions to sustainability;<sup>21</sup> and
- (g) the need for serious consideration of alternative (or renewable) energy sources by OPG was repeatedly raised by numerous participants in the JRP hearing,<sup>22</sup> and OPG's stock answer about its "limited" mandate is both unconvincing and unacceptable for the above-noted reasons.

18. The identification, comparison and ranking of "alternatives to" is an essential cornerstone of sound EA planning, and the range of "alternatives to" should be determined by the functions of the project, rather than the business aims of a proponent.<sup>23</sup> Accepting OPG's suggestion that its business mandate (or the Ministry's directive) should define the purpose of the Project unduly constrains the "alternatives to" analysis and ultimately renders the CEAA meaningless.

**(c) Inadequate Consideration of Alternative Means of Carrying out the Project**

19. CEAA, the EIS Guidelines, and the JRP Terms of Reference made it clear that this EA process was required to evaluate feasible "alternative means" of carrying out the project, and to develop and apply criteria for assessing the environmental effects of each "alternative means" in order to select a preferred alternative.<sup>24</sup>

20. In the EIS, however, OPG failed to specify which particular reactor technology that it intends to construct and operate as the centerpiece of the NNPP Project. Instead, OPG initiated the CEAA process before a vendor or technology has been selected by the Ontario government. Thus, OPG concedes that "for the purposes of this EIS, the Project is not based on a specific reactor type," but on a "set of bounding parameters that, when considered together, form the scope of the Project."

21. OPG's "alternative means" analysis within the EIS and during the JRP hearing is unreasonable, unacceptable, and unsupportable in law for the following reasons:

- (a) the competitive process to procure two new nuclear reactors has been suspended by Ontario, and there is considerable uncertainty as to when this process will be completed, or which of the four proposed reactor types (if any) may be selected. Indeed, it appears that OPG is asking for open-ended CEAA approval to build up to four new reactors (not just two) at the Darlington site;<sup>25</sup>
- (b) unless and until a vendor (and reactor type) has been selected, it is premature and virtually impossible to: (i) fully identify potential environmental effects, (ii) rigorously assess the significance of such impacts; (iii) determine whether significant adverse effects can be justified; (iv) quantify the multi-billion dollar cost of the NNPP Project; (v) assess the efficacy of proposed mitigation measures; or (vi) determine the content requirements of appropriate followup programs;<sup>26</sup>
- (c) various governmental reviewers and interveners correctly stated that their ability to fully assess potential adverse environmental impacts was "challenged" or impaired by lack of design detail or operational information. Several of these persons also correctly concluded that "uncertainties" within OPG's "bounding" exercise precluded meaningful review of "alternative means";<sup>27</sup>
- (d) the mandatory CEAA requirements regarding "alternative means," and comparative analysis of their environmental effects, cannot be satisfied by limited (or conceptual) discussion of such matters within this EA process;<sup>28</sup> and
- (e) OPG failed to conduct a reasonable site selection process as part of the "alternative means" analysis, presumably because of its mistaken belief that it was duty-bound under the Minister's directive to only consider the Darlington location, rather than comply with the mandatory requirements of CEAA.

22. The analysis of "alternative means", the evaluation of their associated environmental effects, and the selection of a preferred alternative should occur only when the operational details of a project have been developed with sufficient particularity to facilitate meaningful public and agency discussion of the full range of potential environmental effects.<sup>29</sup> In the absence of such critical details in this EA process, CELA submits that there is no air of reality to OPG's overgeneralized discussion of environmental impacts, mitigation measures, or followup/monitoring programs.

**(d) Inadequate Consideration of the Followup Program**

23. Section 16(2)(c) of CEAA requires a description of "the need for, and requirements of, any followup program in respect of the project (emphasis added)." The EIS Guidelines also stipulated that the followup program in this case must include a robust environmental effects/effectiveness program, as well as other followup actions and compliance monitoring measures. The EIS Guidelines further specified that "the

followup program plan must be described in the EIS in sufficient detail (emphasis added).<sup>30</sup> The JRP Terms of Reference similarly indicated that the Review would address “the requirements of a followup program.”<sup>31</sup>

24. However, OPG failed to address this important matter adequately or at all in its EIS and in the information adduced at the JRP hearing. In the EIS, OPG presented only a “preliminary plan and scope” for developing the followup program, but the EIS itself did not contain an actual followup program, nor any detailed content that was fully responsive to the numerous items specified by the EIS Guidelines.<sup>32</sup> Similarly, at the JRP hearing, OPG simply asserted that “the Followup Program will be established after the EA hearing is complete.”<sup>33</sup> Thus, while OPG appears to concede the need for a followup program, OPG failed or refused to specify the detailed requirements of an appropriate followup program at the JRP hearing.<sup>34</sup>

25. OPG’s failure to present a sufficiently detailed followup program was duly noted by Natural Resources Canada,<sup>35</sup> Environment Canada,<sup>36</sup> and CNSC staff.<sup>37</sup> While these agencies offered various recommendations for the followup program, CELA submits that such recommendations fall well short of delineating a robust followup program that warrants approval of the NNPP Project.

**(e) Inadequate Consideration of Sustainable Development under CEEA**

26. CEEA’s preamble, purpose and provisions make it abundantly clear that sustainable development is the paramount objective of the legislation.<sup>38</sup> Similarly, the EIS Guidelines in this case expressly required OPG to address various considerations related to sustainable development.<sup>39</sup>

27. However, OPG presented insufficient evidence within this EA process to substantiate its claims about sustainable development. For example, the EIS’s sustainability discussion is generally limited to certain sections of Chapters 3 and 6, but primarily consists of standard sustainability definitions and self-serving tables and “scorecards”.<sup>40</sup> More importantly, the EIS’s Project-specific sustainability conclusions are overgeneralized, unpersuasive, and inherently unreliable since they are premised upon findings contained within the fundamentally flawed environmental impact assessment elsewhere in the EIS.

28. CELA submits that there is no reasonable basis upon which the JRP can conclude that the NNPP Project constitutes sustainable development, or that the Project is the best (or only) option for meeting Ontarians’ electricity demands. In short, there is insufficient evidence within this EA process to demonstrate that the Project will move the province towards a desirable, resilient and sustainable energy future,<sup>41</sup> particularly in light of:

- (a) the unknown (but likely exorbitant) quantum of the economic costs of the Project over its entire lifecycle, most of which will be borne by future generations;<sup>42</sup>

- (b) the likelihood of (or uncertainty about) net environmental effects (i.e. air, water and fisheries), human health risks, cumulative effects, OPG’s inability to ensure “zero discharge” from the Project, and “legacy” effects of the Project over its entire lifecycle (i.e. long-term storage/disposal of radioactive waste for countless generations);<sup>43</sup> and
- (c) the undisputed and unprecedented need for careful, ongoing implementation of appropriate on-site management, off-site monitoring, and regulatory supervision of the decommissioning phase of the Project for numerous centuries.<sup>44</sup>

29. Accordingly, the NNPP Project represents a major – and wholly unjustified – burden upon current and future generations, especially since other less costly and less impactful alternatives for meeting Ontario’s electricity demand were not seriously evaluated by OPG in these proceedings. In short, the social, economic and environmental sustainability of the Project’s entire lifecycle has not been proven by OPG within this EA process. Moreover, while reduction of greenhouse gas (“GHG”) emissions is often touted as a benefit of nuclear power, CELA submits that the JRP should accord no weight to GHG arguments from OPG and its supporters for several reasons: (i) such claims are not borne out by a careful examination of the carbon footprint of the full lifecycle of nuclear power production; (ii) claimed GHG benefits do not offset or excuse impacts caused by emissions of radionuclides and/or conventional contaminants into air, land and water from nuclear power plants; and (iii) an approval of the multi-billion dollar NNPP Project will significantly hinder progress on GHG gas emissions by delaying, displacing, or effectively “capping” the development of a flexible and de-centralized smart grid, or the expansion of cleaner, cheaper, and emissions-free sources of renewable energy (i.e. wind, solar, etc.).<sup>45</sup>

**(f) Non-Compliance with the Precautionary Principle under CEAA**

30. CEAA states that projects must be “considered in a careful and precautionary manner... to ensure that such projects do not cause significant adverse environmental effects.”<sup>46</sup> Similarly, CEAA imposes a mandatory duty on decision-makers (including the JRP) to “exercise their powers in a manner that protects the environment and human health and applies the precautionary principle.”<sup>47</sup> While the precautionary principle is undefined under CEAA, the Supreme Court of Canada has defined and endorsed the principle in the environmental context.<sup>48</sup>

31. CELA submits that the EIS and other information provided within this EA process fails to satisfactorily demonstrate compliance with the precautionary principle under CEAA. For example, no credence should be given by the JRP to OPG’s claim that technical or scientific uncertainty was adequately addressed by “conservative” assumptions within the bounding exercise, or by creating a “hypothetical hybrid” of reactor types under consideration.<sup>49</sup> As described below, CELA submits that unless and until a sufficiently detailed project (i.e. reactor type/number, cooling system type, etc.) is presented by OPG, it is virtually impossible to ensure the NNPP Project has been examined and planned in a precautionary manner, as required by CEAA. Moreover,

OPG's conclusions about the precautionary principle are premised upon the questionable and incomplete environmental effects analysis within the EIS, and therefore cannot be regarded by the JRP as reliable or accurate.

32. In light of the numerous outstanding design/operational issues, CELA submits that approving the NNPP Project would be unjustified, premature, and contrary to the precautionary principle entrenched within CEAA. In particular, CELA submits that it would be the antithesis of the precautionary principle to effectively throw caution to the wind, ignore the numerous deficiencies within this EA process, and approve the Project despite the fundamental uncertainties and lack of design details outlined above. Accordingly, if the precautionary principle is to be taken seriously and properly applied in this case, then the JRP must recommend rejection of the Project under CEAA.<sup>50</sup>

33. Because the consequences of a very severe accident at the new nuclear reactors could result in extensive off-site emission of highly radioactive radionuclides (effectively rendering the contamination of the surrounding area irreversible for any meaningful timeframe), CELA submits that the precautionary principle must be strictly applied by the JRP. Since mitigation measures cannot avoid this risk, the only precautionary approach that would fully prevent such irreversible consequences is for the JRP to determine that the Darlington site is not suitable under NSCA, and to find under CEAA that the potential adverse impacts cannot be justified.<sup>51</sup>

34. Other consequential uncertainties which trigger the strict application of the precautionary principle in this case include uncertainties regarding: (i) impacts of climate change upon frequency/severity of extreme weather events (i.e. tornadoes, ice storms, etc.); (ii) ability of the centralized power grid itself to withstand major events and provide backup power to the Project's safety systems; (iii) potential problems in emergency planning or large-scale evacuations if required; and (iv) long-term storage or disposal of fuel waste. These and other uncertainties undermine the fundamental assumptions made by OPG in asserting its new nuclear facilities could overcome such matters; however, such assertions cannot be maintained with any high degree of confidence.

35. Sustainability also requires consideration of the ethical and intergenerational implications of the NNPP Project. Given that the proposal is intended to only partially meet short-term energy demands, but will leave an incredibly toxic legacy to thousands of future generations, CELA submits that the Project must be considered and rejected in that context. Similarly, it is not ethical to entertain a plan to construct a facility that will produce new nuclear waste from new reactors when there is currently no permanent solution to the high level fuel waste and other radioactive waste already being produced from existing reactors.<sup>52</sup>

**(g) "Adaptive Management" cannot Salvage the Project**

36. In certain situations, the concept of "adaptive management" may be available to address uncertainty about adverse ecological consequences, provided that there are "flexible management strategies" in place which are "capable of adjusting to new

information regarding adverse environmental impacts where sufficient information regarding those impacts and potential mitigation measures already exists (emphasis added).<sup>53</sup> Thus, the CEA Agency has recognized that there are certain cases where reliance upon “adaptive management” is not appropriate.<sup>54</sup>

37. CELA submits that adaptive management cannot be invoked to “save” the NNPP Project for the following reasons: (i) there is no followup program described in the EIS; (ii) no specific reactor technology has been selected to date; (iii) there is insufficient evidence about environmental impacts (or their significance); (iv) the efficacy of proposed mitigation measures has not been adequately proven in these proceedings; and (v) adaptive management was only briefly discussed at a conceptual level in the EIS.<sup>55</sup> Thus, OPG’s promise to practice post-approval “adaptive management” is both hollow and unpersuasive. Moreover, OPG’s vague “adaptive management” pledge should not prevent the JRP from recommending rejection of the NNPP Project under CEAA on the grounds that OPG has failed to demonstrate that it can identify, evaluate and manage future environmental risks over the entire Project lifecycle. In short, adaptive management promises cannot trump the precautionary principle entrenched in CEAA, particularly given the proximity of the risk-laden NNPP Project to Lake Ontario, numerous communities, and agricultural lands.

### **PART III – CELA’S COMMENTS ON LICENCE TO PREPARE A SITE**

#### **(a) Darlington Location is Unsuitable for Granting the LTPS**

##### **Population and Emergency Planning**

38. The JRP should not grant the LTPS for the NNPP Project at the Darlington location for either two or four reactors. The location is not suitable for new nuclear build at Darlington. The populations in the immediate vicinity and in the near-to-medium distance are too great even for two more reactors at the site. Development pressures are increasing and the community is growing quickly.<sup>56, 57, 58, 59</sup> 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 EA for only a 10 km zone around the plant.<sup>60, 61</sup> Evacuation of even a 20 or 30 kilometre zone around the Darlington site would be unimaginably difficult with a 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.<sup>62</sup>

39. 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.<sup>63</sup> 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 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.<sup>64</sup> 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 new reactors must not be built in this location.<sup>65</sup>

40. OPG evaluated only the potential evacuation of a 10 km range, and only assessed the time required to move residents and occupants to a distance at the perimeter of that range. There was no evaluation of the time that would be required to move those residents to the actual evacuation centres in Peterborough and Toronto (which are 50 to 80 km distances from Darlington<sup>66</sup>). No evaluation of evacuation of 20, 30 or 80 km ranges was provided;<sup>67</sup> yet these are the ranges used in the current Japanese nuclear incident by the Japanese government (20 km and 30 km), the U.S. government (50 miles or 80 km) and the Canadian government (80 km). There is no basis in the record for the JRP to find that such evacuation distances could or would be managed appropriately around Darlington in case of a serious accident in order to provide for public safety.<sup>68</sup>

41. In this EA and LTPS application, there has been: (i) no analysis of where residents from this broader vicinity would go for evacuation shelters; (ii) no evaluation of transportation mechanism/routes beyond 10 kilometres (subject to only a limited evaluation of a fifteen km shadow zone in case people opt voluntarily to leave); and (iii) no planning, rehearsal, or provision of emergency supplies for such scenarios. In short, there is insufficient evidence that there are any facilities or locations that could absorb and shelter the numbers of people who would be affected by 20, 30 or 80 km evacuation zones surrounding the Darlington facility. No consideration whatsoever has been given as to how food and safe water would be provided to sizeable populations fleeing from these larger evacuation zones. The JRP must find that these potential effects are too significant to justify granting the LTPS. This finding would be consistent with IAEA Site Evaluation Guidance.

### **Proximity to other Reactors and High Level Used Fuel Increases Risk**

42. The JRP should not grant an LTPS for a location in which new nuclear reactors and their used fuel storage will be aggregated at the same site where there are existing reactors. As demonstrated by the catastrophic accident at Japan's Fukushima Daiichi plant, proximity of multiple reactors in one location leads to much higher potential for disaster in the event of unexpected calamity. Furthermore, the proximity of the high level used fuel storage, even if on an interim basis, massively compounds the high hazard.<sup>69</sup> Hazard from proximate reactors is a highly foreseeable danger and the consequences of such poor planning should be avoided by refusing to allow even more reactors to be added to the four presently in operation at the site. As IAEA Document NS-R-3 states, when "installed nuclear capacity is to be significantly increased, the suitability of the site shall be re-evaluated."

**(b) Inadequate Consideration of Risk of Accidents and Malfunctions**

**Accident/Malfunction Risk is Central to JRP's Decisions**

43. In the EIS and at the JRP hearing, the consequences of a severe accident at a new reactor at Darlington were inadequately considered and unpersuasively dismissed by OPG and CNSC reviewers on the basis that there will be future evaluations of safety.<sup>70</sup>,<sup>71</sup>,<sup>72</sup>. However, accident/malfunction risk is central to the EA itself, which must cover all phases of licensing. The EIS Guidelines explicitly required consideration of risk of accident and malfunction. Accident risk is also central to the NSCA decision on whether to allow the siting of new nuclear reactors at this location. Thus, risk is a central question for the current application for the LTPS, and is a matter squarely before the JRP. According to RD-346, worst case scenarios and maximum *possible* releases (emphasis added) are required to be evaluated,<sup>73</sup> particularly for emergency planning purposes and consideration of local populations. The inadequate consideration of accident/malfunction risk requires the JRP to recommend against approval of this Project under CEAA, and to refuse to issue the LTPS to OPG.

**Inadequate Consideration of Accident/Malfunction Risk**

44. 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 there is no basis before the JRP to accept the OPG analysis since, as noted by Mr. Pereira, the “core damage frequencies and large release frequency data are not as yet available for all of the reactor technologies under consideration.”<sup>74</sup> The fact that there is a general understanding of modelling methodology is not an adequate substitute for the Panel to reach its own conclusions on accident/malfunction risks.

45. The indisputable fact that catastrophic accidents can happen at nuclear power plants must be admitted, accepted, and the potential consequences evaluated. The opposite is the approach taken in this EA and this LTPS.<sup>75</sup> OPG repeatedly refused to clearly acknowledge that catastrophic accidents, with extensive off-site release of radioactive materials, are possible at the Darlington site.<sup>76</sup>,<sup>77</sup>,<sup>78</sup> This approach is contrary to that indicated in the IAEA Guide *Site Evaluation for Nuclear Installations*,<sup>79</sup> which states that site evaluation is primarily concerned with “severe events of low probability.”<sup>80</sup> Catastrophic accidents must be considered possible in the event that: (i) OPG’s probabilistic calculations erred; (ii) there was missing information; (iii) OPG’s defence in depth and redundancies failed; or (iv) a combination of unanticipated events led to large releases.<sup>81</sup> Thus, the JRP is left without essential information necessary to its deliberations and the fulfillment of its statutory duties under CEAA and NSCA.<sup>82</sup> It is neither logical nor prudent to grant CEAA approval or an LTPS Licence in the absence of a comprehensive evaluation of the consequences at this location if things go terribly wrong at a new nuclear reactor – that is, beyond the probabilistic analysis.



### **Unexpected Events Occur**

46. 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, 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.<sup>83</sup> 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.<sup>84, 85</sup> Severe natural catastrophes causing major power failures have occurred in the past decade (i.e. the major ice storm in Ontario 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.<sup>86</sup>

47. OPG advised the JRP that its backup power systems can provide up to three days of power.<sup>87</sup> However, there may be multiple events which challenge the sufficiency of such technical contingency 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 denied.

### **(c) Safety Systems May Fail**

48. When evaluating the suitability of the Darlington site, the JRP must also consider the sufficiency of the evidence in respect of safety systems. It is neither adequate nor appropriate for the JRP to make a decision in reliance upon assumptions of perfect performance of all safety systems. Safety systems may also fail for a variety of reasons, and the same considerations reviewed above may render safety systems incapable of preventing catastrophic results. In addition, part of the system may perform as hoped (i.e. shutdown of fission reaction in the reactor), but this may not necessarily deal with the ongoing need for cooling and removal of heat to prevent re-initiation of fission reactions in the fuel (as occurred in the Japanese accident<sup>88</sup>).

49. While a few passive safety system examples were mentioned in evidence,<sup>89</sup> it was not stated whether any of the potential technologies could operate with entirely passive systems; nor whether there is sufficient backup or redundancy if they themselves fail.<sup>90</sup> While passive safety systems are laudable, the JRP cannot conclude that there are any

entire reactor designs operating, nor within the set of designs before the Panel, which are entirely passive. Large consequence accidents may occur despite these systems, and the timeframes that are available to provide passive safety may be limited without other intervention.<sup>91</sup>

**(d) Unacceptable Consequences of Accident Risk at Darlington Location**

50. The information in the JRP record outlines the range of radionuclides (source term) which would potentially be released in case of a catastrophic accident at the Darlington site. For example, these substances could include Iodine 131 and Cesium 137.<sup>92, 93</sup> Other radioactive isotopes which could be released in an accident are listed in the OPG dose consequence analysis, such as Cobalt 60, Strontium 90, and numerous other radionuclides.<sup>94</sup> However, as noted earlier, the analysis conducted for this EA and licencing application assumes “bounded” scenarios and not catastrophic scenarios. CELA submits that the JRP must consider the possibility of even more serious accidents, as provided in IAEA Standard NG-G-3.2 dealing with consideration of population distribution in site evaluation.<sup>95</sup> The presence of these radionuclides in the reactor core – or other similar lists for the other reactors under consideration – constitute a high hazard for the surrounding population, thereby indicating that this is not a suitable location for new reactors.<sup>96</sup>

51. While it is not conceded that the Darlington location would be an appropriate site even without existing reactors, CELA strongly submits that the addition of new reactors to a location already holding multiple reactors makes the site completely unsuitable. Any consequences and risks from accidents would be magnified by their proximity to multiple sources of material which can achieve critical chain reactions, both in reactor cores and in used fuel storage. Serious damage to one building or facility is not only a massive risk for that reactor, but it also becomes a massive risk to a neighbouring reactor facility simply due to proximity. Thus, the JRP should find that the site’s proximity to large and growing population centres further renders this combination of activities and risks completely unacceptable.

**(e) Frequency of Severe Accidents**

52. As discussed above, unexpected sequences of events do occur despite modelling and planning. The nuclear power experience to date demonstrates this unfortunate fact (i.e. Three Mile Island in 1979; Chernobyl in 1986; and Fukushima Daiichi in 2011), which only takes into account the most serious of recent nuclear accidents. If earlier severe accidents are considered, the frequency rate is even higher.

53. Probabilistic safety analysis does not guarantee that severe nuclear reactor accidents will never happen. They may happen, and very unfortunately, they do happen.<sup>97</sup> The JRP must make its decision regarding the suitability of the Darlington site on the basis of this reality in terms of risk. In short, the JRP should take a precautionary approach and accept that it is both possible and conceivable that a severe accident on the

scale of calamity could occur in this location from the construction and operation of the NNPP Project.

54. Furthermore, the JRP must find that there are no appropriate measures which can mitigate the potential adverse impacts on populations from a worst case severe accident (or even any less severe accident that nevertheless escapes containment) at the Darlington site that causes a 30 to 80 km evacuation zone to be implemented. There is no evidence before the Panel to substantiate that such an evacuation could be managed, mitigated and the population adequately protected, since this type of scenario was not evaluated in these proceedings. In this regard, a finding by the JRP that the site is unsuitable for new nuclear reactors would be consistent with the IAEA *Safety Standard for Site Evaluation for Nuclear Installations*, NS-R\_3.<sup>98</sup> The JRP has no basis on the record to conclude that 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.

**(f) Unsuitable Location due to Fuel Waste and other Radioactive Waste**

55. The JRP should refuse to grant the LTPS to OPG because there is inadequate provision for interim, short- and long- term storage and handling of high level radioactive spent fuel waste. OPG proposes to add additional high level radioactive waste to the Darlington location for an unspecified time, while longer term options are pursued.<sup>99</sup> This alone creates an unacceptable level of risk at one location, as demonstrated by the Japanese accident.<sup>100</sup> Furthermore, it cannot be assumed, as OPG has done, that there will be any other provision for any high level radioactive spent fuel waste, existing or new.<sup>101 102</sup>

56. This EA process does not cover any other proposal for fuel waste storage or disposal. Accordingly, the question of whether this location can accommodate and properly provide for the safety and protection of the environment and human health must be fully resolved before the JRP can recommend approval of the NNPP Project under CEAA, or any LTPS can be granted under NSCA. However, the information provided by OPG to date has not adequately answered this question.<sup>103</sup> For example, OPG claimed that it could safely handle the fuel waste on the Darlington site for the hundreds of thousands of years for which it would remain highly toxic, hazardous and a risk to the environment and humanity.<sup>104</sup> This claim should be recognized by the JRP as unsubstantiated and untenable. No human technology has survived such vast timeframes; indeed, no form of known human civilization has yet survived such timeframes.

57. Transportation and storage of low, intermediate, and high level radioactive waste were inadequately considered and described in these proceedings, and the site was not shown to be suitable for these activities over the necessary timeframe of 60 years of operation, decommissioning, and ultimately the hundreds of thousands of years of toxicity of the intermediate and high level waste to be produced by the site. Failure to do so was contrary to the Siting Guideline (RD-346) section 8.2.

58. Moreover, it cannot be assumed that other off-site waste storage or disposal (i.e. the Deep Geologic Repository) will be available for low and intermediate waste since that proposal has not yet been approved; nor should it be assumed that the proposed DGR facility can or will take waste from new build nuclear at the Darlington site.<sup>105</sup>

59. With respect to nuclear waste matters associated with the NNPP Project, CELA hereby adopts and commends the submissions of Northwatch in these proceedings.

**(g) Unsuitable Location due to Accident Risk to Ontarians' Drinking Water Supply**

60. The Darlington location is unsuitable for the issuance of the LTPS 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 the Dose Consequence Analysis<sup>106</sup> may see much of that material 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 have not been examined in these proceedings in terms of releases to drinking water.<sup>107</sup> Accordingly, the JRP has no basis on which to conclude that the impacts will be fully mitigated or are otherwise justified, which are among the most fundamental questions before the JRP under CEAA. As noted above, this critical matter cannot be deferred to a later Licence to Construct under NSCA since these questions are now squarely before the JRP under CEAA.

61. Very severe accidents which release large portions of the "source term" of radioactive materials contained in reactor cores have not been modelled or examined in these proceedings. Similarly, very severe accidents dealing with the used high level fuel on-site (and their potential impact on drinking water supplies in Lake Ontario) have not been adequately modelled or examined. In addition, potential impacts on inland water supplies (both groundwater and surface water), and downstream surface water along the St. Lawrence River, mean that a serious accident would massively impair 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).

62. In these proceedings, the 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, is not sufficient compared to the provisions of the 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. In addition, these potential long-term impacts cannot be justified in light of the fleeting "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, as discussed above.

63. OPG has not demonstrated that the NNPP Project, as presently formulated, would ensure protection of all surface and groundwater supplies, and in particular, drinking

water supplies, as noted by CNSC staff during the hearing. This is, in part, because of the lack of selection of a particular reactor technology.<sup>108</sup> As a result, CNSC staff noted that this would have to be assured at the stage of an application for a Licence to Construct under NSCA. However, CELA submits that this is not an appropriate question to defer to a later Licence, and is one of the central issues on which the JRP must make a finding at this time.

64. In relation to water quality and fisheries impacts arising from the NNPP Project, CELA hereby adopts and commends the submissions of Lake Ontario Waterkeeper in these proceedings.

**(h) Unsuitable Location due to Routine Emissions of Radioactive Materials**

65. Even in the absence of accidents, routine emissions of radioactive materials make this location completely unsuitable for an LTPS.<sup>109</sup> It is admitted by OPG that in routine operations, each of the proposed plant designs would release a long list of radioactive nuclides.<sup>110</sup> For example, tritium is released from the condenser cooling system radioactive liquid waste management system.<sup>111</sup> In addition, there are leaks from the service water system from time to time.<sup>112</sup>

66. It is also admitted by the CNSC that the “linear no threshold relationship model” is the most appropriate model for calculating cancer and other health effects from exposure to radioactive nuclides.<sup>113</sup> There is a large and growing population in the vicinity of the site.<sup>114</sup> The JRP heard much evidence, concern, and a high level of uncertainty regarding elevated health risks, and increased risk of leukemia, in the vicinity of nuclear plants. On a linear no threshold model (i.e. no lowest dose where effects do not occur), the JRP must find there will be health impacts arising from the NNPP Project. This is because there are admitted routine emissions of a long list of radioactive nuclides, and the most appropriate model indicates effects at any dose on a linear basis.<sup>115</sup>

67. In light of: (i) the high level of uncertainty and public concern regarding the health impacts of the existing reactors, as well as of the proposed new reactors; (ii) the very serious nature of the potential health effects from radioactive emissions during routine operations and incidents or spills (i.e. cancers and leukemias); and (iii) the lack of a lowest dose threshold at which safety should be assured, CELA submits that the population in the vicinity of the Darlington site should not be exposed to the inevitable additional impacts to population health that will result from additional operating reactors.

68. Tritium emissions to air and to drinking water are a hallmark of the CANDU designs due to their use of heavy water. Similarly, with a no lowest dose model, health impacts from these emissions must be found by the JRP to be likely on the basis of the evidence before the Panel. In addition to routine emissions, there are additional health impacts from spills or accidental emissions of tritium from the plant, and these happen with some regularity, such as occurred during the hearing itself.

**(i) Lessons from Japan related to Siting New Nuclear Reactors at Darlington**

69. The Panel heard a presentation early in the hearing regarding “initial lessons” from the Japanese tragedy. CELA submits that it is far too early to learn any complete lessons from the tragic events in Japan.<sup>116</sup> 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 NNPP Project 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 (or JRP) 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”.

70. Instead, this question must be faced directly: is locating new 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 sizeable nearby population even be possible? On the evidence, the JRP cannot conclude or assume that 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).

**(j) Failure to Select Reactor Technology for the Darlington Site**

71. As noted above, CELA submits that it is inappropriate and premature to proceed with this EA without a choice of reactor technology, primarily because this approach does not allow a credible or complete evaluation of the environmental effects of the Project or the ability to have those effects fully mitigated<sup>117</sup>. This has been borne out by reviewers who have noted how difficult or impossible it is to do an evaluation with no choice of technology.<sup>118</sup> In short, the assurances and representations made by OPG that it can mitigate all environmental effects in a satisfactory manner are speculative, and are not built upon an appropriate evidentiary foundation.

72. Contrary to the opinion of CNSC staff,<sup>119</sup> CELA submits that the utilization of a Plant Perimeter Envelope (“PPE”) or “bounding” approach is neither appropriate nor sufficient for the approval of an LTPS under NSCA. Nor is the PPE approach appropriate or sufficient to provide a proper foundation or evidentiary basis for the Panel to find under CEAA that there will be no significant adverse environmental effects, or, for those which cannot be mitigated, that such effects are justified. The PPE approach also creates considerable difficulty in terms of testing the information, and in terms of determining the relevance to the subsequent licensing stages, for the purposes of ensuring that the Panel can meet its mandate in reviewing the EA for the Project as a whole.<sup>120</sup>

73. It became evident late in the process that a fourth reactor technology (i.e. the CANDU 6) was under consideration, and the inadequacy of the PPE approach was demonstrated once this option became a possibility. There was a major lack of information about the CANDU 6 in the EIS because it was not originally one of the potential reactor technologies under consideration, and this lack of information continued into the JRP hearing. There was a late change to the PPE to deal with the CANDU 6, but very limited technical review and assessment was undertaken in relation to this technology within this EA. For example, there was: (i) a lack of an equivalent amount of information in the EA about the CANDU 6 compared to the other technologies; (ii) late provision of the limited information that was generated; and (iii) an inability for interveners' experts to meaningfully review the CANDU 6.

#### **PART IV – CONCLUSIONS**

74. For the foregoing reasons, CELA submits that the JRP Report under CEAA should recommend that the NNPP Project not be approved on the basis of record currently before the JRP.<sup>121</sup> By any objective standard, the EA documentation tendered to date in these proceedings can only be regarded by the JRP as fundamentally incomplete in light of the numerous gaps, deficiencies and omissions identified by public/agency reviewers throughout the JRP proceedings.

75. CELA further submits that the JRP should not recommend conditional approval of the NNPP Project under CEAA or the NSCA. In short, terms and conditions proposed within the JRP Report, or developed within subsequent licencing processes, cannot excuse or remedy blatant non-compliance with mandatory EA requirements prescribed by CEAA, the EIS Guidelines, and the JRP Terms of Reference. Since these EA requirements were not properly satisfied within this EA process to date, CELA submits that it would be premature, inappropriate, and contrary to the public interest for the JRP to recommend conditional approval of the NNPP Project, or to defer the substantive content of such conditions to a future date.<sup>122</sup>

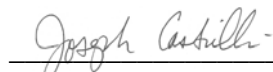
76. Accordingly, CELA respectfully requests that the JRP reject the NNPP Project under both CEAA and NSCA.

May 17, 2011




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## END NOTES

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- <sup>1</sup> CELA, “Review of Alternatives in Darlington New Build Environmental Impact Statement”; October 7, 2010) PMD 11-P1.116; Transcript, Vol. 13, pp. 195-242.
- <sup>2</sup> CEAA, subsections 16(1) and (2); EIS Guidelines, section 7.1.
- <sup>3</sup> *Alberta Wilderness Association v. Cardinal River Coals Ltd.* (1999), 30 C.E.L.R. (N.S.) 175 (Fed.T.D.) at paras. 39-41, 52.
- <sup>4</sup> JRP Agreement (January 29, 2009), sections 2.2, 4.1(a), 4.2, and Appendix, Part IV; CEAA, section 34.
- <sup>5</sup> Final EIS, section 1.1.3.
- <sup>6</sup> Transcript, Vol. 13, pp.227-32, 273-75.
- <sup>7</sup> Transcript, Vol. 16, pp.67-68.
- <sup>8</sup> Ontario Clean Air Alliance Answer to Undertaking 47; Greenpeace, “Presentation to Joint Review Panel”, PMD 11-P1.221A, pp.5-14; PMD 11-P1.221, pp.14-15; ; R.Torrie and D.Morrow, *Review of Ontario Load Forecast in the IPSP* (August 14, 2008), pp.2-8; and *Renewable is Doable* (August 2010).
- <sup>9</sup> *Electricity Act, 1998*, S.O. 1998, c.15, Sch.A, section 1 and Part IV.1.
- <sup>10</sup> Transcript, Vol. 13, pp.198-99; *Friends of the West County Association v. Canada* (2000), 31 C.E.L.R. (N.S.) 239 (Fed.C.A.) at paras.25-26.
- <sup>11</sup> Transcript, Vol. 13, pp.208-09.
- <sup>12</sup> *Electricity Act, 1998*, S.O. 1998, c. 15, Sch. A, section 25.30(4); Transcript, Vol. 5, pp.156-57, 209-10, 218-19; Transcript, Vol. 7, pp.124-25; Transcript, Vol. 13, pp.201-203; Transcript, Vol. 16, pp.232-34; Transcript, Vol. 17, pp.146, 160-61.
- <sup>13</sup> Transcript, Vol. 13, pp.207-08.
- <sup>14</sup> Transcript, Vol. 13, pp.199-200, 211-13.
- <sup>15</sup> *Re West Northumberland Landfill Site* (1996), 19 C.E.L.R. (NS) 181 (Ont.Jt.Bd.), paras.88,90.
- <sup>16</sup> CEAA, section 16(1)(e); EIS Guidelines, section 7.2; JRP Agreement (January 29, 2009), Appendix, Part IV.
- <sup>17</sup> Final EIS, section 1.1.4.
- <sup>18</sup> Transcript, Vol. 13, pp.227-32.
- <sup>19</sup> *Re Metropolitan Toronto (Finch Avenue West) Road Extension Application* (File No. EA 87-01) (Ont.Jt.Bd.), page 13.
- <sup>20</sup> Transcript, Vol. 16, pp.18-25, 36-39.
- <sup>21</sup> Transcript, Vol. 13, pp.205-06.
- <sup>22</sup> Transcript, Vol. 4, pp. 307-08, 314-15; Transcript, Vol. 5, p.216; Transcript, Vol. 6, p. 205; Transcript, Vol. 7, pp.38-39; Transcript, Vol. 8, pp.76, 187-89; Transcript, Vol. 9, pp.43, 203, 223, 226-30; Transcript, Vol. 10, pp. 27-28, 115-16, 125-26, 233, 235-39, 258; Transcript, Vol. 11, p.17, 210, 213-15, 226-27, 275-76; Transcript, Vol. 12, pp.126-27, 158-59, 175-76, 199, 201-04; Transcript, Vol. 13, pp.57-58, 174-75; Transcript, Vol.14, pp.155-56, 266-67; Transcript, Vol. 15, pp.76-80, 127; Transcript, Vol. 16, pp.191-92, 343-45; Transcript, Vol.17, pp.151-56, 195, 205.
- <sup>23</sup> *Re SNC Inc. Proposed EFW Facility Application* (File No.CH-87-01) (Ont. Jt.Bd.), p.30; Transcript, Vol. 13, 204-05.
- <sup>24</sup> CEAA, section 16(2)(b); EIS Guidelines, section 7.3; JRP Agreement (January 29, 2009), Appendix, Part IV.
- <sup>25</sup> Transcript, Vol. 3, pp.131-32; Transcript, Vol. 5, pp.171-72, 212-13; Transcript, Vol. 17, p.149.
- <sup>26</sup> Transcript, Vol. 13, pp.212-14.
- <sup>27</sup> Environment Canada, “Written Submission of the Department of Environment” (January 31, 2011) PMD 11-P1.6, pp.9-10, 18, 20, 24-26, 28-29, 35-39, 41-43, 60; Environment Canada, “Presentation to Joint Review Panel” (March 23, 2011) PMD 11-P1-6A, pp.14-17, 21; Fisheries and Oceans Canada, “Written Submission from Fisheries and Oceans Canada” (January 31, 2011) PMD 11-P1.7, pp.9, 12; Health Canada, “Written Submission of Health Canada” (January 31, 2011) PMD 11-P1.8, pp.4, 6-11; Ministry of Natural Resources, “Written Submission from Ministry Of Natural Resources” (January 28, 2011) PMD 11-P1.14, p.2; Transcript, Vol. 2, p.27; Transcript, Vol. 3, pp.239, 241, 272, 279, 294; Transcript, Vol. 4, pp.43-44, pp.321-22, 324, 328, 394; Transcript, Vol. 7, pp.102-03, 115-123; Transcript, Vol. 8, pp.30, 175-76; Transcript, Vol. 10, pp.64, 188-89; Transcript, Vol. 11, pp.14-15, 26-27, 31, 136-37, 187, 209-10, 286; Transcript, Vol. 12, p.176; Transcript, Vol. 13, p.56; Transcript, Vol. 14, pp.88, 93, 138-39, 256-57; Transcript, Vol. 15, pp.125, 201-02, 207; Transcript, Vol. 16, pp.276-77.



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- <sup>28</sup> *Alberta Wilderness Association v. Cardinal River Coals Ltd.* (1999), 30 C.E.L.R. (N.S.) 175 (Fed.T.D.) at para.80.
- <sup>29</sup> *Friends of the Island Inc. v. Canada* (1993), 10 C.E.L.R. (NS) 204 (Fed. Ct.), para.41; Joint Review Panel Report: Whites Point Quarry and Marine Terminal (2007), pp.25-26.
- <sup>30</sup> EIS Guidelines, section 15.
- <sup>31</sup> JRP Agreement (January 29, 2009), Appendix, Part IV.
- <sup>32</sup> Final EIS, Chapter 11.
- <sup>33</sup> OPG, “Written Submission from OPG” (January 31, 2011) PMD 11-P1.1A, p.7.
- <sup>34</sup> Transcript, Vol. 1, pp.177-78; Transcript, Vol. 13, p.151.
- <sup>35</sup> Natural Resources Canada, “Written Submission from Natural Resources Canada” (January 31, 2011) PMD 11-P1-9, p.4; Transcript, Vol.13, pp.149-50.
- <sup>36</sup> Environment Canada, “Written Submission of the Department of Environment”(January 31, 2011) PMD 11-P1.6, Chapter 8 (Summary of Recommendations); Transcript, Vol. 3, pp.239-40.
- <sup>37</sup> CNSC, “Written Submission from CNSC” (January 31, 2011) PMD 11-P1.3, pp.5, 160, and Recommendation #27.
- <sup>38</sup> CEAA, preamble, sections 2, 4(1)(b) and 4(2); B.Hobby et al., *CEAA: An Annotated Guide* (Canada Law Book, looseleaf), pp.II-26-26.1.
- <sup>39</sup> EIS Guidelines, section 2.4.
- <sup>40</sup> Final EIS, sections 3.2.6 and 6.1.
- <sup>41</sup> Transcript, Vol. 6, pp.198-99, 202, 205; Transcript, Vol. 8, pp.176-78.
- <sup>42</sup> Transcript, Vol. 8, pp.189-92; Transcript, Vol. 9, pp.223-24, 226, 245; Transcript, Vol. 10, pp.107-08, 121-22, 131-32, 202, 233-35; Transcript, Vol. 11, pp.17, 141, 180, 290-91; Transcript, Vol. 12, p.190; Transcript, Vol. 15, pp.55-56, 61, 72-77, 83; Transcript, Vol. 16, pp.249-52; Transcript, Vol. 17, pp.156, 196.
- <sup>43</sup> Transcript, Vol. 7, pp. 17-18, 21-24, 56-57, 105-115, 130-31, 139-40, 173-74, 233-35; Transcript, Vol. 8, pp.14-18, 26, 37-39, 44-50, 83-84, 282; Transcript, Vol. 9, pp.33-35, 128; Transcript, Vol. 10, pp.52, 81, 192, 194-96, 198-99, 201, 228, 273; Transcript, Vol. 11, pp.177-78, 183-84, 283-84; Transcript, Vol. 12, pp.205-06; Transcript, Vol. 14, pp.87-88, 202-03; Transcript, Vol. 16, pp.203, 247-49; Transcript, Vol. 17, pp.156-57.
- <sup>44</sup> Transcript, Vol. 8, pp.70-71, 75, 161-65; Transcript, Vol. 9, pp.35-36; Transcript, Vol. 10, pp.33, 36, 128, 267-68.
- <sup>45</sup> NIRS Answer to Undertaking 58; Transcript, Vol. 7, pp.36-38; Transcript, Vol. 8, pp.174-75, 178-80, 182-86, 210-12; Transcript, Vol. 9, pp.94, 201, 233-35; Transcript, Vol. 10, pp.18-20, 91, 112-13, 118, 120, 135-38, 186-87, 202-05, 216, 232-33, 270-71; Transcript, Vol. 11, pp.12-13, 154-59, 214, 230, 276; Transcript, Vol.12, pp.108-09, 130, 206-07; Transcript, Vol. 13, pp.82-83, 177-82; Transcript, Vol. 14, p.262; Transcript, Vol. 15, pp.130, 198-200; Transcript, Vol.16, pp.229-32, 235-39, 350-52; Transcript, Vol. 17, pp.120-24, 151.
- <sup>46</sup> CEAA, preamble, section 4(1)(a).
- <sup>47</sup> CEAA, section 4(2).
- <sup>48</sup> *11497 Canada Ltee v. Hudson*, 2001 SCC 40 at para.31.
- <sup>49</sup> Final EIS, section 3.2.7.
- <sup>50</sup> Transcript, Vol. 9, pp.38-39; Transcript, Vol. 10, pp.89-90, 132, 148; Transcript, Vol. 11, pp.279-81; Transcript, Vol. 13, pp.80-81; Transcript, Vol. 14, pp.95-96.
- <sup>51</sup> Compare to evidence of CEAA witness Mr. Leboeuf, at Transcript, Vol. 2, p. 19, line 5 to p. 20 line 7.
- <sup>52</sup> Transcript, Vol. 11, Mr. Roche, pp.35, 36, 50; Transcript, Vol. 17, Dr. Rutherford, p. 118.
- <sup>53</sup> *Pembina Institute for Appropriate Development v. Canada* (2008), 35 C.E.L.R. (3d) 254 (F.C.), paras. 32-33, 56.
- <sup>54</sup> CEA Agency, *Operational Policy Statement: Adaptive Management Measures under CEAA* (March 2009).
- <sup>55</sup> Final EIS, sections 3.2.5 and 11.3.
- <sup>56</sup> Transcript, Vol. 3, p.113 line 21 to p.117 line 12 .
- <sup>57</sup> Transcript, Vol. 3 .p.122 lines 3 to 9 (Mme Beaudet noting new residential development already under construction in relatively close proximity to the Darlington site); Transcript, Vol. 4, pp.174 to 177 (Mme Beaudet asking questions of Mayor Foster).

<sup>58</sup> While the JRP members explored the question about how to ensure that the population even in the immediate vicinity of the site does not continue to grow such that emergency planning would be compromised, and greater numbers of people would be impacted in the event of a serious emergency, no adequate information or evidence was provided to the Panel on this point; rather, it was evident that there is no sufficient regulatory control over this question: Transcript, Vol. 4, pp.87-102 (questions by Mme Beaudet, Mr. Pereira, and Chair Graham; the Ministry of Municipal Affairs and Housing and CNSC do not exercise regulatory control over development applications within specified distances of proposed or operating nuclear reactors; Transcript, Vol.4, pp.174-177 (plans for residential development are proceeding closer to the site than is supported by the local Municipality in part because approval authority is at a different level of local government). See also Transcript, Vol. 5, pp.66- 67 (Mr. Hefkey, advising that Emergency Management Ontario does not control land use decisions affecting population growth in the vicinity of the existing or proposed new nuclear reactors and takes the decisions of others as a “given”); and Transcript, Vol. 5, pp.77-81 (Mr. Hefkey, despite further questioning from the Chair, confirming that their input to municipal planning decisions is limited and primarily their role at EMO consists of determining that they are asked to plan for 3 km contiguous zone and 10 km primary zone, although municipal representatives sit on their emergency planning committees). See also Transcript, Vol. 5, p.94, lines 11-22 (Mr. Hefkey confirmed that the emergency planning legislation in Ontario, the *Emergency Management and Civil Protection Act*, does not have any provision as to population densities that would be precluded in the vicinity of a nuclear power plant).

<sup>59</sup> Transcript, Vol. 4, p.150, Mayor Foster, lines 19-20 (“We [Municipality of Clarington] are one of the fastest growing communities within the GTA and southern Ontario.” Clarington hopes to grow from its current 86,000 people to 140,000 people by 2031; a fifty percent increase in population: *Ibid.*, pp 150- 52.

<sup>60</sup> Transcript, Vol. 3, p.159 line 20 to p.161 line 10 (Mr. Richardson and Ms. Swami); See also CMD 11-P1.2 (CNSC staff report), p. 64.

<sup>61</sup> Transcript, Vol. 4, p. 71 lines 7 to 11 (Ms. Swami).

<sup>62</sup> Despite the evidence of Mr. Hefkey at Transcript, Vol. 5, pp. 96-97, no assessment of evacuation beyond 10 km has been done for this EA; see evidence cited at endnotes 60 and 61. At best, Mr. Hefkey’s testimony about the usefulness of the provincial plan could be considered wishful thinking as there is nothing before the panel demonstrating that hundreds of thousands or millions of people who live within, for example, 80 km of the Darlington site could be evacuated and housed in communities like Belleville or Kingston. Furthermore, an 80 km evacuation range would also extend to the west of the Darlington site, encompassing very large populations which presumably would not be evacuated through routes closer to the site and there is no planning or evaluation in the EA as to where these populations would be evacuated.

<sup>63</sup> Transcript, Vol. 4, pp. 224-27 (question by Chair Graham).

<sup>64</sup> The finding as to whether the site is suitable in order to provide a basis for issuance of a Licence to prepare the site for construction and operation is a matter for the Panel, and not Commission staff. Determination as to suitability must be made by the Commission based on the information available to it, and not based on CNSC staff opinions which are not binding on the Panel. Where information is not available to support the finding of suitability, CELA submits that the Panel must reject the Licence application.

<sup>65</sup> See International Atomic Energy Agency Safety Standard Series, Site Evaluation for Nuclear Installations, NS-R-3 (referenced by the CNSC in RD-346 as providing Guidance to the Canadian Guide).

<sup>66</sup> Transcript, Vol. 5, p.101 (Mr. Hefkey); and *ibid.*, Mr. Hefkey confirmed that the time to actually get to evacuation centres is highly variable and dependant on many conditions and only the time to arrive at the perimeter of a 10 km range from the plant has been evaluated “they’re going to take whatever time they’re going to take to get there.”

<sup>67</sup> Transcript, Vol. 1, pp.199-200 (Ms. Swami). Ms. Swami added that they also did a 15 km “shadow” evacuation analysis (but with no assessment of the time for that extra 15 km to evacuate) – but not beyond that: Transcript, Vol. 4, p.110 (Ms. Swami).

<sup>68</sup> Transcript, Vol. 3, p.157 line 8 to p.15 line 19 (Dr. Thompson confirming that the only scenarios evaluated for evacuation were those in which a population may have to be relocated up to 1 km from the facility (i.e. plant boundary); that more serious accidents with greater distances for evacuation would not meet the regulatory requirements of the Licence to construct, RD-337. See also CMD 11-P1.2 (CNSC staff report), p. 61.

<sup>69</sup> Transcript, Vol. 2, p.84 line 20 to p.85 line 2 (Mr. Frappier).

<sup>70</sup> Transcript, Vol. 2, p.90 lines 13-17 (Dr. Newland).

<sup>71</sup> Transcript, Vol. 2, p.109, lines 5-13 (Mr. Frappier).

<sup>72</sup> Transcript, Vol. 3, p.100, lines 5-20 (Mr. Howden).

<sup>73</sup> RD 346 section 5.4.

<sup>74</sup> Transcript, Vol. 2, pp. 235, 236 (Mr. Pereira question to Dr. Newland).

<sup>75</sup> For example, as noted by Environment Canada: “With respect to atmospheric releases, the atmospheric dispersion modelling was appropriately conducted for the two accident scenarios that were included in the EIS; however, we would point out that an accident scenario involving a high-temperature release of radionuclides was not conducted; in our view remains a gap. And, given the events that are happening in Japan, we would put forward the consideration that such a scenario would be modeled”: Transcript, Vol. 3, p.247 lines 4 to 15 (Mr. Dobos); see also Transcript, Vol. 3, p.293. Undertaking 16 by CNSC staff concluded that temperature of the plume would be relatively insignificant, but re-confirmed that only a particular set of accidents that fit the “bounding” scenarios – i.e. up to one in a million predicted frequency – were considered; and only the maximum permitted burnup in terms of release of inventory from the core; i.e. limiting conditions on the radioisotopes that escape the core are assumed.

<sup>76</sup> Transcript, Vol. 1, pp. 203-6 (in response to a question as to whether OPG evaluated accidents that could release radioactivity off-site, OPG said they analyzed “credible” accidents beyond design basis up to 1 in a million.

<sup>77</sup> Transcript, Vol. 1, p.216 (Mr. Vachiarelli confirmed that the designs are for 1 in 100 to 1 in 100,000 year accidents – this is the design basis. He continued to say – “this is the category of events which is fully designed for; safety systems are designed for these events”; see also Transcript, Vol. 1, p. 219 (Dr. Newland discusses briefly provisions for beyond design basis accidents – i.e. beyond design basis – he mentioned only mitigation against hydrogen and more robust containment and “other”).

<sup>78</sup> Transcript, Vol. 4, p.301 line 14 to p. 303 line 6 (Mr. Vecchiarelli stated their analysis is meant to “bound the realm of credible accidents”); *Ibid.*, at p. 310 line 5 to p.311 line 11 (anything beyond 1 in a million not considered “credible”).

<sup>79</sup> International Atomic Energy Agency Safety Standard Series, Site Evaluation for Nuclear Installations, NS-R-3 (referenced by the CNSC in RD-346 as providing Guidance to the Canadian Guide).

<sup>80</sup> At p.3, section 1.13; the IAEA site evaluation document at pp. 4-5 further states that the objective of site evaluation is as follows: “OBJECTIVE

2.1. The main objective in site evaluation for nuclear installations in terms of nuclear safety is to protect the public and the environment from the radiological consequences of radioactive releases due to accidents. Releases due to normal operation should also be considered. In the evaluation of the suitability of a site for a nuclear installation, the following aspects shall be considered:

(a) The effects of external events occurring in the region of the particular site (these events could be of natural origin or human induced);

(b) The characteristics of the site and its environment that could influence the transfer to persons and the environment of radioactive material that has been released;

(c) The population density and population distribution and other characteristics of the external zone in so far as they may affect the possibility of implementing emergency measures and the need to evaluate the risks to individuals and the population.

2.2. If the site evaluation for the three aspects cited indicates that the site is unacceptable and the deficiencies cannot be compensated for by means of design features, measures for site protection or administrative procedures, the site shall be deemed unsuitable.”

<sup>81</sup> In fact, CNSC staff did not request OPG to provide such information either; a deficiency which does not mean that the Panel is obliged to accept the information and analysis that has been provided as sufficient. The CNSC requested only analysis of a “limiting credible accident”; a “credible severe accident or beyond design basis accident that has offsite radiological consequences”: Transcript, Vol. 2, p.188, lines 5-18 (Dr. Thompson).

<sup>82</sup> For example, Health Canada testified that it “is aware that the Proponent will provide more information concerning accidents and malfunctions during the licensing phase once a reactor design is selected. We advise that the Proponent model a more realistic nuclear accident scenario to more accurately determine potential health effects and doses to workers and the public. This information will also be required for nuclear emergency planning”: Transcript, Vol. 4, p.323 lines 1 to 10 (Mr. Basiji). CELA submits that this must not be left to later licensing as it is central both to the current licence and to the EA recommendations by the Panel.

<sup>83</sup> Transcript, Vol. 2, p.80 lines 14 to 19 (Mr. Frappier indicating Magnitude 9 is approximately 8 times stronger than Magnitude 8.2 in terms of energy, and the following aftershocks were significant earthquakes in their own right).

<sup>84</sup> As in the case of Japan: Transcript, Vol. 2, pp.81-82 (Mr. Frappier).

<sup>85</sup> See also Transcript, Vol. 11, pp.53, 54 (Mr. Kamps).

<sup>86</sup> Transcript, Vol. 2, p.104 lines 4 to 9 (Dr. Newland).

<sup>87</sup> Contrary to the lessons learned from the Japan events, as cited by Mr. Frappier which include the capability of the plant to withstand a complete station blackout and loss of back-up power among other things: Transcript, Vol. 2, p.88 lines 1-10 (Mr. Frappier); Transcript, Vol. 2, pp.167-68 (Mr. Vecchiarelli describing a variety of back up power and cooling options that may provide days of cooling).

<sup>88</sup> Transcript, Vol. 2, p.81, lines 8 – 13 (Mr. Frappier).

<sup>89</sup> Transcript, Vol. 2, p.93, lines 9-10 (Dr. Newland).

<sup>90</sup> Various examples were given for the reactor technologies by Dr. Vecchiarelli: Transcript, Vol. 1, p.197; Transcript, Vol. 2 pp.134-35.

<sup>91</sup> See Transcript, Vol. 7, pp. 6-11 (Mr. Vecchiarelli); see also Transcript, Vol. 3, p. 13.

<sup>92</sup> OPG Document 397, Dose Consequence Analysis, at p. 6 (CEAA Registry document 46371E).

<sup>93</sup> See also answer to Undertaking 7, CNSC independent analysis of full core inventory of three reactors; CEAA Registry Document 49118E.

<sup>94</sup> Appendix B, OPG Document 397, Dose Consequence Analysis (CEAA Registry document 46371E).

<sup>95</sup> The Objective of NG-G-3.2 in part is noted in the following statement contained therein: Radioactive materials discharged from a nuclear power plant might reach the public and might contaminate the environment in the region by way of both direct and indirect pathways. The objective of this Safety Guide is to provide guidance on the studies and investigations necessary for assessing the impact of a nuclear power plant on humans and the environment. It also provides guidance on the feasibility of an effective emergency response plan, in consideration of all the relevant site features.

<sup>96</sup> Dispersion of Radioactive Materials in Air and Water and Consideration of Population distribution in site evaluation, IAEA Safety Standard Series, No. NG-G-3.2, Vienna 2002.

<sup>97</sup> See Undertaking 77 compiled by CNSC reviewing at a high level, 33 nuclear accidents worldwide and the role of human error and other facts in these accidents (human error directly attributable in one-third of the cases; and with a potential role in another third; the remaining third with unknown causes).

<sup>98</sup> At p.9 of the IAEA document, under the heading “Criteria Derived from Considerations of Population and Emergency Planning: “2.27. In relation to the characteristics and distribution of the population, the combined effects of the site and the installation shall be such that:

(a) For operational states of the installation the radiological exposure of the population remains as low as reasonably achievable and in any case is in compliance with national requirements, with account taken of international recommendations;

(b) The radiological risk to the population associated with accident conditions, including those that could lead to emergency measures being taken, is acceptably low.

2.28. If, after thorough evaluation, it is shown that no appropriate measures can be developed to meet the above mentioned requirements, the site shall be deemed unsuitable for the location of a nuclear installation of the type proposed.”

<sup>99</sup> Transcript, Vol. 11 pp.40-41 (Mr. Roche).

<sup>100</sup> Transcript, Vol. 11, p.52 (Mr. Kamps); see also pp. 67, 68 regarding risk of fuel pools, especially in close configuration; and p,70.

<sup>101</sup> Transcript, Vol. 11, pp. 40-42 (Mr. Roche).

<sup>102</sup> Also as noted by Mr. Pereira: Transcript, Vol 11, p.108.

<sup>103</sup> This is another example of an issue which CNSC stated may be deferred to a later licencing process; CELA submits that the JRP itself must be satisfied that this integral activity would not cause adverse effects or if not so satisfied, to deny the licence application and the EA. Transcript, Vol. 2, pp. 234, 235 (Mr. Khotylev and Dr. Thompson referring to dry fuel storage requirements and impacts).

<sup>104</sup> Transcript, Vol. 11, pp.88-91 (question of Mr. Pereira to OPG; response of Mr. Sweetnam).

<sup>105</sup> Transcript, Vol. 11, pp. 38-40 (Mr. Roche).

<sup>106</sup> Transcript, Vol. 4, p.317 lines 8 to 21 (Reference to Document "OPG New Nuclear at Darlington, Dose Consequence Analysis in Support of Environment Assessment" CEEA registry document 397).

<sup>107</sup> Transcript, Vol. 3, p.246 line 22 to p.247 line 3 (Mr. Dobos); see also Transcript, Vol. 4, p.324 lines 6 to 14 (Mr. Basiji).

<sup>108</sup> Transcript, Vol. 2, p.198 lines 11-16 (Mr. McAllister); Transcript, Vol. 4, p.324, lines 6 to 14 (Mr. Basiji).

<sup>109</sup> Impact of increasing radioactive nuclide exposures from routine operations and "upset" events and spills, including tritium exposures and pathways, as well as numerous other emissions such as C-14. Emissions of up to four new reactors in the same geographic vicinity directly increases these exposures to the same population base and increases individual and population wide exposures through a variety of pathways.

<sup>110</sup> Transcript, Vol. 4, p.53 (Ms. Swami referring to PPE revised in November 2010 and provided to JRP, tables 4.3 and 4.4; and referred to August submission to JRP IR response providing total tritium emissions for all four technologies)..

<sup>111</sup> Transcript, Vol. 7, pp.58-59 (Ms. Swami).

<sup>112</sup> *Ibid.* p.60 (Ms. Swami).

<sup>113</sup> Transcript, Vol. 7, p.58 (Dr. Thompson).

<sup>114</sup> See references at endnotes 56-59.

<sup>115</sup> For list of routine radioactive emissions, see Revised Plant Parameter Envelope Nov. 2010, CEEA Registry document 46697E, Tables 4.1 to 4.4.

<sup>116</sup> For example, as Dr. Newland testified, "there may be lessons learned on the characterization of external events and on severe accident progression and phenomena;" and Transcript, Vol. 2, p.157.

<sup>117</sup> Transcript, Vol. 2, p.214 line 9 to p.215 line 15 (Mme. Beudet questions of Dr. Thompson).

<sup>118</sup> Such as CNSC in respect of liquid effluent and surface water: Transcript, Vol. 2, p.196 lines 10-16 and pp.197-198 (Mr. McAllister stating that requirements for additional dry fuel storage which would depend on reactor technology) and Transcript, Vol. 2, p.209 line 20 to p.210 line 2 (Dr. Thompson). An example of the very limited approach to evaluation of accident consequences was provided by CNSC in advising that the approach used was a "safety goal based assessment" because there has been no specific technology selected for the project; a hypothetical "large release frequency" and a "small release frequency" were used for their assessment of adverse effects: Transcript, Vol. 2, p.177, lines 6-22 (Dr. Thompson); lack of information about conventional and radiological effluents since no reactor technology yet selected: Transcript, Vol. 3, p. 241 (Mr. Dobos).

<sup>119</sup> Transcript, Vol. 2, p.193 line 28 to p.194 line 17 (Mr. McAllister).

<sup>120</sup> For example, see Transcript, Vol. 2, p.196 (Mr. McAllister advising that OPG's "commitment to meet all regulatory guidelines" (as opposed to demonstrating same) was not consistent with the EIS Guidelines. CELA submits that the Panel must not accept such "assurances" of future compliance and in the event that the JRP is not fully satisfied, on all of the information actually before it in this EA and Licence Application, that the OPG met the EIS Guidelines and the requirements of CEEA and NSCA to justify issuance of the Licence, then both should be refused.

<sup>121</sup> Transcript, Vol. 13, pp.215-16.

<sup>122</sup> *Re Steetley Quarry Products Inc.* (1995), 16 C.E.L.R. (NS) 161 (Ont.Jt.Bd.), paras.436-37; Transcript, Vol. 3, pp.141-42, 153; Transcript, Vol. 11, pp.169-71; Transcript, Vol. 13, pp.213-14. "See also sections 20 and 24 of NSCA for the statutory test regarding the LTPS").