



Oral presentation

Submission from the Canadian Coalition for Nuclear Responsibility

In the Matter of

Ontario Power Generation Inc.

Application to renew the Power
Reactor Operating licence for the
Darlington Nuclear Generating Station

Commission Public Hearing
Part 2

November 2-5, 2015

Exposé oral

Mémoire du Regroupement pour la surveillance du nucléaire

À l'égard de

Ontario Power Generation Inc.

Demande concernant le renouvellement
du permis d'exploitation pour la centrale
nucléaire de Darlington

Audience publique de la Commission
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The Canadian Coalition for Nuclear Responsibility urges the CNSC Commissioners not to approve the relicensing of the Darlington reactors.

Events of recent years have revealed that the nuclear establishment in Canada, including the staff of the CNSC, has not demonstrated the necessary degree of competence or trustworthiness to justify a decision by you, the Commissioners, to give a green light to this multibillion dollar adventure involving the complete rebuilding of the primary cooling systems of the four Darlington reactors without any adequate assurance that the many hundreds of workers involved will be adequately protected against needless radiation exposure and/or long-lasting radioactive contamination of their persons, while producing tens of thousands of tonnes of highly radioactive nuclear wastes that OPG admits will remain dangerous for a hundred thousand years. The CNSC staff still seems unwilling to acknowledge the plain fact that nuclear power is a technology that is inherently dangerous and requires the utmost honesty and constant vigilance to adequately address the dangers that it poses to workers and society].

We begin with the observation that CNSC staff is unwilling or unable to report the truth faithfully and unflinchingly when it comes to the potential dangers posed by the Darlington nuclear reactors.

(1) The CNSC staff has recently demonstrated that it cannot be counted on to provide objective scientific advice to the Canadian public, to provincial and federal decision-makers, to emergency measures planners, or even to you, the Commissioners, when reporting on the potential dangers of nuclear power plants.

When directed by the Commissioners to write a report detailing the health and environmental consequences of a severe nuclear accident at Darlington, CNSC staff chose instead to produce a document that, in the opinion of CCNR, is lacking in objectivity and scientific integrity.

Released in August 2015 and entitled **Study of Consequences of a Hypothetical Severe Nuclear Accident and Effectiveness of Mitigation Measures**, the CNSC staff report understates the

radioactive releases that would be expected in the event of an actual severe accident at Darlington, thereby providing a distorted picture of the health and environmental consequences that could result under worst – or even moderately bad -- circumstances.

First, the CNSC staff report chose the lowest conceivable radioactive release that can still be regarded as a large release, according to the CNSC's own definition. The CNSC staff report hypothesizes a release of exactly 100 terabecquerels (TBq) of radioactive cesium-137, whereas the CNSC's own definition stipulates that a large release involves MORE than 100 terabecquerels of cesium-137. (In the CNSC staff report, 100 terabecquerels is expressed as 1×10^{14} becquerels.)

" 3.1 How a hypothetical severe nuclear accident was identified for this study

"REGDOC-2.5.2 defines a large release as a release of radioactive cesium (Cs-137) greater than 1×10^{14} becquerels (Bq) over the duration of the accident. The underlying goal has been defined in terms of avoiding undue public disruption, in the case of the large release of Cs-137, to avoid long term relocation. It is a release of this magnitude that was examined in this study."

Moreover, that number was originally chosen with the "underlying goal" of "avoiding undue public disruption" or "long term relocation". These are political criteria, not scientifically determined realistic consequences associated with a genuine severe accident scenario.

This truth is reiterated on page 18, in section 3.2 of the CNSC Study: *"The selected severe accident source term is based on the CNSC large release safety goal for new nuclear power plants (CNSC 2014)."* (page 18) So it turns out this number that is adopted in the CNSC staff report is a SAFETY GOAL for NEW nuclear plants -- plants that are presumably better-designed and better-built than Darlington -- NOT a realistic appraisal of OLD plants like Darlington.

Second, the CNSC staff report neglects to take into account the inherent uncertainties in any such hypothetical nuclear accident scenario involving a large radioactive release. It is common knowledge within the reactor safety community that each radioactive release category (RC) has a range typically spanning one order of magnitude – that is, a factor of 10. Thus a hypothetical accident releasing 100 TBq of cesium-137 could just as well release 1000 TBq of cesium-137, given the inherent uncertainties surrounding the presumed “release fraction”. Indeed, internal CNSC staff correspondence obtained through Freedom of Information reveals that a previous draft of the CNSC staff report did include a scenario involving the release of ten times as much cesium-137 – that is, 1000 terabecquerels of cesium-137 – but that possibility is not even mentioned in the published report.

It is important to realize that 100 TBq of cesium-137 represents much less than one percent of the total inventory of cesium-137 in the core of the reactor – it is only 0.152 percent of the total (see footnote 3 on p. 17 of the CNSC staff report). Thus 1000 TBq of cesium-137 is only about one-and-a-half percent.

I quote from the December 2013 Bruce A Level 2 PRA study, entitled Bruce A Level 2 At-Power Internal Events Risk Assessment (December 2013), because the comparable PRA study for Darlington has not been made public by OPG.

“The release to containment associated with limited core damage is much smaller than for severe accidents (of the order of 1% of core inventory of Cesium and Iodine isotopes as opposed to 10-100% for severe accidents)”

“RCs [release categories] do not represent specific accident sequences or plant conditions but are defined only in terms of radioactivity release to the environment from the point of view of an observer at the site boundary. . . . The range of each RC is typically about one order of magnitude between the lower and upper boundary.”

(Bruce A PRA document, p. 317/330)

Thirdly, the CNSC staff assumes, without any scientific justification, that there are no radioactive releases for the first 24 hours following the accident.

"Three release scenarios were derived for this study....

Scenario 1: A severe accident that progresses for 24 hours, after which a short one-hour release of the GLR occurs (also referred to as the 24-01 scenario).

Scenario 2: A severe accident that progresses for 24 hours, after which a medium-length GLR release starts and continues for 24 hours (also referred to as the 24-24 scenario).

Scenario 3: A severe accident that progresses for 24 hours, after which time a long-length GLR release starts and continues for 72 hours (also referred to as the 24-72 scenario)." (page 19, CNSC staff report)

In fact, it is well known within the reactor safety community that large releases following a severe nuclear accident typically occur early (within the first 24 hours) rather than later (after 24 hours).

"Typically, large releases occur early, before many of the removal mechanisms have had time to take effect, and are of relatively short duration."

"'early' release (<24 hours after reactor trip, i.e., prior to the time that offsite protective action can reliably be credited)." (Bruce A PRA document, page 78/330)

"The RC0 [Release Category Zero] sequences involve severe core damage at all four reactors more or less simultaneously. These sequences are predicted to result in containment failure within 24 hours of the initiation of the accident sequence."

(Bruce A PRA document, page 319/330)

By omitting any mention of this well known principle, CNSC staff is depriving emergency measures planners of a realistic assessment of the urgency with which emergency measures may have to be deployed. Moreover, a great deal more cesium-137 (and iodine-131) will be given off into the environment if the release is early rather than late because there is that much less opportunity for the aerosols to be deposited on surfaces inside the reactor or removed from the air by gravitational settling.

“... relatively small variations of a few hours between the occurrence of an overpressure transient and fission product release transient can result in large differences in predicted releases due to gravitational settling.”

(Bruce A PRA document, page 324/330)

Once again, internal CNSC correspondence obtained through Freedom of Information reveals that earlier releases were considered in earlier drafts of the CNSC study but these were not only omitted from the final published study but were not even mentioned, thereby conveying the impression to the reader that early releases are simply not possible rather than the truth – that they are more likely than late releases.

If the CNSC staff had indicated in their report that they were making these choices – picking the lowest possible number in the lowest possible release category corresponding to the definition of a “large release”, eliminating the admittedly large uncertainty band in each release category, and arbitrarily assuming no early releases – then it would at least have been scientifically respectable though not objective. As it is, CCNR judges that the report is neither scientifically justifiable nor objective.

Fourthly, the CNSC staff indicate in the published report that they are making “every effort” to meet the expectations of the public intervenors that were expressed in previous hearings, and that the assumptions made throughout the report are “conservative” – meaning that the assumptions overestimate rather than underestimate the harmful consequences of a severe accident.

"During the course of the hearings on the EA for the refurbishment and continued operation of the DNGS, intervenors raised concerns regarding the severity of the accident assessed, the absence of an "early release" scenario, adequacy of offsite emergency planning, including evacuation, and potential health effects to the public. Every attempt was made to capture these concerns in the approach to this study..."

from the "Project Overview

"In order to simplify a complex topic, yet be responsive to the concerns raised by intervenors, conservative assumptions have been made throughout the study.... As such, the study is of a theoretical nature, and uses hypothetical severe accident scenarios with a number of conservative assumptions." (page 18)"

Whether deliberate or not, the CNSC staff report seems to be quite misleading. In its defence, one might argue that the study is merely an academic exercise of little or no practical utility. However, the authors of the report make a point of stressing its intended utility:

"The purpose of the study is to consider hypothetical severe accident scenarios and to assess the subsequent consequences to human health and the environment.... The results of the study provide insights that are useful for the purposes of emergency planning and response. Most importantly, it informs the public and other stakeholders of the possible consequences of a hypothetical severe nuclear accident, the effectiveness of emergency planning, and the inherent safety of Canadian nuclear power plants." (page 1)

CCNR finds this passage disturbing, because it suggests that the CNSC staff does not intend decision makers or emergency measures planners to realize that early releases could occur, thereby making timely evacuation difficult or impossible; or that such releases could

be much larger than those presented in this report, resulting in correspondingly greater health and environmental consequences,

CCNR also finds it disturbing that the CNSC staff would see fit to promulgate the dangerous view that nuclear reactors are inherently safe. All responsible bodies that have concerned themselves with actual severe accidents have specifically repudiated this attitude. The difficulty is that workers and managers as well as emergency planners and governmental decision makers are thereby prevented from taking the necessary measures to protect the citizens and the environment as they should – a duty, by the way, that the CNSC is legally mandated to fulfill.

But most of all, CCNR is concerned that this attitude may be leading the CNSC staff to refrain from communicating sound objective scientific advice to decision-makers, including CNSC Commissioners. As a result you, the Commissioners, are being asked to lend your good names to approve multibillion-dollar decisions based on the advice of a staff that may have lost sight of its legal responsibilities to defend, not the nuclear industry, but the workers and the Canadian public, and “to promulgate objective scientific information”.

The CCNR finds it alarming that the CNSC staff would think it acceptable, within their mandate, to promulgate a report that seems to mislead the Commissioners -- and other decision makers at both the federal and provincial level. We note that the CNSC staff report was released in draft form on June 5, 2014, at the very moment when Members of Parliament serving on the House of Commons Standing Committee on Natural Resources were debating the merits of the Nuclear Liability and Compensation Act, a piece of legislation predicated on exempting the nuclear industry from anything more than a token liability for offsite damages in the event of a severe nuclear accident. Of course, the magnitude of the potential public liability cannot be grasped without an honest assessment of what those offsite consequences might be.

CCNR asks the members of the Commission to search their conscience and ask themselves whether they are content to follow

the advice of a staff, which has so clearly indicated its willingness to be party to a scientifically compromised exercise lacking in objectivity. Even more significant is the fact that granting a licence for a decade or more will not only rule out any meaningful public accountability during that lengthy period of time, but will also exclude you, the Commissioners, from exercising an adequate oversight role.

Here's what the Report of the President's Commission on the Accident at Three Mile Island Accident had to say:

“After a six-month investigation of all factors surrounding the accident and contributing to it, the Commission has concluded that:

“To prevent nuclear accidents as serious as Three Mile Island, fundamental changes will be necessary in the organization, procedures, and practices – and above all – in the attitudes of the Nuclear Regulatory Commission, and, to the extent that the institutions we investigated are typical, of the nuclear industry.”

[Overview, sentence 2 - indentation in original]

“After many years of operation . . . the belief that nuclear power plants are sufficiently safe grew into a conviction. One must recognize this to understand why many key steps that could have prevented the accident at Three Mile Island were not taken The Commission is convinced that this attitude must be changed to one that says nuclear power is by its nature potentially dangerous, and, therefore, one must continually question whether the safeguards already in place are sufficient to prevent major accidents.” (page 9)

Here is what the Director General of the IAEA recently had to say on the same subject, in relation to the Fukushima Daiichi triple meltdown:

"A major factor that contributed to the accident was the widespread assumption in Japan that its nuclear power plants were so safe that an accident of this magnitude was simply unthinkable. This assumption was accepted by nuclear power plant operators and was not challenged by regulators or by the Government. As a result, Japan was not sufficiently prepared for a severe nuclear accident in March 2011." [August 2015 Report of the IAEA, Foreword by the Director General]

In addition CCNR believes that there are numerous serious deficiencies relating to worker safety and public safety that argue against any blanket approval for refurbishment activities. The kinds of hazards encountered by workers during refurbishment are more complicated and more insidious than the risks encountered in day-to-day operations at a nuclear plant. There are clear indications that the training of workers and managers is inadequate to provide these many hundreds of workers with adequate information about the hazards of radioactive contamination, especially in the case of the relatively non-penetrating but highly damaging and long-lived beta and alpha emitters.

Moreover, CNSC has no health professionals on staff to address the long-term health risks of the many hundreds of workers who have been needlessly contaminated with carbon-14 (6000 year half-life) and/or plutonium (24 000 year half life). CNSC staff seldom if ever express any concern about the latent health effects that may arise decades later from radioactive contamination that was caused by a failure on the part of CNSC staff to anticipate the radiological hazards, to prevent the workers' exposures, or even to shorten the length of time lasting several weeks during which workers were being exposed on a daily basis.

CCNR has long advocated that CNSC should have a Health Department staffed by health professionals independent of the nuclear industry. CCNR believes that CNSC has an obligation to ensure that the hundreds of contaminated workers in question be followed carefully for many decades to come in view of the decades-

long latency period associated with radiation-induced solid cancers and other radiogenic diseases. This will not only assure the workers that they will receive the best medical care but also provide valuable scientific evidence of the long-term health effects to be expected from such unfortunate examples of radiological contamination.

There is also the question of adequate education of nuclear workers. CCNR has discovered that licensees seldom allow their instructional materials to be taken out of the plant, and with good reason – for those instructions are often woefully inadequate. Should it not be the responsibility of the CNSC to ensure that proper educational materials on the potential harmful effects of radiation exposure and radioactive contamination are prominently displayed on its web site? Should CNSC not have regulations requiring its licensees to communicate detailed prescribed information to the workers so that they fully understand the potential radiological risks? Should not those educational materials provided by the licensees to their own employees be required to be posted on the Internet in case some workers have not been properly instructed?

Is it not time for workers at all nuclear plants to be trained (using specially programmed simulators) to cope with the eventuality of a really severe beyond-design-basis accident? By not addressing these eventualities as real possibilities, and by not planning for them in advance, we are running the risk that the occurrence of a Fukushima-type accident or some other severe event will leave our work force stunned and paralyzed rather than well-prepared.

CCNR believes that the concerns raised by Dr. Sunil Nijhawan regarding unappreciated risks in CANDU reactors under severe accident conditions must be addressed and resolved, preferably with the active participation of outside nuclear experts drawn from other jurisdictions. CCNR is convinced that Dr. Nijhawan is correct in his assessment that, at elevated temperatures, the hydrogen gas generated by steam interacting with the carbon steel in the feeder pipes is far greater than the volume of hydrogen gas presently considered by CNSC staff and utility analysts. CCNR also believes that the other technical concerns raised by Dr. Nijhawan have serious

implications for a proper understanding of the progression of severe accidents in CANDU reactors. These concerns must be addressed and resolved, we feel, before any permission is granted by the Commissioners for the refurbishment of the Darlington reactors, for the simple reason that a series of design changes may be necessary.

CCNR believes that CNSC staff must be told in no uncertain terms to stop regarding critics of CANDU safety as enemies and begin treating them instead as allies. This is particularly true of people like Dr. Frank Greening and Dr. Sunil Nijhawan, both highly knowledgeable and experienced professionals who should be welcomed by CNSC staff as outside experts who can be helpful in highlighting problems that are being overlooked for one reason or another. It should be recognized that most if not all intervenors at CNSC hearings are public-spirited citizens who are genuinely concerned to ensure that the health and safety of Canadians and of the environment is protected.

Thank you for considering these views.

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Canadian Coalition for Nuclear Responsibility.