Media Release

The Refurbishment of Gentilly-2: A Bad Decision for Human Health

Thursday, August 21, 2008 *For immediate release*

Montreal, August 21, 2008. Three non-governmental organizations today deplored the decision of Hydro Quebec to spend two billion dollars to refurbish an aging nuclear reactor at Bécancour.

"This decision guarantees that the air and water will continue to be polluted with radioactive poisons for decades to come, and that the stockpile of long-lived radioactive wastes sitting by the banks of the St. Lawrence River will continue to accumulate, posing a threat to future generations of Quebeckers," said Gordon Edwards, president of the Canadian Coalition for Nuclear Responsibility. "It is a bad decision, and it should be reversed."

"According to Hydro-Quebec documents, the Gentilly-2 nuclear reactor releases radioactive poisons into the environment routinely: 49 different varieties go into the atmosphere, and 42 other varieties go into the water," said Marcel Jetté, president of the Regroupement des travailleurs victimes du nucléaire. "Even the storage area at Gentilly-2, where the radioactive wastes are kept, releases 8 different kinds of radioactive poisons into the environment all the time."

One of the radioactive materials released from the Gentilly-2 reactor is tritium, a radioactive form of hydrogen. It is released into the air in the form of radioactive water vapour, and into the river in the form of radioactive water. When breathed into the lungs, 100 percent of the tritium is absorbed into the body. About half as much again is absorbed directly through the skin. Once inside the body, tritium can cause cancer and genetic damage to DNA molecules; in pregnant women, the tritium is absorbed readily by the developing fetus.

Each year, the Gentilly-2 reactor emits more than 100 trillion becquerels of tritium into the atmosphere, and an even greater amount into the water. (A "becquerel" is a unit of radioactivity: one becquerel indicates that one radioactive disintegration is taking place every second.)

"These figures show that nuclear power is not a clean form of energy," said André Belisle, president of l'Association québécoise de lutte contre la pollution atmosphérique (AQLPA). "In its 2006 report, the BAPE reported that the routine releases of tritium are so great that the radioactivity in the drinking water in nearby communities would be illegal if California drinking water standards were used."

In Canada, drinking water is allowed to have up to 7,000 becquerels of tritium; in California, no more than 15 becquerels per litre is allowed. In 1993, an independent scientific advisory board asked that the permissible level of tritium in Ontario's drinking water be reduced to 20 becquerels per litre. Recently, Toronto City Council passed a resolution asking that the more stringent standard be adopted, but so far it hasn't happened.

What about the other 48 radioactive substances that are given off routinely by Gentilly-2? Only one of them is singled out for special attention: iodine-131. Radioactive iodine concentrates in milk and in the thyroid glands of adults and children. It can cause cancer and a host of other developmental problems in children, from stunted growth and mental retardation to other ailments.

Hydro-Quebec has issued a supply of "iodine tablets" to people living around the Gentilly-2 reactor, to be taken in case there is a sudden increase in the release of radioactive iodine. The non-radioactive iodine in the pills will go to the thyroid gland and prevent the uptake of very much radioactive iodine.

But there is no protection against the other 48 radioactive poisons that are released into the atmosphere, not for the other 42 radioactive materials that go into the drinking water.

"Quebeckers do not need nuclear power," said André Belisle. "Why should we be adding radioactive poisons to the air we breathe? Quebec has had a moratorium against any new reactors since 1978, but now Hydro-Quebec wants to cheat by building a new reactor inside the shell of the old reactor. This should not be allowed."

The three organizations are calling on Prime Minister Charest to enforce the existing moratorium and safeguard the environment of Quebec against further radioactive contamination by saying "no" to the proposed refurbishment. The two billion dollars would be much better spent on energy efficiency programs throughout the province, which will save far more energy than the Gentilly-2 reactor will ever be able to produce.

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According to Hydro-Québec, here are some radioactive substances given off into the environment by Gentilly-2 on a regular basis:

Note: the "m" indicates a "metastable" isotope -- that's an isotope that disintegrates by giving off a gamma ray without any accompanying alpha ray or beta ray.
A "radionuclide" is a particular type of radioactive atom.
An "isotope" is a different variety of the same chemical element; differentisotopes have the same chemical properties but different nuclear properties such as radioactive characteristics.

Gordon Edwards, Ph.D., President,
Canadian Coalition for Nuclear Responsibility

List of radionuclides
by source of emission
http://www.hydroquebec.com/gentilly-2/pdf/ev_risques/2b.pdf

Gentilly-2 Nuclear Generating Station -- emissions into the air

49 radionuclides :

^{3}H (tritium = hydrogen-3 = radioactive hydrogen),
^{14}C (carbon-14), ^{60}Co (cobalt-60),
$^{85}Kr(m)$, ^{85}Kr, ^{87}Kr, ^{88}Kr (4 isotopes of krypton gas),
^{88}Rb, ^{89}Rb (2 isotopes of rubidium),
^{89}Sr, ^{90}Sr, ^{91}Sr, ^{92}Sr (4 isotopes of strontium),
^{95}Zr, ^{97}Zr (2 isotopes of zirconium),
^{95}Nb, ^{97}Nb (2 isotopes of niobium),
^{103}Ru, ^{106}Ru (2 isotopes of ruthenium),
^{110}Ag, ^{111}Ag (2 isotopes of radioactive silver) ,
^{124}Sb, ^{125}Sb (2 isotopes of antimony),
^{130}I, ^{131}I, ^{132}I, ^{133}I, ^{134}I, ^{135}I (6 isotopes of iodine),
^{131}Xe, ^{133}Xe, $^{133}Xe(m)$, ^{135}Xe, $^{135}Xe(m)$, ^{138}Xe
(6 isotopes of xenon gas),
^{134}Cs, ^{136}Cs, ^{138}Cs (3 isotopes of cesium),
^{140}Ba (barium-140),
^{140}La, ^{141}La, ^{142}La (3 isotopes of lanthanum),
^{141}Ce, ^{143}Ce, ^{144}Ce (3 isotopes of cerium),

^{239}Pu, ^{240}Pu, ^{241}Pu (3 isotopes of plutonium),
^{241}Am (americium-241)

Gentilly-2 Nuclear Generating Station -- emissions into the water

42 radionuclides :

^{3}H (tritium = hydrogen-3 = radioactive hydrogen),
^{14}C (carbon-14), ^{51}Cr (chromium-51),
^{54}Mn (managnese-54), ^{59}Fe (iron-59),
^{60}Co (cobalt-60), ^{65}Zn (zinc-65),
^{86}Rb (rubidium-86), ^{89}Sr, ^{90}Sr (2 isotopes of strontium),
^{95}Zr (zirconium-95), ^{95}Nb (niobium-95),
^{99}Mo (molybdenum-99),
^{103}Ru,^{106}Ru (2 isotopes of ruthenium),
^{110}Ag, ^{111}Ag (2 isotopes of silver),
^{124}Sb, ^{125}Sb (2 isotopes of antimony), ^{131}I (iodine-131),
^{134}Cs, ^{136}Cs, ^{137}Cs (3 isotopes of cesium),
^{140}Ba (baryum-140), ^{140}La (lanthanum-140),
^{141}Ce, ^{143}Ce, ^{144}Ce (3 isotopes of cerium),
^{154}Eu, ^{155}Eu, ^{156}Eu (3 isotopes of europium),
^{234}U, ^{235}U, ^{238}U (3 isotopes of uranium),
^{238}Pu, ^{239}Pu, ^{240}Pu, ^{241}Pu (4 isotopes of plutonium),
^{241}Am, ^{243}Am (2 isotopes of americium),
^{242}Cm, ^{244}Cm (2 isotopes of curium)

G-2 external storage area for radioactive wastes -- emissions

8 radionuclides :

^{3}H (tritium = hydrogen-3 = radioactive hydrogen),
^{14}C (carbon-14), ^{54}Mn (manganese-54),
^{60}Co (cobalt-60), ^{95}Zr (zirconium-95),
^{95}Nb (niobium-95), ^{124}Sb (antimony-124),
^{181}Hf (hafnium-181)

Gentilly-2 Nuclear Generating Station: data on some routine radioactive emissions as identified by H-Q.

[ext = external risk; int = internal risk]

SYMBOL	NAME	HALF-LIFE	RAYS	ORGANS	RISK
^{3}H	tritium (hydrogen-3)	13 years	beta	whole body, DNA, fetus	int
^{14}C	carbon-14	5 750 years	beta	whole body	int
^{51}Cr	chromium-51	28 days	beta, gamma, x	intestine, kidney	int
^{54}Mn	manganese-54	10 months	beta, gamma, x	bone, whole body	int
^{59}Fe	iron-59	45 days	beta & gamma	intestine, spleen	int
^{60}Co	cobalt-60	5.4 years	beta & gamma	whole body	Int
^{65}Zn	zinc-65	144 days	beta & gamma	whole body	int
$^{85}Kr(m)$	krypton-85m	4.4 hours	beta & gamma	whole body	ext
^{85}Kr	krypton-85	11 years	beta & gamma	whole body	ext
^{87}Kr	krypton-87	76 minutes	beta & gamma	whole body	ext
^{88}Kr	krypton-88	2.8 hours	beta & gamma	whole body	ext
^{86}Rb	rubidium-86	19 days	beta & gamma	bone, lung, kidney	ext
^{88}Rb	rubidium-88	18 minutes	beta & gamma	bone, lung, kidney	ext
^{89}Rb	rubidium-89	15 minutes	beta & gamma	bone, lung, kidney	ext
^{89}Sr	strontium-89	51 days	beta	bone, milk, teeth	int
^{90}Sr	strontium-90	29 years	beta	bone, milk, teeth	int
^{91}Sr	strontium-91	9.6 hours	beta & gamma	bone, milk, teeth	ext
^{92}Sr	strontium-92	2.7 hours	beta & gamma	bone, milk, teeth	ext
^{95}Zr	zirconium-95	64 days	beta & gamma	liver	int
^{97}Zr	zirconium-97	17 hours	beta & gamma	liver	ext
^{95}Nb	niobium-95	35 jours	beta & gamma	bone, lung	int
^{97}Nb	niobium-97	1.2 hours	beta & gamma	bone, lung	ext
^{99}Mo	molybdenum-99	2.8 days	beta & gamma	all organs	ext
^{103}Ru	ruthenium-103	39 days	beta & gamma	blood, liver, musc.	int
^{106}Ru	ruthenium-106	1 year	beta & gamma	blood, liver, musc.	int
^{110}Ag	silver-110	25 seconds	beta & gamma	pancreas, heart	ext
^{111}Ag	silver-111	7.5 days	beta & gamma	pancreas, heart	ext
^{124}Sb	antimony-124	50 days	beta & gamma	gastrointestinal	ext
^{125}Sb	antimony-125	2.8 years	beta & gamma	gastrointestinal	ext
^{130}I	iodine-130	12 hours	beta & gamma	thyroid	ext
^{131}I	iodine-131	8 days	beta & gamma	thyroid, body	ext
^{132}I	iodine-132	2.3 hours	beta & gamma	thyroid	ext

^{133}I	iodine-133	21 hours	beta & gamma	thyroid	ext
^{134}I	iodine-134	53 minutes	beta & gamma	thyroid	ext
^{135}I	iodine-135	6.6 hours	beta & gamma	thyroid	ext
^{131}Xe	xenon-131	stable	none	none	
$^{133}Xe(m)$	xenon-133m	2 days	gamma	whole body	ext
^{133}Xe	xenon-133	5 days	beta & gamma	whole body	ext
$^{135}Xe(m)$	xenon-135m	15 minutes	gamma	whole body	ext
^{135}Xe	xenon-135	9 hours	beta & gamma	whole body	ext
^{138}Xe	xenon-138	14 minutes	beta & gamma	whole body	ext
^{134}Cs	cesium-134	2 years	beta & gamma	muscle	int
^{136}Cs	cesium-136	13 days	beta & gamma	muscle	ext
^{137}Cs	cesium-137	30 years	beta & gamma	muscle	int
^{138}Cs	cesium-138	33 minutes	beta & gamma	muscle	ext
^{140}Ba	barium-140	13 days	beta & gamma	bone	int
^{140}La	lanthanum-140	1.7 days	beta & gamma	liver, spleen, fetus	int
^{141}La	lanthanum-141	3.9 hours	beta & gamma	liver, spleen, fetus	ext
^{142}La	lanthanum-142	1.5 hours	beta & gamma	liver, spleen, fetus	ext
^{141}Ce	cerium-141	31.5 days	beta & gamma	liver, spleen, fetus	int
^{143}Ce	cerium-143	1.4 days	beta & gamma	liver, spleen, fetus	ext
^{144}Ce	cerium-144	285 days	beta & gamma	liver, spleen, fetus	int
^{154}Eu	europium-154	8.6 years	beta & gamma	bone	ext
^{155}Eu	europium-155	4.8 years	beta & gamma	bone	ext
^{156}Eu	europium-156	15 days	beta & gamma	bone	ext
^{181}Hf	hafnium-181	42 days	beta & gamma	bone	ext
^{234}U	uranium-234	250 000 yrs	alpha	lung, kidney	int
^{235}U	uranium-235	700 million yr	alpha	lung, kidney	int
^{238}U	uranium-238	4.5 billion yrs	alpha	lung, kidney	int
^{238}Pu	plutonium-238	88 years	alpha	bone, lung	int
^{239}Pu	plutonium-239	24 400 yrs	alpha	bone, lung	int
^{240}Pu	plutonium-240	6 567 years	alpha	bone, lung	int
^{241}Pu	plutonium-241	14 years	beta	bone, lung	int
^{241}Am	americium-241	433 years	alpha	bone, lung, kidney	int
^{242}Am	americium-242	16 hours	beta	bone, lung, kidney	int
^{242}Cm	curium-242	163 days	alpha	bone, lung, kidney	int
^{244}Cm	curium-244	18 years	alpha	bone, lung, kidney	int

Predominant contributors to radiation dose through ingestion:

Sr-90, I-131, Cs-134, Cs-137, Ru-103, Ru-106, Pu-238, Pu-239, and Am-241